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Research Article

The Role of Design Characteristics in Shaping Perceptions of Similarity: The Case of Online Shopping Assistants[1]

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Abstract

This research proposes that technological artifacts are perceived as social actors, and that users can attribute personality and behavioral traits to them. These formed perceptions interact with the user's own characteristics to construct an evaluation of the similarity between the user and the technological artifact. Such perceptions of similarity are important because individuals tend to more positively evaluate others, in this case technological artifacts, to whom they are more similar.

Using an automated shopping assistant as one type of technological artifact, we investigate two types of perceived similarity between the customer and the artifact: perceived personality similarity and perceived behavioral similarity. We then investigate how design characteristics drive a customer's perceptions of these similarities and, importantly, the bases for those design characteristics. Decisional guidance and speech act theory provide the basis for personality manifestation, while normative versus heuristic-based decision rules provide the basis for behavioral manifestation. We apply these design bases in an experiment. The results demonstrate that IT design characteristics can be used to manifest desired personalities and behaviors in a technological artifact. Moreover, these manifestations of personality and behavior interact with the customer's own personality and behaviors to create matching

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perceptions of personality and behavioral similarity between the customer and the artifact.

This study emphasizes the need to consider technological artifacts as social actors and describes the specific ways in which technology design can manifest social attributes. In doing so, we show that it is possible to match the social attributes of a technological artifact with those of the user.

Keywords: online shopping, personality similarity, behavioral similarity, online relationships.

Introduction

Attempting to explain acceptance and use of information systems (IS), in general, and of e-commerce technological artifacts, in particular, has taken center stage in IS research. In the context of e-commerce, researchers have advocated that websites should be designed with the goal of building relationships and improving the online customer experience (e.g., Benbasat, 2006; Keen, 2000; Kumar and Benbasat, 2002). Consequently, a significant portion of recent research in e-commerce has focused on how to better understand the many factors that play a role in affecting the *relationship* between customers and online stores, especially those that concern the design of technological artifacts (e.g., the web interface). This paper complements these efforts by investigating the role of design characteristics in shaping customers' perceptions of their similarity to technological artifacts, given that similarity has been shown to be an influential antecedent of relationship satisfaction and growth.

With this new focus on the relational issues of e-commerce technological artifact adoption, researchers now seem to realize that the cognitive beliefs (e.g., perceived usefulness) that dominate traditional models of adoption (e.g., Technology Acceptance Model (TAM); Davis, 1989) have largely ceased to be the sole salient beliefs, and as a result, models of adoption have been complemented with constructs such as social influences and facilitating conditions (Benbasat and Barki, forthcoming). While the addition of new constructs to the traditional adoption models has significantly improved their predictive power and their ability to capture many differing antecedents of artifact adoption and use, there have been theoretical disputes about the appropriateness of the conceptualizations of these new constructs. These disputes have led to discussions regarding the nature of technological artifacts and how users perceive them.

This new challenge is the result of the fact that many of the newly introduced constructs have been traditionally applied to interpersonal contexts (e.g., trust). While these constructs have been re-conceptualized to fit the context of IS adoption, the advent of new technological artifacts that possess interactive and human-like characteristics that encourage users to attribute social qualities to them (Reeves and Nass, 1996) has helped to call into question the notion that technological artifacts are impersonal tools lacking any ability for social action.

On the other hand, while these psychologically-oriented new constructs (e.g., trust, social presence), often conceptualized at a broad level, have been shown to be highly predictive of loyalty toward, and reuse intentions of, particular information technology (IT) artifacts, researchers have often narrowly investigated the role of design

characteristics in shaping these beliefs (Benbasat, 2006; Benbasat and Barki, forthcoming). This study specifically addresses this issue: namely, bridging the gap between design characteristics and new antecedents of IS adoption, as it is believed to be of most relevance to Human-Computer Interaction (HCI) researchers and practitioners alike. This paper focuses on a new construct that has received increased attention in the last few years: namely, the *similarity* between the technological artifact and its users.

Perceived similarity, which has been typically shown to be highly predictive of attraction and relationship satisfaction in interpersonal contexts, has been used recently to supplement models of IS adoption (Al-Natour et al., 2005), and has been re-conceptualized to fit the context of human-technological artifact interaction. In achieving our objective, we propose a framework for conceptualizing the similarity between a technological artifact (an automated online shopping assistant) and its users, and investigate the role of design characteristics in shaping these perceptions of similarity. Hence, the focus of this study is not on showing that the psychologically-oriented broad belief construct of perceived similarity acts as an antecedent to customers' evaluations of automated shopping assistants, but rather on investigating the role of design characteristics in shaping these perceptions of similarity, and thus, bridging the gap between the psychologically-oriented beliefs and the artifact's design characteristics.

We propose that users will perceive online shopping assistants as social actors, and consequently, interactions with them are social processes that function in a manner consistent with theories of interpersonal interaction. We further propose that a customer's perceptions of an automated shopping assistant can take the form of social attributions regarding that assistant's *behavior* (e.g., decision-making strategy) and the assistant's *personality* (e.g., dominance). Customers consequently evaluate these attributions for similarity to their own characteristics.

