The Adoption and Use of E-Commerce Technological Artifacts: A Similarity-Consistency Model and an Empirical Investigation

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Abstract

The goal of explaining user acceptance and continued use of information systems (IS) has taken center stage in IS research (Venkatesh et al., 2003). In recent publications, researchers have argued that websites should be designed with the goal of building relationships. Although such research has focused on relationship-building, the theories that have been utilized to explain this process have been static in nature, and many have been based on traditional models like TAM and TPB, which focus on the utilitarian benefits users receive from their interactions with technological artifacts. This research develops a new model for studying e-commerce relationships, proposing that technological artifacts are perceived as *social actors*, which can manifest social characteristics that interact with those of its users in a manner predicted by theories of interpersonal interaction. The model is then tested in an empirical study. Using an automated shopping assistant, the study investigates the effects of perceived measures and computed scores of both similarity and consistency on a number of dependent variables. Similarity and consistency have been both shown to be instrumental in predicting attraction and satisfaction in all forms of relationships. Furthermore, the study investigates the role of design characteristics, such as communication channel modality, the use of suggestive guidance and directives, and two different decision strategies, in forming social perceptions about the shopping assistant as well as shaping perceptions of consistency.

Both similarity and consistency have positive effects on users' evaluations of automated shopping assistants. While the effects of consistency are stronger overall, two types of similarity (personality similarity and behavioral similarity) as well as two types of consistency (consistency across time and consistency across components) are shown to exert unique influences on evaluations of the shopping assistant, such as its trustworthiness, social presence, perceived enjoyment and perceived ease of use. Furthermore, the computed similarity measures were successful in predicting perceived similarity. Design choices, such as the use of decisional guidance, directives, and the elimination by aspect decision strategy, were effective in forming social perceptions of technological artifacts, which were found to be later used as bases for evaluating the artifact's similarity and consistency.

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Acknowledgements

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1. Introduction

A vast collection of e-commerce literature in information systems and marketing discusses how websites can, and should, interact with customers. An assortment of predictor variables, such as the interactivity of websites (Ghose et al., 1998), navigation and content (Davern & Te'eni, 2000), interactive decision aids (Häubl & Trifts, 2000), download times and responsiveness (Dellaert et al., 1999), and even background color and pictures (Mandel et al., 1999), have been studied to determine their impact on outcome variables such as customers' overall satisfaction, trust, loyalty towards a website, their decision quality, and their intentions to buy products from the website or to re-visit it.

In recent studies, researchers have argued that websites should be designed with the goal of *relationship-building* (e.g., Keen, 2000; Ghose et al., 1998; Kumar & Benbasat, 2002). Online stores as well, due to the high costs of attracting and retaining customers, have realized the importance of building ongoing relationships with their customers. The subject of relationship-building has been extended to encompass all activities directed toward establishing, developing, and maintaining successful relational exchanges between customers and online stores. Generally, relationship-building is considered to include a range of ongoing processes, in contrast to a transactional perspective, where transactions are characterized by distinct beginnings, short durations, and clear endings (Morgan & Shelby, 1994).

A substantial amount of relationship-building research has focused on one or more types of social qualities that customers attribute either to the technological artifacts or to the human entities involved in online shopping. For example, *trustworthiness*, a social attribution often confined to human-like entities, has been studied in regards to technological artifacts, such as websites (Gefen et al., 2003; Jarvenpaa et al., 2000; McKnight et al., 2002; Pavlou, 2003; Suh & Han, 2002; 2003), recommendation agents (Sinha & Swearingen, 2002; Komiak & Benbasat, 2004; Wang & Benbasat, 2005), and automated service personnel (Qiu & Benbasat, 2005). Similarly, trust has been studied in relation to proxies of human-like entities, such as trust in a *community of sellers* (Pavlou & Gefen, 2004), trust transfer between websites (Stewart, 2003), and trust and distrust in organizations (Kramer, 1999). Additionally, attempts have been made to study other social dispositions, such as *social action* and *social presence*, as they are manifested by software agents (Reeves & Nass, 1996;

Wang & Benbasat, 2005), and the ability of technological artifacts to convey the kinds of emotive expressions that arise in interpersonal relationships (Zhu & Benbasat, 2004; Kumar & Benbasat, 2002; 2004).

A major concern with the studies conducted to date is that while many of them have focused on relationship-building, the theories they have utilized are *static* in nature, often based on such theories as the Theory of Reasoned Action (TRA) (Fishbein & Ajzen, 1975), the Theory of Planned Behavior (TPB) (Ajzen, 1991), the Technology Acceptance Model (TAM) (Davis, 1989), or Expectation-Disconfirmation models (McKinney et al, 2002). All of these theories focus on the more *extrinsic* determinants of consumer intentions to accept and adopt IT artifacts, including perceived usefulness, ease of use, subjective norm, and perceived behavioral control. However, these theories do not consider relationships as dynamic systems, in which a given relationship is continuously influenced by the properties that individuals bring to their interactions, by the social, cultural, and physical environments in which their interactions occur (Reis et al., 2002), by the participants' perceptions of other entities involved in the interaction (Reeves & Nass, 1996), and by the type and nature of interactions that take place (Reis et al., 2002). In short, while recent studies seem to advocate an experiential and a relationship-building stance, the models they test lack the ability to represent the dynamics of relationships.

This research takes a different approach by proposing that technological artifacts are perceived by their users as social actors, and consequently, interactions in e-commerce relationships are inherently dynamic and interdependent processes, which cannot be completely comprehended solely from an examination of the static dispositions and attitudes of one of the members of the relationship. Berscheid and Reis (1998) have stated that "a relationship between two people is viewed as residing in neither one of the partners but, rather, in their interaction with each other" (p. 198). Hence, e-commerce interactions, whether with other customers or with technological artifacts, constitute the living tissue of the dynamic organism called the "online relationship", and research should focus on the interactions in order to understand the relationships. Prior literature based on static models has either focused on understanding typical interactions (e.g., talking to a serviceperson online compared to conversations in a store) or on examining users' perceptions of technological entities (e.g., regarding the usefulness of the technology). However, these

models have failed to study the interplay of the entities' predispositions, and most importantly, how those predispositions can affect the unfolding patterns of interactions.

Based on the assumption that technological artifacts can be considered social actors, in Figure 1, I propose a general model of the role of design characteristics in forming customers' perceptions of a technological artifact as a social actor.

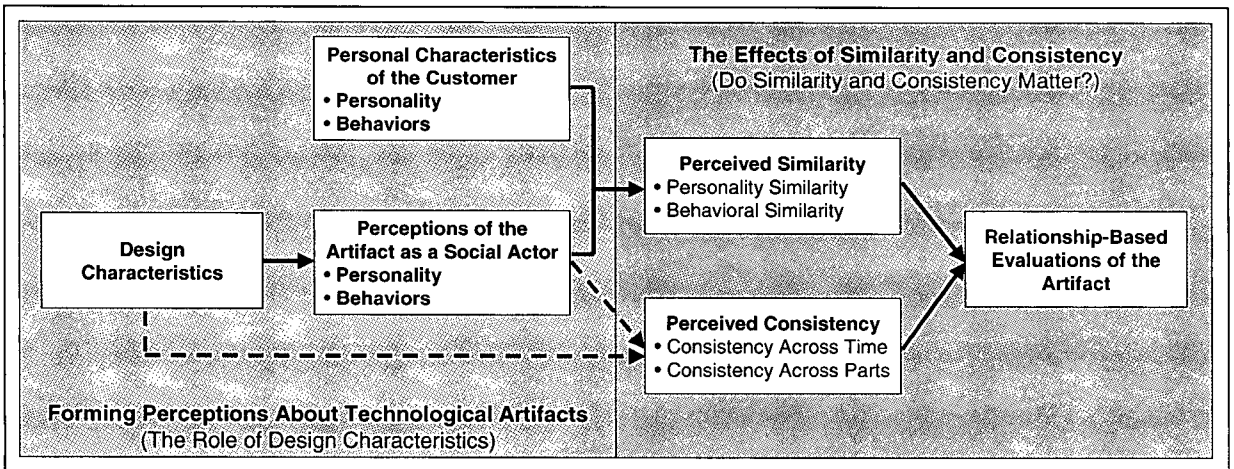

Figure 1: Proposed Model of Evaluating Online Shopping Experiences

Users' perceptions of a technological artifact can take the form of social attributions regarding *behavior* (e.g., decision-making style), *personality* (e.g., personality type), or *social categories* (e.g., gender and gender stereotypes). These attributions are made and elaborated as an individual gathers information over the duration of her interaction with the technological artifact. Consequently, an artifact involved in interactions can be evaluated based on its consistency across time and based on its consistency with other artifacts within the same website or among its parts. The degree of an artifact's consistency can consequently influence the relationship-based evaluations of the IT artifact, since consistency has been demonstrated to affect familiarity and predictability: two central pillars of successful relationships. Furthermore, these perceptions made in regards to the artifact's personality, behaviors or social categories, can then be evaluated by the customer in terms of their similarity to her own characteristics. This evaluation of similarity will consequently influence her evaluations of the artifact (e.g., trust or intentions to return to the website).

2. Purpose of the Study

The general objectives of this study are twofold. First, this study investigates how different types of similarity and consistency influence customer's evaluations of a

technological artifact. Second, the study investigates the role of design characteristics in cueing technological artifacts' personalities and behavioral types. These perceptions are consequently used by the customer to evaluate the artifact's similarity to self, as well as the consistency of these perceptions across time, and their match with each other.

As shown in Figure 1, a customer's evaluations of a technological artifact's similarity to herself or its consistency are contingent on her social perceptions of the artifact. While it is difficult for design characteristics to directly affect perceptions of similarity and consistency, their effects on customer's perceptions of the artifact as a social actor are what can be influenced. Hence, this study is divided into two major parts. First, we investigate the effects of similarity and consistency on users' evaluations of technological artifacts. Second, having shown that both similarity and consistency significantly influence users' evaluations of technological artifacts, we proceed to show how design characteristics can be used to manifest certain personalities and behaviors and shape perceptions of consistency. The specific objectives are:

1. To investigate how the similarity between the customer and the artifact in terms of personality and behaviors can affect the customer's evaluations of the technological artifact.
2. To investigate how the consistency of the artifact can affect the customer's evaluations of the technological artifact.
3. To investigate how some interface design characteristics can manifest specific personality types, cue certain behaviors, and shape perceptions regarding the consistency of the technological artifact.
4. To investigate whether attributions of personality and behaviors depend on the modality of the communication channel (i.e., the interaction richness).

3. Theoretical Background

The proposed model is based on one key assumption: in e-commerce contexts, customers perceive their interactions with technological artifacts as *social interactions*. Two streams of research are relevant to this study. First, human-computer interaction (HCI) literature provides support for the proposition that technological artifacts are perceived as social actors that can manifest specific personalities and behaviors. Second, literature from

social psychology can provide a theoretical foundation of how these personality and behavioral manifestations can be expected to interact with those of the artifact users in a manner predicted by theories of interpersonal interaction.

3.1 Technological Artifacts as Social Actors

While it may be illuminative in some cases to view a technological artifact simply as a medium, user interactions with technological artifacts, such as websites, often extend beyond their communication with other social entities. For example, a user's interaction in an e-commerce setting can extend to one with a product or with a non-human serviceperson (e.g., automated agent). While technology functions primarily as a medium in some activities, such as in e-commerce interactions occurring between human entities engaged in collaborative shopping, a mechanism to understand users' perceptions of technological artifacts as social actors, especially when the artifact is not mediating human-to-human interaction, is required for a complete understanding of the artifacts.

In addition to mediating social interactions between human entities, technological artifacts can be seen as social actors in and of themselves. In their responses to prompts and questions posed by technological artifacts, users often seem to treat the technologies as people (e.g. Turkle, 1984; Winograd & Flores, 1987). In other words, users exhibit *anthropomorphism*, "the tendency of people to believe that [technological artifacts] are people" (Nass et al., 1995, p. 224).

Researchers have offered alternative explanations for anthropomorphism. The first is that "anthropomorphic behaviors are born of ignorance, or of psychological or social dysfunction" (Turkle, 1984). Thus, in order to induce anthropomorphic responses from computer-savvy individuals, complex, agent-based interfaces that are so sophisticated that they would "fool" the user are needed (e.g., animated faces on a screen, use of language, or use of first-person references) (Oren et al., 1990; Nass et al., 1995). This explanation, however, has been refuted through a series of empirical studies confirming that users do not actually view technological artifacts as people, while they tend to make social attributions even when presented with a minimal set of personality cues (Reeves & Nass, 1996).

Another explanation for anthropomorphism is that when individuals respond socially to technological artifacts, "they are adopting the perspective that they are interacting with the human creator or programmer of the machine" (Nass et al., 1995, p. 224). According to this

view of the *artifact as a proxy*, individuals respond rationally to the fact that machines are human-made artifacts (e.g., Dennett, 1988). This view has been repeatedly discredited in relation to computers (e.g., Sundar & Nass, 2000), and is clearly inapplicable in the case of websites, since it is extremely unlikely that an individual will use the website as a proxy for its programmer, inasmuch as the programmer is an anonymous employee or contractor of the company hosting the website.

Both of these explanations fail to account for the results of a number of studies of anthropomorphism (Nass et al., 1995). Under the "Computers Are Social Actors" paradigm (CASA) (Nass et al., 1993; Nass et al., 1994), researchers have consistently demonstrated empirically that individuals unconsciously attribute human-like characteristics (e.g., gender or ethnicity) to technology and media representations, and apply social rules and expectations when they interact with technologies. The application of these social categories and rules has been demonstrated to affect judgments about, and responses to technological artifacts (Lee & Nass, 2003). Table A.1 in Appendix A offers a summary of several studies where computers were found to elicit social responses from users.

The CASA model, which we concur with, stops short of adopting one of the central implications of anthropomorphism, that people believe that technology artifacts are in fact people. Empirical research suggests that the primary characteristics of media that seem to cue these social responses are the *use of language* (Clark, 1999), *interactivity* (Nass & Moon, 2000), and *voice* (Nass & Steuer, 2000). CASA simply suggests that people engage in social interactions with technological artifacts even when they don't think the artifacts are people or proxies of people. The CASA model further asserts that human-computer interaction is social and not anthropomorphic, (i.e. people behave *as if* computers are humans while knowing that they are not) (Nass et al., 1995). This assignment of human attitudes, intentions or motives to non-human entities is referred to as *ethopoeia*, from the Greek term meaning *attributions* (Nass et al., 1993). Reeves and Nass (1996) have concluded that individuals behave in ways that are consistent with *ethopoeia*, and that human-computer interaction can be considered a form of interpersonal communication.

Nevertheless, although empirical studies seem to support the propositions that users can view technological artifacts as social actors, and their interactions with them as

interpersonal, a mechanism that explicates the process is needed in order to better understand this phenomenon. The notion of *mindlessness* is such a mechanism.

While users tend to attribute human-like characteristics and traits to technological artifacts, they know that "the computer [technology artifact] is not a person and does not warrant human treatment or attribution" (Nass & Moon, 2000, p. 82). This is an interesting paradox that can be explained by the state of *mindlessness*, which occurs as a result of conscious attention to a subset of contextual cues (Langer, 1992). These cues are said to trigger various scripts, labels, and expectations on the part of human individuals, which in turn focus attention on certain information while diverting attention away from other information (Nass & Moon, 2000). Experimental evidence has indicated that *mindless* responses toward computers arises in two general areas: 1) overuse of categories such as *gender* (Nass, Moon & Green, 1997), *ethnicity* (Reeves & Nass, 1996), or *in-group versus out-group distinctions* (Nass, Fogg & Moon, 1996); and 2) exhibiting behavior that is irrelevant to computers, such as *politeness* and *reciprocity* (Fogg & Nass, 1997a). Specialist and generalist user behaviors have also been examined and compared to each other, as well as the breadth and depth of social responses exhibited by users (Reeves & Nass, 1996).

3.2 Forming Perceptions of Social Actors

Depending on the degree of interaction richness and type, customers are likely to form perceptions about technological artifacts as social actors. These social perceptions may be related to social categories, behavior, and personality types and traits.

3.2.1 Social Categorization

Users attribute qualities to computers and agents that fit into a number of social categories, such as *gender* and *ethnicity* (Reeves & Nass, 1996). Similarly, we propose that the tendencies of e-commerce consumers to apply social categories when interacting with technological artifacts in online contexts differ depending on the number of cues that are communicated to the consumers. For example, gender attributions are likely to occur when a customer interacts with an artifact that has a physical embodiment, or an artifact that uses voice communication. These social attributions have been demonstrated to affect users' evaluations of technological artifacts (e.g., expertise, Nass, et al., 1997), to encourage the use of social rules (e.g., politeness, Nass, et al., 1999) and to apply stereotypes (e.g., gender

stereotypes, Nass, et al., 1997), and they are likely to be used as input toward evaluating similarity between the users and the artifacts.

3.2.2 Behavioral Attributions

Benbasat and Dhaliwal (1989) proposed four validation criteria to be applied to knowledge-based systems, with the two most important being an assessment of the system's structure and its behaviors. Behavioral attributions can range from attributions of particular tastes or beliefs (e.g., likes and dislikes of particular products) to attributions of decision-making styles and methods of reasoning when choosing among alternatives (e.g., elimination by aspect, or weighted average assessments). For example, particular decision-making styles (e.g., welfare-maximizing) are likely to be attributed to recommendation agents, as demonstrated by Aksoy and Bloom (2001), if enough behavioral cues are communicated.

An important aspect of any decision aid's behavior, in addition to the nature of the recommendations that it makes, is the user's perception of how the aid reasons about its decisions. Following, Wang and Benbasat (2005) have investigated the effects of three types of explanations on trust in Recommendation Agents (RAs). Their analysis supports the hypothesis that explanations, especially in regards to how recommendations are made, can increase customers' trust in RAs. Consequently, the similarity and the consistency of an RA to a user can be evaluated on the bases of the process followed in making a decision, the inputs and outputs offered, or the explanations provided by the RA.

3.2.3 Personality Attributions

Arguably, of the factors that distinguish interpersonal communication from other forms of communication, the personalities of the individuals participating in the interactions constitute the most influential factor (Dryer, 1999). In the context of human interaction, people have been found to automatically and unintentionally simplify the behavior of other people into conventional traits (Uleman et al., 1996; Dryer, 1999), and people generally agree about which other people are best described by particular traits (Moskowitz, 1988). Beyond serving as a categorization mechanism, personality has been found to shape the very nature of social relationships, most importantly impacting the extent to which participants are satisfied with their interactions (Dryer & Horowitz, 1997).

Personality has been conceptualized in many different ways, and at various levels of abstraction. Consequently, the number of personality concepts, scales, and building blocks

recognized by behavioral theorists has increased exponentially throughout the years (Nass et al., 1995). It was not until Cattell (1945), however, that a distinction was drawn between *surface* and *source* traits, leading to several attempts to reduce the number of personality traits to a limited set of dimensions using cluster and factor analysis (Cattell et al., 1970), eventually leading to the famous Big Five structure of personality dimensions (Costa & McCrae, 1988).

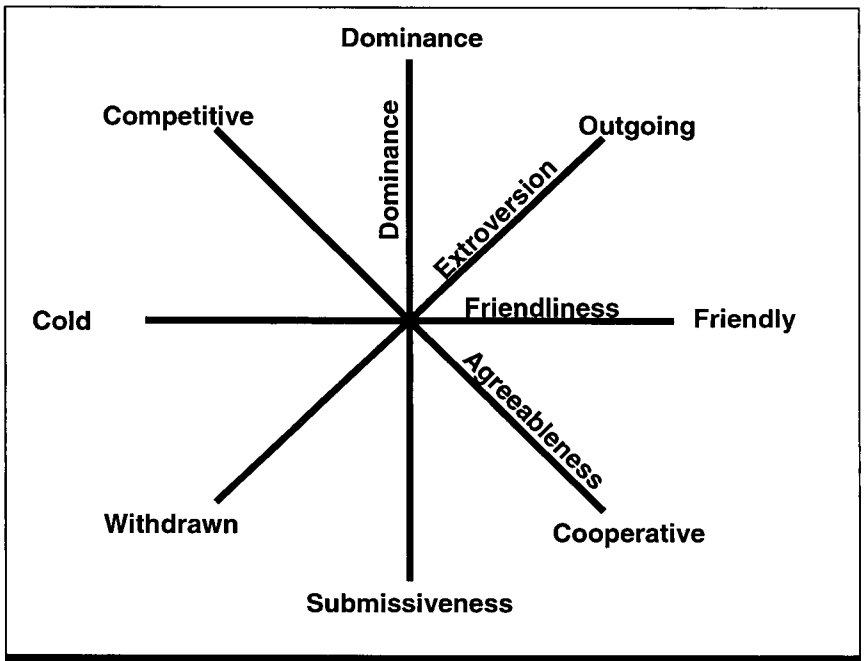

Figure 2: The Two-Dimensional Interpersonal Space

Of the Big Five personality dimensions, two, namely, extroversion and agreeableness, were argued to be most important for social interactions, since they concern individual differences in social behavior (McCrae & Costa, 1989). The three other dimensions, neuroticism, openness to experience, and conscientiousness were shown to have low predictive power in predicting personality-based attraction in social interaction settings (Dryer, 1999). In fact, researchers have developed a two-dimensional circumplex of interpersonal behavior, which corresponds with extroversion and agreeableness (Wiggins & Pincus, 1989). In this circumplex, all interpersonal behaviors are organized along these two orthogonal dimensions. The extroversion factor is commonly referred to as the *power* or *control* factor, and its common rotation "dominance" ranges from dominance to submissiveness. The agreeableness factor is commonly referred to as the *affiliation* or

warmth factor, and it's common rotation "friendliness" ranges from friendly to cold (Nass et al., 1995; Wiggins, 1979; 1982) as shown in Figure 2.

Although many personality studies have assumed that humans are the objects of study, recently attempts have been made to extend the concepts underlying human personalities to non-human objects. A prominent example of this is the considerable amount of attention paid to the construct of *brand personality*, which "refers to the set of human characteristics associated with a brand" (Aaker, 1997, p. 347). Researchers in this area have focused primarily on ways that the personality of a brand enables a consumer to express her own self, an ideal self, or particular dimensions of herself (Aaker, 1997; Kleine at al., 1993). Another example of utilizing concepts of human personality to measure personalities of non-human objects is found in Nass and Moon (2000) and Nass et al. (1995). Although Nass et al. did not attempt to develop an instrument to measure computer personalities, they, however, conducted a number of experiments endowing computers (or software agents) with human-like personalities. The experiments demonstrate that personality attributions can be based on voice, text (Nass & Lee, 2001), physical representation (Dryer, 1999), and textual descriptions of other humans (Byrne et al., 1967). Table A.2 in Appendix A summarizes some of the studies in which computers and software agents have been endowed with human-like personalities, which were perceived by experiment participants and which affected the participants' judgments of and attitudes towards the artifacts.

3.3 Theories of Interpersonal Interaction

Personality and behavior have been shown to play a central role in interactions, relationships, and evaluations one person makes of someone else with whom they interact (e.g., Berscheid & Reis, 1998; Hinde, 1997). Reis et al. (2002) have stated that "it perhaps ought to go without saying that to understand a relationship, one must consider the perspective of both partners. Thus, correlating personality data obtained from one partner with the same person's relationship cognitions, feelings, or experiences, without reference to the other partner's cognitions, feelings, or experiences, or to their interaction with each other, has limited value" (p. 815).

In this section, we first offer an overview of the *similarity-attraction* hypothesis, which postulates that people are attracted to others who are similar to them in terms of personality or behavior. Next, we offer an overview of the *consistency-attraction* hypothesis,

which posits that people are attracted to others who they perceive to have a consistent personality and consistent behavior.

3.3.1 The Similarity-Attraction Hypothesis

It has been proposed that attraction is facilitated by similarity, complementarity, or both (Byrne et al., 1967). The *similarity-attraction* theory postulates that individuals are attracted to others who are similar to themselves. The *complementary* hypothesis, in contrast, proposes that opposites attract. The combination of these hypotheses forms a middle ground, in that it gives only partial support to the similarity hypothesis: similarity is positively associated with attraction only under limited conditions, only in specific groups, or with respect to only a few variables (Bonney, 1946).

Byrne et al. (1967) have provided evidence that attraction toward another individual is a positive linear function of the proportion of similar characteristics. Although support has been found for demographic characteristics, academic interests, achievements, leisure activities, and values, most research focuses on attitude and personality similarity (Morry, 2005). The relationship between similarity and attraction has been the source of both theoretical disputes and empirical inconsistency (Byrne & Griffitt, 1969). The association between similarity and attraction was explained using *cognitive* models (Newcomb, 1961), and using *reinforcement* models (Byrne et al., 1967; 1969). Both models agree on the positive effects of similarity, and on the additive nature. However, in the cognitive model, attributes of others are assumed to be evaluated by the receiver according to his own motives and goals (Newcomb, 1956). Hence, if the salient attributes involve support for one's values and believe, then the perception of similarity will lead to a positive evaluation.

Byrne et al. (1967), a champion of the reinforcement model for explaining the similarity attraction, suggests that in the conceptualization of a reinforcement model of attraction, positive and negative reinforcers (including information about similarity and dissimilarity) are assumed to serve as unconditioned stimuli for implicit affective responses. He further adds that the implicit affective responses serve as mediators for any subsequent evaluative responses such as attraction, or subsequent similarity evaluations. It is therefore proposed that the effect of similar and dissimilar personality characteristics on attraction represents the outcome of a series of conditioning trials.

Reinforcement theories emphasize the role rewards and punishment play in attraction (Berscheid, 1985). Three relevant reinforcement-based explanations are effectance-arousal, uncertainty reduction, and pleasurable and enjoyable interactions (Morry, 2005). The effectance-arousal model posits that since attitudes lack objective verification, individuals look to others for validation (e.g., Byrne, 1969). Clore and Byrne (1974) elaborated on this model to propose that a reinforcement stimulus is linked to attraction through an implicit affective response triggered by this stimulus: a reinforcement-affect model. On the other hand, uncertainty reduction theory proposes that similarity create predictability, allowing individuals to communicate with less effort and greater confidence (e.g., Berger & Calabrese, 1975). Finally, similarity may have a more direct effect by creating pleasurable and enjoyable interactions (e.g., Berscheid & Walster, 1978).

The effects of similarity on attraction have been shown to occur independently of verbalization (Duck, 1977). Hence, evaluations of similarity could occur unconsciously. Additionally, Duck (1977) has provided evidence that the standards for evaluating similarity changes during the course of an acquaintance, where individuals tend to evaluate others on a progressively more specialized and specific set of criteria as their relationship with them matures. Primarily, because interactions at later stages in a relationship tend to be deeper in the sense that they offer more cues in regards to specialized internal characteristics (e.g., attitudes about specific issues).

3.3.2 The Consistency-Attraction Hypothesis

Regardless of how personalities interact in social situations, people prefer to interact with individuals who behave consistently, compared to individuals who behave inconsistently, because consistency in others lightens an individual's cognitive load and makes it easier for the individual to predict what will happen when they engage with others (Fiske & Taylor, 1991; Nass & Lee, 2001). This is usually referred to as the *consistency-attraction* hypothesis.

As is the case with similarity-based attraction, consistency can be evaluated based on behavior and personality characteristics. Additionally, depending on the context, consistency can also be evaluated through time, or across different aspects of an individual's behavior and personality (Dryer, 1999). Hence, unlike similarity-based attraction, consistency-based attraction has a contextual component, where both the length of the relationship, as well as

the depth of the interaction between two individuals can affect perceptions of consistency. For example, in the case of websites, both the customer's length of experience with the website, and the depth of that experience allow the customer to better evaluate the consistency of the website's behavior, appearance, or any combination of the above. This may be manifested through an evaluation of its consistency throughout the relationship, across the website's components (e.g. consistency between text and images), or across the tools it offers (e.g. consistency of voice used by an agent and the text displayed in the case of mixed voice and text displays).