The resulting two types of similarity evaluations - personality and behavioral similarity, have been shown to be highly predictive of attraction and relationship satisfaction in interpersonal contexts (e.g., Byrne et al., 1967). They will subsequently act as antecedents to the customer's evaluations of the shopping assistant and her intentions to reuse it (e.g., Al-Natour et al., 2005). We have chosen the context of an automated online shopping assistant acting as a decision support aid for customers involved in an online shopping task. In addition to offering specific product recommendations, this shopping assistant has the added function of providing pertinent information about the product domain. Such agents are likely to encourage social responses through their capacity to embody task knowledge, their capability to autonomously perform actions on a customer's behalf, and their ability to use rich communication modes (Dryer, 1999).

The remainder of this paper proceeds as follows: Section II offers a review of relevant literature from HCI and social psychology research. Section III offers a detailed overview of prior research investigating the effects of perceived similarity on evaluations of shopping assistants. We present our research model and develop our hypotheses in section IV and outline our research methodology in section V. Section VI outlines the results of our empirical investigation, while we present a discussion of the results and the contributions to research and theory, and the study's limitations and practical implications in section VII. In section VIII we offer some concluding remarks.

Theoretical Background

Two streams of research are relevant to this study. First, the HCI literature provides support for the proposition that users perceive technological artifacts are perceived as social actors that can manifest specific social characteristics, and that users' interactions with these artifacts are social in nature. Second, the literature from social psychology can provide a theoretical foundation for how users are likely to form and process their perceptions of these artifacts as social actors, and how these perceptions can be expected to interact with the users' own characteristics in a manner predicted by theories of interpersonal interaction.

Technological Artifacts as Social Actors

Under the "Computers are Social Actors" paradigm (CASA) (Nass et al., 1995), researchers have consistently demonstrated that individuals unconsciously attribute human-like characteristics (e.g., gender, ethnicity) to technology and media representations, and apply social rules and expectations when they interact with technologies. Individuals' application of these social categories and rules was found to affect their judgments about, and processing of, the artifact. This assignment of human attitudes, intentions, or motives to non-human entities is referred to as "ethopoeia," from the Greek meaning *attributions* (Nass et al., 1995). Reeves and Nass (1996) conclude that individuals behave in ways that are consistent with ethopoeia, and that human-computer interaction can be considered a form of interpersonal communication.

The CASA model stops short of accepting one of the central implications of anthropomorphism: the tendency for people to believe that technological artifacts *are* people (Turkle, 1984). Instead, it posits that human-computer interaction is social and not anthropomorphic, (i.e., people behave *as if* computers are humans, knowing that they are not) (Nass et al., 1995). Empirical research suggests that the primary characteristics of media that cue these social responses are the *use of language* (Clark, 1999), *interactivity* (Nass and Moon, 2000), and *voice* (Nass and Brave, 2005). Langer (1992) believes that users engage in a state of *mindlessness*, a state that occurs as a result of conscious attention to a subset of contextual cues. These cues 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 and Moon, 2000). Hence, when interacting with technological artifacts that trigger scripts similar to those in interpersonal interaction, users will accordingly interact with these artifacts as if they were human.

The Similarity-Attraction Hypothesis

If technological artifacts are indeed perceived by their users to be social actors that can manifest specific personality and behavioral types, and interactions with these artifacts are seen as interpersonal, then it should be expected that users would evaluate their perceptions of the artifacts' characteristics similarly to how they evaluate characteristics in the context of interpersonal interaction. In this section, we offer an overview of the most extensively studied theory of interpersonal interaction: the *similarity-attraction*

hypothesis, which postulates that people are attracted to others who are similar to them in terms of personality or behavior.

Byrne et al. (1967) provided evidence that attraction toward another individual is a positive linear function of the proportion of similar characteristics. Similarity is attractive, seemingly because shared beliefs result in validation of one's views and fewer disagreements and conflicts among parties (e.g., Byrne, 1967). Therefore, relationships with similar others provide positive reinforcement. Reinforcement theories emphasize the role of rewards and punishment 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 positive and negative reinforcers (including information about similarity and dissimilarity) serve as stimuli for affective responses, which subsequently serve as mediators for evaluative responses, such as attraction, or ensuing similarity evaluations (Clore and Byrne, 1974). Alternatively, uncertainty reduction theory proposes that similarity serves as a stimulus that creates predictability and reduces uncertainty (Berger and Calabrese, 1975). Finally, similarity may have a more direct effect by creating pleasurable and enjoyable interactions, which come as a result of increased ease of communication and reduced potential for conflict (Berscheid and Walster, 1978).

Two primary indicia of similarity are behavior and personality. Behavioral similarity to self, whether involving attitudes, values, abilities, decision-making styles, emotional responses, tastes, adjustive responses, or other factors, provides evidence that one is functioning in a logical and meaningful manner. In the investigation of personality similarity, researchers have defined personality similarity on one or, at best, a small subgroup of personality variables so that similarity along all other personality dimensions is not controlled (Byrne and Griffitt, 1969). Byrne et al. (1967) further suggested that an adequate test of personality similarity effects requires that the characteristics defining similarity or dissimilarity be discriminable to the individual under investigation. Results indicated that individuals seem to respond to information about similarity of personality characteristics in the same manner that they respond to similarity of attitudes, values, beliefs, and opinions.

The Effects of Perceived Similarity on Evaluations of Shopping Assistants

Consistent with the CASA model, a number of studies have provided evidence that users tend to interact with online decisional aids as if they were humans (e.g., Nass and Moon, 2000). As a result, users make attributions regarding the aids' characteristics (e.g., decision process, Komiak and Benbasat, 2006), evaluated for their similarity to self, just as they would in the context of interpersonal interaction (e.g., Isbister and Nass, 2000). Furthermore, in accordance with theories of interpersonal interaction, these evaluations of similarity are then shown to act as mediators of subsequent evaluative responses (e.g., Lee and Nass, 2003).

Personality-based similarity has been studied extensively in relation to technological artifacts (e.g., Nass et al., 1995), and more specifically, online decisional aids. Most recently, Hess et al. (2006) show that not only are decision aids able to manifest certain personality types that are recognizable to human users, but these perceived

personalities interact with users' in a manner consistent with the similarity-attraction hypothesis. Likewise, behavior-based similarity has been studied in relation to online decisional aids. Komiak and Benbasat (2006) provide evidence of users' tendencies to evaluate a decisional aid based on their perceptions of an aid's behaviors (e.g., decision-making style). They showed that users' familiarity with the workings of a recommendation agent (RA) (e.g., the way the RA specifies preference, accesses explanations, and reviews information on recommended items) allowed them to build up trust-relevant knowledge and assess the level at which the RA personalizes their needs. Similarly, Aksoy and Bloom (2001) examined the effects of perceived similarity, albeit not directly measured, between users' and RAs' choices of attribute weights 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 with recommendations based on attribute weights similar to their own tended to make better decisions and engage in reduced amounts of information search information search.

In a recent study, Al-Natour et al. (2005) proposed a model of the effects of perceived personality similarity and perceived behavioral similarity on evaluations of automated online shopping assistants. Their results indicated that the two types of perceived similarity exert strong and unique influences on a number of evaluative responses, which positively affect the users' intent to reuse the assistant. More specifically, perceived personality similarity was shown to have a positive effect on the user's perceived interaction enjoyment. Perceived behavioral similarity had significant and positive effects on trust and the assistant's perceived usefulness, while fully mediating the effects of perceived personality similarity on trust.

Research Model and Hypotheses

Having established that both perceived personality and behavioral similarity do, in fact, affect customers' evaluations of shopping assistants, we now turn our attention to addressing the question regarding the role of *IT design characteristics* in shaping these perceptions of similarity. This is considered to be a question of equal importance in HCI research (Benbasat and Barki, forthcoming; Benbasat and Zmud, 2003; Orlikowski and Iacono, 2001). More specifically, the current study addresses the following two questions: 1) How do we design a shopping assistant in such a way that customers perceive a certain personality or behavior?, and 2) Will customers evaluate these personality and behavioral perceptions for their similarity to self?

The research model is shown in Figure 1. This study investigates how design characteristics shape perceptions of the shopping assistant in terms of behaviors and personality. We propose that these perceptions significantly affect the customer's perceived similarity to the assistant in terms of personality and behaviors.