4. Empirical Investigation of the Effects of Similarity and Consistency

The research model is shown in Figure 3. This study investigates the effects of similarity and consistency on users' evaluations of an automated shopping assistant acting as a decision support aid. As argued by Dryer (1999), such agents are likely to encourage social responses through three important features:

1) Potentially, these agents can be created to use full-sentence text and vocal communications, in addition to typical user interface forms of communication, like menus, controls, and icons. Full-sentence text and voice are more natural and human-like, especially for users who prefer verbal over nonverbal communication methods (Horn & Cattell, 1966).
2) Agents can embody task knowledge, as well as reasoning, concerning when and how to engage a user in interaction. This "gives them a compelling kind of contingent behavior" (Dryer, 1999, p. 277).
3) Agents can autonomously perform actions on a person's behalf (e.g. an agent can be delegated to shop on behalf of its users).

It is hypothesized that the perceived similarity between the shopping assistant's personality and behaviors and those of the user will give rise to higher evaluations of the shopping assistant across a number of experiential variables. Furthermore, this study tests for the effects of the consistency of the shopping assistant on customers' evaluations of the shopping assistant. Both, the shopping assistant's perceived consistency across time as well as its perceived consistency across its components are measured and tested.

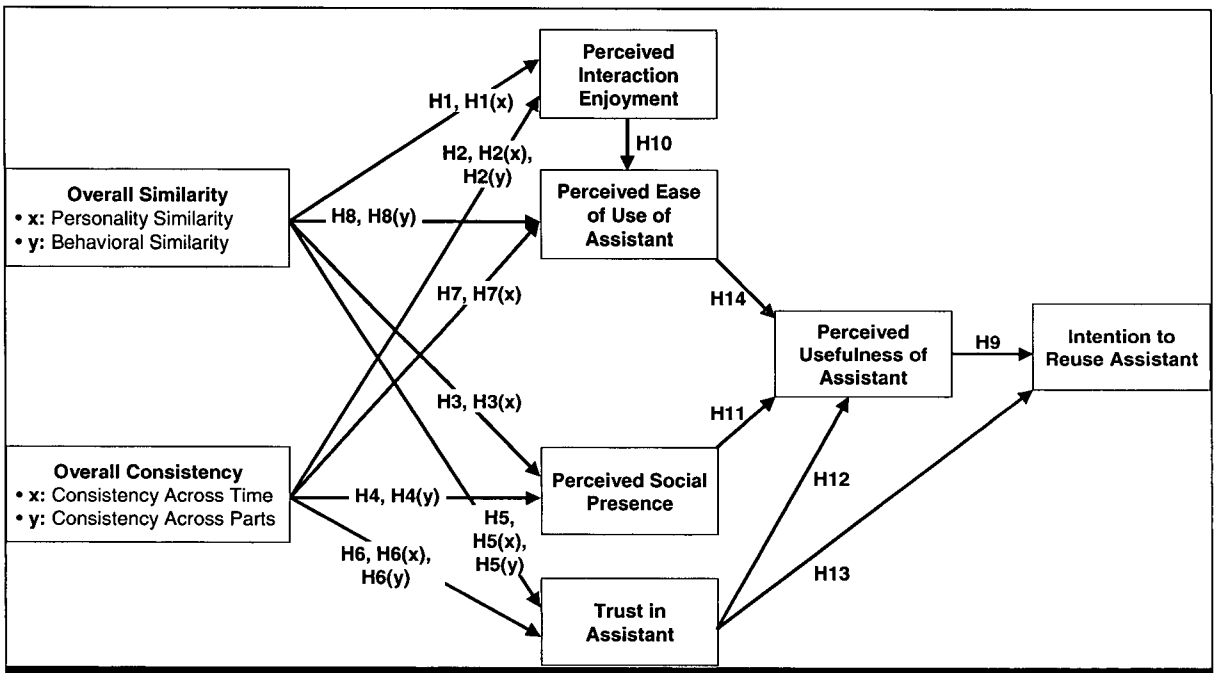

Figure 3: The Effects of Perceived Similarity and Consistency

4.1 Types of Similarity

Two primary indicia of similarity are behavior and personality. In relation to personality-based similarity, researchers have consistently demonstrated that individuals tend to evaluate their similarity to others in terms of one, or at best a small subgroup of personality variables (e.g., Byrne et al., 1967). Similarly, behavioral similarity between two agents, whether it involves their attitudes, values, abilities, emotional responses, tastes, adjustive responses, worries, or even need hierarchies, has been shown to be a commonly used indicia of similarity evaluations (Morry, 2005). Personality-based similarity has been extensively studied in relation to technological artifacts (e.g., Nass et al., 1995). Most recently, Hess et al. (2005) have shown that not only are decision aids able to manifest certain personality types that are recognizable by human users, but these perceived personalities interact with those of the users' in a manner consistent with the similarity-attraction hypothesis.

Similarly, behavior-based similarity has been studied in relation to technological artifacts. Evidence of users' tendencies to use their formed attributions in regards to specific behaviors of technological artifacts, such as decision-making style, in their evaluation of these artifacts was provided by Komiak and Benbasat (2004a). They provided evidence that

users' familiarity with the workings of an RA (e.g. the way to specify preference, access explanations, and review information on recommended items) allowed them to build up trust-relevant knowledge and assess the consistency of RA's actions. Likewise, Aksoy and Bloom (2001) examined the effects of perceived similarity between users' choices of attribute weights and those chosen by an RA when evaluating alternatives. Their findings showed a significant effect for attribute weight similarity on subjects' amount of information search and decision quality. Consumers who were presented recommendations based on attribute weights similar to their own tended to make better decisions (e.g. they were less likely to choose dominated alternatives) and engage in less information search.

4.2 Types of Consistency

As is the case with similarity-based attraction, consistency can be evaluated based on behavior and personality characteristics. At a different level, consistency can also be evaluated through time, or across different aspects of an individual's behavior and personality (Isbister & Nass, 2000; Dryer, 1999). In this study, the consistency of the shopping assistant's personality and behaviors throughout the interaction are measured and treated as one construct (consistency across time) for sake of parsimony, as well as the match between the assistant's personality, behaviors and its physical representation (consistency across components).

This first type of consistency relates to what is typically referred to as the consistency-attraction hypothesis, where people have been shown to prefer to interact, and enjoy interacting, with individuals who have consistent personalities and behave consistently, compared to individuals who have inconsistent personalities and behave inconsistently, because consistency in others lightens an individual's cognitive load and makes it easier for the individual to predict what will happen when they engage with others (Fiske & Taylor, 1991; Nass & Lee, 2001). At a behavioral level, this notion of consistency-attraction is related to Komiak and Benbasat's (2004a) notion of familiarity. Komiak and Benbasat (2004a) have shown that with increased behavioral consistency and familiarity, the actions of a decision support agent, become predictable, leading to a greater level of trust.

The second type of consistency deals primarily with customers' perceptions of the match between the assistant's components. This type of consistency has been studied recently in relation to automated characters. For example, Nass and Lee (2001; 2003) have

conducted two studies that provide evidence that customers are likely to attribute certain personality types to synthesized voices and textual information communicated through a website, and that they also tend to evaluate consistency between the personality that is manifested through a voice and the personality manifested through text. When the personality of a synthesized voice reading a product review on the website matches the personality of textual content, they conclude that users feel a greater sense of social presence (Lee & Nass, 2003), and users judge the voice and the source to be more attractive, informative and credible than when the voice and text are mismatched (Nass & Lee, 2001). Similarly, Isbister and Nass (2000) investigated the effects of matching and mismatching the personality manifested through verbal cues and that manifested through non-verbal cues on participants' evaluations of an interactive character acting as a decisional aid. Their results demonstrated the importance of the consistency across the two manifested personalities, and furthermore, that this type of consistency is more important than personality similarity between the interactive character and its user.

4.3 Hypotheses

Since the model in Figure 1 is designed to demonstrate aspects of relationships in online shopping experiences, this study measured a number of *relationship-based evaluations* (e.g., trust, social presence, perceived enjoyment, and loyalty). Furthermore, since the task used in this study is utilitarian in nature, we further incorporated the traditional TAM variables to illustrate how our model supplements traditional models by incorporating utilitarian measures of system use: *perceived usefulness* and *ease of use*. The TAM variables, and specifically perceived usefulness, have been shown to be highly predictive of reuse intentions of an assortment of technological artifacts (e.g., Davis, 1989; Gefen et al., 2003), and have been widely used and extensively cited in IS research (Venkatesh et al., 2003).

Next, a detailed discussion of the hypothesized effects of similarity and consistency on the different dependent variables is offered, followed by a discussion in regards to differing ways of measuring similarity and consistency. This is followed by an overview of the relationship between the different dependent measures.

Since two different types of similarity and two types of consistency are examined, hypotheses are first developed regarding the overall effects of similarity and consistency, and then detailed hypotheses are developed regarding which type of similarity or consistency is

expected to account for this effect. These hypotheses are suffixed by the letters "x", indicating personality similarity (in the case of similarity hypotheses) or consistency across time (in the case of consistency hypotheses), or "y" indicating behavioral similarity (in the case of similarity hypotheses) or consistency across components (in the case of consistency hypotheses). Hypotheses that are specific to the effects of one type of similarity or consistency are not shown separately in Figure 3, since any individual effect of any of the four types of similarity and consistency will result in a hypothesis regarding overall similarity and overall consistency effects.

4.3.1 The Effects of Similarity and Consistency

4.3.1.1 Perceived Enjoyment

The effects of personality similarity in addition to increasing attraction bases have been shown to extend to affect the level of interaction enjoyment (Newcomb, 1961), in what has been termed "interactions as pleasurable and enjoyable" reinforcement-based explanation (Morry, 2005). It is believed that this enjoyment comes as a result of increased communication ease and reduced potential for conflict (e.g., Berscheid & Walster, 1978). This conclusion has even been confirmed in relation to technological artifacts. For example, Nass et al. (1995) have shown that users who were matched with a computer that was similar to them in terms of its manifested personality thought their interaction with the computer was more enjoyable, exciting, fun, and engaging. The effects of behavior-based similarity however are unclear. To the best of our knowledge, there is no clear empirical evidence supporting the notion that behavioral similarity causes increased levels of interaction enjoyment, since behavioral similarity has often been discussed under similarity as an "uncertainty reduction" reinforcement model. Hence, in addition to offering an overall hypothesis regarding the effects of overall similarity on the perceived interaction enjoyment, we can only hypothesize that personality-based similarity between the shopping assistant and the user accounts for this effect.

H1: *Overall similarity between the customer and the shopping assistant will result in higher perceived interaction enjoyment.*

H1 (x): *Perceived personality similarity between the customer and the shopping assistant will result in higher perceived interaction enjoyment.*

Consistent with traditional studies conducted on the consistency-attraction hypothesis (e.g., Fiske & Taylor, 1991), Nass and Lee (2001) provided evidence that people liked a voice more if its personality matched that of an accompanying text, liked the text-writer more as a result of this match, and consequently, this match resulted in a higher interaction enjoyment. Similarly, Isbister and Nass (2000) showed that when an interactive character's verbal and non-verbal cues were matched, subjects thought their interaction with the character was more fun. In this study, it is hypothesized that both the shopping assistant's consistency across time as well as the consistency across components will have a positive effect on the perceived interaction enjoyment. A primary benefit of both types of consistency is that they ease cognitive load by enhancing familiarity and predictability. This, in part, is expected to result in less conflicts and ease of communication, eventually, making the interaction less cognitively demanding, fun, and more enjoyable.

H2: *Overall consistency of the shopping assistant will increase customers' perceived interaction enjoyment.*

H2 (x): *A perception of a high level of consistency of the shopping assistant across time will increase customers' perceived interaction enjoyment.*

H2 (y): *A perception of a high level of the shopping assistant's consistency across its components will increase customers' perceived interaction enjoyment.*

4.3.1.2 Social Presence

Lee and Nass (2003) have provided evidence that personality similarity between a user and an interactive agent will lead to higher evaluations of the agent's social presence. Since a higher perception of personality similarity is likely to result in an increased desire for interaction and increased attention in both human-human (Berscheid & Walster, 1978; Hartz, 1996; McCroskey et al., 1974) and human-computer interaction (Suler, 1999), this focused and selective attention should lead to increased feeling of social presence. Since we have no empirical evidence showing that such effect also holds in the case of behavioral similarity, we hypothesize that this effect will come specifically as a result of personality-based similarity.

H3: *Overall similarity between the customer and the shopping assistant will result in higher evaluations of the shopping assistant in terms of social presence.*

H3 (x): *Perceived personality similarity between the customer and the shopping assistant will result in higher evaluations of the shopping assistant in terms of social presence.*

Following from the study conducted by Lee and Nass (2003), in which they conclude that users feel a greater sense of social presence when interacting with an automated character that is consistent across its parts, we hypothesize that the consistency between the shopping assistant's personality, behaviors and physical appearance will positively affect its social presence. Lee and Nass (2003) have argued that the reduced cognitive load and decreased disbelief regarding the humanness of the technological artifact that are a byproduct of consistency, will make it easier for users to become deeply engrossed in the virtual environment, consequently, increasing feelings of social presence. Thus, a shopping assistant that exhibits consistency between its components will be perceived as being more socially present than inconsistent assistants.

H4: *Overall consistency of the shopping assistant will increase customers' perceptions of its social presence.*

H4 (y): *A perception of a high level of consistency of the shopping assistant across its components will increase customers' perceptions of its social presence.*

4.3.1.3 Trust

Researchers have discussed the effects of the interaction of personalities and behaviors on trust. The effects of similarity, in addition to increasing the levels of attraction, typically extend to affect feelings of trust (McKnight et al., 1998; Brehm & Kassin, 1996; Levin et al. 2002; Lichtenthal & Tellefsen, 1999; Zuckers, 1986). For example, Lichtenthal and Tellefsen (1999) have integrated findings from past studies into consumer research and psychology, which indicate that buyers often judge their degree of similarity with a salesperson in terms of observable characteristics (physical attributes and behavior) and internal characteristics (perceptions, attitudes, and values). They conclude that while internal similarity can increase a buyer's willingness to trust a salesperson and follow her guidance, observable similarity often exerts a negligible influence on a buyer's perceptions of a salesperson's effectiveness. Additionally, similarity is likely to encourage perceptions of others as in-group members. This common membership can then serve as a catalyst for increased interpersonal trust when interacting with other group members, while bypassing the need for personal knowledge (Brewer, 1981). Hence, one tends to perceive in-group

members to be trustworthier than out-group members, in what was termed identification-based trust (Brewer, 1996; Brewer & Silver, 1978).

In this study, it is hypothesized that overall similarity will have a positive effect on evaluations of the shopping assistant's trustworthiness, as well as the two individual similarity types, namely, personality-based and behavioral-based similarity. This effect will take the form of an uncertainty-reduction reinforcement stimuli (Berger & Calabrese, 1975), where similarity in terms of personality and behaviors will afford predictability, resulting in increased confidence and uncertainty reduction. Furthermore, due to the utilitarian nature of the experimental task, we expect that the behavior-based similarity effect will be greater than that of the personality-similarity based one.

H5: *Overall similarity between the customer and the shopping assistant will result in higher evaluations of the shopping assistant in terms of trust.*

H5 (x): *Perceived personality similarity between the customer and the shopping assistant will result in higher evaluations of the shopping assistant in terms of trust.*

H5 (y): *Perceived behavioral similarity between the customer and the shopping assistant will result in higher evaluations of the shopping assistant in terms of trust.*

Consistency across time typically enhances feelings of familiarity with the interaction partners and their predictability (Fiske & Taylor, 1991). Komiak and Benbasat (2004a) have shown that increased familiarity can lead to a greater level of trust. Similarly, consistency across components was shown to act as an antecedent of credibility (Nass & Lee, 2001; 2003), a construct that is similar to trust in the context of a utilitarian task.

H6: *Overall consistency of the shopping assistant will result in higher evaluations of it in terms of trust.*

H6 (x): *A perception of a high level of consistency of the shopping assistant across time will result in higher evaluations of it in terms of trust.*

H6 (y): *A perception of a high level of the shopping assistant's consistency across its components will result in higher evaluations of it in terms of trust.*

4.3.1.4 Perceived Ease of Use

Consistency is particularly relevant to perceived ease of use. The increased familiarity that is a byproduct of an agent's consistency across time is expected to positively affect a its perceived ease of use. Hence, we hypothesize an effect of overall consistency on the

shopping assistant's perceived ease of use, as well as a hypothesis regarding the effects of the shopping assistant's consistency across time on its perceived ease of use.

H7: *Overall consistency of the shopping assistant will result in higher perceptions of its ease of use.*

H7 (x): *Perceived consistency of the shopping assistant across time will result in higher perceptions of its ease of use.*

An additional hypothesis is offered in regards to the effects of behavioral similarity on the perceived ease of use. We concede that the perceived consistency across time is likely to be the strongest predictor of the assistant's perceived ease of use, but we also believe that in the presence of this type of consistency, similarity of behaviors is likely to have an additional incremental effect on perceived ease of use. Moreover, since more accurate perceptions regarding consistency across time can only be formed in later stages of the interaction, behavioral similarity is also expected to be an influential predictor of ease of use in the absence of accurate perceptions of consistency across time. This effect will take the form of an uncertainty-reduction reinforcement stimuli (Berger & Calabrese, 1975), where similarity in terms of behaviors, holding consistency constant, will afford predictability, allowing the communication to occur with less effort (Morry, 2005). Hence, we offer a hypothesis regarding the effects of overall similarity on perceived ease of use, and another specifically regarding the effects of behavioral similarity.

H8: *Overall similarity between the customer and the shopping assistant will result in higher evaluations of the shopping assistant in terms of ease of use.*

H8 (y): *Perceived behavioral similarity between the customer and the shopping assistant will result in higher evaluations of the shopping assistant in terms of ease of use.*

4.3.2 Relationship Among the Dependent Variables

In this study, customer loyalty will be assessed as a construct of behavioral intentions (loyalty is an intention to use the artifact on a regular basis), exhibiting the relational aspects of a customer's beliefs about the artifact. While objective measures of loyalty have been proposed and empirically tested (e.g., bookmarking behavior; Murphy & Hofacker, 2004), the measurement of loyalty that seems most suitable to capturing the complexities of online relationships is a subjective measure of a customer's willingness to initiate reciprocal interactions with an artifact in the future (e.g., Wang & Benbasat, 2005).

Perceived Usefulness (PU), a central construct in TAM, refers to "the degree to which a person believes that using a particular system would enhance his or her job performance" (Davis, 1989, p. 320). Traditionally, PU has been found to be a strong predictor of a technological artifact's reuse intention (e.g., Davis, 1989; Gefen et al., 2003).

H9: *Higher perceptions of the shopping assistant's perceived usefulness will positively affect its reuse intention.*

Perceived Enjoyment (PE) has been proposed as an important addition to TAM, especially when measuring the adoption and the continuous use of hedonic systems (Van der Heijden, 2004). This concept is defined as "the extent to which the activity of using the computer is perceived to be enjoyable in its own right, apart from any performance consequences that may be anticipated" (Davis et al. 1992, p. 1113). Conflicting evidence exists for whether perceived enjoyment acts as an antecedent of perceived ease of use (Van der Heijden, 2004), or whether in fact the causality is in the opposite direction (Zhu & Benbasat, 2005). However, noting that the study conducted by Van der Heijden (2004) focused on the hedonic nature of information system use, we believe that in a utilitarian task, such as the one used in this study, perceived enjoyment acts as an antecedent to a system's perceived ease of use.

H10: *Perceptions of higher interaction enjoyment with the shopping assistant will lead to higher perceptions of the assistant's ease of use.*

Social presence refers to the degree to which a medium allows its users to establish personal connections (Short et al., 1976). Presence as social richness reveals the extent to which an artifact is perceived as sociable, warm, personal or intimate when interacting with it (Kumar & Benbasat, 2004). Social presence, we argue, is a belief structure that can capture the connection users will feel with the automated shopping assistant, which cannot be captured as effectively by other belief structures like perceived usefulness.

Given previous TAM-based studies that successfully tested social presence as an antecedent to perceived usefulness (e.g., Karahanna and Straub, 1999), we hypothesize a direct link between social presence and perceived usefulness of the shopping assistant.

H11: *Perceptions of higher shopping assistant social presence will lead to higher perceptions of its perceived usefulness.*

Many studies have analyzed different aspects of trust in e-commerce. For example, researchers have investigated whether specific individual characteristics can affect the likelihood of a customer trusting another person or an online store. Lee and Turban (2001) have argued that *trust propensity*, a personality trait, moderates the effects of antecedent variables on trust in Internet shopping. Additionally, researchers have used the trustworthiness of online stores and other technological artifacts as a dependent variable. Applying this approach, numerous studies in e-commerce have studied trust in regards to technological artifacts, such as websites (e.g., Gefen et al., 2003; Jarvenpaa et al., 2000), recommendation agents (e.g., Sinha & Swearingen, 2002; Komiak & Benbasat, 2004a), and automated service personnel (Qiu & Benbasat; 2005). In this last stream of research, the trustworthiness of a technological artifact was found to affect its reuse intentions as well as act as an antecedent of it perceived usefulness (e.g., Gefen et al., 2003).

H12: *Trust in the shopping assistant will positively affect its perceived usefulness.*

H13: *Trust in the shopping assistant will positively affect its reuse intentions.*

Perceived Ease of Use (PEU), another of the original TAM constructs, has been defined as "the degree to which a person believes that using a particular system would be free of effort" (Davis 1989, p. 320). In its original form, PEU has been proposed as an antecedent to perceived usefulness (Davis, 1989). Since then, a number of studies have established the validity of this relationship (e.g., Gefen et al., 2003; Van der Heijden, 2004).

H14: *Higher perceptions of the shopping assistant's ease of use will positively affect its perceived usefulness.*

4.3.3 Measures of Similarity and Consistency

4.3.3.1 Measuring Similarity

Personality and behavioral similarity can be measured in two different ways. Perceived subjective similarity can be measured by directly asking the user to assess her similarity with the shopping assistant. Alternatively, a similarity measure can be computed from the two separate assessments of the user's and the assistant's personality and behaviors. The subjective approach can be traced back at least as far as Allport (1937), who observed, "similarity is personal" (p. 283). Mischel (1977) agreed, stating that "clearly different persons may group and encode the same events and behaviors in different ways" (p. 342). Similarly, Hoyle (1993) demonstrated that, especially in the formation stage of a relationship,

it was the individuals' perceptions of similarity rather than actual similarity that was important in predicting attraction, since accurate estimates of actual similarity often require deep knowledge of others (see also Klohnen & Luo, 2003). Nevertheless, even in earlier stages, actual similarity based on observable characteristics, such as the individuals' age and physical attractiveness, is likely to be predictive of initial attraction (Hill et al., 1976). Moving from the formation stage of relationships and into the maintenance phase, the role of actual similarity in predicting attraction increases relative to perceived similarity, as individuals gain more detailed knowledge of each other (Blieszner & Adams, 1992; Winstead et al., 1997).

Within this approach of measuring perceived similarity, similarity can further be measured using either a variable-centered or an overall-centered (Furr & Funder, 2004) approach. The variable-centered approach defines similarity as a property of a specific behavior or a personality dimension (e.g., asking the user to evaluate their similarity with the assistant on one specific personality trait), and the overall-centered approach defines similarity as a property of overall personality and overall behaviors (e.g., asking the user to rate the perceived similarity of their overall personality with that of the assistant). However, since the relationship between the different personality dimensions is often unclear (e.g., a dominant individual could equally be cold or warm), a variable-centered approach is likely to result in a more meaningful similarity estimate that is specific to the dimension of concern.

An alternative to the subjective approach, similarity can also be measured using computed scores. The perceived approach to similarity has some obvious merits and has been widely endorsed, but it is important to note that the approach assumes rather than demonstrates that similarity is primarily a matter of idiosyncratic perception (Furr & Funder, 2004). Moreover, the perceived similarity may not be the whole story. People may not be fully aware of their similarity to others or the effects of this similarity on their behavior, especially that the effects of similarity have been shown to occur independently of the individuals' ability to verbalize their similarity with others, as demonstrated by Duck (1977). A more accurate estimate of true similarity can be computed using the separate assessments of the user's and the shopping assistant's personality and behaviors. Similar to the case of the subjective measures, these individual measures of personality and behavioral assessments can take a variable-centered or an overall-centered approach. For example, variable-centered

assessments of personality will ask the user to rate her personality, as well as that of the shopping assistant, on a set of specific traits. In an overall-centered approach, for example, the user could be asked to rate her, a well as the assistant's, overall decision style rather than rating them using specific elements of decision style. In this study, we use a variable-centered approach for measuring the separate assessments of personality and behaviors, as well as for directly measuring the perceived personality and behavioral similarity.

This study directly measures the perceived personality and behavioral similarity using two Likert scales. While we do not expect the subject's assessment of the shopping assistant's personality to be related to their ratings of the assistant's behaviors, we, however, expect that perceived behavioral similarity to correlate with the perceived personality similarity. Since the personality treatment will precede the behavioral one in the experimental task, we expect that subjects will have formed some assessment of their personality similarity with the assistant by the time they are administered the behavioral treatment. Hence, this perceived personality similarity will influence their assessment of their behavioral similarity, since different similarity stimuli have been shown to interact and affect each other (e.g., Byrne et al., 1967; Morry, 2005). Specifically, the initial perceptions of personality similarity are expected to give rise to some positive affective responses (Byrne et al., 1967). These can then partially influence the subject's perceived behavioral similarity with the shopping assistant, in what is commonly referred to as the *Attraction-Similarity* hypothesis (Morry, 2005)[1].

H15: *Perceived personality similarity will increase perceptions of behavioral similarity.*

4.3.3.2 Measuring Consistency

Like similarity, consistency can be measured in at least two ways. Within the subjective approach, perceived overall consistency can either be directly measured, or computed through separate assessments of the consistency of individual components (e.g.,

[1] For example, Bochner (1991) proposed that attraction precedes similarity. Bochner reasoned that individuals assume that they and their relational partners should have things in common and therefore communicate in ways to foster the impression of similarity. This influence of attraction on similarity does not preclude the influence of similarity on attraction. In fact, a mutual influence is the most likely scenario. Byrne et al. (1969) found that recent information about attitude similarity influenced liking more than earlier information about attitude similarity, indicating that similarity influences attraction. At the same time, research on projection indicates that attraction also influences perceptions of similarity (e.g., Morry, 2005).

personality). For example a direct measure of the perceived consistency across time is the degree to which a person sees or believes an agent to be consistent throughout the relationship. Similarly, a direct measure of the perceived consistency across components is the evaluator's perception of whether the parts that make up the agent being evaluated fit with each other. Alternatively, consistency can be measured using separate perceived assessments of any of the consistency bases (e.g., personality or behavior) (Furr and Funder, 2004). For example, consistency across time can be measured using two sets of separate assessments of an agent's personality and behavior obtained at different stages of the relationship. Consistency across components, similarly, can be measured using separate assessments of the fit of each of the agent's components (e.g., personality) with all of other components. On the other hand, objective measures of consistency can also be obtained in some cases. These measures are mainly concerned with the actual objective differences that occur throughout the relationship (consistency across time), or the objective inconsistencies between the different components (consistency across components). This study uses perceived subjective measures of consistency to directly measure the perceived consistency across time and across components, as well as perceived measures of the consistency of two individual consistency bases.

As is the case with similarity, consistency whether subjective or objective can be measured at varying levels of abstraction. An agent's consistency across time (whether this agent is human or technologically-based) can be evaluated in regards to one variable (e.g., decision strategy), or in regards to the agent's overall behaviors and personality. Likewise, consistency across components can be measured in relation to the fit between specific aspects of behavior, specific personality traits and physical attributes, or measured as a fit between overall behaviors, personality and physical characteristics. For example, consistency across components can either be measured by asking the user to evaluate the fit between the agents overall behavior and their overall personality, or at a more specific level, the fit between their decision strategy and their level of dominance.

5. Manifesting Personalities and Behaviors

It is not enough to show that perceived similarity and consistency do in fact affect customers' evaluations of such technological artifacts, but we also need to address the question regarding the role of IT design characteristics in shaping these perceptions, an

equally, if not a more, important question in HCI research (Benbasat & Zmud, 2003; Orlikowsky & Iacono, 2001). Specifically, we need to answer the question of how exactly do we design interfaces in such a way that customers perceive a certain personality or behavior? The role of design characteristics, we believe, resides in shaping the social perceptions formed regarding technological artifacts. Since one of the major objectives of this study is to investigate the role of design characteristics in forming social perceptions regarding technological artifacts (e.g., personality traits), we next offer a discussion regarding ways in which design characteristics can be used to manifest certain personalities and behaviors. The model in Figure 4 shows some of the relationships and hypotheses that will be discussed in this section.

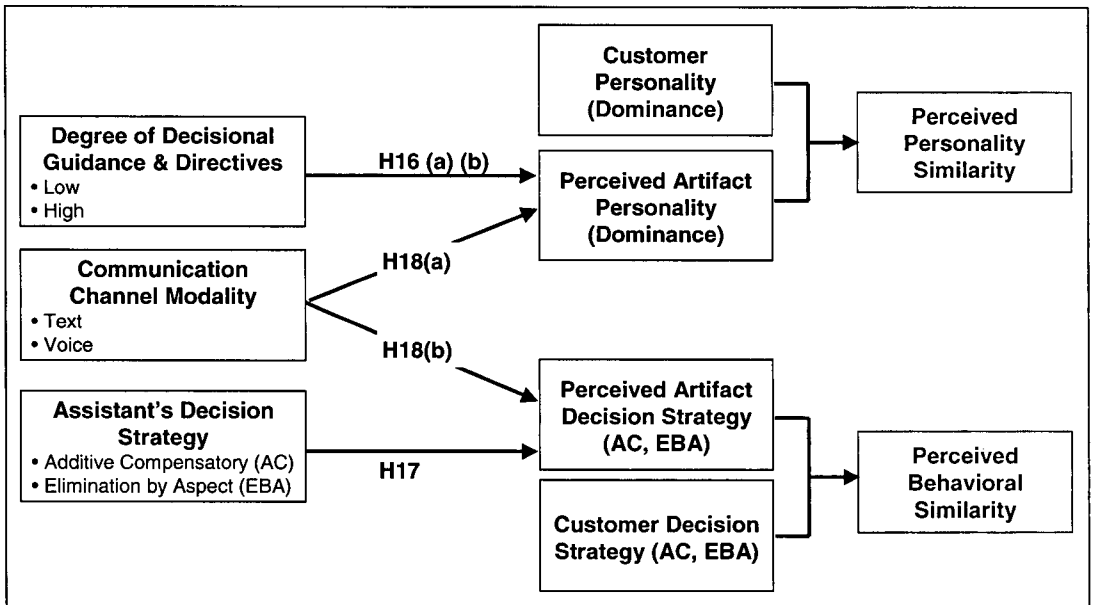

Figure 4: The Role of Design Characteristics

The present study focuses on the dominance factor of the interpersonal circumplex theory of personality, and investigates the effects of behavioral similarity in terms of the decision strategy followed by the shopping assistant to arrive at a recommendation. The dominance dimension of the interpersonal circumplex theory of personality was chosen since it was believed to be more relevant, than the friendliness dimension, to the role of decision support aids primarily as tools to influence users' decision making. More specifically, it is believed that dominance is strongly related to ideas that were extensively studied MIS research, namely decisional guidance (Silver, 1990) and speech acts (Janson et al., 1993). The rotated dimension of dominance was used because it has been shown to be more

influential than the unrotated extroversion dimension in the context of interpersonal interaction (Isbister & Nass, 2000). Decision strategy was chosen as the behavioral basis since it was believed to be most relevant to the utilitarian nature of the task administered, and to the role of shopping assistants as primarily decision support tools.

5.1 Manifesting Dominance

Dominance is marked by behavior that is self-confident, leading, self-assertive, and take-charge. Submissiveness is marked by behavior that is self-doubting, weak, passive, following, and obedient (Wiggins, 1979). Dominant individuals tend to try to exercise power over the behaviors of others, to make decisions for others, and to command and direct others to take certain actions (Kiesler, 1983). Submissive individuals tend to avoid such behavior (Nass et al., 1995). In particular, dominance is behaviorally marked by the following: 1) the ability to give orders, 2) the ability to make decisions and talking others into following them, and 3) often assuming responsibility. Conversely, submissiveness is behaviorally marked by the following: 1) being easily led, 2) letting others make decisions, and 3) avoiding responsibility (Kiesler, 1983).

In this study, dominance will be effected in three separate ways: 1) the use of suggestive guidance (consistent with dominant individuals as often making decisions for others), 2) the use of directives (consistent with dominant individuals having the ability to give orders), and 3) expressing higher confidence levels (e.g. "A TrueLife display *will certainly* offer a viewing experience that is *surely* more crisp and *unquestionably* more vivid") and using assertive and action words (e.g., I *need you* to provide me with your email address") (consistent with the dominant individuals as being self-confident, self-assertive, leading, and take-charge). In contrast, submissiveness will be cued by: 1) the lack of use of any suggestive guidance, 2) abstaining from making any directives, and 3) expressing lower confidence levels (e.g., "A TrueLife display *may* offer a viewing experience that is *probably* more crisp and *possibly* more vivid") and the use of timid and unassertive statements (e.g., "*please* provide me with your email") (consistent with dominant individuals as being self-doubting and passive).

5.1.1 Suggestive Decisional Guidance as a Form of Dominance

System restrictiveness and decisional guidance were first studied in relation to decision support systems (DSS) (e.g., Silver 1990). While the restrictiveness attribute refers

to how much discretion a system allows decision makers, decisional guidance allows us to understand how a system is likely to affect decisional behavior and how that system aids its users in exercising the freedom they are given. Decisional Guidance is defined as "the *degree to which* and the *manner in which* a system guides its users in constructing and executing decision-making processes, by assisting them in choosing and using its operators" (Silver, 1990, p. 57). Decision makers can benefit from computer-based guidance at points in the decision-making process where they must execute judgment, such as deciding which product to choose from a list satisfying certain search criteria, or what complementary products to buy. Decisional guidance can be divided into *suggestive* guidance and *informational* guidance (Silver, 1990). Suggestive guidance proposes courses of action to the user, while informative guidance provides users with relevant information without indicating how the user should proceed.

In this study, *only dominant assistants will offer suggestive guidance*, while both dominant and submissive assistants will offer informative guidance (both assistants will offer the same information, and will only differ in whether any suggestive guidance is given).

H16 (a): *High perceived level of suggestive guidance will increase the shopping assistant's perceived dominance, while low perceived level of suggestive guidance will increase its perceived submissiveness.*

5.1.2 Directive Speech Acts as a Form of Dominance

Speech act theory postulates that to communicate is to perform an act, such as stating facts, making requests, making promises, or issuing orders (Searle, 1979). For example, by making the statement, "I will call you tomorrow," the speaker commits to a future course of action, which in turn affects the hearer. Hence, by uttering the sentence the speaker says something, does something in saying the sentence, and affects the hearer by saying the sentence (Janson et al., 1993). Speech acts are performed to make factual statements (assertives), to request someone to do something (directives), to make promises and commitments (commissives), to effect change (declaratives), and to express a personal feeling (expressives) (Searle, 1979).

Assertives are speech acts that inform the hearer of facts or states of nature. For example, the speech act "The CPU is the most important element of a computer system" describes a fact about computers: its specific function is informing. Directives are acts that request the hearer to do something. Thus, the function of the speech act "Buy this product" is

requesting. Its purpose is to drive the hearer to bring about the condition referred to by the directive. The cornmissive speech acts are those that commit the speaker to accomplishing specified acts. The speech act "We will refund the product if you don't like it" has the specific function of promising and commits the speaker to making good on a promise. The declarative, is used for effecting change by saying so. The speaker brings about a match between the state of the world and the content of the sentence by the act of vocalizing the utterance. Successful completion of the speech act represented by the utterance "Your order will be canceled if a US shipping address is not specified" hinges on the speaker's authority to make such decisions. The last speech act type, the expressive, seeks to express a certain psychological state by the speaker or by the transmitter of the message (Janson et al., 1993). The utterance "We apologize, but this product is out of stock at the moment" has the specific function of apologizing by expressing concern. The implicit goal is to make the inconvenience more acceptable to the hearer.

One of the key behavioral markers of dominance is the ability to give orders (Kiesler, 1983). In this study, the shopping assistant's utterances will take the form of assertives, *followed by directives only in the case of dominant assistants.* The relationship between the use of assertive and directive speech acts and the type of decisional guidance can take many forms. For example, informative guidance can be viewed as assertive speech acts, since both informative guidance and assertives inform the hearer about a state of the world (Searle, 1979). Nevertheless, informative guidance can also include elements of directives. For example, informative guidance such as "A TrueLife display will certainly offer a viewing experience that is crisper than lower resolution displays" could be perceived to be an indirect directive in addition to having assertive speech act elements. Suggestive guidance can be viewed as indirect directive speech acts (Reiss, 1985) if the shopping assistant does not explicitly request the customer to perform a certain action (e.g., this product best fits your needs), as direct directives if the assistant clearly requests the customer to perform a specific action (e.g., buy this product), or directives could occur independently of any guidance. For example, an assistant commanding the user to change her selection (e.g., "My selection is the 700m model ... you should change yours") is likely to be perceived as highly directive, while a one informing the user of its selection without asking her to change hers will be perceived as low in its use of directives.

H16 (b): *High perceived directiveness of the shopping assistant will increase its perceived dominance, while low perceived directiveness will increase its perceived submissiveness.*

5.2 Manifesting Shopping Assistant Behaviors

Consumers were shown to apply up to 12 different decision-strategies to multi-alternative/multi-attribute choice problems, where they choose one out of a number of alternatives described by a common set of attributes (Svenson, 1979). Among these, the Additive Compensatory (AC) strategy is considered to be closest to the normative strategy, while many others are based on heuristics. AC is based on the evaluation of one alternative at a time along all relevant attributes. Each attribute is assigned a weight. A score for each alternative is determined by adding the product of the attribute value and the weight. In contrast, the Elimination by Aspect (EBA) strategy, the most studied heuristic, compares attribute values against user-specified threshold levels across all alternatives. The major difference is that AC allows a high value on one attribute to compensate low ones on others, whereas, EBA eliminates alternatives with an attribute value that does not meet the cut-off level regardless of values of other attributes (Payne et al., 1993). Nevertheless, these decision strategies are not necessarily orthogonal. Individuals are more likely to apply different strategies at different stages of the decision-making process, in some sort of a hybrid decision strategy (Payne et al., 1993). However, it is also likely that the extent of use of one strategy will be higher/lower than the use of a divergent strategy. For example, high use of an AC strategy is likely to imply low use of an EBA strategy.

In this study, a shopping assistant using an Additive Compensatory decision strategy to a high extent: 1) will allow all product attributes to factor into its decision, 2) will assign importance levels to each attribute, 3) will weigh each alternative's specifications against the importance level of each attribute, 4) will use all of the information provided about the importance of each attribute, 5) will not eliminate an alternative until all of its attributes are considered, 6) will not discard an alternative that is rated low on a certain attribute, if it was rated very high on an equally important attribute, and 7) will choose an alternative that is the best on average when considering all attributes and assigned importance levels. A shopping assistant that is high in its reliance on an Elimination by Aspect decision strategy: 1) will allow only some of the product attributes to factor into its decision, 2) will discard some

alternatives after considering only some of their attributes, 3) will discard some alternatives primarily because they didn't meet the cut-off value for a certain attribute(s), 4) will not use all of the information provided about the importance of each attribute, 5) will evaluate the different alternatives based on one attribute at a time, 6) will discard an alterative only because it is rated low on a certain important attribute, and 7) all models that are not chosen by the assistant will not meet the requirements of at least one attribute.

Hence, it is hypothesized that:

H17: *A shopping assistant in the AC manipulation will be perceived to employ an AC decision strategy, while a shopping assistant in the EBA manipulation will be perceived to employ EBA decision strategy.*

5.3 The Role of Interaction Richness

One way to classify social interactions is by the degree of immediacy of feedback and the types of cues conveyed (Kumar & Benbasat, 2002). Taking face-to-face communication as the standard for comparison, other types of interactions are evaluated based on the degree to which participants can express (and perceive) textual information, verbal information, and important cues such as verbal style and non-verbal cues. If verbal communication is natural (as in human speech), important cues such as verbal style, which includes the "choice of words and types of sentences and fluidity of speech, as well as how the person refers to another while speaking" (Isbister & Nass, 2000, p. 253) are communicated. Non-verbal cues, which include "posture as well as the way that the person moves their body when interacting with others" (Isbister & Nass, 2000, p. 254) can only be observed if the communication is visual.

The number of personality cues communicated through an interaction with a technological artifact will depend both on the modality of the interaction as well as the embodiment of the technological artifact. For example, suggestive guidance communicated by a shopping assistant through voice is expected to provide the customer with a larger number of personality cues rather than when the guidance is communicated through text. Similarly, if the assistant was represented by an avatar, additional personality cues could be inferred on the basis of the assistant's physical appearance.

Nevertheless, the specific effects of the additional cues on customers' ratings of a technological artifact along a specific personality dimension are unclear. For example,

depending on the nature of the additional personality cues manifested through the voice of an assistant offering suggestive guidance in an authoritative manner, the interaction of the cues manifested through the decisional guidance with those manifested through voice could further increase the customer's rating of the assistant as dominant, or if the voice cues manifest a submissive rather than a dominant personality, the opposite effect can be expected.

In this study, the effects of the degree of interaction richness are investigated by manipulating the modality of the communication channel. Modality will be manipulated at two levels: 1) information communicated through written text, and 2) information communicated through voice (using text-to-speech technology). In all cases, the embodiment of the shopping assistant will be held constant, where the shopping assistant is represented by a *naturalistic* 2D avatar. Naturalistic avatars are usually humanoid in form, but they have a degraded level of detail (Salem & Earle, 2000). This type of avatar was chosen not only because it is technically feasible, but also because it is cost-efficient under the current Internet access environment for its limited requirements on bandwidth and computing power for visual rendering.

Reeves and Nass (1996) demonstrated in a number of studies that users tend to make social attributions toward technological artifacts even if minimal cues are presented (e.g., text, Lee & Nass, 2003). Hence, the manifestation of a dominant personality by a shopping assistant that is intended to be dominant should be possible regardless of the modality of the communication channel or the embodiment of the shopping assistant. Similarly, the manifestation of the intended assistant decision strategy should be possible under both conditions of communication channel modality.

Since, in this study we do not manipulate the specific cues manifested through voice and embodiment, we cannot offer specific hypotheses in regards to the effects of the additional cues afforded by the increased degree of interaction richness on participant's ratings of the assistant's dominance or decision strategy. Instead, we offer a null hypothesis regarding the effects of modality on participants' perceptions of the artifact as a social actor. A pre-test will be conducted to ensure that the voice chosen as well as the physical representation of the shopping assistant do not offer additional cues in regards to dominance.

H18 (a): *The modality of the communication channel will not have a main effect on participants' ratings of the dominance of the shopping assistant.*

H18 (b): *The modality of the communication channel will not have a main effect on customers' ratings the shopping assistant's decision strategy.*

On the other hand, although we cannot predict the specific effects of the additional cues on ratings of the assistant's personality or behaviors, we can expect the effects of interaction richness to translate into increased perceptions of the social presence of the technological artifact. Presence as social richness reveals the extent to which an artifact is perceived as sociable, warm, personal or intimate when interacting with it. Previous research has indicated that the perception of social presence is a very important mediating variable in forming users' attitudes towards social communication with an information system and influencing their intention to use that system (e.g. Kumar & Benbasat, 2004; Gefen & Straub, 1997). Increased modality of the communication channel is proposed to positively affect customers' rating of the assistant's social presence.

H19: *The modality of the communication channel will affect customers' ratings of the social presence of the shopping assistant, where a shopping assistant using voice will be rated higher in terms of social presence.*

6. Research Methodology

A 2 x 2 x 2 x 2 between subjects research design was used by varying the level of communication channel modality (text only, voice only), the shopping assistant personality (dominant, submissive), the shopping assistant decision strategy (additive compensatory, elimination by aspect), and the shopping assistant's gender (male, female). Subjects were randomly assigned to one of the sixteen treatment conditions. The decision task in each treatment was identical. The shopping assistant's recommendation was not manipulated a priori, and the assistant was limited to choosing one of two similar alternatives. Deciding which one of these two alternatives to recommend to the subject depended on the subject's choice, where the assistant always recommended the alternative (of these two) that was closest to the subject's choice. The final design of this study came after two extensive pilot studies were conducted to refine the experimental manipulation.

6.1 Participants

Participants were 181 e-commerce shoppers recruited from a nationwide panel from a marketing research firm. An invitation to participate in the study was broadcast via electronic

mail to members of the marketing research firm's panel. Individuals were provided a point-based incentive for their assistance in the study redeemable for various prizes available through the marketing firm. The experimental procedure could be accessed online from any Internet enabled computer. Participants had the freedom of when and from where to access the study. The average age of participants was 40. Ninety-one were 91 males and 90 were females. Participants made on average 13 online purchases in the last 12 months, and 46% of participants had at least a Bachelor's degree, while 48% had a household income of $45,000 or more. On average, participants had a mean score of 4 and a standard deviation of 1.49 on the 7-point expertise scale.

6.2 Task

Participants performed an online shopping task for a laptop computer. Since participants' preferences for laptops and their components and accessories might vary, participants were told that they are buying the laptop for a friend. A full description of the friend, as well as a general description of his computer needs was provided to all participants. Participants were also informed that they are at liberty to buy any system, but they would be later asked to provide explanations for their choices. Participants' expertise with laptops and shopping for them was measured. Participants were advised that their chosen laptop model will be evaluated by a panel of judges according to the following criteria: 1) the goodness of the deal attained, and 2) the fit between the chosen system and the needs of the imaginary friend. The treatment laptop store website offered 6 laptop alternatives that varied by the 11 attributes shown in Table 1. Laptop alternatives were specified so that all of the alternatives were non-dominated when price is taken into account.

Model	XPS	9300	700m	600m	6000	2200
Price	$1,630	$1,450	$1,200	$1,075	$999	$870
Processor	Intel Pentium M 760 (2GHz)	Intel Pentium M 730 (1.60 GHz, 2MB Cache, 533MHz FSB)	Intel Pentium M 725 (1.6GHz) Processor	Intel Pentium M Processor 715(1.50GHz, 400MHz FSB)	Intel Celeron M 350 Processor (1.30GHz, 1MB Cache, 400MHz FSB)	Intel Celeron M 350 Processor (1.30GHz, 1MB Cache, 400MHz FSB)
Operating System	Microsoft Windows XP Professional and Windows Media Center Edition	Microsoft Windows XP Professional	Microsoft Windows XP Home Edition	Microsoft Windows XP Home Edition	Microsoft Windows XP Home Edition	Microsoft Windows XP Home Edition
Memory (RAM)	512MB GB DDR2 Dual Channel Memory (up to 2GB)	256 MB DDR2 SDRAM at 533MHz	256MB Shared DDR Memory	256MB DDR Memory	256MB Shared DDR2 Memory	256MB Shared DDR SDRAM
Display	17" UltraSharp Display with TrueLife	17" UltraSharpTM Wide Screen XGA+ Display	12.1" Wide Screen Display with TrueLife	14.1" XGA TFT Display	15.4" Wide Screen XGA Display	14.1" XGA Display
Hard Drive	80GB Ultra/ATA 100 Hard Drive	60GB Ultra/ATA 100 Hard Drive	40GB Ultra/ATA 100 Hard Drive	40GB Ultra/ATA 100 Hard Drive	30GB10 Ultra/ATA 100 Hard Drive	30GB5 Ultra/ATA Hard Drive
CD ROM/DVD ROM	24x CD-RW/DVD Combo Drive	24x CD-RW/DVD Combo Drive	24x CD-RW/DVD Combo Drive	8x DVD-ROM Drive	8x DVD-ROM Drive	8x DVD-ROM Drive
Limited Warranty, Services and Support Options	Premium Service Package plus Nights and Weekend	Plus Service Package plus Nights and Weekend	2Yr Ltd Warranty w/2 Yr At-Home Service + 90 day PC Essentials	1Yr Ltd Warranty, 1Yr At-Home Service, and 1Yr Technical Support	90-Day Limited Warranty and At-Home Service	None
Primary Battery	80 WHr 9-cell Lithium Ion Primary Battery	80 WHr 9-cell Lithium Ion Primary Battery	53 WHr 6-cell Lithium Ion Primary Battery	53 WHr 6-cell Lithium Ion Primary Battery	32 WHr 6-cell Lithium Ion Primary Battery	32 WHr 4-cell Lithium Ion Primary Battery
Wireless Networking Cards	Intel Wireless 1450 Internal Wireless (802.11a/b/g, 54Mbps)	Intel Wireless 1350 Internal Wireless (802.11b/g, 54Mbps)	Intel Wireless 1350 Internal Wireless (802.11b/g, 54Mbps)	Intel PRO/Wireless 2200 Internal Wireless (802.11 b/g, 54Mbps)	Intel PRO/Wireless 2200 Internal Wireless (802.11 b/g, 54Mbps)	Intel PRO/Wireless 2100 Internal Wireless (802.11b, 11Mbps)
Weight	Starting at 7.20 lbs	Starting at 7.50 lbs	Starting at 4.1 lbs	Starting at 4.98 lbs	Starting at 6.65 lbs	Starting at 5.99 lbs

Table 1: Laptop Alternatives

6.3 Treatment Conditions

The different levels of communication channel modality were either programmed using Active Server Pages (ASP) for the text treatment, or a commercial Virtual Host service

for the voice treatment. In the Voice treatment, previously recorded computer-generated voice statements, using TTS technology, were read by an animated avatar representing the shopping assistant. In the text treatment, the same statements appeared below a still picture of the avatar. Participants in the voice treatment were able to refresh the last voice stream by pressing "F5". A screenshot of the experimental interface is shown in Appendix D.

As noted earlier, the dominance dimension of the circumplex model of interpersonal behavior was used to assess the effect of personality similarity. This personality trait was manifested in the treatments by varying the degree of suggestive guidance, the extent of use of directives, as well as the use of more assertive words and expressing higher confidence levels. The same information content was used in all treatments, but consistent with past research on personality, the manner in which the information was conveyed was altered. The scripts for the dominance and submissiveness treatments are included in Appendix B.

Two behavioral treatments were used. The shopping assistant either mainly relied on an AC strategy to arrive at his/her choice or an EBA one. In all conditions, the decision strategy treatment was presented at the end of the task after participants had already made their choice. Both the personality and behavioral treatments were separately pre-tested and were shown to be successful.

The two gender treatments were equivalent in all aspects with the exceptions of the gender of the voice and the avatar representation. Since it was not desired that the face and voice used to manifest unintended additional dominance or submissiveness, a pre-test was conducted to ensure that the shopping assistant's voice and physical representation (i.e. face) used in the final data collection are neutral in terms of their dominance. Six male and four female voice samples were tested. Eight participants rated each voice using the dominance scale and indicated which voice is most natural and human-like. The chosen male voice had a mean of 4.3 on the 7-point Likert dominance scale and a standard deviation of 0. 7, with 75% of the participants indicating it is the most natural and human-like. The chosen female voice had a mean dominance of 4.1 and a standard deviation of 0.7, with 50% of the participants indicating it is the most natural and human-like. Ten potential facial representations of the male shopping assistant were tested as well as six female representations. The chosen male representation had a mean dominance score of 4.1 and a standard deviation of 0.9. The

chosen female representation had a mean dominance score of 4.2 and a standard deviation of 0.3.

6.4 Study Procedure and Measures

An automated shopping assistant was available to offer product-specific information and recommendations (when applicable) communicated through text or voice. Before given the opportunity to make a laptop choice, the shopping assistant provided information about each laptop attribute, one attribute at a time. After the shopping assistant introduced all attributes, participants were asked to rate the assistant on the dominance scale as well as two new scales that were developed to measure the degree of the assistant's decisional guidance and its use of directive speech acts. Next, participants were presented with six laptop alternatives and asked to make a choice. Once a choice was made, participants were asked to provide a detailed description of their decision-making strategy, as well as rate the extent to which they used each strategy on the two newly developed scales measuring the degree to which participants used an AC or an EBA strategy.

Next, participants were directed to a new page informing them that based on the information provided about the friend's computer needs, the shopping assistant would provide a recommendation. Depending on a participant's choice, the shopping assistant's choice was either identical to that of the participants or different. The friend's computer needs were specified so that two of the six models were most suitable. If a participant had already chosen one of these two models, then the assistant's recommendation matched that of the participant, and mismatched it otherwise. This allowed us to develop the outcome similarity manipulation without confounding the behavioral treatment. On the same page on which the assistant's choice was revealed, participants were asked to indicate how surprised they were with the assistant's choice on a semantic differential scale ranging from "Not at all surprised" to "Extremely surprised". Next, participants were directed to a page on which the assistant offered a complete description of its decision-making process. This acted as the behavioral treatment. Next, participants were given a choice of either changing their initial choice, and were informed that a change at this point will not have an impact on the judges' evaluation of how they completed the task (i.e., changing their choice will have no impact on whether they are awarded any of the additional cash prizes). Next, participants were directed to a page where they rated the extent to which the assistant used an AC and an EBA decision

strategy. These two scales were identical to the ones participants used to rate their own decision-making process. Finally, participants were directed to another page and were shown three faces, one of which was the face used during the experimental task, and asked to listen to three voice samples (for the voice treatment), one of which was the voice used in the experimental task, and then asked to indicate which of the faces and voices they believed to be most fitting to the shopping assistant based on their experience interacting with it.

Once participants completed the task, they were directed to an online questionnaire asking them to evaluate the shopping assistant in terms of trust, perceived enjoyment, ease of use, social presence, usefulness, and reuse intentions. The scales used were adapted from previously established scales, and are shown in Appendix C. As a part of the questionnaire, participants were asked to indicate their level of dominance using the dominance scale on which they rated the shopping assistant earlier (IAS-R, Wiggins et al., 1988). Furthermore, the participants completed two scales that measured the perceived behavioral and personality similarity between the shopping assistant and themselves, in addition to two consistency scales measuring the perceived consistency of shopping assistant throughout the interaction, and the perceived match between its behaviors, personality, and physical appearance. Finally, participants were asked to answer several demographics questions, and a 4-item scale measuring their level of expertise with laptop computers.

7. Results

7.1 Reliability and Factor Analysis

Confirmatory factor and reliability analyses were conducted using SPSS for all measures. The results for new measures as well as established scales are described in the next two sections.

7.1.1 Established Measures

A confirmatory factor analysis in SPSS, using the *principal component* method, was conducted to assess the convergent validity of all previously established reflectively measured constructs. The loadings obtained through confirmatory factor analysis were sufficient (> 0.7) for all dependent measures. Exceptions included the fifth and sixth items measuring dominance both in relation to the shopping assistant and the subject[2]. It appeared

[2] These two items were especially problematic in the case of the assistant. While in the case of the self-assessment of the subject's own dominance, the two items loaded adequately on the first

that the variance within these two items was small compared to the variance within other items in the scale. These two items were causing another component to emerge. When deleted, only one factor with an eigenvalue greater than 1.00 emerged for each scale, with the first component explaining at least 50% of the variance (Hair et al., 1998) as shown in Table 2, which also shows the estimates of Cronbach's alpha.