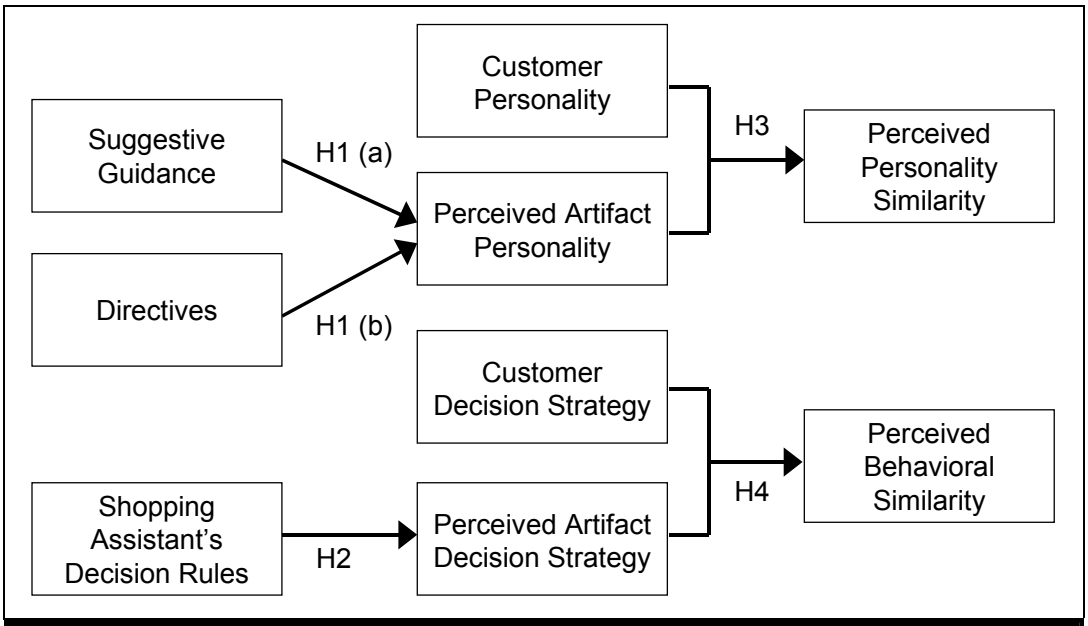


Figure 1: Research Model

Manifesting Personalities and Behaviors

As noted, two primary indicia of similarity are personality and behavior. To study personality similarity, we chose to focus on the dominance factor of the interpersonal circumplex theory of personality (Wiggins, 1979). To study behavioral similarity, we chose to focus on the shopping assistant's decision strategy in arriving at a recommendation (Payne et al., 1993).

With respect to manifesting personality, it is important to note that of the Big Five personality dimensions, two, namely, extroversion and agreeableness, have been argued to be most relevant to the context of social interactions, because they concern individual differences in social behavior (McCrae and Costa, 1989). In fact, researchers have developed a two-dimensional circumplex of interpersonal behavior that corresponds with extroversion and agreeableness (Wiggins and Pincus, 1989). The extroversion factor is commonly referred to as the *power* factor, and its common rotation "dominance" ranges from dominance to submissiveness. The agreeableness factor is commonly referred to as the *affiliation* factor, and its common rotation "friendliness" ranges from friendly to cold (Wiggins and Pincus, 1989). We chose the dominance dimension of the interpersonal circumplex theory of personality is chosen instead of the friendliness dimension because we believe it to be more relevant to the primary role of decision support aids as tools to influence customers' decision making. More specifically, dominance addresses both how individuals make decisions, as well as how they communicate these decisions to others. Furthermore, we believe that dominance is strongly related to ideas that have been extensively studied in MIS research, namely, decisional guidance (Silver, 1990) and speech acts (Janson et al., 1993).

With respect to manifesting behaviors, we focused on decision-making strategy because it closely relates to the utilitarian nature of the task administered and to the primary role of shopping assistants as decision support tools. These decision-strategy

manifestations, we believe, can be cued through the shopping assistant's explanations describing how it reached its decisions. In fact, Wang and Benbasat (2005) have investigated the effects of three types of explanations on trust in decision aids, and their analysis supports the hypothesis that explanations, especially those related to how recommendations are made, are used by customers in their evaluations of the aid's trustworthiness.

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) giving orders, 2) making decisions and talking others into following them, and 3) 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 cued in three different ways: 1) the use of suggestive guidance, corresponding with the description of dominant individuals as often making decisions for others, 2) the use of directives, corresponding with the description of dominant individuals having the ability to give orders, and 3) the expression of higher confidence levels (e.g. "A TrueLife display *will certainly* offer a viewing experience that is *surely* more crisp and *unquestionably* more vivid") and use of assertive and action words (e.g., I *need you* to provide me with your email address"), which corresponds with the description of dominant individuals as self-confident, self-assertive, and leading. In contrast, submissiveness will be cued by: 1) abstaining from giving any suggestive guidance, 2) refraining 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 using timid and unassertive statements (e.g., "*please* provide me with your email").
While it is true that dominance can be cued in additional ways, we limited our study of dominance to this set of behavioral markers for two reasons. First, we wanted to illustrate how dominance can be manifested using a set of minimal cues, especially those that are limited to the message content itself. Second, while many prior HCI studies addressing this topic have focused on creating the strongest personality treatment (e.g., creating the most dominant artifact) without clearly identifying the role played by each design manipulation, or clearly explicating why such manipulations lead to increasing perceptions of dominance, we took special care in designing this study to highlight the importance of isolating the effects of each design manipulation to be able to provide clear and actionable design implications, and to use existing and accepted theories to explain their effects.

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 tells us 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), and 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.

One of the key behavioral markers of dominance is often making decisions for others (Kiesler, 1983). 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).

H1 (a): Perceived suggestive guidance of a shopping assistant is directly related to its perceived dominance.

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" (Searle, 1969, p. 24). Hence, by uttering the sentence, the speaker says something, does something by speaking, and affects the hearer by what is said (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 component of a computer" 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 to drive the hearer to bring about that condition.

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, because 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 that the customer perform a specific action (e.g., buy this product), or directives that occur independent of any guidance. For example, an assistant directing the customer 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 an assistant

who informs the customer of its selection without asking her to change hers will be perceived as low in its use of directives.

H1 (b): Perceived directiveness of a shopping assistant is directly related to its perceived dominance.

Manifesting Decision Strategy

Consumers have been 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). Research has indicated that these strategies vary in terms of their effort (how much cognitive work is necessary to make the decision using that strategy) and accuracy (the ability of that strategy to produce a good outcome), and are further categorized based on their level of use of decision heuristics and/or normative rules, where each strategy falls somewhere on a continuum from "completely normative" to "completely heuristic" (Bettman et al., 1998). Among these, the Additive Compensatory (AC) strategy, considered to be closest to the normative strategy, was shown to be the most accurate but also the one requiring the highest cognitive effort (Bettman et al., 1998). The AC strategy is based on the evaluation of one alternative at a time along all relevant attributes, where individuals assign a weight to each attribute and determine a score for each alternative by adding the product of the attribute value and the weight. In contrast, the Elimination by Aspect (EBA) strategy is the least accurate of the heuristic strategies and requires the least effort (Bettman et al., 1998; Johnson and Payne, 1985). The EBA strategy compares attribute values against user-specified threshold levels across all alternatives. The major difference is that the AC strategy allows a high value on one attribute to compensate for low ones on others, whereas the EBA strategy eliminates alternatives with an attribute value that does not meet the cut-off level regardless of the values of other attributes (Payne et al., 1993).

While the AC and the EBA decision strategies are not completely orthogonal, it is likely that higher use of one strategy will reduce the use of the alternative strategy, especially because these two strategies represent the extremes of normative-based and heuristic-based strategies (Johnson and Payne, 1985). Hence, it should be possible to define a human or software-based agent's decision-making strategy by using a combined reliance on these two divergent strategies, where the agent's overall decision strategy falls somewhere on the continuum anchored by *normative* (high accuracy, high effort) and *heuristic* (low accuracy, low effort). Consequently, an agent that uses a more normative (heuristic) strategy is expected to be perceived as high (low) in its reliance on AC decision rules, and low (high) in it reliance on EBA decision rules.

Bettman et al. (1998) have identified four primary aspects that characterize decision strategies: 1) the level of total amount of information processed, whether extensive or limited, 2) the selectivity in information processing, whether consistent or selective, 3) the pattern of processing, whether alternative-based or attribute-based, and 4) whether the strategy is compensatory or non-compensatory. Consequently, as is the case with manifesting personality types, each decision strategy can be manifested through a number of behavioral markers (decision rules) that can be cued through technology design. More specifically, a high reliance on an AC decision strategy can be behaviorally cued through the use of the following decision rules: 1) using all of the information provided about the importance of each attribute (extensive), 2) assigning importance levels to each attribute and allowing all attributes to factor into the evaluation of each

alternative (consistent), 3) evaluating each alternative, one alternative at a time (alternative-based), and 4) allowing for low scores on a certain attribute to be compensated by high scores on an equally important attribute (compensatory) (Bettman et al., 1998). On the other hand, a high reliance on an EBA strategy can be behaviorally cued through the use of the following decision rules: 1) using a subset of the information provided about the importance of each attribute (limited), 2) allowing only some of the product attributes to be used in the evaluation, where different alternatives are evaluated on different sets of attributes depending on the order in which they are evaluated and eliminated (selective), 3) evaluating alternatives one attribute at a time (attribute-based), and 4) discarding some alternatives after considering only some of their attributes, because they didn't meet the cut-off value for a certain attribute (non-compensatory) (Bettman et al., 1998).

In this study, shopping assistants will differ in their use of either set of the above-described decision rules to explain their recommendations. More specifically, an assistant manifesting a normative-based strategy will explain its recommendations using the decision rules that are identified with the AC strategy, while ensuring that none of the characteristics associated with the EBA strategy are cued (e.g., ensure that the subject is aware that all of the information provided was used in arriving at a recommendation).[2] On the other hand, an assistant manifesting a heuristic-based strategy will explain its recommendations using the decision rules that are identified with the EBA strategy, while ensuring that none of the characteristics associated with the AC strategy are cued (e.g., ensure that the subject is aware that alternatives are evaluated one attribute at a time, rather than creating an overall score for each alternative). Hence, the following hypothesis is offered:

H2: Customers' perceptions of the strategy used by an assistant will be influenced by the decision rules it employs.

H2a: An assistant using decision rules that are associated with the AC strategy will be perceived as high in its reliance on an AC and low in its reliance on an EBA strategy.

H2b: An assistant using decision rules that are associated with the EBA strategy will be perceived as high in its reliance on an EBA and low in its reliance on an AC strategy.

Forming Perceptions Of Similarity

Having discussed the role of design characteristics in shaping perceptions of the assistant's personality (dominance) and behaviors (decision strategy), we now turn our attention to discussing the relationship between these perceptions and subsequent similarity evaluations. More specifically, we need to answer the question of whether the customer's perceptions of the assistant's personality and behaviors, together with the customer's perceptions of her own personality and behaviors, do in fact affect the customer's perceptions of her similarity to the assistant.

[2] AC and EBA were chosen because they represent the extremes of the accuracy-effort continuum, where AC is typically considered to be the closest to a normative strategy, and EBA as the least accurate of the heuristic-based strategies. All other strategies fall somewhere in-between these two strategies in terms of accuracy, effort, and their reliance on normative rules or heuristics.

Personality and behavioral similarity can be measured in two different ways. Perceived subjective similarity can be measured by 1) directly asking the customer to assess her similarity to the shopping assistant, or 2) computing a similarity measure from two separate assessments of the customer's and the assistant's personality and behaviors. The direct 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 evaluative responses (e.g., trust), because accurate estimates of actual similarity often require deep knowledge of others (see also Klohnen and Luo, 2003).