Construct	Reliability (Cronbach's Alpha)		Explained Variance (%)	
	Before Modification	After Modification	Before Modification	After Modification
Dominance (Shopping Assistant)	.8247	.8610	45.94	59.59
Dominance (Subject)	.8826	.8680	55.46	60.64
Reuse Intentions	.9404		78.33	
Perceived Usefulness	.9527		87.81	
Perceived Ease of Use	.7845		62.51	
Trust	.8812		73.88	
Interaction Enjoyment	.8856		74.54	
Social Presence	.9487		83.10	
Trust Propensity (Automated Agent)	.9182		81.00	
Trust Propensity (Human)	.8498		70.49	

Table 2: Estimates of Reliability and Variance – Established Measures

7.1.2 New Measures

Reliability and variance explained estimates are shown in Table 3. As discussed earlier, two new scales were developed to measure the shopping assistant's perceived decisional guidance and the extent of use of directives. The two scales were reliable (i.e., Cronbach's alpha values were greater than the recommended 0.7) and unidimensional (i.e., only one component emerged with an eigenvalue greater than 1). Two other scales were developed to measure the extent to which the subject and the shopping assistant used an AC and an EBA decision strategy. In each scale two items did not load as expected and caused a problem with the scales unidimensionality, where two components with an eigenvalue greater than 1 emerged. Once the two problematic items were deleted from each scale, the two scales became reliable and unidimensional. The same two problematic items in the scales measuring the subject's extent of use of these decision strategies were also problematic in the case of rating the shopping assistant's decision strategy, and hence were deleted from these

component, but gave rise to a second one, these two items caused both problems with unidimensionality and convergent validity in the case of the assistant.

two scales as well. An exploratory factor analysis, using a principal component method, was also performed, where all of the items from the two scales were included in the analysis, to check whether the AC and EBA scales had discriminant validity. That analysis indicated the existence of another problematic item in each scale. These two items were cross loading on the two scales, and hence, the two items were deleted from the scales to ensure that the AC and EBA scales have discriminant validity. At the end, we were left with two scales with 4 items each (item 1, 2, 3 and 4 from the AC scale, and items 1, 2, 3 and 6 from the EBA scale), but most importantly, the two scales were discriminant and reliable, and symmetric across the subject and the assistant. Individual item loadings are shown are shown in Tables 4 (a) and 4 (b).

Construct	Reliability (Cronbach's Alpha)		Explained Variance (%)	
	Before Modification	After Modification	Before Modification	After Modification
Perceived Decisional Guidance	.7951		62.80	
Perceived Directiveness	.7811		70.32	
Additive Compensatory (Subject)	.8185	.7814	50.51	61.13
Elimination by Aspect (Subject)	.6779	.7753	38.71	60.41
Additive Compensatory (Assistant)	.8424	.8445	53.54	68.63
Elimination by Aspect (Assistant)	.8338	.8453	51.37	68.78
Product Expertise	.9318		83.00	
Perceived Behavioral Similarity	.8966		83.29	
Perceived Personality Similarity	.9685		86.40	
Perceived Consistency (Time)	.9608		83.51	
Perceived Consistency (Components)	.9430		85.52	

Table 3: Estimates of Reliability and Variance – New Measures

Item	Component	
	1	2
Subj_AC1	.692*	-.225
Subj_SAC2	.803	.011
Subj_SAC3	.846	-.019
Subj_SAC4	.742	-.175
Subj_SEBA1	-.303	.612*
Subj_SEBA2	-.133	.818
Subj_SEBA3	-.019	.852
Subj_SEBA6	-.093	.765

Table 4 (a): Item Loadings (Subject)

Item	Component	
	1	2
Assis_PAC1	.802	-.245
Assis_PAC2	.814	-.102
Assis_PAC3	.840	-.122
Assis_PAC4	.798	-.116
Assis_PEBA1	-.317	.727
Assis_PEBA2	-.208	.877
Assis_PEBA3	-.019	.819
Assis_PEBA6	-.104	.823

* Item loadings are greater than 0.7 when confirmatory factor analysis is conducted.

Table 4 (b): Item Loadings (Assistant)

The scale measuring the subject's perceived level of expertise with laptops was both unidimensional and reliable. Two scales were developed to measure the subject's perceived behavioral and personality similarity with the shopping assistant. The two scales were highly reliable, and a confirmatory factor analysis showed them to be unidimensional. A principal component analysis also showed that the two scales have discriminant validity. Two other scales were developed to measure the two types of perceived shopping assistant consistency; the consistency of the assistant across time and the consistency of its components. The two scales were shown to be reliable and unidimensional, and a principal component analysis showed them to have discriminant validity. All reliability and variance estimates are listed in Table 3, and items' loadings are shown in Table 5.

Item	Component			
	1	2	3	4
B_SIM1	.849	.297	.090	.119
B_SIM2	.824	.377	.221	.066
B_SIM3	.836	.284	.120	.145
P_SIM1	.195	.888	.091	.143
P_SIM2	.222	.890	.089	.128
P_SIM3	.172	.908	.104	.170
P_SIM4	.211	.875	.056	.110
P_SIM5	.204	.911	.106	.050
P_SIM6	.138	.893	.063	.019
T_CONSIS1	.140	.082	.888	.190
T_CONSIS2	.079	.071	.908	.164
T_CONSIS3	.164	.102	.871	.232
T_CONSIS4	.043	.054	.877	.279
T_CONSIS5	.060	.128	.816	.330
T_CONSIS6	.089	.079	.864	.226
C_CONSIS1	.068	.106	.383	.821
C_CONSIS2	.189	.158	.449	.738
C_CONSIS3	.076	.113	.279	.902
C_CONSIS4	.107	.160	.272	.890

Table 5: Similarity and Consistency Item Loadings

7.2 Manipulation Checks

The subjects' perception of the shopping assistant's dominance was used to verify that the personality treatment was adequately manipulated. As shown in Table 6, overall, the

dominant shopping assistant was perceived to be more dominant ($F(1,179) = 21.86$, $p < .001$), provide more decisional guidance ($F(1,179) = 92.26$, $p < .001$), and more directive ($F(1,179) = 44.38$, $p < .001$) than the submissive shopping assistant. Subject's self-assessed level of dominance did not differ across the two personality treatment groups ($F(1,179) = 0.192$, $p = .662$). The manipulation was also adequate across the two modes of communication and shopping assistant's gender. An exception was the case where a female assistant communicated through voice. While the difference in the perceived dominance of the shopping assistant is marginally significant, it is worth noting that in general the manipulation seemed to be more effective in the case of a male shopping assistant as shown in Table 6.

Measure	Treatment	Text		Voice		Overall
		Male	Female	Male	Female	
Personality (Dominance Scale)	Submissive	2.93	3.58	3.27	3.82	3.44
	Dominance	4.29	4.16	4.07	4.42	4.27
	p-value	.001	.032	.004	.086	.000
Decisional Guidance	Submissive	3.50	4.04	3.87	3.65	3.78
	Dominance	5.32	5.03	5.40	5.07	5.30
	p-value	.000	.000	.000	.001	.000
Use of Directives	Submissive	3.37	3.87	3.72	3.35	3.59
	Dominance	4.92	4.83	4.82	4.67	4.83
	p-value	.000	.007	.002	.008	.000

Table 6: Manipulation Checks – Personality Treatment

The behavioral treatment was successful as shown in Table 7 (a). Overall, subjects' perception of the extent to which the shopping assistant used an AC decision strategy was higher in the condition where the assistant in fact utilized an AC strategy ($F(1,179) = 22.55$, $p < .001$), and their perception of the extent to which the shopping assistant used an EBA decision strategy was higher in the condition where the assistant relied on an EBA strategy ($F(1,179) = 20.30$, $p < .001$). Furthermore, subjects' perception of the assistant's use of an AC strategy was significantly negatively correlated with their perception of its use of an EBA strategy ($r = -0.37$, $p < .001$). These effects seemed to hold under either type of communication channel modality.

Measure \ Treatment	Text			Voice			Overall		
	AC	EBA	*p-value*	AC	EBA	*p-value*	AC	EBA	*p-value*
Assistant's Perceived AC	5.49	4.73	.001	5.88	4.95	.001	5.67	4.84	.000
Assistant's Perceived EBA	3.92	4.99	.000	4.12	4.79	.025	4.01	4.89	.000
Correlation (r)	r = -.386, p = .000			r = -.365, p = .000			r = -.372, p =.000		
Subject's AC	5.81	5.71	.626	5.77	5.64	.544	5.76	5.68	.425
Subject's EBA	4.10	4.48	.163	4.43	4.20	.414	4.26	4.33	.696

Table 7 (a): Manipulation Checks – Behavioral Treatment

However, within the EBA treatment, it seemed that subjects perceived the assistant to be using an AC strategy equally to an EBA strategy. While this could be the result of a recency or a projection bias (note that subjects overwhelmingly rated themselves higher on the AC scale than they did on the EBA one), it is believed that this comes as a result of inherent differences in each scale, where scores on each scale mean little when compared across the two scales. As argued by Sirdeshmukh et al. (2002), the data obtained on most response scales have at best interval properties such that absolute points do not have identical interpretation across different dimensions, and hence, the use of standardized scores are recommended when comparing across different scales. This was further confirmed when the standardized scores of the perceived assistant's reliance on the two strategies were used instead of absolute values. As shown in Table 7 (b), when standardized scores are used, in addition to the main effects of the treatment, an assistant in the AC condition was perceived to be relying more on an AC strategy than an EBA one, and an assistant in the EBA condition was perceived to be relying more on an EBA strategy than an AC one.

Measure	Treatment		
	AC	EBA	*p-value*
Assistant's Perceived AC (Standardized)	0.367	-0.304	.000
Assistant's Perceived EBA (Standardized)	-0.350	0.290	.000

Table 7 (b): Behavioral Treatment Using Standardized Scores

7.3 The Effects of Overall Similarity and Overall Consistency

Analysis of the full model shown in Figure 3 was performed using partial least squares (PLS). PLS is chosen over LISREL in this case because of sample size constraints. For PLS, Chin et al. (1999) suggest 5-10 times the scale with the largest number of formative

indicators, or 5-10 times the largest number of structural paths directed at a particular construct in a structural model.

To determine item-construct loadings, a factor analysis was conducted in PLS using the items and the reflective constructs with no relationships specified between the constructs (Chwelos et al., 2001). The resulting loadings were used for computing the internal consistency statistics, and assessing the measurement model. In Table 8 (a), the diagonal elements represent the square root of average variance extracted (AVE), providing a measure of the variance shared between a construct and its items. A rule for assessing discriminant validity requires that the square root of AVE be larger than the correlations between constructs, i.e., the off-diagonal elements in Table 8 (a) (Chwelos et al., 2001). When the model was first estimated, reuse intentions as well as perceived enjoyment had an AVE value that was smaller than each construct's correlation with perceived usefulness. The item with the lowest loading was removed from each construct (fourth item in reuse intention[3], and second item in perceived enjoyment). The model was re-estimated after the items were removed, and as shown in Table 8 (a), all constructs now meet the discriminant validity requirement. 1995). Likewise, the values for internal consistency are all above the suggested minimum of 0.70 (Fornell & Larcker, 1981). The construct-item correlations are shown in Table 8 (b).

	Fornell	RI	PE	PU	PEU	SP	TR	BS	PS	CT	CC
Reuse Intentions	**0.920**	**0.847**									
Perceived Enjoyment	**0.896**	0.698	**0.804**								
Perceived Usefulness	**0.935**	0.823	0.764	**0.875**							
Perceived Ease of Use	**0.780**	0.552	0.600	0.590	**0.617**						
Social Presence	**0.914**	0.686	0.632	0.670	0.577	**0.836**					
Trust	**0.858**	0.629	0.615	0.652	0.570	0.626	**0.740**				
Behavior Similarity	**0.914**	0.415	0.412	0.471	0.403	0.393	0.410	**0.836**			
Personality Similarity	**0.924**	0.183	0.246	0.183	0.290	0.187	0.290	0.544	**0.854**		
Consistency Across Time	**0.912**	0.392	0.394	0.358	0.512	0.262	0.376	0.295	0.213	**0.832**	
Consistency Across Components	**0.924**	0.376	0.427	0.384	0.496	0.390	0.458	0.308	0.281	0.612	**0.854**

Note. Diagonal elements are the square root of average variance extracted (AVE), which, for discriminant validity, should be larger than inter-construct correlations (off-diagonal elements).

Table 8 (a): PLS Measurement Model (Re-estimated Model)

[3] This was a recoded item, and prior research showed that such items might cause validity problems (Hess et al., 2005)

	RI	PE	PU	PEU	SP	TR	BS	PS	CT	CC
RI1	0.894	0.611	0.726	0.518	0.678	0.576	0.385	0.196	0.359	0.359
RI2	0.932	0.643	0.756	0.532	0.676	0.626	0.374	0.165	0.348	0.382
RI3	0.936	0.640	0.763	0.495	0.625	0.570	0.396	0.173	0.346	0.356
RI4	0.729*									
RI5	0.916	0.674	0.763	0.481	0.539	0.565	0.403	0.187	0.371	0.297
RI6	0.922	0.630	0.781	0.482	0.631	0.576	0.416	0.190	0.381	0.345
PE1	0.765	0.865	0.807	0.587	0.627	0.627	0.436	0.226	0.335	0.343
PE2		0.840*								
PE3	0.511	0.896	0.587	0.513	0.500	0.514	0.336	0.215	0.415	0.423
PE4	0.601	0.928	0.664	0.529	0.569	0.524	0.358	0.246	0.311	0.388
PU1	0.709	0.647	0.880	0.504	0.634	0.560	0.403	0.158	0.290	0.320
PU2	0.798	0.759	0.955	0.559	0.641	0.639	0.477	0.188	0.367	0.402
PU3	0.753	0.689	0.953	0.530	0.589	0.618	0.471	0.208	0.311	0.337
PU4	0.819	0.756	0.953	0.573	0.634	0.642	0.449	0.182	0.372	0.384
PEU1	0.517	0.570	0.544	0.838	0.516	0.490	0.314	0.115	0.525	0.476
PEU2	0.192	0.323	0.212	0.761	0.241	0.281	0.220	0.218	0.405	0.320
PEU3	0.541	0.580	0.555	0.879	0.475	0.523	0.448	0.338	0.506	0.443
PEU4	0.451	0.400	0.503	0.643	0.533	0.477	0.290	0.247	0.201	0.323
SP1	0.650	0.612	0.651	0.523	0.922	0.567	0.386	0.166	0.236	0.368
SP2	0.705	0.609	0.672	0.533	0.902	0.596	0.480	0.225	0.287	0.380
SP3	0.614	0.575	0.569	0.558	0.928	0.604	0.377	0.234	0.279	0.356
SP4	0.607	0.539	0.574	0.475	0.909	0.554	0.287	0.126	0.226	0.324
SP5	0.553	0.542	0.582	0.461	0.910	0.552	0.314	0.161	0.168	0.360
TR1	0.656	0.667	0.729	0.629	0.572	0.828	0.466	0.319	0.487	0.453
TR2	0.336	0.338	0.332	0.310	0.400	0.757	0.194	0.216	0.171	0.275
TR3	0.531	0.521	0.549	0.442	0.588	0.922	0.362	0.280	0.262	0.392
TR4	0.637	0.585	0.636	0.549	0.588	0.923	0.421	0.222	0.377	0.463
BS1	0.444	0.434	0.485	0.378	0.384	0.441	0.907	0.485	0.238	0.282
BS2	0.419	0.388	0.448	0.405	0.417	0.393	0.936	0.560	0.347	0.299
BS3	0.312	0.326	0.388	0.340	0.304	0.327	0.899	0.477	0.268	0.314
PS1	0.209	0.246	0.203	0.285	0.207	0.272	0.519	0.926	0.230	0.309
PS2	0.205	0.253	0.186	0.279	0.223	0.316	0.541	0.931	0.228	0.297
PS3	0.225	0.297	0.233	0.323	0.200	0.327	0.514	0.944	0.248	0.341
PS4	0.215	0.223	0.185	0.274	0.186	0.269	0.518	0.909	0.188	0.271
PS5	0.120	0.193	0.151	0.252	0.155	0.265	0.530	0.938	0.218	0.248
PS6	0.122	0.201	0.135	0.201	0.134	0.217	0.455	0.898	0.159	0.200
CT1	0.376	0.376	0.325	0.449	0.254	0.313	0.317	0.212	0.919	0.535
CT2	0.331	0.315	0.278	0.412	0.209	0.273	0.258	0.188	0.922	0.516
CT3	0.409	0.375	0.351	0.528	0.272	0.419	0.345	0.239	0.918	0.572
CT4	0.325	0.370	0.329	0.492	0.226	0.316	0.238	0.173	0.924	0.583
CT5	0.340	0.383	0.339	0.524	0.219	0.361	0.275	0.247	0.887	0.616
CT6	0.364	0.341	0.343	0.527	0.252	0.392	0.272	0.200	0.901	0.548
CC1	0.377	0.393	0.362	0.468	0.368	0.451	0.261	0.244	0.590	0.918
CC2	0.384	0.444	0.381	0.528	0.385	0.461	0.379	0.315	0.646	0.893
CC3	0.315	0.387	0.348	0.445	0.343	0.396	0.265	0.253	0.524	0.940
CC4	0.324	0.368	0.338	0.421	0.351	0.407	0.304	0.302	0.520	0.944

* Item was deleted when model was re-estimated. Original loading shown

Table 8 (b): Construct-Item Correlations

First, an analysis of the full model was conducted where overall similarity and overall consistency were used. Overall measures were modeled as formative constructs with the means of the perceived similarity and consistency measures acting as formative indicators. To guard against collinearity bivariate correlations were examined for the two pairs of similarity and consistency indicators. The maximum inter-correlation was 0.612 between the two consistency indicators, less than the suggested tolerance of 0.90 to guard against collinearity (Tabachnick & Fidell, 2001). All dependent measures were reflected using their respective scale items. This model was analyzed to: 1) investigate whether similarity and consistency in general do in fact affect the dependent variables, and 2) compare the relative effects of consistency and similarity. The full model is shown in Figure 5.

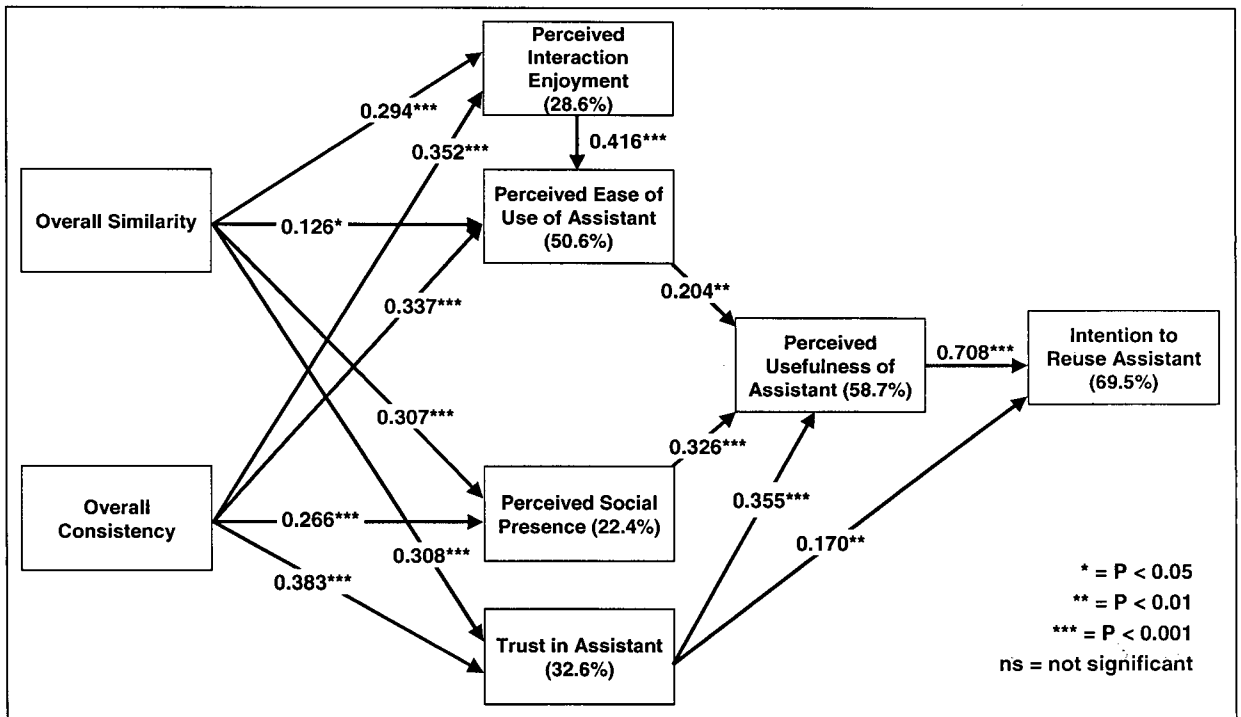

Figure 5: The Effects of Overall Similarity and Consistency

First, the model results validate the proposed and previously established relationships between the dependent variables. Hypotheses 9, 10, 11, 12, 13 and 14 were all supported. Second, the results of the model indicate that both similarity and consistency have strong positive effects on a number of the dependent variables. The results lend full support to all of the hypotheses made in regards to the effects of overall similarity and overall consistency (Hypotheses 1, 2, 3, 4, 5, 6, 7, and 8). Furthermore, the model analysis reveals that overall;

consistency exerts stronger effects on the dependent variables that it conjointly influences with similarity, with the exception of social presence where the reverse is observed. This replicates previous results arrived at in similar studies, where,, for example, Isbister and Nass (2000) provided evidence that the consistency between the two personality types manifested by an interactive character's verbal and non-verbal cues was more influential than the similarity of these personality types with that of the user.

Indicator	Weight	t-stat
Overall Similarity		
Behavior Similarity	0.939	10.346
Personality Similarity	0.104	0.655
Overall Consistency		
Consistency Across Time	0.444	2.737
Consistency Across Components	0.665	4.649

Table 9: Formative Constructs: Weights and t-statistics

Finally, another conclusion that can be drawn from the model is in regards to the relative importance of the two types of similarity and two types of consistency. The importance of each similarity and consistency type is reflected in the coefficients of each indicator, which are shown in Table 9. The magnitude of the coefficient is compared to the standard error of the estimate and thus determines if the coefficient is significantly different from zero. If so, then the indicator is a valid contributing measure for the construct. An insignificant formative path coefficient is usually the result of an indicator that is either redundant to other items or one that does not make a valid contribution to the construct or its consequents (Bollen, 1989; Diamantopoulos & Winklhofer, 2001). Note that typical tolerances for reflective item loadings (e.g. 0.7) do not apply in this case. A coefficient of even 0.10, so long as it is statistically significant, makes the item a valid contributor to the dimension. In this model, while both consistency types had significant coefficients, only behavioral similarity had a significant coefficient. This, as mentioned earlier, could mean that either personality similarity doesn't make a significant contribution, or that it becomes redundant when conjointly forming overall similarity with behavioral similarity[4]. If the latter

[4] Note that since an evaluation of any formative indicators requires an underlying reflective model for mathematical identification, the coefficients of the formative indicators are likely to change with the changes in the underlying model. Hence, the relative effects of both types of similarity or consistency are likely to change if the relationship between the overall similarity and consistency constructs and the dependent variables changes.

is true, then it is possible for personality similarity when modeled as a separate construct to be an influential predictor.

7.3.1 The Specific Effects of Similarity and Consistency

Having answered the question of whether similarity and consistency do in fact matter, we now move our attention to investigate the specific effects of the different types of similarity and consistency. While the model shown in Figure 5 indicates that behavioral similarity and consistency across components are the stronger predictors, this conclusion is both insufficient, and may be misleading. First, while it is indeed important to validate the notion that similarity and consistency do indeed matter, this conclusion adds little to our knowledge in terms of the different effects that each similarity and consistency type can have (e.g., which similarity type affects which dependent variable). Second, this model may overestimate the effects of similarity and consistency by incorporating some effects of one of the two types of similarity or consistency on a dependent variable, which when modeled separately are insignificant or cannot be supported by theory. For example, the overall similarity effect on perceived ease of use may include components of personality similarity effects, which maybe insignificant when the separate effect of personality similarity on perceived ease of use is examined, and most importantly, an effect that has no support in theory. Finally, while the results of the model in Figure 5 may imply that personality similarity is inconsequential, modeling the two similarity types separately may provide a clearer, and potentially opposing picture of the role of personality similarity.

Item	Loading	t-stat	Item	Loading	t-stat
Behavior Similarity			**Consistency Across Time**		
B_SIM1	0.917	45.219	T_CONSIS1	0.913	47.460
B_SIM2	0.937	60.500	T_CONSIS2	0.914	41.608
B_SIM3	0.887	36.925	T_CONSIS3	0.921	56.025
Personality Similarity			T_CONSIS4	0.924	54.096
P_SIM1	0.932	39.441	T_CONSIS5	0.892	38.758
P_SIM2	0.938	42.683	T_CONSIS6	0.905	43.914
P_SIM3	0.948	92.350	**Consistency Across Components**		
P_SIM4	0.908	43.030	C_CONSIS1	0.921	43.658
P_SIM5	0.931	42.132	C_CONSIS2	0.903	39.619
P_SIM6	0.886	31.096	C_CONSIS3	0.934	77.471
			C_CONSIS4	0.938	77.966

Table 10: Reflective Constructs: Loadings and t-statistics

Consequently, we evaluated two additional structural models, the first examining the specific effects of the two types of similarity on the dependent measures, and a second examining the effects of the two types of consistency. These two models were intended to test the hypotheses in regards to the specific effects of the types of similarity and consistency, suffixed in Figure 3 by the letter "x" or "y". The two models are shown in Figures 6 and 7. The loadings and t-statistics of the items in each of the reflectively modeled perceived similarity and consistency types are shown in Table 10. All loadings were adequately high and statistically significant.

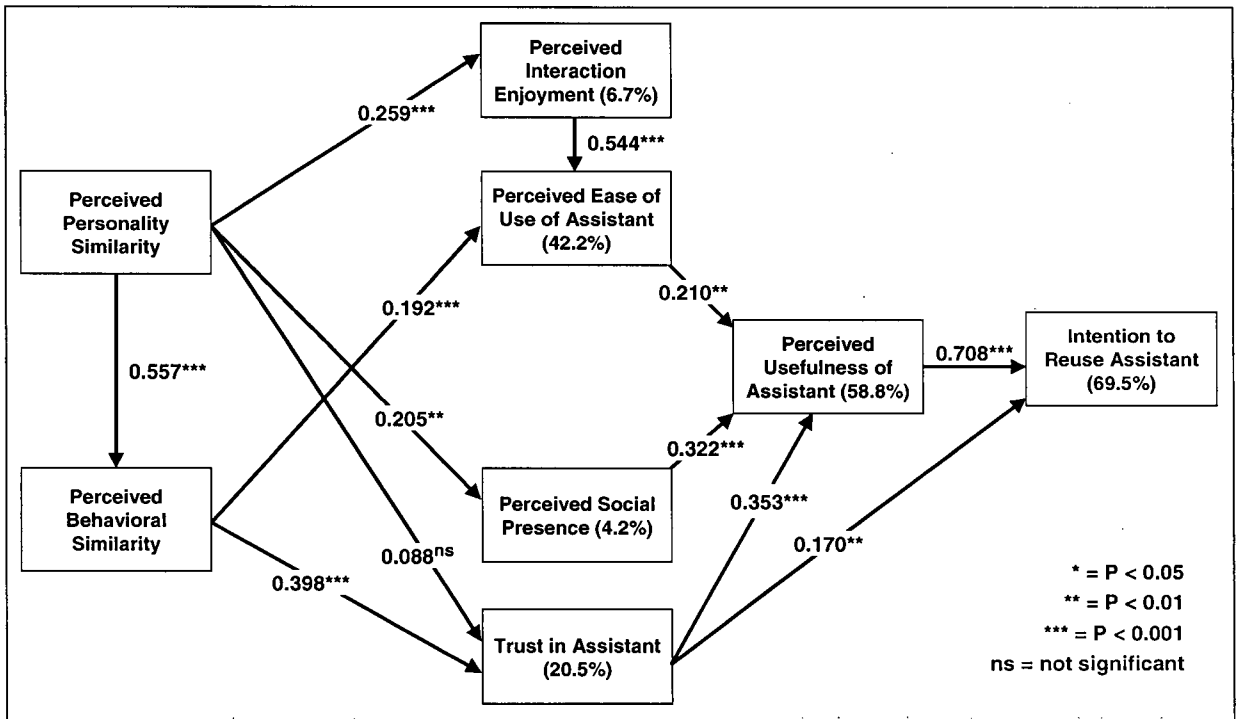

Figure 6: The Specific Effects of Similarity

The results of the two models lend support to all hypotheses made in regards to the specific effects of the two types of similarity and consistency. An exception is the hypothesized effect of personality similarity on trust (H5 (x)), which seems to be mediated by perceived behavioral similarity. Hence, while Hypothesis 5 (x) is not supported, hypothesis 15 is supported.