As an alternative to the subjective direct approach, similarity can be measured using computed scores, where, for example, an estimate of personality similarity can be computed using separate assessments of the customer's and the shopping assistant's personalities. Such a *dyadic* measure of similarity tends to better reflect the level of similarity that truly exists, because people may not be fully aware of their similarity to others or the effects of this similarity on their behavior. Although direct perceived similarity is expected to be more predictive of subsequent evaluative responses, it will also likely be biased by perceptions of similarity on other dimensions. Hence, while the computed measure of similarity will likely be reflected in the perceived measure of similarity, the opposite is not necessarily true.

In this study, we directly measure the customer's perceived personality and behavioral similarity to the shopping assistant. We further investigate the relationship between these perceived measures and the separate assessments of the assistant's and the customer's personality and behaviors. This approach will allow us to determine whether the design-influenced perceptions of the assistant's personality and behavior do in fact affect customers' perceptions of their similarity to the assistant, or whether these variations in perceptions of the assistant's personality and behavior are inconsequential. We propose that the interaction of the separate assessments of the assistant's and the customer's personality and behaviors will predict perceived personality and behavioral similarity, thus we expect that perceptions of similarity are influenced by the degree of similarity that exists in reality, especially because all measures are obtained from the same evaluator. Hence, we offer the following two hypotheses:

H3: A customer's perceptions of the assistant's dominance and her own dominance will interact to affect the customer's perceived personality similarity to the assistant.

H4: A customer's perceptions of the assistant's decision strategy and her own decision strategy will interact to affect the customer's perceived behavioral similarity to the assistant.

Research Methodology

We used 2 x 2 between-subjects experimental design, varying the level of the shopping assistant's use of directives and suggestive guidance, and the shopping assistant's use of decision rules associated with AC and EBA strategies. Subjects were randomly assigned to one of the four conditions. The decision task in each treatment was identical.

The final design of this study came after we conducted two extensive pilot studies to refine the experimental manipulation. In order to increase the generalizability of the results, the chosen sites offered shopping assistants of both genders that communicated either through text or voice. In all cases, the shopping assistant was represented by a *naturalistic* 2D avatar (shown in Appendix D), which is humanoid in form, but has a degraded level of detail (Salem and Earle, 2000).

Participants

Participants were 181 e-commerce shoppers recruited from a marketing research firm's nationwide panel. An invitation to participate in the study was broadcast via electronic mail to members of the 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 for a period of one week. The average age of participants was 40. Ninety-one were males. Participants made on average 13 online purchases in the last 12 months, and had a mean score of 4 on the 7-point expertise scale.

Task

Participants performed an online shopping task for a laptop computer.[3] Because participants' preferences for laptops and their components might vary, participants were told that they were buying the laptop for a friend,[4] and were given a full description of his computer needs (Available in Appendix C). Participants were also informed that although they are at liberty to buy any system, they would be later asked to provide a complete description of how they arrived at a choice, where best rationalizations would be rewarded with cash prizes. The treatment laptop store website offered six laptop alternatives that varied by 11 attributes. These are shown in Appendix B. Laptop alternatives were specified so that all of the alternatives were non-dominated when price is taken into account.

Treatment Conditions

As noted earlier, we used the dominance dimension of the circumplex model of personality. 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 expressions of higher confidence levels. The same information content was used in all treatments (sample scripts are available in Appendix B). We used two behavioral treatments. The shopping assistants differed in their reliance on decision rules that are identified with either an AC or EBA strategy. In all conditions, the decision strategy treatment was presented at the end of the task after participants had already made their choice. We separately tested both the personality and behavioral treatments in pilot studies and they were shown to be effective.

[3] Only six alternatives were offered to minimize information overload, which was shown to bias decision-makers to rely more heavily on heuristics (Bettman et al., 1998)

[4] This allows us to minimize the effects of negative emotions when making attribute trade-offs, which will likely play an important confounding role if participants were asked to shop for themselves (Bettman et al., 1998).

The different levels of communication channel modality were programmed using either Active Server Pages (ASP) for text communication, or a commercial Virtual Host service for the voice communication. In the case of voice communication, an animated avatar representing the shopping assistant read statements using text-to-speech technology. When the assistant communicated through text, the same statements appeared below a still picture of the avatar. Participants receiving the voice treatment were able to refresh the last voice stream by pressing the function key "F5." A screenshot of the experimental interface is shown in Appendix D. To control for possible gender effects, we manipulated the gender of the avatar both in terms of voice and appearance. To ensure that the face and voice used did not communicate additional unintended dominance or submissiveness cues, we conducted a pre-test to ensure that the shopping assistant's voice and physical representation (i.e., face) used in the final data collection were neutral in terms of their dominance. We pre-tested six male and four female voice samples, as well as ten potential facial representations of the male shopping assistant and six female representations.

Study Procedure and Measures

An automated online shopping assistant named Pat, a gender-neutral name, was available to the study participants to offer product-specific information and recommendations that were communicated through text or voice. Before the customer was 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 (IAS-R, Wiggins et al., 1988) as well as on 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 to rate the extent to which they used each strategy (measured via the two newly developed scales assessing 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. 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. If the participant had chosen an alternative other than the two suitable ones, then the assistant would recommend one of the two suitable alternatives that was closest to the participant's choice. This allowed us to make recommendations without confounding the behavioral treatment. 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. Finally, 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. Once participants completed the task, they were directed to an online questionnaire that included two scales measuring their level of dominance and that of

the shopping assistant[5] (Wiggins et al., 1988), as well as two scales that measured the perceived behavioral and personality similarity between the shopping assistant and themselves. All measures are available in Appendix A.

Results

Reliability and Factor Analysis

Factor and reliability analyses were conducted using the Statistical Package for the Social Sciences (SPSS) for all measures. All item loadings are shown in Appendix A. Reliability estimates for the latent constructs and the percentage of variance explained, both computed using SPSS, are shown in Table 1. The two new scales developed to measure the shopping assistant's perceived suggestive guidance and the extent of use of directives were shown to be reliable and unidimensional. Two items were deleted from the dominance scale because they caused a problem with the scale's unidimensionality when measuring the assistant's dominance. The two scales that were developed to measure the perceived behavioral and personality similarity with the shopping assistant were highly reliable, and a confirmatory factor analysis showed them to be unidimensional.

Table 1: Estimates of Reliability and Variance

Construct	Reliability (Alpha)		Explained Variance (%)	
	Before Modification	After Modification	Before Modification	After Modification
Perceived Decisional Guidance	0.80		62.80	
Perceived Directiveness	0.78		70.32	
Additive Compensatory (Subject)	0.82	0.78	50.51	61.13
Elimination by Aspect (Subject)	0.68	0.78	38.71	60.41
Additive Compensatory (Assistant)	0.84	0.84	53.54	68.63
Elimination by Aspect (Assistant)	0.83	0.85	51.37	68.78
Perceived Behavioral Similarity	0.90		83.29	
Perceived Personality Similarity	0.97		86.40	

Before conducting a confirmatory factor analysis on the two scales that were developed to measure the extent to which the subject and the shopping assistant relied on decision rules identified with the AC and the EBA strategies, an exploratory factor analysis, using the maximum likelihood extraction method was conducted in SPSS, using the pooled set of all items to ensure that the two scales have adequate discriminant validity. We used maximum likelihood to ensure that the factors extracted would be similar in size (Thurstone, 1947). The results indicated that a few items, in either the assistant or the subject scales, were causing problems with the scales' discriminant validity and dimensionality. As a result, we deleted three items in each of the two scales because 1) they did not load as expected and caused a problem with the scales unidimensionality

[5] The perceived dominance of the shopping assistant was measured twice: first during the task (before the behavioral treatment was introduced), and again after task completion to ensure that participants' ratings of the assistant's dominance were not confounded by the behavioral treatment.

(Gefen et al., 2003), or 2) they caused a problem with the scale's discriminant validity. If an item was deleted from the scale assessing the customer's reliance on either strategy, the same item was also deleted from the scale used to assess the assistant's strategy to ensure the symmetry of the two measures. We reran exploratory factor analysis in SPSS after the problematic items were deleted, and as expected, only two factors emerged, and all items had strong and statistically significant loadings on their intended factors.

Manipulation Checks

The subjects' perceptions of the shopping assistant's use of suggestive guidance and directiveness were used to verify that the personality treatment was effective. Overall, the dominant shopping assistant was perceived to be more directive ($M = 4.78$ vs. 3.56, $F(1,179) = 44.38$, $p < 0.001$), and provide more suggestive guidance ($M = 5.29$ vs. 3.74, $F(1,179) = 92.26$, $p < 0.001$) than the submissive assistant, as shown in Table 2 (a). Analysis of Covariance (ANCOVA) results, computed in SPSS, indicated that neither gender nor modality had any significant effects on perceptions of the assistant's directiveness, use of suggestive guidance, or dominance. Subjects' self-assessed level of dominance did not differ across the two treatment groups ($F(1,179) = 0.19$, $p > 0.10$).

Manipulation Checks – Mean Scores

Table 2 (a): Personality Treatment

	Treatment		*p-value*
Measure	Sub.	Dom.	
Decisional Guidance	3.74	5.29	< 0.001
Use of Directives	3.56	4.78	< 0.001
Assistant Dominance	3.33	4.01	< 0.001
Subject Dominance	4.21	4.27	0.66

Table 2 (b): Behavioral Treatment

	Treatment		*p-value*
Measure	AC	EBA	
Assistant's Perceived AC	5.67	4.85	< 0.001
Assistant's Perceived EBA	4.01	4.89	< 0.001
Subject's AC	5.80	5.68	0.43
Subject's EBA	4.26	4.33	0.70