Based on the similarity model, behavioral similarity appears to dominate personality similarity when the two have a shared effect on a certain independent variable. Nevertheless, since this model excludes any effects that that behavioral similarity may have on some

dependent variables, which are not theory-driven, the results indicate that personality similarity, when modeled as a separate construct, is indeed a significant predictor of perceived interaction enjoyment and social presence. Nonetheless, behavioral similarity clearly dominates personality similarity when both conjointly influence trust. We attribute this to the utilitarian nature of the experimental task, and believe that the assistant's behavior, and specifically its decision strategy, was probably more salient and viewed to be most relevant.

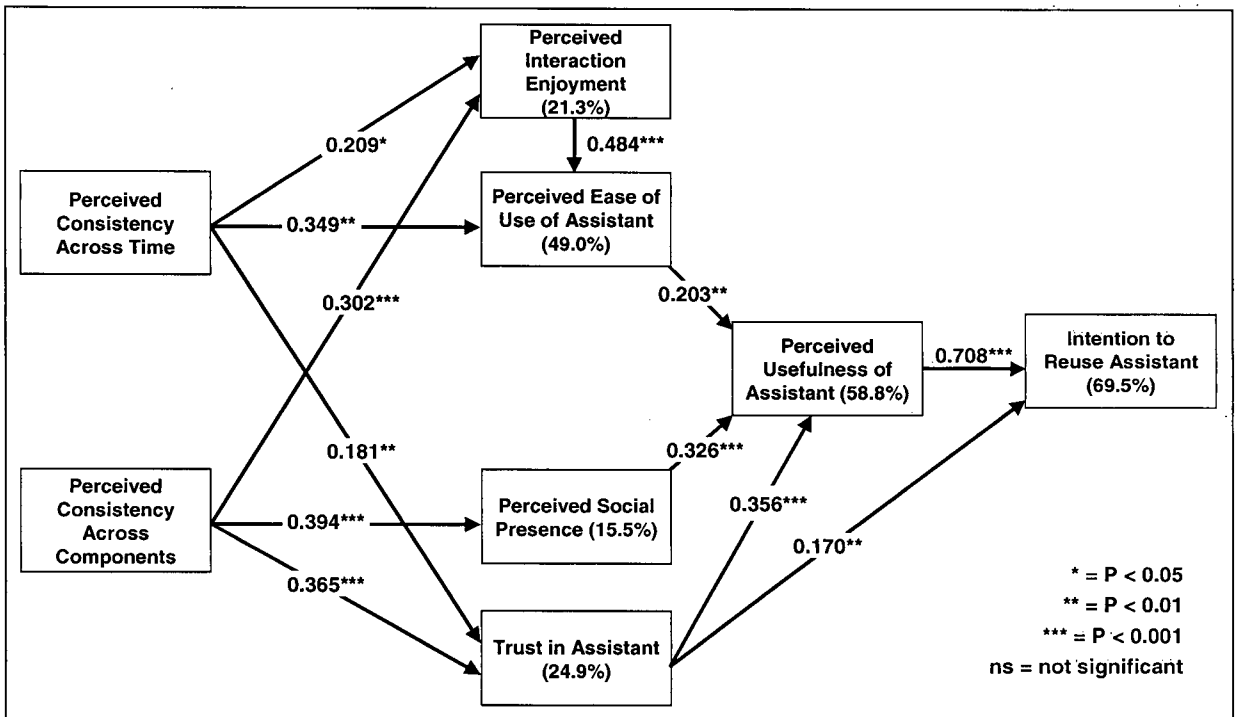

Figure 7: The Specific Effects of Consistency

The results of the consistency model provide support to the notion that the effects of both types of consistency are indeed different, and reaffirm the conclusion that can be derived from the model in Figure 5 that perceived consistency across components is indeed a stronger predictor than perceived consistency across time when both predict the same dependent variable.

7.4 Explaining Perceived Similarity and Consistency

The above analysis provided evidence that perceived similarity and perceived consistency, whatever the type is, are significant predictors of a number of relationship-based

evaluations of technological artifacts. However, in order for this conclusion to be of practical use, we need to answer the question of what may give rise to such perceptions of similarity and consistency. In this section, we investigate the relationship between the perceived measures of similarity and computed measures calculated from the separate assessments of the subject's own personality and decision strategy and those of the shopping assistant. If these computed measures, which often are often referred to as actual similarity measures (Morry, 2005), are shown to give rise to perceived similarity, then we can proceed in investigating the role of design characteristics in forming the specific perceptions regarding the technological artifact's personality and behaviors.

In the case of consistency, and since consistency is a notion that only relates to the technological artifact (i.e., no interaction with the subject's personality or behaviors), we investigate the role of design characteristics in strengthening perceptions of the two types of consistency. However, this study did not involve any specific consistency manipulations. Instead, one measure of the consistency of the assistant's personality across time is computed from two separate assessments of its personality at different points in the interaction, and another measure of its consistency across components is obtained through an assessment of the fit between the assistant's physical representation and the rest of its components.

7.4.1 Actual Similarity Measures

Due to known methodological problems with the use of difference scores (Edwards, 2001), actual personality and behavioral similarity were computed using pairwise intraclass correlations (Fisher, 1925) between the subject's assessments of her own personality and behaviors and those of the assistant. Intraclass correlations (ICC) are calculated between two classes of measurement, where a common mean derived from all the items in both measurement scales, as well as a common standard deviation about that mean, are used. The correlation was calculated using Fisher's original formula (1925, p. 178). Interclass correlations have been formalized more recently (Griffin & Gonzalez, 1995; 2003) for the analysis of dyad-level data, and used to test for personality similarity (Neyer & Voigt, 2004) and interdependence between different characteristics (Neyer, 2002). Conway and Schaller (1998) offer an excellent overview of the specific advantages of using intraclass correlations.

An intraclass correlation measures absolute similarity, whereas the Pearson interclass correlation measures relative similarity. For example, the subject's rating of her dominance

has to be identical to that of her rating of the shopping assistant's dominance on each matching scale item to get an ICC of 1, whereas the two ratings can differ in terms of the specific values given to the matching items in the two scales but have a similar pattern of item scores in relation to their deviation from each scale's mean to get a Pearson interclass of 1 (Conway & Schaller, 1998). An intraclass correlation ranges between -1.0 and +1.0. In the case of the two ratings of dominance (the rating of the subject's dominance and that of the assistant's), an ICC of 1.0 means that each matching item in the dominance scale has an identical value in the subject's rating as well as the assistant's, and hence all of the variation is across the different items. When it is -1.0, all the variation is due to different ratings on each matching item (Griffin & Gonzalez, 1995).

Personality similarity was calculated as an interclass correlation between the subject's self-assessed item scores on the dominance scale and their assessment of the personality of the shopping assistant. A separate ICC was calculated for each subject, giving us a subject-specific measure of similarity. Behavioral similarity was calculated using two separate intraclass correlations, for each subject, measuring the similarity between a subject's assessment of the extent of her use of each decision strategy (AC and EBA) and the subject's assessment of the extent of the shopping assistant's use of each strategy. Since the two decision strategies are not completely orthogonal, we need to treat them as separate indicia of behavioral similarity. Nevertheless, similarity based on the extent of use of an EBA strategy proved to be a better predictor of perceived behavioral similarity (Table 12), and its scores had more variance. The low variance in AC is believed to be the result of a social desirability or a demand characteristics bias (Orne, 1962) (for a complete review of biases in behavioral research see Podsakoff et al. (2003)). As is the case with Pearson correlations, an ICC can only be calculated if there is some variance within the items of the two scales (in this case at least one item from either of the two scales has to vary from the overall mean). Hence, an ICC could not be calculated for responses that didn't have any variance as witnessed by the changing sample size in Table 12. The results in Table 11 also indicate that not only does perceived personality similarity correlate highly with perceived behavioral similarity, but also does the computed personality similarity (r = 0.23). This, as discussed earlier could be the result of the order of the treatments.

		Perceived Behavioral Similarity	Perceived Personality Similarity	ICC (Personality Similarity)	ICC (AC Similarity)
Perceived Personality Similarity	*r*	0.54**	1		
	N	181			
ICC (Personality Similarity)	*r*	0.23**	0.24**	1	
	N	179	179		
ICC (AC Similarity)	*r*	0.04	-0.08	0.05	1
	N	164	164	164	
ICC (EBA Similarity)	*r*	0.17*	0.03	-0.03	0.22**
	N	174	174	173	162

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

Table 11: Correlations Between Perceived and Actual Similarity Measures

7.5 Does Actual Similarity Predict Perceived Similarity?

An Analysis of Variance (ANOVA) was conducted to investigate whether the computed personality similarity measures do in fact predict perceived personality similarity. However, to run the ANOVA a dummy variable to represent the extent of actual personality similarity between the subject and the assistant was obtained to act as the fixed factor in the ANOVA. The cutoff points were obtained by (1) standardizing the intraclass correlation scores measuring actual similarity between the subject and the assistant, and (2) coding the dummy variable as 2 for evaluations greater than zero and as a 1 otherwise (see Sirdeshmukh et al., 2002 for a complete description of this method). A similar dummy variable was created to represent the extent of the subject and assistant similarity in terms of their use of an EBA strategy (as discussed earlier, both the EBA scores as well as the intraclass correlation measuring similarity on the EBA scores had more variance). This latter factor was used as a covariate together with the modality factor (1 for the text treatment and 2 for the voice treatment) and a new factor representing gender match (1 if subject's gender matched the assistant's gender and 0 otherwise). The results of this ANOVA are shown in Table 12 (a).

	df	MS	F	Sig.
Modality	1	0.301	0.187	0.666
Gender Match	1	1.013	0.630	0.428
Computed EBA Use Match	1	0.868	0.540	0.463
Computed Personality Match	1	6.667	4.149	0.043
Error	168	1.607		
Total	173			

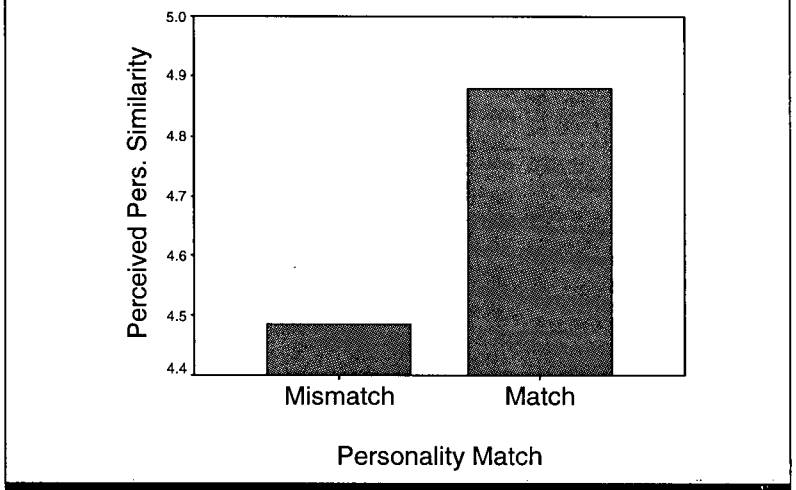

Table 12 (a): Predicting Perceived Personality Similarity

The results in Table 12 (a) indicate that actual personality similarity indeed has a main effect on the perceived personality similarity ($F(1, 168) = 4.149$, $p < 0.05$). This conclusion was further confirmed with another ANOVA that was computed where the subject's and assistant's personality classifications were used as two factors, with the same covariates as before. Subjects and assistants were classified as either dominant or submissive using the same method described above (Sirdeshmukh et al., 2002). A statistically significant 2-way interaction ($F(1, 167) = 7.49$, $p < 0.01$) emerged between the subject's personality and the assistant's personality signifying that personality match positively affects perceived personality similarity (no other effects were observed). This method of using 2-way interactions as a measure of personality similarity has been widely used in the HCI literature (e.g., Isbister & Nass, 2000; Reeves and Nass, 1996). The plot of means further showed that while personality match is effective when both personalities are dominant, it is less effective when they are submissive. This conclusion is consistent with Hess et al. (2005). Hess et al. (2005) observed that while personality matches when both the subject and the decision aid

are extroverts does affect a subject's level of involvement, this effect does not hold when both are introverts.

	df	MS	F	Sig.
Modality	1	0.012	0.008	0.929
Gender Match	1	0.690	0.455	0.501
Computed EBA Use Match	1	1.771	1.168	0.281
Assistant Personality (dom., sub.)	1	4.828	3.185	0.076
Subject Personality (dom., sub.)	1	5.764	3.802	0.053
Ass. Per. * Subj. Per.	1	11.354	7.490	0.007
Error	167	1.516		
Total	174			

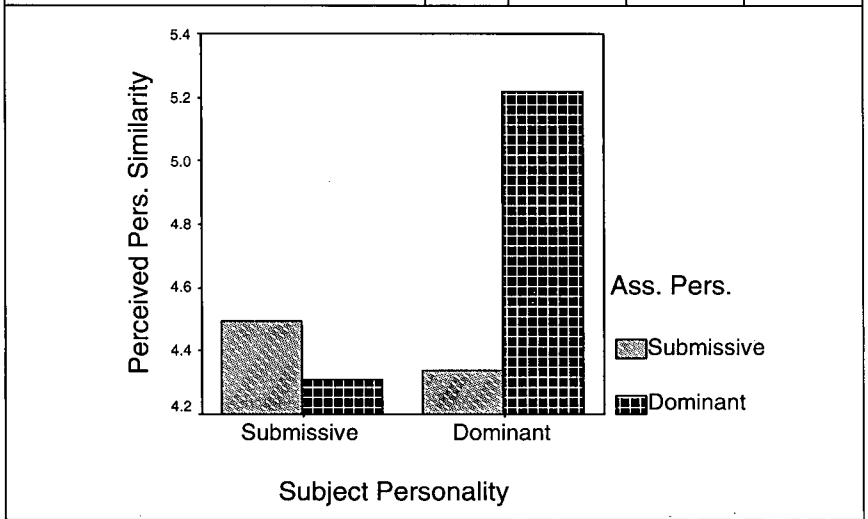

Table 12 (b): Predicting Perceived Personality Similarity

Table 13 (a) shows the results of the ANOVA using the behavioral match, represented by a dummy variable obtained from the standardized scores of the intraclass correlation of the EBA scores using the same classification method as described above, as a fixed factor, and with gender match, modality and personality match as covariates.

The results in table 13 (a) indicate that behavioral match in regards to the extent of use of an EBA strategy is predictive of perceived behavioral similarity ($F(1, 168) = 4.236$, $p < 0.05$). Furthermore, the results indicate that personality match also has a positive main effect on perceived behavioral similarity ($F(1, 168) = 7.688$, $p < 0.01$). This effect further confirms the proposition that personality similarity, and due to the order in which the treatments were presented, had an effect on behavioral similarity.

	df	MS	F	Sig.
Modality	1	1.737	0.977	0.324
Gender Match	1	0.008	0.004	0.947
Computed Personality Match	1	13.672	7.688	0.006
Computed EBA Use Match	1	7.533	4.236	0.041
Error	168	1.778		
Total	173			

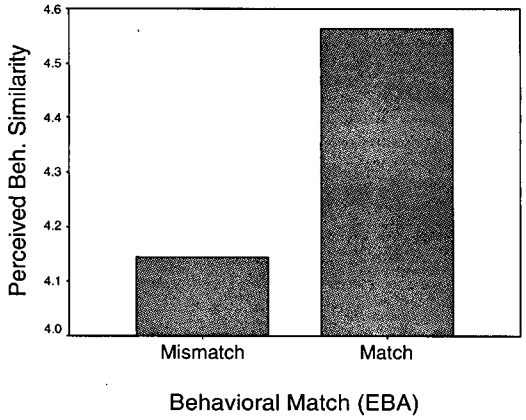

Table 13 (a): Predicting Perceived Behavioral Similarity (EBA)

A second ANOVA was computed using the subject's and the assistant's extent of use of an EBA strategy as two fixed factors, and gender match, modality and personality match as covariates. Dummy variables were used to classify the extent of use of an EBA strategy (low, high) in the case of the subject and the assistant. The dummy variables were obtained using the same classification described earlier.

The results in Table 13 (b) confirm the previous results regarding the effects of actual behavioral match on perceived behavioral similarity, with a marginally statistically significant 2-way interaction between the subject's extent of use of an EBA strategy and that of the assistant ($F(1, 172) = 3.788$, $p < 0.053$). The results further substantiate the role personality match plays in influencing perceptions of behavioral similarity ($F(1, 172) = 10.061$, $p < 0.01$).

	df	MS	F	Sig.
Modality	1	2.677	1.526	0.218
Gender Match	1	0.193	0.110	0.740
Computed Personality Match	1	17.646	10.061	0.002
Assistant Use of EBA (low, high)	1	0.733	0.418	0.519
Subject Use of EBA (low, high)	1	2.610	1.488	0.224
Ass. EBA * Sub. EBA	1	6.643	3.788	0.053
Error	172	1.754		
Total	179			

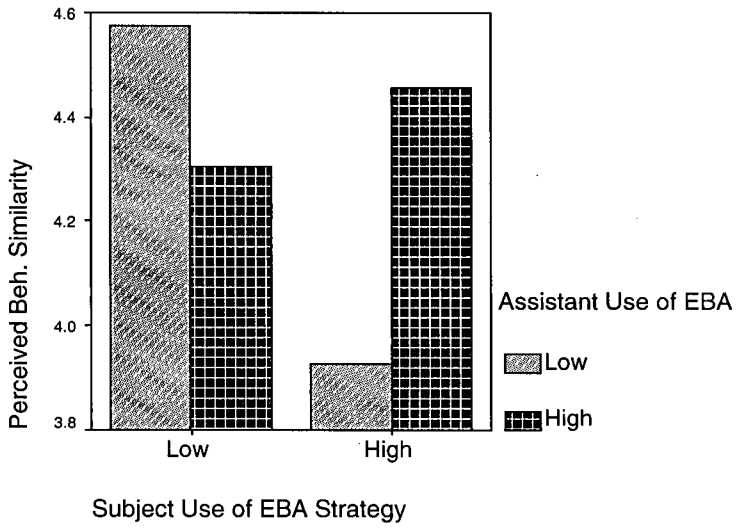

Table 13 (b): Predicting Perceived Behavioral Similarity (EBA)

At this stage, it is worth mentioning that structural model analysis, similar to the one in Figure 6, performed using the computed actual similarity scores instead of perceived similarity measures produced similar results, with relatively smaller effects.

7.6 The Role of Design Characteristics in Shaping Perceptions of Consistency

Although this study did not include any specific consistency-related manipulations, two measures of perceived consistency of two specific characteristics were collected. First, after participants completed the task, they were presented with three facial representations of the shopping assistant (one of which was the one used in the experimental procedure). They were then asked to indicate which face, based on their experience interacting with the assistant, best fits its behaviors, personality, and attitudes. Since one of the three faces included the one they were exposed to during the experimental procedure, choosing a different face indicates that the subject believes that the assistant was inconsistent in terms of

the fit between its physical representation on one hand, and its behaviors and personality on the other. Subjects' choices were recoded where a choice of a face other than the one used in the procedure was coded as low match between the face and the assistant characteristics. One hundred and eight subjects chose the same face that was used in the experimental procedure, while 64 indicated that another face better suits the shopping assistant.

The second measure of consistency is more related to the notion of personality consistency across time. As discussed earlier, two measures of perceived shopping assistant's dominance were recorded. This enabled us to compute a measure of consistency of the shopping assistant's personality throughout the interaction. These two measures of similarity correlated highly ($r = 0.6$) as expected. A set of Pairwise intraclass correlations, similar to those described earlier, were computed between the two ratings of the assistant's dominance. A separate ICC was computed for each subject's ratings, yielding an actual personality consistency score perceived by each subject (termed *consistency of personality*). These scores were then standardized and replaced by a dummy variable, using the method previously described, to classify subjects into two group of low and high perceived personality consistency of the shopping assistant.

Two full factorial ANOVAs were performed to test whether the two scores of perceived consistency of these specific characteristics (face match and personality consistency) predict subjects' overall perceived assistant's consistency across time and across components. The results are shown in Tables 14 and 15 respectively.

The results, shown in Table 14 indicate that only personality consistency has an effect on the subject's perceived consistency of the assistant across time ($F(1, 148) = 6.908$, $p < 0.01$). This is to be expected, since the assistant's overall consistency across time inherently includes aspects of its personality consistency, in addition to the consistency of its behaviors, physical representation and interaction style. Although such initial conclusion can be drawn, it is noteworthy that the consistency of the personality was not intentionally manipulated (i.e., all assistants had consistent personalities throughout the interaction). Hence, it is important to note that these effects are rather the result of variations in the subjects' perceptions of the consistency of the assistant's personality, rather than actual consistency.

	df	MS	F	Sig.
Choice of Face (different, same) [CF]	1	0.079	0.075	0.784
Consistency of Personality (low, high) [CP]	1	7.285	6.908	0.009
CF * CP	1	0.705	0.668	0.415
Error	148	1.054		
Total	152			

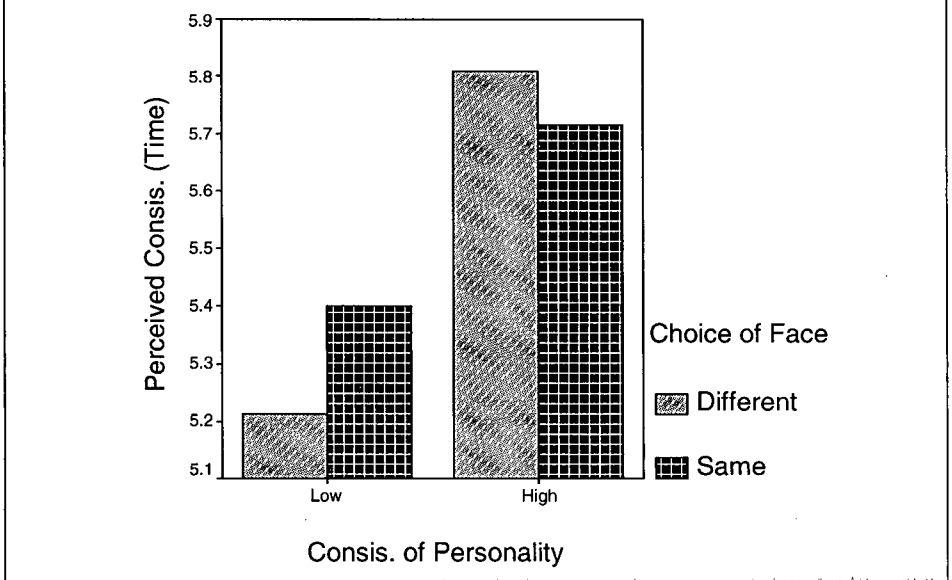

Table 14: Predicting Perceived Consistency Across Time

The results, shown in Table 15 indicate that both the personality consistency ($F(1, 148) = 6.798$, $p < 0.02$) and the subject's perception of how much the assistant's face matched its personality and behaviors ($F(1, 148) = 5.751$, $p < 0.02$) have positive main effects on perceptions of consistency across components. While the positive effect of the face match is expected, the personality consistency effect warrants a second look. It is likely that this effect comes as a result of the high correlation between the two perceived consistency measures. This observed positive effect might be the result of the fact that when subjects perceive a temporal consistency (consistency across time), they are more likely to also perceive the target to have a cross sectional match between its components.

The results above validate the notion that the perceived overall consistency across components can be influenced by the perceived consistency of any of the artifact's components. For example, choosing a face that fits with the personality and the behaviors of the assistant is likely to result in higher evaluations of the assistant's consistency across

components. Additionally, it appears that having an assistant that is consistent in its personality can also result in increased perceptions of the assistant's overall consistency across components. Nevertheless, it is important to note that both independent variables in this analysis are perceptual, since both the face match and personality consistency were not manipulated in this study. Hence, what the above analysis tells us is that perceptions of the match between one component and all others are important, but the analysis remains inconclusive as to whether we can manipulate these perceptions.

	df	MS	F	Sig.
Choice of Face (different, same) [CF]	1	7.491	5.751	0.018
Consistency of Personality (low, high) [CP]	1	8.855	6.798	0.010
CF * CP	1	0.023	0.018	0.895
Error	148	1.303		
Total	152			

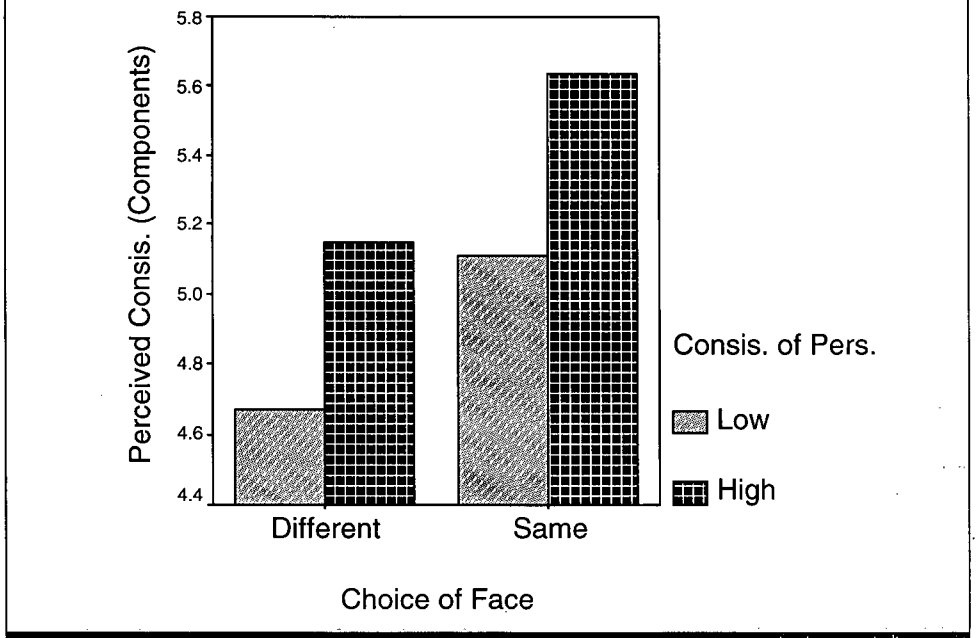

Table 15: Predicting Perceived Consistency Across Components

As a side note, we thought it might be interesting to investigate the relationship between the previously discussed similarity measures and the two measures of consistency just discussed. In our case, similarity and consistency were both measured using the same indicia of personality and behaviors. Nevertheless, the relationship between both variables is somewhat unclear. For example, it is possible that perceived similarity could bias the subject

to perceive the assistant to be more consistent, or it could be that consistency affects perceived similarity.

Two binary logistic regressions were performed to investigate whether the different types of similarity, as well as modality, affect the perceived personality consistency of the two components (personality consistency and face match), where the binary score (low, high) of personality consistency is used as the dependent measure[5]. The results, shown in Table 16 indicate that both the modality of the communication channel ($z\ (140) = 2.31$, $p < 0.05$) as well as personality match ($z\ (140) = 3.71$, $p < 0.001$) increase the odds of the subject perceiving the assistant's personality to be consistent throughout the interaction. The personality similarity effect can be explained by the fact that if the subject believed that she shares a similar personality with the assistant, she is more likely to project her self-assessed personality consistency unto the assistant. The effect of modality could be due to the fact the use of voice is likely to encourage the subject to believe that she is interacting with a social actor (modality had a positive effect on perceived social presence as discussed in the next section). People have been observed to overestimate both personality similarity between themselves and others, as well as the consistency of others' personalities and behaviors (Byrne et al., 1967; Dryer, 1999). As such, the more human-like the subject believes the assistant is, the more likely that she will overestimate its consistency.

	Unstandardized Coefficients		Odds Ratio	z	Sig.
	B	Std. Error			
(Constant)	-2.496	0.861		-2.90	0.004
Modality	0.837	0.362	2.31	2.31	0.021
Gender Match	0.054	0.358	1.06	0.15	0.880
Computed Personality Match	1.339	0.361	3.82	3.71	0.000
Computed EBA Use Match	0.083	0.357	1.09	0.23	0.816

Table 16: Predicting Personality Consistency

The results of the second binary logistic regression with the face switching behavior as the dependent variable (1 = subject chooses a different face than the one used in the treatment, 0 = subject uses the same face) are shown in Table 17. The results show again a

[5] The regression results are indistinguishable when the intraclass correlation score, which is a continuous variable, is used as the dependent variable.

significant effect of modality (z (167) = -2.08, $p < 0.05$) and personality match (z (167) = -2.16, $p < 0.05$), where subjects receiving the voice treatment and perceiving the assistant's personality to be similar to them are less likely to choose a different face than the one used in the treatment (note that the face match variable was recoded to denote a face switching behavior). The modality effect could be explained in a similar fashion to that in the case of the personality consistency regression. Since perceptions of personality similarity are often used as a reinforcement mechanism individuals use to reason that they are functioning in a meaningful manner (Berscheid & Reis, 1998), this positive reinforcement could also extend to think of the interaction partner to be functioning in a meaningful manner. If so, then higher similarity perceptions are likely to induce more feelings of cross-component consistency.

	Unstandardized Coefficients		Odds Ratio	z	Sig.
	B	Std. Error			
(Constant)	1.246	0.756		1.65	0.099
Modality	-0.681	0.327	0.51	-2.08	0.037
Gender Match	-0.257	0.326	0.77	-0.79	0.430
Computed Personality Match	-0.707	0.328	0.49	-2.16	0.031
Computed EBA Use Match	-0.191	0.326	0.83	-0.59	0.830

Table 17: Predicting Face Switching

7.6.1 The Role of Design Characteristics in Manifesting Personalities and Behaviors

Three separate 2 (modality: text only, voice only) x 2 (personality treatment: dominant, submissive) x (decision strategy treatment: AC, EBA) x (assistant gender: male, female) full factorial ANOVAs were run to test for the effects of these four factors on subject's assessments of the shopping assistant's dominance, and extent of use of an AC and an EBA decision strategies. The results of the three ANOVAs are shown in Tables 18, 20 (b) and 20 (c) (note that although a full factorial model was run, only main effects are shown in the tables). Furthermore, since the ratings of the extent of use of both decision strategies are related, a Multivariate Analyses of Variance (MANOVA) was also performed to test for the aggregate effects of the four treatment factors on decision strategy ratings, as shown in Table 20 (a).

Table 18 shows that the dominance treatment had a statistically significant main effect (F (1, 65) = 23.415, $p < 0.001$) on subjects' perceived dominance of the shopping

assistant. As discussed earlier, subjects were asked to evaluate the shopping assistant's dominance at two points in the experimental procedure. The first was before the behavioral treatment, and the second occurred at the end of the questionnaire. The two scores correlated highly (0.6, $p < 0.001$) and had means of 3.83 and 4.23 respectively. The increase in the perceived dominance is attributed to the fact that the behavioral treatment was not made independent of the personality treatment. For example, dominant assistants continued to be dominant, expressing higher levels of confidence with their choices and directing subjects on which model to choose. In the above ANOVA, an average of the two dominance scores was used. The effects however, are the same if either measure is independently used.

	df	MS	F	Sig.
Personality Treatment (PT)	1	21.792	23.415	0.000
Behavioral Treatment (BT)	1	1.027	1.104	0.295
Assistant Gender (AG)	1	3.989	4.286	0.040
Modality (M)	1	2.277	2.447	0.120
Error	165	0.931		
Total	181			

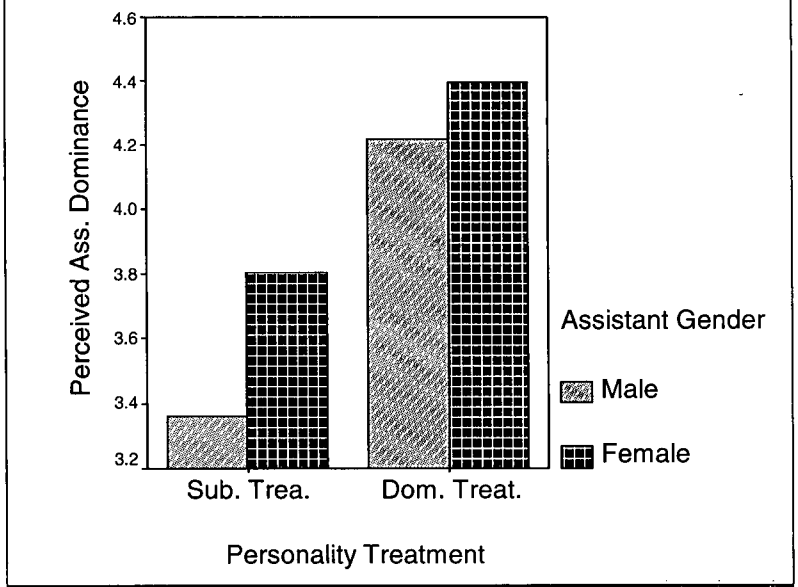

Table 18: Manifesting Assistant Dominance

A gender main effect also emerged ($F(1,165) = 4.286$, $p < 0.05$), where female shopping assistants were perceived to be more dominant on average. There does not seem to be a clear reason why female shopping assistants are perceived to be more dominant. However, this effect could be the result of the chosen facial representation for the female

assistant. As discussed earlier, pretests were conducted to ensure that the chosen avatars are neutral on the dominance scale in terms of their appearance. However, the chosen female avatar, which was the closest among the female avatars to the neutral point, had a mean dominance score of 4.16 while the chosen male avatar had a mean score of 4.07. Nevertheless, the results clearly show that modality has no effect (neither main effect nor through an interaction) on subjects' assessment of the shopping assistant's dominance. Hence, hypothesis 18 (a) is fully supported[6].

The personality treatment involved three main elements that were used to manifest dominance on the part of the shopping assistant. However, the dominance manipulation was completely restricted to the content of the information communicated and did not extend to other elements (i.e., our manipulation did not include any additional voice-based or embodiment-based personality cues). Dominance was cued by the use of directives and decisional guidance that were communicated in an authoritative manner (examples of the latter are the use of action words and expressing higher confidence levels) on the part of the shopping assistant. As discussed earlier, two scales were used to measure the assistant's extent of use of directives and decisional guidance. The scores on both scales were regressed on subjects' assessment of the assistant's dominance (an average of the two dominance scores was used). The results, shown in Table 19, indicate that both the assistant's extent of use of directives ($t(178) = 3.80$, $p < 0.01$) as well as its use of decisional guidance ($t(178) = 2.60$, $p < 0.02$) cued dominance with total explained variance $R^2 = 0.319$. Hence, hypotheses16 (a) and (b) are supported.

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	1.93	0.23		8.23	0.00
Degree of Suggestive Guidance	0.19	0.07	0.24	2.60	0.01
Extent of Use of Directives	0.27	0.07	0.36	3.80	0.00

Table 19: The Role of Guidance and Directives in Manifesting Dominance

[6] Some similar studies may have reported main or interaction effects of voice (e.g., Reeves & Nass, 1998). However, in these studies voice was manipulated (by changing speed and pitch) and was a part of the intended personality treatment.

The result of the MANOVA analysis, shown in Table 20 (a), indicate that only the behavioral treatment had an effect on the aggregate ratings of the use of both decision strategies (Wilks's $\Lambda = .995$, $F\ (2, 175) = 17.065$, $p < 0.001$). The other treatment factors had no effect on the aggregate ratings of decision straggly ($p > 0.05$). Although MANOVA is a more stringent test of statistical significance, which would lower the risk of making a Type I error, we further performed ANOVA tests on each dependent variable separately to ensure that the behavioral treatment was adequate in relation to each decision strategy.

	Hypothesis df	Error df	Wilks' Lambda	F	Sig.
Personality Treatment	2	175	0.995	0.447	0.640
Behavioral Treatment	2	175	0.837	17.065	0.000
Assistant Gender	2	175	0.968	2.904	0.057
Modality	2	175	0.983	1.517	0.222

Table 20 (a): Manifesting Assistant Decision Strategy (MANOVA)

	df	MS	F	Sig.
Personality Treatment	1	0.012	0.009	0.927
Behavioral Treatment	1	30.880	22.807	0.000
Assistant Gender	1	0.007	0.005	0.941
Modality	1	3.611	2.667	0.104
Error	165	1.354		
Total	181			

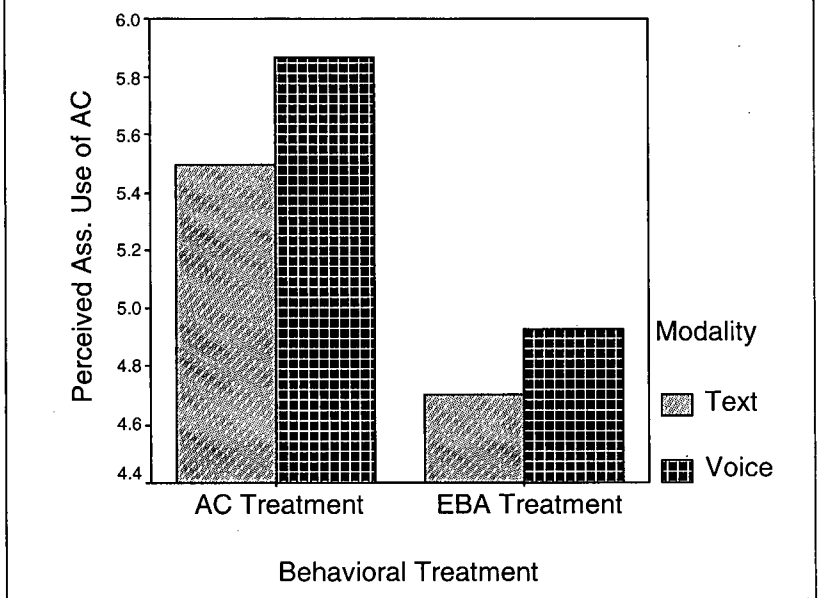

Table 20 (b): Manifesting Assistant Decision Strategy (AC)

The results in Table 20 (b) indicate that the behavioral treatment was successful in regards to manifesting a reliance on an AC strategy. The behavioral treatment has a main effect on subjects' perceived assessment of the extent of the shopping assistant's use of an AC strategy ($F(1, 165) = 22.807$, $p < 0.001$). No other factors had a statistically significant main effect.

	df	MS	F	Sig.
Personality Treatment	1	2.509	1.486	0.225
Behavioral Treatment	1	27.945	16.557	0.000
Assistant Gender	1	11.260	6.671	0.011
Modality	1	0.899	0.533	0.466
Error	165	1.688		
Total	181			

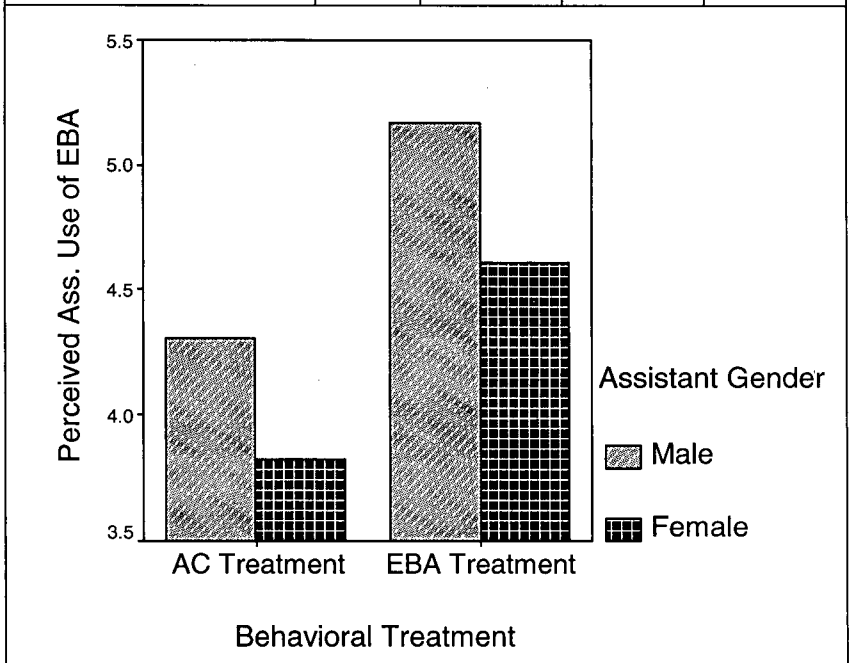

Table 20 (c): Manifesting Assistant Decision Strategy (EBA)

The results in Table 20 (c) indicate that the behavioral treatment was successful in regards to manifesting a reliance on an EBA decision strategy. The behavioral treatment has a main effect on subjects' perceived assessment of the extent to which the shopping assistant's used an EBA strategy ($F(1, 165) = 16.557$, $p < 0.001$). A gender main effect is also observed ($F(1, 165) = 6.671$, $p < 0.05$), where male shopping assistants are perceived to be higher in their extent of the use of an EBA strategy. However, we have no explanation for this effect except that while more male subjects received the voice treatment (N = 31 vs. 37),

more females received the text treatment (N = 38 vs. 22). However, neither modality has an effect on the perceived ratings of the assistant's extent of use of an EBA strategy, nor is the modality * gender interaction significant.

The results in Tables 20 (b) and (c) further indicate that while the behavioral treatment was successful in manifesting both types of decision strategies, the communication channel modality had no effect on subjects' assessment of the shopping assistant's extent of use of either decision strategy. Hence, both hypotheses 17 and 18 (b) are fully supported.

7.7 Other Effects

While the above analysis revealed that modality had many unexpected effects, one hypothesized effect of modality was in affecting perceptions of the assistant's social presence (Hypothesis 19). A full factorial ANOVA was performed with the four treatment groups acting as the fixed factors. The results, with only main effects shown in Table 21, reveal that Modality has the only statistically significant main effect on perceived social presence ($F(1, 165) = 5.146$, $p < 0.05$) where an assistant using voice was perceived to have more social presence. Hence, Hypothesis 19 is supported.

	df	MS	F	Sig.
Personality Treatment	1	0.839	0.338	0.562
Behavioral Treatment	1	2.872	1.157	0.284
Assistant Gender	1	0.002	0.001	0.976
Modality	1	12.775	5.146	0.025
Error	165	2.483		
Total	181			

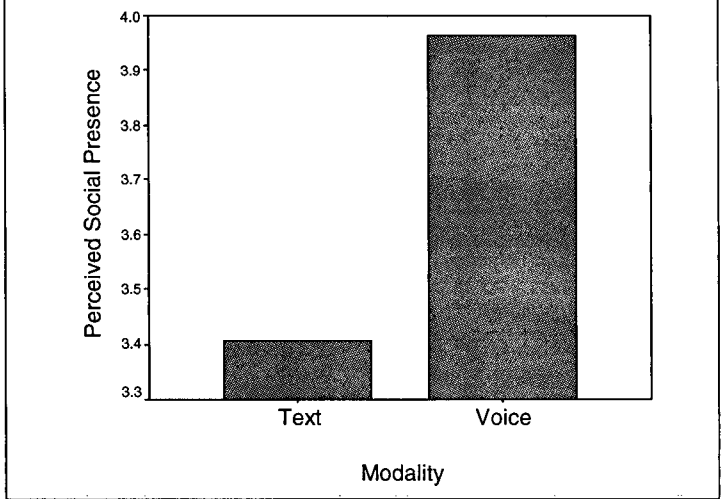

Table 21: Modality and Social Presence

Of the 181 participants, 128 had a different initial choice than the one recommended by the shopping assistant. Of these, only 30 participants switched their choice to that recommended by the assistant after the assistant explained their decision strategy. A binary logistic regression was performed with the actual similarity measures, as well as modality acting as the independent variables, and with switching behavior as the binary dependent variable. Results, shown in Table 22, revealed that only behavioral match ($z(117) = 2.020$, $p < 0.05$) is a statistically significant predictor of switching behavior where subjects who had a different initial choice, but were working with an assistant that was similar in terms of behaviors were more likely to switch than those who used an assistant that differed in behaviors. Naturally, this is to be expected, since an assistant using the same decision strategy as the user is expected to be viewed as more competent and trustworthy (effects of behavioral similarity on trust were previously discussed).

	Unstandardized Coefficients		Odds Ratio	z	Sig.
	B	Std. Error			
(Constant)	-2.926	1.071		-2.730	0.006
Modality	0.422	0.440	1.52	0.960	0.338
Gender Match	-0.206	0.440	0.81	-0.470	0.640
Computed Personality Match	0.212	0.438	1.24	0.480	0.624
Computed EBA Use Match	0.891	0.442	2.44	2.020	0.044

Table 22: Predicting Choice Switching

8. Discussion and Concluding Remarks

This study had two main objectives. First, it investigated the role of two types of perceived similarity and two types of perceived consistency in affecting customers' evaluations of a technological artifact, in the form of a shopping assistant, on a number of relationship-based variables. Results revealed that overall similarity, as well as overall consistency, positively influence customers' evaluations of automated shopping assistants in a number of ways, and more interestingly, results also revealed that both similarity and consistency have their own unique effects on certain variables. Furthermore, the results of this study also revealed that both types of perceived similarity and perceived consistency had

their own specific effects. While much of the research conducted on the effects of similarity and consistency in relation to computer interfaces was limited to testing one type of similarity or another, this study is comprehensive in that it sheds light on the relative importance of the different types of similarity and consistency.

The second objective of this study was to investigate the role of design characteristics. In our new model proposed in Figure 1, and tested in this study, we put forward the idea that while design and interface characteristics can be manipulated to manifest certain social characteristics of technological artifacts, these formed perceptions interact with the user's own characteristics to affect her evaluations of the artifact. However, this notion of how the user' perception of the artifact and those of herself interact is an intricate issue. This study investigated two types of similarity measures. First, perceived similarity was measured directly and was found to positively affect a number of dependent variables. Second, computed actual similarity scores, where not only found to predict perceived similarity, but were also found to affect the dependent variables, albeit they had weaker effects. Hence, another contribution of this study is the conclusion that while computed scores may be one way of investigating the effects of similarity, methodological problems surrounding their computation, and their relatively weaker predictive power, makes the use of perceived measures that directly measure similarity constructive. While many prior studies had suggested that the interaction of personalities and behaviors, and hence evaluation of similarity and consistency, occurs mindlessly (e.g., Reeves & Nass, 1996), this study looked at both mindless evaluations of similarity (i.e., computed measures) as well as mindful ones. Perceived similarity on average was found to be higher than actual similarity. This indicates that many factors other than actual similarity do give rise to perceived similarity. But since we are often concerned with what customers perceive rather than their true, bias free beliefs, perceived measures are recommended for measuring similarity. After all, it is unlikely that customers will compute pairwise intraclass correlations to correctly evaluate their similarity with a decision aid.

Actual similarity measures should not be ignored, since they directly relate to the role of design characteristics. Particularly, since these so-called actual similarity measures are simply some sort of combination of the formed perceptions in regards to self and the artifact. The latter is where design characteristics play a role. Perceptions users form regarding the

technological artifact are what design characteristics can be used to influence. In the case of similarity, design characteristics can be manipulated to manifest specific personalities and behaviors, which can eventually be matched to those of the user if users' characteristics are known. In the case of consistency, while this study did not directly manipulate consistency, the process is similar to that of forming perceived similarity. Design characteristics can be used to cue certain behaviors or personalities. Hence, that prerequisite of forming social perceptions about these artifacts (e.g., personality types) still remains. In either case, consistency evaluations are likely to be formed, and will influence the user's evaluations of the technological artifact.

8.1 Practical Implications of the Theoretical Model

A variety of challenges and opportunities are inherent in the prospect of putting the model presented in Figure 1 into practice. Tools to personalize technological artifacts should be extended to account for the potential effects of similarity and consistency. *Personalization* can be defined as "a process of providing special treatment to a repeat visitor to a website by providing information and applications that are matched to the visitor's interests, roles and needs" (Kumar & Benbasat, 2004, p. 13). A related concept is *adaptability*, which is the potential to personalize a message to a particular receiver (Te'eni, 2001). On the other hand, *customization* is a personalization process controlled by the user rather than the website provider, enabling users to customize the look and feel of a website, as well as specifying what information they would like to receive. While traditional customization mechanisms have focused on allowing users to customize the look and feel of an online store, more advanced personalization mechanisms incorporate sophisticated data mining techniques and the ability to display dynamic content without any user input (Kumar & Benbasat, 2004).

We propose that personalization mechanisms should be extended to take into account relevant customer characteristics, and consequently to personalize message content, the behavior of artifacts on the website, and the communication techniques used on the website to better suit each customer's personality, behavior, and preferences. For example, answers to just few questions, such as the dominance scale items used in this study, can rapidly classify users as dominant or submissive. Consequently, verbal and non-verbal actions of a 3D avatar can be customized to better suit those of the user (e.g., matching the avatar's personality and behavior to those of the user). In the case of repeat users, data mining techniques can be used

to infer a customer's behavioral, taste, and attitude preferences and manipulate the artifact to suit the customer, capitalizing on the positive effects of behavioral similarity. Since gender stereotypes have been shown to operate when interacting with computers (Nass et al., 1997), an artifact's gender and other related social categories could also be manipulated to induce higher evaluations of the trustworthiness or the expertise of the artifact.

Given the established effects of personality-based individual differences on decision-making styles, information searches, and even communication preferences, another personalization opportunity stems from capturing these individual differences and allowing for the customization of tools, or providing alternative tools when applicable, to ensure that the online store meets individual customers' needs and expectations, and conversely, to encourage deeper and more frequent future interactions. Imagine a recommendation agent that adapts to your search tendencies and offers you the exact same information that you need to make your decision, asks you the right questions, and automatically employs the search, ranking and sorting techniques that best fit your decision-making style. Alternatively, a 3D Avatar might behave and speak in the manner you prefer, increasing the enjoyment you feel every time you interact with it. Similarly, a website might recognize how you like to search and order products, thus providing you with the information you need to make your decision before you ask for it.

As could be inferred from the results of this study, in an e-commerce context, encouraging perceptions of the artifact's consistency may be of more importance than encouraging perceptions of similarity between the technological artifact and its users. In the case of consistency, it is important for website developers to ensure that their websites, as well as all other technological artifacts residing on it, are consistent in appearance, behavior, and in the personality they manifest, both among their individual components and across time. In our earlier discussion, we investigated a number of personality and behavioral indicators that can be used to ensure that a website is consistent across its parts, including other e-commerce technological artifacts.

8.2 Limitations, Future Research and Extensions

While the generalizability of this study is enhanced by the use of real-life e-commerce shoppers, conducting the experiment outside the laboratory environment, though

strengthens its experimental realism, may diminish its internal validity. Other limitations include the lack of any real consistency related manipulations, and the moderate sample size.

Future research could be directed towards testing the ability of other design characteristics to cue different dimensions of technological artifacts' personalities, as well as replicating the findings of this study in regards to other e-commerce technological artifacts. For example, it is likely that less-confident users, or ones who have no expertise in the product area they are shopping for, would appreciate a shopping assistant that manifests a competent personality. Similarly, it is possible that upper-class customers will be attracted to shopping assistants exhibiting sophisticated personalities, a phenomenon that has been observed in the physical store environment. Sophistication is marked by a communication style that is charming, upper class, pretentious, glamorous and smooth (Aaker, 1997). Such traits can be cued through varying the textual content (e.g., use of ostentatious words), physical representation (e.g., dressy cloths), or even choosing a voice that is charming and likeable.

Two specific extensions of this study are proposed. First, the present study can be extended to include a test of personality consistency across the assistant's components. To achieve this, the voice manipulation can be extended to include specific cues manifested through voice. Additionally, a 3D avatar that has the capability of conveying non-verbal cues (e.g., gestures) can be used to convey a non-verbal cues-based personality. Once such manipulations are in place, it will be possible to measure the perceived consistency of the shopping assistant's manifested personality through textual content, the personality manifested through voice, and that manifested through non-verbal cues.

Another extension of the study could involve the manipulation of another artifact's personality (e.g., the website), and measuring the perceived consistency between the two manifested personalities and its effects on participants' evaluations. Alternatively, the same artifact can be used in multiple tasks, where its characteristics can be made to vary. For example, such behavioral variations are expected to negatively affect the perceived consistency, but might enhance the artifact's perceived usefulness if these variations were seen to have a good fit with the different tasks performed.

While this study presented some evidence that similarity can impact switching behavior, the degree to which perceptions of similarity and consistency affect actual

behaviors remains an open question. For example, is it possible that personality similarity will affect customers' initial choices or the likelihood of purchasing accessorial products? If that is true, then this will have serious implications on the way online stores advertise and recommend products and accessories. It is possible that the use of strong and confident language can have unintended negative effects on some shoppers.

9. Bibliography

Aaker, J. L. "Dimensions of Brand Personality," Journal of Marketing Research (34:3), August 1997, pp. 347-356.

Ajzen, I. "The Theory of Planned Behavior," Organizational Behavior and Human Decision Processes (50:2), 1991, pp. 179-211.

Aksoy, L., & Bloom, P. N. "Impact of Ordered Alternative Lists on Decision quality: The Role of Perceived Similarity," Paper presented at the Society for Consumer Research: Winter Conference, 2001.

Bem, D. J., and Allen, A. "On predicting some of the people some of the time: The search for cross-situational consistencies in behavior," Psychological Review (81), 1974, pp. 506-520.

Benbasat, I. and Dhaliwal, J. S. "A Framework for the Validation of Knowledge Acquisition," Knowledge Acquisition (1), 1989, pp. 215-233.

Benbasat, I. and Zmud, R. W. "The Identity Crisis Within The IS Discipline: Defining and Communicating the Discipline's Core Properties," MIS Quarterly (27:2), 2003, pp. 183-194.

Berger, C. R., & Calabrese, R. J. "Some explorations in initial interaction and beyond: Toward a developmental theory of interpersonal communication," Human Communication Research (1), 1975, pp. 99–112.

Berscheid, E. Interpersonal attraction. In G. Lindzey & E. Aronson (Eds.), Handbook of social psychology: Volume 2. Special fields and applications (3rd ed., pp. 413–484). Random House, New York, 1985.

Berscheid, E., and Reis, H. T. "Attraction and close relationships," in The handbook of social psychology, D. T. Gilbert, S. T. Fiske, and G. Lindzey (eds.), New York: McGraw-Hill, 4th ed., vol. 2, pp. 193–281.

Berscheid, E., and Walster, E., Interpersonal attraction (2nd ed.). Addison-Wesley, Reading, MA, 1978.

Blankenship, V., Hnat, S. M., Hess, T. G. and Brown, D. R. "Reciprocal interaction and similarity of personality attributes," Journal of Social and Personal Relationships (1), 1984, pp. 415-432.

Blieszner, R. and Adams, R. G. Adult friendships. Sage, Newbury Park, CA, 1992.

Bochner,A. P. On the paradigm that would not die. In J. A. Anderson (Ed.), Communication yearbook, 14 (pp. 484–491). Sage, Newbury Park, CA, 1991.

Bollen, K.A., Structural Equations with Latent Variables, Wiley-Interscience, 1989.

Brehm, S., and Kassin, S. Social Psychology (1st edition), Houghton, Boston, MA, 1996.

Brewer, M.B. "Ethnocentrism and its role in interpersonal trust," in: Scientific Inquiry and the Social Sciences, M.B. Brewer and B.E. Collins (eds.), Jossey-Bass, New York, 1981, pp. 345-359.

Brewer, M.B. "In-group favoritism: the subtle side of intergroup discrimination," in: Codes of Conduct: Behavioral Research and Business Ethics, D.M. Messick and A. Tenbrunsel (eds.), Russell Sage Found, New York, 1996, pp. 160-171.

Brewer, M.B., and Silver, M. "Ingroup Bias As a Function of Task Characteristics," European Journal of Social Psychology (8), 1978, pp. 393-400.

Byrne, D. and Griffitt, W. "Similarity and awareness of similarity of personality characteristic determinants of attraction," Journal of Experimental Research in Personality (3), 1969, pp. 179-186.

Byrne, D. The attraction paradigm. Academic Press, New York, 1971.

Byrne, D., Griffitt, W. and Stefaniak, D. "Attraction and similarity of personality characteristics," Journal of Personality and Social Psychology (5), 1967, pp. 82-90.

Cattell, R. B. "The description of personality: principles and findings in a factor analysis," American Journal of Psychology (58), 1945, pp. 69–90.

Cattell, R. B., Eber, H. W. and Tatsuoka, M. M. The handbook for the Sixteen Personality Factor Questionnaire, Institute for Personality and Ability Testing, Champaign, IL, 1970.

Chin, W.W., and Newsted, P.R. "Structural Equation Modeling Analysis With Small Samples Using Partial Least Squares," in: Statistical Strategies For Small Sample Research, R. Hoyle (ed.), Sage Publications, 1999, pp. 307-341.

Chwelos, P., Benbasat, I. and Dexter, A. "Research Report: Empirical Test of an EDI Adoption Model," Information Systems Research (12:3), 2001, pp. 304–321.

Clark, H.H. "How do real people communicate with virtual partners?" Proceedings of 1999 AAAI Fall Symposium, Psychological Models of Communication in Collaborative Systems, AAAI, North Falmouth, MA, 1999, pp. 43-47.

Clore, G. L., & Byrne, D. A. A reinforcement-affect model of attraction. In T. L. Huston (Ed.), Foundations of interpersonal attraction (pp. 143–165). Academic Press, New York, 1974.

Conway, L. G. and Schaller, M. "Methods for the Measurement of Consensual Beliefs Within Groups," Group Dynamics: Theory, Research, and Practice (2:4), 1998, pp. 241-252.

Costa, P. T., Jr. and McCrae, R. R. "From catalog to classification: Murray's needs and the five factor model," Journal of Personality and Social Psychology (55), 1988, pp. 258-265.

Davern, M.J. and Te'eni, D. "Content Versus Structure in Information Environments, A Longitudinal Analysis of Web Site Preferences," Proceedings of the International Conference on Information Systems, Brisbane, Australia, 2000.

Davis, F.D. "Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology," MIS Quarterly (13:3), 1989, pp. 319-339.

Dellaert, B. and Khan, B.E. "How Tolerable is Delay? Consumers' Evaluations of Internet Web Sites after Waiting," Journal of Interactive Marketing (13:1), 1999, pp. 41-54.

Dennett, D. C. "Precis of the intentional stance," Behavioral and Brain Science (11), 1988, pp. 495-546.

Diamantopoulos, A. and Winklhofer, H.M. "Index construction with formative indicators: An alternative to scale development," Journal of Marketing Research (38:2), 2001, pp. 269-277.

Dryer, C. "Getting Personal with Computers: How to Design Personalities for Agents," Applied Artificial Intelligence (13), 1999, pp. 273- 295.

Dryer, D. C. "Personalities of user interface characters," Technical report for Walt Disney Pictures and Television, Burbank, CA, 1995.

Dryer, D. C., and Horowitz, L. M. "When do opposites attract? Interpersonal complementarity versus similarity," Journal of Personality and Social Psychology (72:3), 1997, pp. 592- 603.

Dryer, D. C., Nass, C., Steuer, J. S. and Henriksen, L. "Interpersonal responses to computers programmed to function in social roles," Presented at the Annual Meeting of the Western Psychological Association, Phoenix, Arizona, 1993.

Duck, S. W. "Personality similarity and friendship choice: Similarity of what, when?" Journal of Personality (41), 1973, pp. 543-558.

Edwards, J. R. "Ten Difference Score Myths," Organizational Research Methods (4:3), 2001, pp. 265-287.

Fishbein, M., and Ajzen, I. Belief, Attitude, Intention and Behavior: An Introduction to Theory and Research, Addison-Wesley, Reading, MA, 1975.

Fisher, R. A. Statistical Methods for Research Workers. Oliver and Boyd, London, 1925.

Fiske, S. T. and Taylor, S. E. Social Cognition. McGraw-Hill, New York, NY, 1991.

Fogg, B. J. and Nass, C. "Do users reciprocate to computers?" Proceedings of the CHI Conference (Atlanta, GA). Association of Computing Machinery, New York, NY, 1997(a).

Fogg, B. J. and Nass, C. "Silicon sycophants: Effects of computers that flatter," International Journal of Human-Computer Studies (46:5), 1997(b), pp. 551-561.

Fornell, C. and Larcker, V.F. "Evaluating structural equation models with unobservable variables and measurement error," Journal of Marketing Research (18), 1981, pp. 39-50.

Gefen, D., Karahanna, E., and Straub, D.W. "Trust and TAM in Online Shopping: An Integrated Model," MIS Quarterly (27:1), March 2003, pp. 51-90.

Ghose, S., and Dou, W. "Interactive Functions and Their Impacts on the Appeal of Internet Presence Sites," Journal of Advertising Research, 1998, pp. 29-43.

Griffin, D. and Gonzalez, R. "Correlational analysis of dyad-level data in the exchangeable case," Psychological Bulletin (118), pp. 430-439.

Griffin, D. and Gonzalez, R. "Models of dyadic social interaction," Philosophical Transactions: Biological Sciences (358:1431), 2003, pp. 573-581.

Hair, J.F., Anderson, R.E., Tatham, R.L., and Black, W.C. Multivariate Data Analysis, fifth edition, Prentice-Hall, Inc., 1998.

Hartz, A.Z. "Psycho-socionomics: Attractiveness research from a societal perspective," Journal of Social Behavior and Personality (11), 1996, pp. 683-694.

Häubl, G. and Trifts, V. "Consumer Decision Making in Online Shopping Environments: The Effects of Interactive Decision Aids," Marketing Science (19:1), 2000, pp. 4-21.

Hess, T., Fuller, M. and Mathew, J. "Involvement and Decision-Making Performance With a Decision Aid: The Influence Of Social Multimedia, Gender, and Playfulness," Forthcoming in Journal of MIS.

Hill, C. T. and Stull, D. E. "Sex differences in effects of social and value similarity in same sex friendships." Journal of Personality and Social Psychology (41), 1981, pp. 488–502.

Hill, C. T., Rubin, Z., and Peplau, L. A. "Breakups before marriage: The end of 103 affairs," Journal of Social Issues (32), 1976, 1pp. 47–168.

Hinde, R. A. Relationships: A dialectical perspective. Psychology Press, East Sussex, England, 1997.

Horn, J. L., and Cattell, R. B. "Refinement and test of the theory of fluid and crystallized ability intelligences," Journal of Educational Psychology (57), 1966, pp. 253- 270.

Hoyle, R. H. "Interpersonal attraction in the absence of explicit attitudinal information," Social Cognition (11), 1993, pp. 309–320.

Isbister, K. and Nass, C. "Consistency of personality in interactive characters: verbal cues, non-verbal cues, and user characteristics," International Journal of Human-Computer Studies (53), 2000, pp. 251-267.

Janson, M., Woo, C. and Smith L. D. "Information systems development and communicative action theory,"" Information & Management (25), 1993, pp. 59-72.

Keen, P. "Relationships The Electronic Commerce Imperative," in Information Technology and the Future Enterprise: New Models for Managers, G. Dickson, and G. Desanctis, Prentice Hall, 2000, pp. 163-185.

Kiesler, D. J. "The 1982 interpersonal circle: a taxonomy for complementarity in human transactions," Psychological Review (90), pp. 185-214.

Kim, D. and Benbasat, I. "The Effects of Trust-Assuring Arguments on Consumer Trust in Internet Stores," Working paper, Sauder School Of Business, UBC, 2004.

Klohnen, E. C., & Luo, S. "Interpersonal attraction and personality: What is attractive - self similarity, ideal similarity, complementarity, or attachment security?" Journal of Personality and Social Psychology (8), 2003, pp. 709–722.

Komiak, S. and Benbasat, I. "The Effects of Internalization and Familiarity On Trust and Use of Recommendation Agents," Working paper, Sauder School Of Business, UBC, June 2004(a).

Komiak, S., and Benbasat, I. "Understanding Customer Trust in Agent-Mediated Electronic Commerce, Web-Mediated Electronic Commerce, and Traditional Commerce," Information Technology and Management (5:1-2), 2004(b), pp. 181-207.

Kramer, R. "Trust and Distrust in Organizations: Emerging Perspectives, Enduring Questions," Annual Review of Psychology (50), 1999, pp. 569-598.

Kumar, N. and Benbasat, I. "Para-Social Presence and Communication Capabilities of a Website: A Theoretical Perspective," e-Service Journal (1:3), 2002, pp. 5-24.

Kumar, N. and Benbasat, I. "The Impact of Personalization and Virtual Communities on Customers' Evaluation of a Web Site," Working paper, Sauder School Of Business, UBC, March 2004.

Langer, E. J. "Matters of mind: Mindfulness/mindlessness in perspective," Consciousness and Cognition (1), 1992, pp. 289-305.

Lee, E. and Nass, C. "Does the ethnicity of a computer agent matter? An experimental comparison of human-computer interaction and computer-mediated communication," Proceedings of the Workshop on Embedded Conversational Characters Conference, Lake Tahoe, CA, 1998, pp. 123-128.

Lee, K. M., and Nass, C. "Designing Social Presence of Social Actors in Human Computer Interaction," Proceedings of the International CHI Conference, Ft. Lauderdale, FL, 2003.

Lee, M. K. O., and Turban, E. "A Trust Model for Consumer Internet Shopping," International Journal of Electronic Commerce (6:1), 2001, pp. 75–91.

Levin, D. Z., Cross, R., and Abrams, L. C. "Why should I trust you? Predictors of interpersonal trust in a knowledge transfer context," Paper presented at the 2002 Academy of Management meeting, Denver, Colorado, 2002.

Lichtenthal, J. D., and Tellefsen, T. "Toward a theory of buyer-seller similarity," University Park: Institute for the Study of Business Markets, The Pennsylvania State University, No. 22, 1999.

Mandel, N., and Johnson, E.J. "Constructing Preferences Online: Can Web Pages Change What You Want?" Working Paper, MIT Ecommerce Forum, Boston, 1999.

McCrae, R. R. and Costa, P. T. Jr. "Comparison of EPI and psychotics scales with measures of the five-factor model of personality," Personality and Individual Differences (6), 1985, pp. 587-597.

McCrae, R. R. and Costa, P. T. Jr. "The structure of interpersonal traits: Wiggins's circumplex and the five-factor model," Journal of Personality and Social Psychology (65), 1989, pp. 586-595.

McCroskey, J.C., Hamilton, P.R. and Weiner, A.N. "The effect of interaction behavior on source credibility, homophily and interpersonal attraction," Human Communication Research (1), 1974, pp. 42-52.

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

McKnight, D.H., Choudhury, V., and Kacmar, C. "The impact of initial consumer trust on intentions to transact with a web site: a trust building model," Journal of Strategic Information Systems (11:3-4), December 2002, pp. 297-323.

Moon, Y. and Nass, C. "Are computers scapegoats? Attributions of responsibility in human-computer interaction," International Journal of Human-Computer Studies (49), 1998, pp. 79-94.

Morgan, R.M., and Hunt, S.D. "The commitment-trust theory of relationship marketing," Journal of Marketing (58:3), 1994, pp. 20–38.

Morry, M. "Relationship satisfaction as a predictor of similarity ratings: A test of the attraction–similarity hypothesis," Journal of Social and Personal Relationships (22:4), 2005, pp. 561–584.

Moskowitz, D. S. "Cross-situational generality in the laboratory: Dominance and friendliness," Journal of Personality and Social Psychology (54), 1988, pp. 829- 839.

Murphy, J. and Hofacker, C. "A Methodology and Investigation of an eLoyalty Metric, Consumer Bookmarking Behavior," Journal of Computer-Mediated Communication (10:1), 2004.

Nass, C. and Moon, Y. "Machines and mindlessness: Social responses to computers," Journal of Social Issues (56:1), 2000, pp. 81-103.

Nass, C. and Steuer, J. "Voices, boxes, and sources of messages: Computers and social actors," Human Communication Research (19:4), 2000, pp. 504-527.

Nass, C. I., Steuer, J. and Tauber, E. "Computers are social actors," Proceedings of the CHI conference, Boston, MA, 1994.

Nass, C. I., Steuer, J., Tauber, E. and Reeder, H. "Anthropomorphism agency and ethopoeia: computers as social actors," Proceedings of the International CHI Conference, Amsterdam, 1993.

Nass, C., and Lee, K. M. "Does Computer-Synthesized Speech Manifest Personality? Experimental Tests of Recognition, Similarity-Attraction, and Consistency-Attraction," Journal of Experimental Psychology: Applied (7:3), 2001, pp. 171-181.

Nass, C., Fogg, B. J. and Moon, Y. "Can computers be teammates?" International Journal of Human-Computer Studies (45:6), 1996, pp. 669-678.

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

Nass, C., Moon, Y., and Carney, P. "Are respondents polite to computers? Social desirability and direct responses to computers," Journal of Applied Social Psychology (29:5), 1999, pp. 1093-1110.

Nass, C., Moon, Y., Fogg, B. J., Reeves, B. and Dryer, D. C. "Can computer personalities be human personalities?" International Journal of Human-Computer Studies (43), 1995, pp. 223-239.

Newcomb, T. M. The Acquaintance Process. Holt, Rinehart and Winston, New York, NY, 1961.

Neyer, F. J. "The dyadic interdependence of attachment security and dependency: A conceptual replication across older twin pairs and younger couples," Journal of Social and Personal Relationships (19:4), 2002, pp. 483-503.

Neyer, F. J. and Voigt, D. "Personality and Social Network Effects on Romantic Relationships: A Dyadic Approach," European Journal of Personality (18), 2004, pp. 279–299.

Oren, T., Salomon, G. Kreitman, K., and Don, A. "Guides: characterizing the interface," in The Art of Human-Computer Interface Design, Addison-Wesley, Reading, MA, 1990.

Orne, M. "On The Social Psychology of the Psychological Experiment: With Particular Reference to Demand Characteristics and Their Implications," American Psychologist (17:11), 1962, pp. 776–783.

Pavlou, P. and Gefen, D. "Building Effective Online Marketplaces with Institution-Based Trust," Information Systems Research (15:1), March 2004, pp. 37-59.

Pavlou, P.A. "Consumer acceptance of electronic commerce: Integrating trust and risk with the technology acceptance model," International Journal of Electronic Commerce (7:3), Spring 2003, pp. 101-134.

Payne, J.W., Bettman, J., R., and Johnson, E.J. The Adaptive Decision-maker Cambridge University Press, New York, 1993.

Podsakoff, P., MacKenzie, S., Lee, J. and Podsakoff, N. "Common Method Biases in Behavioral Research: A Critical Review of the Literature and Recommended Remedies," Journal of Applied Psychology (88:5), 2003, pp. 879–903.

Qiu, L. and Benbasat, I. "Online Consumer Trust and Live Help Interfaces: The Effects of Text-to-Speech Voice and Three-Dimensional Avatars", International Journal of Human-Computer Interaction (19:1), 2005, pp. 75-94.

Reeves, B. and Nass, C. The media equation: How people treat computes, television, and new media like real people and places, CLSI Publication, Stanford, CA, 1996.

Reis, T., Capobianco, A. and Tsai, F. "Finding the Person in Personal Relationships," Journal of Personality (70:6), December 2002, pp. 813-850.

Reiss, N. Speech Act Taxonomy. John Benjamins Publishing Company, Philadelphia, 1985.

Salem, B., and Earle, N. "Designing a Non-Verbal Language for Expressive Avatars," Proceedings of the third international conference on Collaborative virtual environments, San Francisco, California, United States, 2000, pp. 93-101.

Searle, J. R. Expression and Meaning. Cambridge University Press, Cambridge, 1979.

Short, J. Williams, E., and Christie, B. The Social Psychology of Telecommunication, John Wiley and Sons, New York, NY, 1976.

Silver, M. S. "User perceptions of decision support system restrictiveness: An experiment," Journal of Management Information Systems 5(1), 1988, pp. 51-65.

Silver, M. S. "Decision support systems: Directed and nondirected change," Information Systems Research (1:1), 1990, pp. 47-70.

Sinha, R. and Swearingen, K. "The Role of Transparency in Recommender Systems," Paper presented at the ACM CHI 02 Conference on Human Factors in Computing Systems, Minneapolis, Minnesota, 2002.

Sirdeshmukh, D., Singh, J. and Sabol, B. "Consumer Trust, Value, and Loyalty in Relational Exchanges," Journal of Marketing (66:1), pp. 15-38.

Stewart, K. "Trust Transfer on the World Wide Web," Organization Science (14:1), January–February 2003, pp. 5–17.

Suh, B., and Han, I. "Effect of trust on customer acceptance of Internet banking," Electronic Commerce Research and Applications (1:3-4), 2002, pp 247-263.

Suh, B., and Han, I. "The impact of customer trust and perception of security control on the acceptance of electronic commerce," International Journal of Electronic Commerce (7:3), Spring 2003, pp. 135-161.

Suler, J. The psychology of cyberspace. Available: http://www.rider.edu/users/suler/psycyber/psycyber.html, 1999.

Sundar, S. and Nass, C. "Source Orientation in Human-Computer Interaction," Communication Research (27: 6), December 2000, pp. 683-703.

Svenson, O. "Process Descriptions of Decision Making: the Effect of Information Display," Acta Psyc (65), 1979, pp. 165-179.

Torkzadeh, G. and Dhillon, G. "Measuring factors that influence the success of Internet commerce," Information Systems Research, (13:2), 2002, pp. 187-204.

Trapnell, P. and Wiggins, J. "Extension of the Interpersonal Adjective Scales to Include the Big Five Dimensions of Personality," Journal of Personality and Social Psychology (59:4), 1990, pp. 781-790

Turkle, S. The Second Self: Computer and Human Spirit, Simon and Schuster, New York, NY, 1984.

Uleman, J. S., A. Hon, R. Roman, and G. B. Moskowitz "On-line evidence for spontaneous trait inferences at encoding," Personality and Social Psychology Bulletin (22), 1996, pp. 377- 394

Van der Heijden, H. "User Acceptance of Hedonic Information Systems," MIS Quarterly (28:4), 2004, pp. 695-704.

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

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

Wang, W. and Benbasat, I. "Trust in and Adoption of Online Recommendation Agents", Journal of AIS (6:3), 2005, pp. 72-101.

Wiggins, J. S. "A psychological taxonomy of trait-descriptive terms: The interpersonal domain," Journal of Personality and Social Psychology (37), 1979, pp. 395-412.

Wiggins, J. S. Circumplex models of interpersonal behaviour in clinical psychology. In P. C. Kendall and J. N. Butcher, Eds. Handbook of research methods in clinical psychology, pp. 183-21. Wiley, New York, NY, 1982.

Wiggins, J. S. and Broughton, R. The interpersonal circle: a structural model for the integration of personality research. In R. Hogan, Ed. Perspectives in Personality, 1, 1985, pp. 1-47.

Wiggins, J. S. and Pincus, A. L. "Conceptions of personality disorders and dimensions of personality," Psychological Assessment (1), 1989, pp. 305-316.

Wiggins, J., Trapnell, P. and Phillips, N. "Psychometric and geometric characteristics of the revised Interpersonal Adjective Scale (IAS-R)," Multivariate Behavioral Research (23), 1988, pp. 517-530.

Winograd, R. and Flores, C. Understanding computers and cognition: a new foundation for design, Addison-Wesley, Reading, MA, 1987.

Winstead, B. A., Derlega, V. J., and Rose, S. Gender and close relationships. Sage, Thousand Oaks, CA, 1997.

Zhu, L. and Benbasat, I. "Let's Shop Online Together: An Investigation of Online Collaborative Shopping Support," Working paper, Sauder School of Business, UBC, March 2004.

Zuckers, L. G. "Similarity Based Trust," Research in Organizational Behavior (8), 1986, pp. 53-111.

10. Appendix A: Sample Studies

Table A.1: Sample studies highlighting people's social responses to artifacts

Study	Research Questions	Theoretical Bases	Procedure	Conclusions
Nass et al., 1993	Can minimal social cues induce computer-literate individuals to use social rules to evaluate the performance of computers?	Anthropomorphism and Ethopoeia	The experimental situation involved a computer-based tutoring and testing system, which evaluated both the subject's performance and the tutor's performance, through a 2 (same voice/different voice) x 2 (same box/different box) x 2 (praise/criticism), between-subjects design.	– The results provide the first experimental evidence that users make social attributions toward minimal computer-based agents (through applying social rules), even when users believe that these attributions are inappropriate, a process that is termed ethopoeia.
Nass et al., 1996	Will humans readily form team relationships with computers?	Group dynamic in human-human interactions.	A laboratory experiment manipulated identity and interdependence to create team affiliation in a human-computer interaction, through a 2 (identity / non-identity) x 2 (interdependent / non-interdependent) between-subjects design.	– Subjects who are told they are interdependent with the computer affiliate with the computer as a team. – The effects of being in a team with a computer are the same as the effects of being in a team with another human: + Subjects in the interdependence conditions perceived the computer to be more similar to themselves, thought the information from the computer was of higher quality and friendlier, and conformed more to the computer's information. + Subjects in the identity conditions showed neither team affiliation nor the effects of team affiliation.

Table A.1 (Continued): Sample studies highlighting people's social responses to artifacts				
Fogg & Nass, 1997b	– Are humans susceptible to flattery from computers? – Are the effects of flattery from computers the same as the effects of flattery from humans?	Flattery (and its effects) in human-human interaction	In a cooperative task with a computer, participants received one of three types of feedback from a computer: "sincere praise", "flattery" (insincere praise) or "generic feedback".	– Compared to generic-feedback subjects, flattery subjects reported more positive effects, better performance, more positive evaluations of the interaction and more positive regard for the computer. – Subjects in the sincere praise condition responded similarly to those in the flattery condition.
Nass, Moon & Green, 1997	Would subtle gender cues cause stereotyped responses?	Gender stereotypes	Participants were tutored (on different topics) and evaluated by a computer that had either a male or a female voice.	– Participants were more influenced by praise from the computer with the male voice than the computer with the female voice. – Evaluation from a male-voice computer was rated as more friendly. – The female-voice computer was rated as a better teacher of love and relationships.
Nass, Moon & Carney, 1999	Are people polite to computers?	Politeness in human-human interaction	Participants were tutored by a computer, and then asked to evaluate the computer. The evaluation either occurred on the same computer or on a different machine.	– Participants who completed their evaluation of the computer on the same machine significantly rated the computer more favorably.
Sundar & Nass, 2000	What are individuals orienting to when they interact with a computer?	– Computer-as-Source (CAS) – Computer-as-Medium (CAM)	Compared participants' ratings of a tutor program when the computer is refereed to as a "computer", and when referred to as a "programmer/networker".	– The attributions made to the computer qua machine were different from those made to the computer qua programmer or networker. – "These results provide strong evidence that, when individuals respond socially to computers, they do not respond as if they are engaging in computer-mediated interaction." (p. 699)

Table A.2: Sample studies of artifacts endowed with personalities				
Study	**Research Questions**	**Theoretical Bases**	**Procedure**	**Conclusions**
Dryer et al., 1993; Dryer, 1999	Would people perceive a personality when interacting with an agent (based on the agent's behavior alone)?	Personality dimensions (friendliness and authoritativeness)	Participants were tutored, tested, and then evaluated on a certain topic. – The first manipulation concerned whether the evaluating and tutoring computers were the same or different. – The second manipulation concerned whether the evaluation was typically positive or negative.	– In this study the machines' personalities were determined by their behavior alone. – People use the personality traits of dominance and friendliness to organize the behavior of machines and people in the same way.
Dryer et al., 1995; Dryer, 1999	Would people perceive a personality when interacting with an agent (based on the agent's behavior and representation)?	Personality dimensions (extroversion and agreeableness)	Participants rated the similarities of 37 animated characters that were potential user interface agent representations.	– Participants distinguished these agents within the two-dimensional interpersonal space, specifically along the dimensions of extroversion and agreeableness.
Nass et al., 1995	Can computer personalities be human personalities? – How easily can we create computer personalities? – Will people respond to them in the same way they would respond to similar human personalities?	Similarity-attraction hypothesis	Dominant and submissive subjects were randomly matched with computers that were endowed with properties associated with dominance or submissiveness.	– Subjects recognized the computer's personality type and distinguished the type from other closely related personality types. – In addition, "subjects not only preferred the similar computer, but they were more satisfied with the interaction." (p. 223)
Moon & Nass, 1998	How do people make attributions of responsibility when interacting with computers? – Under what circumstances will users blame computers for failed outcomes? – Under what circumstances will users credit computers for successful outcomes?	– Similarity-attraction hypothesis – Control and internal attributions	Dominant and submissive participants were randomly matched with either a "dominant" or "submissive" computer in a 2 (Similarity: similar, dissimilar) x 2 (Control: user, computer) x 2 (Outcome: success, failure) balanced, between-subjects design.	– When the outcome was negative (positive), participants working with a similar computer were less (more) likely to blame (credit) the computer and more (less) likely to blame (take the credit) themselves, compared with participants working with a dissimilar computer. – When users were given more control over outcomes, they tended to make more internal attributions, regardless of whether the outcome was positive or negative.

Table A.2 (Continued): Sample studies of artifacts endowed with personalities				
Isbister & Nass, 2000	Would people interpret and respond to verbal (text) and non-verbal cues (posture) of personality in interactive characters just as they interpret cues from a person?	– Consistency-attraction hypothesis – Similarity-attraction hypothesis – Complementary-attraction hypothesis	Extroverted and introverted participants were randomly assigned to one of four conditions in a 2 x 2 balanced, between-subjects design: matching (the participant) or mismatching verbal cues by matching or mismatching non-verbal cues.	– Participants accurately identified the character's personality type in their assessment of its verbal and non-verbal cues. – Preference was for consistent characters, regardless of participant personality. Consistent characters also had greater influence over participant behavior. – Contrary to previous research, participants tended to prefer a character whose personality was complementary, rather than similar, to their own.
Nass & Lee, 2001	Would people interpret and respond to paralinguistic personality cues in computer-generated speech in the same way they respond to human speech?	– Similarity-attraction hypothesis – Consistency-attraction hypothesis	Two studies where participants used a book-buying website and heard five book reviews: – Study 1 (testing similarity-attraction) was a 2 (computer voice personality: extrovert vs. introvert) × 2 (participant personality: extrovert vs. introvert) between-subjects design, with the five book descriptions as a repeated factor. – Study 2 (testing for both similarity and consistency attraction) added a 2 (text personality: extrovert vs. introvert) factor.	– Participants accurately recognized personality cues in text to speech and showed similarity-attraction in their evaluation of the computer voice, the book reviews, and the reviewer. – In addition to the similarity results in study 1, participants were even more attracted when there was a consistency between the personality of the voice and the text.
Lee & Nass, 2003	Can personality similarity and consistency affect perceptions of social presence?	– Similarity-attraction hypothesis – Consistency-attraction hypothesis – Social presence	– Study 1 (testing for similarity-attraction) was a 2 (Participant Personality: Extrovert vs. Introvert) x 2 (Computer Voice Personality: Extrovert vs. Introvert) between-subject factorial design. – Study 2 (testing for both similarity and consistency attraction) added a 2 (text personality: extrovert vs. introvert) factor.	– Both Experiment 1 and Experiment 2 show that matching synthesized voice personality to user personality positively affects users' (especially extrovert users') feelings of social presence. – Experiment 2 also reveals that users feel a stronger sense of social presence when the personality of synthesized voice matches the personality of textual content than when those two are mismatched.

11. Appendix B: Scripts

About John Script
John is a graduate student at the University of British Columbia. He is in his third year of the PhD program and hopes to graduate in a year or so. Being a student of limited income, he prefers not to spend too much on his new laptop computer. While it is true that John spends much of his time reading and researching in the library, he spends an equivalent amount of time writing. Lately, John discovered that his University Library hosts a large number of academic journals online, and he's indeed happy to know that now he can save a couple of his trips to the Library. Due to the large size of the documents he often needs to save on his computer, John thinks it's somewhat important that his next computer has a relatively large hard drive. John's studies usually leave him little time to take a vacation, but John travels on average a couple of times a year to attend academic conferences. Additionally, John often has to make the daily long commute to campus. Since, the new laptop will be sure to accompany him on these trips, a lighter machine will definitely make it easier for him. John doesn't run any astronomical applications on his computer. His computer use is often limited to office tools, the Internet, and the occasional times he runs statistical software, some of which may run for hours before producing the final output. In other words, processor power is of moderate to low importance to John, while having additional memory might allow John to utilize his computer even when running many programs. John is definitely not into video games, but he often uses his computer to watch movies. He doesn't like pirated software, so he doesn't mind being a regular customer at his neighborhood DVD store. If I were asked to describe John, I would definitely describe him as risk-neutral. The guy believes in fate, but he is careful enough not to drive an uninsured car. Having said that, I think that John will be pretty upset if his new laptop breaks down and he has to pay to fix it. At school John has a small cramped office. He is thinking that once he buys his new laptop, he will move his home PC to his office. He is a bit worried about keeping his files up to date on both computers. Floppy disks are often too small to hold any of John's files. He knows that for sure because of the countless times he had to use multiple floppy disks to save his class presentations, so he can show them in class. That's not to say that his files are too large for a CD or a similar device. John is a thinker in every sense of the word. Once he gets into his "zone", many brilliant ideas can start flowing. At times like this, John doesn't like being interrupted. I actually remember once when there was a power outage during one of his creative moments. I have never seen John as upset as he was that day. Other than the fact that he lost all of his unsaved files, knowing that he now has to restart his complicated statistical engine, was even worse. John has lately become an Internet addict. He likes checking his email tens of times a day, and likes reading online news with his coffee. That's why I think that being able to connect

to the Internet from as many places as possible is relatively important to him. Since John just newly upgraded from a dialup Internet connection to a DSL one, I imagine he has a strong tolerance for slower connections.

Although that he never explicitly told me, I know John's eyesight is definitely less than perfect. He likes to print things in larger font, and his TV has one of the largest screens I've seen. It seems to me that John considers this to be of some importance in relation to his decision of buying a laptop.

Assistant Scripts		
	Dominant	**Submissive**
Introduction	Hello and welcome to MyLaptopStore.com. My name is Pat, and I will be your shopping assistant. **I will provide you** with useful information throughout the process of choosing a suitable laptop computer. On the next page, I will introduce you to the different components of a laptop system. Once you are familiar with the different laptop system attributes, you will be given the chance to make a selection from a set of six laptops. An attribute of a laptop could be any of its components that help differentiate one laptop from another. For example, a laptop attribute could be the size of its hard drive, the speed of its processor, or the type of warranty it comes with. Once you've made your selection, I will tell you about my own selection and provide full justification for my choice. Before you start, **I need you to provide** me with your email address.	Hello and welcome to MyLaptopStore.com. My name is Pat, and I will be your shopping assistant. **I will try my best to provide you** with useful information throughout the process of choosing a suitable laptop computer. On the next page, I will introduce you to the different components of a laptop system. Once you are familiar with the different laptop system attributes, you will be given the chance to make a selection from a set of six laptops. An attribute of a laptop could be any of its components that help differentiate one laptop from another. For example, a laptop attribute could be the size of its hard drive, the speed of its processor, or the type of warranty it comes with. Once you've made your selection, I will tell you about my own selection and provide full justification for my choice. Before you start, **please provide** me with your email address.
Processor	Your processor **is undoubtedly** the brain of your computer. It is also called the central processing unit (CPU). In terms of computing power, the CPU **is definitely** the most important element of a computer system. When it comes to choosing between processors, you **should definitely** take into account how data intensive your data processing is. I strongly recommend you choose a Pentium processor that has a speed of at least 2GHz.	Your processor **is probably** the brain of your computer. It is also called the central processing unit (CPU). In terms of computing power, the CPU **may be** the most important element of a computer system. When it comes to choosing between processors, you **may want to** take into account how data intensive your data processing is.

Operating System	The Operating System **is indisputably the most important** program that run on your computer. Your overall computing experience **will surely be** enhanced by choosing the right operating system for your needs. Windows XP Professional **will indeed lead to higher** productivity at home, school, or the office with excellent networking and remote access tools, and is strongly recommended.	The Operating System **may be one of the most** important programs that run on your computer. Your overall computing experience **could be** enhanced by choosing the right operating system for your needs. Windows XP Professional **could mean higher** productivity at home, school, or the office with excellent networking and remote access tools.
Memory	Random Access Memory (RAM) is **without doubt** the workhorse behind the performance of your computer. The amount of RAM you have **will unquestionably** determine how many programs can be executed at one time, how much data can be readily available to a program, and how quickly your applications perform. I personally recommend you buy 512MB of RAM at minimum.	Random Access Memory (RAM) is **perhaps** the workhorse behind the performance of your computer. The amount of RAM you have **may** determine how many programs can be executed at one time, how much data can be readily available to a program, and how quickly your applications perform.
Display	Choosing a screen resolution is **definitely similar to** choosing a tool suited for a particular job. A TrueLife display **will certainly** offer a viewing experience that is **surely** more crisp and **unquestionably** more vivid than lower resolution displays. A benefit of the wide screen technology is **without doubt** being able to see more information on screen. For example, the wide aspect 15.4" screen **will** provide 30% more information than standard aspect ratio 15" screens. A 17" wide-screen is what I recommend.	Choosing a screen resolution is **possibly similar to** choosing a tool suited for a particular job. A TrueLife display **may** offer a viewing experience that is **probably** more crisp and **most likely** more vivid than lower resolution displays. A benefit of the wide screen technology **may be** being able to see more information on screen. For example, the wide aspect 15.4" screen **may** provide 30% more information than standard aspect ratio 15" screens.
Hard Drive	A hard drive is the primary storage unit of the computer. It is where the operating system, applications, files and data are kept. As software programs **indeed** require more and more storage space, buying a larger hard drive now **will surely** save you the trouble of having to buy a bigger hard drive later. That's why I strongly recommend you buy a hard drive of at least 60GB of storage space.	A hard drive is the primary storage unit of the computer. It is where the operating system, applications, files and data are kept. As software programs **arguably** require more and more storage space, buying a larger hard drive now **could possibly** save you the trouble of having to buy a bigger hard drive later.
DVD/CD	A DVD-ROM **will allow** you to watch DVD Movies on your notebook. A CD-RW **will indeed** allow you to copy music and data from your computer to CDs. A CD-RW/DVD Combo Drive **should certainly be chosen** if you plan to do all or a combination of the activities listed	A DVD-ROM **allows** you to watch DVD Movies on your notebook. A CD-RW **allows** you to copy music and data from your computer to CDs. A CD-RW/DVD Combo Drive **should perhaps be chosen** if you plan to do all or a combination of the activities

	above. The CD-RW/DVD combo is strongly recommended.	listed above.
Warranty	Approximately 50% of computer snags occur after the first year, where a single service repair without warranty coverage **will certainly** cost between $150 and $699. You should definitely get a warranty plan that offers at minimum a year of full coverage.	Approximately 50% of computer snags occur after the first year, where a single service repair without warranty coverage **might possibly** cost between $150 and $699.
Primary Battery	Most notebooks use either Nickel Metal Hydride (NiMH) or Lithium Ion (LiON) batteries. You **will surely** get 2 to 5 hours from a fresh LiON battery, **regardless of usage level and/or system configuration**. NiMH batteries are a lower-cost and will provide about 1.5 hours of battery life. The 80 WHr 9-cell LiON battery is positively what I would recommend.	Most notebooks use either Nickel Metal Hydride (NiMH) or Lithium Ion (LiON) batteries. You **may perhaps** get 2 to 5 hours from a fresh LiON battery, **depending on usage level and/or system configuration**. NiMH batteries are a lower-cost and will provide about 1.5 hours of battery life.
Wireless Networking Card	A wireless card is an internal card in your notebook that allows your notebook to connect wirelessly to access the Internet. The speed at which a wireless card can access and send data is measured in Mbps (megabits per second). A network card with high Mbps, will **definitely** mean faster data transfer, and **undoubtedly** a more enjoyable Internet experience. I recommend that you buy a wireless card that operates at 54Mbps at minimum.	A wireless card is an internal card in your notebook that allows your notebook to connect wirelessly to access the Internet. The speed at which a wireless card can access and send data is measured in Mbps (megabits per second). A network card with high Mbps, will **almost certainly** mean faster data transfer, and **probably** a more enjoyable Internet experience.
Weight	The weight of the machine will **surely** influence its ease of movement and carry. A light laptop will **indeed** make it easier for you to take it wherever you desire without much effort. That's why I strongly recommend you buy a laptop that weighs a maximum of 5.50 lbs.	The weight of the machine **almost certainly** will influence its ease of movement and carry. A light laptop **most likely** will make it easier for you to take it wherever you desire without much effort.
Link to Introduction	Now that you have acquired **the essentially needed information** that **will definitely** help you make a better decision on which laptop system to choose, you will now be **directed** to a page where you can make your choice.	Now that you have acquired **some information** that **may** help you make a better decision on which laptop system to choose, you will now be **taken** to a page where you can make your choice.
Choice Introduction	Now, take few minutes to choose a laptop based on what you learned about John's preferences. Once you make your choice, click the submit button at the bottom of the page. On the next page I will offer you my choice of a laptop system with and provide you with full justification for my choice. **Note** that clicking on the attribute name will open a new window showing my	Now, **please** take few minutes to choose a laptop based on what you learned about John's preferences. Once you make your choice, **please** click the submit button at the bottom of the page. On the next page I will offer you my choice of a laptop system with and provide you with full justification for my choice. **Please note** that clicking on the

	previously made comments about each attribute.	attribute name will open a new window showing my previously made comments about each attribute.
Post Choice	On your right, you can find the model you have chosen. Next, **tell me** about how you arrived at your choice. For example, I want to know how you narrowed down your selection, and about the criteria you used. **I need you** to provide me with a detailed description of your decision-making process in the box to the right, and once finished, click the "Submit Comments" button.	On your right, you can find the model you have chosen. Next, **I would like to** hear about how you arrived at your choice. For example, I am very interested in hearing about how you narrowed down your selection, and if possible, about the criteria you used. **Please** provide a detailed description of your decision-making process in the box to the right, and once finished, **please** click the "Submit Comments" button.
Pat Choice Intro (Same)	I see you have selected the <<model>> model. I am too 100% certain that this is the most appropriate Laptop computer for John. As you can see, my selection, which is the exact same as yours, is shown on your right. On the next page, I will give you a detailed description of my decision-making process. Afterwards, I will give you a chance to change your selection if you desire.	I see you have selected the <<model>> model. I too think this might be the most appropriate Laptop computer for John. As you can see, my selection, which is the same as yours, is shown on your right. On the next page, I will give you a detailed description of my decision-making process. Afterwards, I will give you a chance to change your selection if you desire.
Pat Choice Intro (Different)	I see you have selected the <<model>> model. Before you complete the shopping task, I thought I tell you about what I am 100% certain is the most appropriate Laptop computer for John. My selection, the <<assistant_model>> model is shown on your right. On the next page, I will **give you** a detailed description of my decision-making process. Afterwards, I will give you a chance to change your selection, which I honestly think you should do.	I see you have selected the <<model>> model. Before you complete the shopping task, I thought I tell a bit about what might be another appropriate Laptop computer for John. My selection, the <<assistant_model>> model is shown on your right. On the next page, I will **offer** a detailed description of my decision-making process. Afterwards, I you will be given a chance to change your selection.
Post Choice (EBA/Different)	It is **absolutely** clear to me that John **would surely** not want a computer that doesn't come with sufficient warranty. Since the 2200 model does not offer a **warranty** option, **it should be discarded.** Since John indicated how he hates it when some sort of power outage interrupts his work, I am **certain** that he will **definitely** be unwilling to settle for a laptop computer that comes with a short-life **primary battery**. As a result, **I strongly believe the** 6000 model **should surely be** discarded. The XPS and 9300 models are **indeed** much heavier and would be **tough** for John to	It is **somewhat** clear to me that John **might** not want a computer that doesn't come with sufficient warranty. Since the 2200 model does not offer a **warranty** option, **it may be discarded.** Since John indicated in his description how he hates it when some sort of power outage interrupts his work, **it may be that he** will be unwilling to settle for a laptop computer that comes with a short-life **primary battery**. As a result, the 6000 model **may be discarded**. The XPS and 9300 models are **perhaps** much heavier and would be **not be**

	shuttle around on his long commutes and occasional trips. That's why **I think** these two models **should indeed be discarded**. That only leaves the 700m and the 600m models. I strongly believe that either of these two models is perfectly suitable. However, considering John's weak eyesight as well as his desire to use his computer to watch movies, I recommend the 600m since it definitely offers the larger display. ***Choose 700:*** However, I am **positively certain** that John considers a CD burner as a must-have. That's why I **strongly** recommend the 700m, since it's the only one of the two that comes with a CD-RW.	**easy** for John to shuttle around. That's why these two models **may be discarded**. That only leaves the 700m and the 600m models. I somewhat believe that either of these two models is probably suitable. However, considering John's weak eyesight as well as his desire to use his computer to watch movies, I recommend the 600m since it probably offers the larger display. ***Choose 700:*** However, **It could be** that John considers a CD burner as a must-have. That's why I **may well** recommend the 700m, since it's the only one of the two that comes with a CD-RW.
Post Choice (AC/Different)	**I am extremely confident** that John considers both the laptop's warranty option as well as a CD-RW as must-have attributes, and hence most important. Next, in terms of importance, **indeed** comes the laptop's primary battery, **definitely** followed by its weight and the size of its screen, where the last two seem to be of equal importance. Next, **surely** comes the hard drive, the processor speed, and the amount of memory where all three are **certainly** of moderate importance. While John **is indeed** flexible on what Operating System the laptop should have, or what speed its wireless network card should be at, it **is evident** that John considers the price of the laptop to be of moderately importance. While the 2200 model **certainly has** the worst warranty, it **certainly** offers a relatively large display, and comes as a light machine. The 6000 model, while **positively** offering a reasonable warranty option, an average processor speed and hard drive, a moderate weight, and a fairly large display, **is surely** plagued by its below average primary battery and its lack of a CD-RW. Both the 600m and the 700m models **positively** offer an average processor and slightly above average warranty with a good battery and are relatively lightweight, but are definitely the two with the smallest display, while the 600m doesn't even come with a CD-RW. Both	**It seems to me** that John considers both the laptop's warranty option as well as a CD-RW as must-have attributes, and perhaps most important. Next, in terms of importance, **perhaps** comes the laptop's primary battery, **probably** followed by its weight and the size of its screen, where the last two seem to be of equal importance. Next, **may** come the hard drive, the processor speed, and the amount of memory where all three are **possibly** of moderate importance. While John **seems to be** flexible on what Operating System the laptop should have, or what speed its wireless network card should be at, it is **likely** that John considers the price of the laptop to be of moderately importance. While the 2200 model **may have** the worst warranty, it offers a relatively large display, and comes as a light machine. The 6000 model, while **perhaps** offering a reasonable warranty option, an average processor speed and hard drive, a moderate weight, and a fairly large display, **seem to be** plagued by its below average primary battery and its lack of a CD-RW. Both the 600m and the 700m models offer an average processor and slightly above average warranty with a good battery and are relatively lightweight, but are

	the 9300 and the XPS models **definitely** rank above average in terms of their display size, warranty, battery life, processor speed, amount of memory, and the size of their hard drive, as well as offering a CD-RW, but they are both **certainly** much heavier and somewhat pricy, as well as offering an Operating System that goes beyond John's needs. When all attributes and their relative importance are considered, it appears that both the 700m and the 600m models are suitable and are the best models on average, with the 600m model having a slight edge. I strongly recommend **going with** the 600m model. ***Choose 700:*** When all attributes and their relative importance are considered, it appears that both the 700m and the 600m models are suitable and are the best models on average, with the 700m model having a slight edge. I **strongly** recommend going with the 700m model.	definitely the two with the smallest display, while the 600m doesn't even come with a CD-RW. Both the 9300 and the XPS models **most likely** rank above average in terms of their display size, warranty, battery life, processor speed, amount of memory, and the size of their hard drive, as well as offering a CD-RW, but they are both **possibly** much heavier and somewhat pricy, as well as offering an Operating System that goes beyond John's needs. When all attributes and their relative importance are considered, it appears that both the 700m and the 600m models are suitable and are the best models on average, with the 600m model having a slight edge. I recommend **going with** the 600m model. ***Choose 700:*** When all attributes and their relative importance are considered, it appears that both the 700m and the 700m models are suitable and are the best models on average, with the 700m model having a slight edge. I recommend going with the 700m model.

12. Appendix C: Instrument

Questions administered during the task:

How well does each of these statements describe the way you made your decision about which laptop to buy?

Weighted Average / Additive Compensatory – Subject (7-point Likert scale, ranging from "extremely inaccurate" to "extremely accurate"):

1. All laptop attributes factored into my decision
2. My first step was to assign importance levels to every laptop attribute
3. To arrive at a choice, I weighed each model's specifications against the specified importance level of each attribute
4. All of the information provided by John about the importance of each attribute was used to derive my final choice
5. No model was eliminated before I considered all of its attributes
6. I did not discard a model that was rated low on a certain attribute, if it was rated very high on an equally important attribute
7. The chosen model appears to be the best model on average when considering all attributes and John's assigned importance levels.

Elimination by Aspect – Subject (7-point Likert scale, ranging from "extremely inaccurate" to "extremely accurate"):

1. Only some of the laptop attributes were used to arrive at my choice
2. I discarded some models after I considered only some of their attributes
3. I discarded some models primarily because they didn't meet the cutoff value for a certain attribute(s)
4. It was unnecessary for me to use all of the information provided about the importance of each attribute to arrive at a decision
5. I evaluated the different laptop models based on one attribute at a time
6. It was enough for me to discard a model only because it was rated low on a certain important attribute
7. Each model that was not chosen by me did not meet the requirements of at least one attribute

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In your opinion, how well does each of these statements describe the way the shopping assistant made his decision about which laptop to buy?

Weighted Average / Additive Compensatory – Assistant (7-point Likert scale, ranging from "extremely inaccurate" to "extremely accurate"):

1. All laptop attributes appear to have factored into Pat's decision
2. Pat's first step appeared to have been assigning importance levels to every laptop attribute
3. To arrive at a choice, Pat appears to have weighed each model's specifications against the specified importance level of each attribute

4. All of the information provided by John about the importance of each attribute appears to have been used by Pat to derive the final choice
5. It appears that no model was eliminated before Pat I considered all of its attributes
6. It appears that Pat did not discard a model that was rated low on a certain attribute, if it was rated very high on an equally important attribute
7. The model chosen by Pat appears to be the best model on average when considering all attributes and John's assigned importance levels

Elimination by Aspect – Assistant (7-point Likert scale, ranging from "extremely inaccurate" to "extremely accurate"):

1. It appears that only some of the laptop attributes were used to arrive at Pat's choice
2. It seems that Pat discarded some models after considering only some of their attributes
3. It appears that Pat discarded some models primarily because they didn't meet the cutoff value for a certain attribute(s)
4. It seems that it was unnecessary for Pat to use all of the information provided about the importance of each attribute to arrive at a decision
5. It appears that Pat evaluated the different laptop models based on one attribute at a time
6. It seems that it was enough for Pat to discard a model only because it was rated low on a certain important attribute
7. It appears that each model that was not chosen by Pat did not meet the requirements of at least one attribute

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Suggestive Guidance (7-point Likert scale, ranging from "extremely inaccurate" to "extremely accurate"):

1. The shopping assistant makes judgmental recommendations.
2. The shopping assistant provides suggestions in terms of what options to select.
3. The shopping assistant suggests a specific course of action.
4. The shopping assistant provides specific recommendations on what components to choose.

Directives (7-point Likert scale, ranging from "extremely inaccurate" to "extremely accurate"):

1. The statements made by the shopping assistant (or a subset of them) could be classified as requests.
2. The statements made by the shopping assistant (or a subset of them) are attempts to make me act in a certain way.
3. The statements made by the shopping assistant (or a subset of them) attempt to direct my actions.

Questions administered after the task:

Behavioral intention (7-point Likert scale, ranging from "strongly disagree" to "strongly agree"; Wang and Benbasat, 2005; Gefen et al. 2003; McKnight et al., 2002):
Answer the following questions assuming that you needed to shop from a site that offers a choice of similar shopping assistants. How much do you agree or disagree with the following statements about the shopping assistant?

1. I intend to reuse the shopping assistant for the same shopping task in the future.
2. I predict that I will reuse the shopping assistant for the same shopping task in the future.
3. I would consider using the shopping assistant for similar future purchases
4. I have no desire to use the shopping assistant in the future
5. I am willing to use this shopping assistant as an aid to help with my decision about which product to buy.
6. I am willing to let this shopping assistant assist me in deciding which product to buy.

Perceived enjoyment (7-point semantic differential scale; Van der Heijden, 2004):
Overall, how do you feel about your interaction with the shopping assistant?

1. Enjoyable - Irritating
2. Exciting - Dull
3. Pleasant - Unpleasant
4. Interesting - Boring

How much do you agree or disagree with the following statements about the shopping assistant you have just used?

Usefulness (7-point Likert scale, ranging from "strongly disagree" to "strongly agree"; (Davis, 1989; Gefen et al., 2003; Venkatesh, 2000; Venkatesh et al., 2003):

1. Using the shopping assistant enabled me to shop more quickly.
2. In my opinion, using the shopping assistant increased my shopping effectiveness.
3. In my opinion, using the shopping assistant increased my shopping efficiency.
4. Overall, the shopping assistant was useful for shopping.

Perceived ease of use (7-point Likert scale, ranging from "strongly disagree" to "strongly agree"; Venkatesh, 2000):

1. The interaction with the shopping assistant is clear and understandable.
2. Interaction with the shopping assistant does not require a lot of mental effort.
3. I find the shopping assistant easy to use.
4. I find it easy to get the shopping assistant to do what I want it to do.

Social Presence (7-point Likert scale, ranging from "strongly disagree" to "strongly agree", Kumar and Benbasat, 2004):

1. There is a sense of human contact when interacting with the shopping assistant.

2. There is a sense of personalness when interacting with the shopping assistant.
3. There is a sense of sociability when interacting with the shopping assistant.
4. There is a sense of human warmth when interacting with the shopping assistant.
5. Interacting with the shopping assistant felt like interacting with a real human being.

Trust (7-point Likert scale, ranging from "strongly disagree" to "strongly agree"; Kim and Benbasat, 2004)**:**

1. I believe this shopping assistant is competent.
2. I believe this shopping assistant to be benevolent.
3. I believe this shopping assistant has a high integrity.
4. Overall, I believe this shopping assistant is trustworthy.

How much do you agree with each of these statements about yourself? Please note, there are no right or wrong answers, we are interested in a your honest appraisal of yourself the way you are, not the way you wish or think should be.

Trust Propensity (human) (7-point Likert scale, ranging from "strongly disagree" to "strongly agree"; Wang and Benbasat, 2005)**:**

1. It is easy for me to trust a person.
2. My tendency to trust a person is high.
3. I tend to trust a person, even though I have little knowledge of it.
4. Trusting someone is difficult for me.

Trust Propensity (thing) (7-point Likert scale, ranging from "strongly disagree" to "strongly agree"; Wang and Benbasat, 2005)**:**

1. It is easy for me to trust an automated shopping assistant.
2. My tendency to trust an automated shopping assistant is high.
3. I tend to trust an automated shopping assistant, even though I have little knowledge of it.
4. Trusting something like an automated shopping assistant is difficult for me.

In your opinion, how well does each of these words describe the shopping assistant?

Dominance (7-point Likert scale, ranging from "extremely inaccurate" to "extremely accurate"; Wiggins et al., 1988)**:**

1. Dominant
2. Assertive
3. Domineering
4. Forceful
5. Self-confident
6. Self-assured
7. Firm
8. Persistent

How well does each of these words describe you?

Please describe yourself as you are, not as you want to be, or think should be. There are no right or wrong answers. We are interested in an honest description of yourself.

Dominance (7-point Likert scale, ranging from "extremely inaccurate" to "extremely accurate"; Wiggins et al., 1988)**:**

1. Dominant
2. Assertive
3. Domineering
4. Forceful
5. Self-confident
6. Self-assured
7. Firm
8. Persistent

Perceived Similarity (7-point Likert scale, ranging from "very different" to "exactly the same")**:**
How similar or different do you think you and the shopping assistant are in terms of:

- ***Behavioral Similarity:***
  1. Your decision making style
  2. The way you solve choice problems
  3. How you arrived at a decision of which laptop to pick
- ***Perceived Personality Similarity:***
  1. Your self-confidence level
  2. Your self-assurance level
  3. Your firmness level
  4. Your persistence level
  5. Your authoritativeness level
  6. Your level of dominance

How much do you agree with the following statements about the shopping assistant?
Consistency (7-point Likert scale, ranging from "strongly disagree" to "strongly agree"):

- ***Perceived Consistency Across Time:***
  1. The shopping assistant appeared to be consistent in terms of its behaviors
  2. The shopping assistant appeared to have consistent attitudes
  3. The shopping assistant appeared to be consistent in terms of its decision-making style
  4. The shopping assistant appeared to have a consistent interaction style
  5. The shopping assistant appeared to be consistent in terms of its personality
  6. The shopping assistant appeared to be consistent overall
- ***Perceived Consistency Across Components:***
  1. The shopping assistant physical appearance seemed to fit its attitudes
  2. The shopping assistant's personality matched its behaviors
  3. The shopping assistant's personality matched its physical appearance

4. The shopping assistant's behaviors matched its physical appearance

Product Expertise (7-point Likert scale, ranging from "strongly disagree" to "strongly agree"):

1. I consider myself to be an expert in choosing computers.
2. I consider myself to be an expert in computer parts.
3. I am knowledgeable about computers.
4. I have extensive experience in buying computers

13. Appendix D: Experimental Interface Screenshot