The behavioral treatment was also successful. Overall, subjects' perception of the extent to which the shopping assistant used AC decision rules was higher in the condition where the assistant, in fact, relied on decision rules that were intended to cue an AC strategy ($M = 5.67$ vs. 4.85, $F(1,179) = 22.55$, $p < 0.001$), and their perception of the extent to which the shopping assistant used EBA decision rules was higher in the condition where the assistant relied on decision rules that were intended to cue an EBA strategy ($M = 4.89$ vs. 4.01, $F(1,179) = 20.30$, $p < 0.001$), as shown in Table 2 (b). ANCOVA results indicated that neither gender nor modality had any significant effects on perceptions of the assistant's reliance on an AC or EBA strategies. Subject's self-assessed use of AC and EBA decision rules did not differ across the two treatment groups ($F(1,179) = 0.64$, $p > 0.10$; $F(1,179) = 0.15$, $p > 0.10$, respectively). Nevertheless, the subjects' relatively high self-ratings on the AC scale point out the existence of strong social desirability and demand characteristics biases (Orne, 1962), or perhaps a false uniqueness bias, where for highly self-relevant aspects, individuals want to perceive themselves as being different, and often better, than others (Campbell, 1986; Perloff and Brickman, 1982). Note that even in the AC treatment, the subjects, on average, rated their extent of use of AC rules to be higher than that of the assistant's.

Manifesting Personalities and Behaviors

Manifesting Dominance

The personality treatment involved three main elements that were used to manifest dominance on the part of the shopping assistant. Dominance was cued by the use of directives and decisional guidance that were communicated in an authoritative manner (e.g., the use of action words and expressions of higher confidence levels) on the part of the shopping assistant. Accordingly, 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). Two scales were used to measure the assistant's extent of use of directives and suggestive guidance. The scores on both scales were regressed (using SPSS) on the subjects' assessment of the assistant's dominance.[6] The results, shown in Table 3, revealed that both the assistant's extent of use of directives (β = 0.38, t (178) = 4.05, $p < 0.01$) as well as its use of suggestive guidance (β = 0.21, t (178) = 2.21, $p < 0.05$) cued dominance, jointly explaining 31% of the variance in the perceived dominance construct. Hence, Hypotheses 1 (a) and (b) are supported.

Table 3: The Role of Guidance and Directives in Manifesting Dominance

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	1.90	0.24		7.94	< 0.01
Degree of Suggestive Guidance	0.17	0.08	0.21	2.21	0.03
Extent of Use of Directives	0.29	0.07	0.38	4.05	< 0.01

Manifesting Behaviors

As discussed in Section IV, an agent's perceived decision strategy is multidimensional, because agents (whether human or automated) are rarely seen to employ a pure form of any of the 12 decision-making strategies described in the literature (Payne et al., 1993). In order to show that decision rules can be used to influence perceptions of the assistant's decision strategy along the normative-heuristic continuum, we need to show that: 1) the use of decision rules influenced both of the constituent parts of the perceived decision strategy, namely, the extent to which the assistant was perceived to use an AC strategy and an EBA strategy, and 2) the assistant was perceived to trade off these opposing decision strategies against each other, such that an assistant that was perceived to be high (low) in its use of an AC strategy was also perceived to be low (high) in its use of an EBA strategy.

[6] 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 ($r = 0.6$, $p < 0.001$) and had means of 3.70 and 4.17 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 laptop model to choose. The average of the two dominance ratings was used in the regression, as well as all subsequent analysis. All results are, however, the same when either measure is independently used.

Because the ratings of the extent of use of both decision strategies are related, we performed a Multivariate Analysis of Variance (MANOVA) in SPSS to test for the aggregate effects of the behavioral treatment (manipulation of decision rules) on decision strategy ratings. To ensure that the behavioral treatment explains unique variance in the aggregate decision strategy ratings, the personality treatment, together with gender and modality, were used as covariates. The result of the MANOVA analysis, shown in Table 4, indicated that only the behavioral treatment had an effect on the aggregate ratings of the use of both decision strategies (Wilks's $\Lambda = 0.84$, $F(2, 175) = 17.07$, $p < 0.001$). To answer the question of whether perceived reliance on an AC strategy is inversely related to perceived reliance on an EBA strategy, we plotted the standardized scores of the perceived assistant's reliance on the two strategies against the two treatment groups. As shown in Figure 2, when standardized scores are used, in addition to the main effects of the behavioral treatment on the aggregate rating of the decision strategy, we can conclude that an assistant that was perceived to be high in its reliance on an AC strategy was also perceived to be low in its reliance on an EBA strategy, and an assistant that was perceived to be high in its reliance on an EBA strategy was, indeed, also perceived to be low in its reliance on an AC strategy.[7] The results of the MANOVA analysis, together with the standardized score analysis, lend full support to Hypothesis 2 (H2a and H2b).

Table 4 Manifesting Assistant Decision Strategy (MANOVA)

	Hypothesis df	Error df	Wilks' Lambda	F	Sig.
Personality Treatment	2	175	0.99	0.45	0.64
Behavioral Treatment	2	175	0.84	17.07	< 0.001
Assistant Gender	2	175	0.97	2.90	0.06
Modality	2	175	0.98	1.52	0.22

[7] 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 ($r = -0.37$, $p < 0.001$)

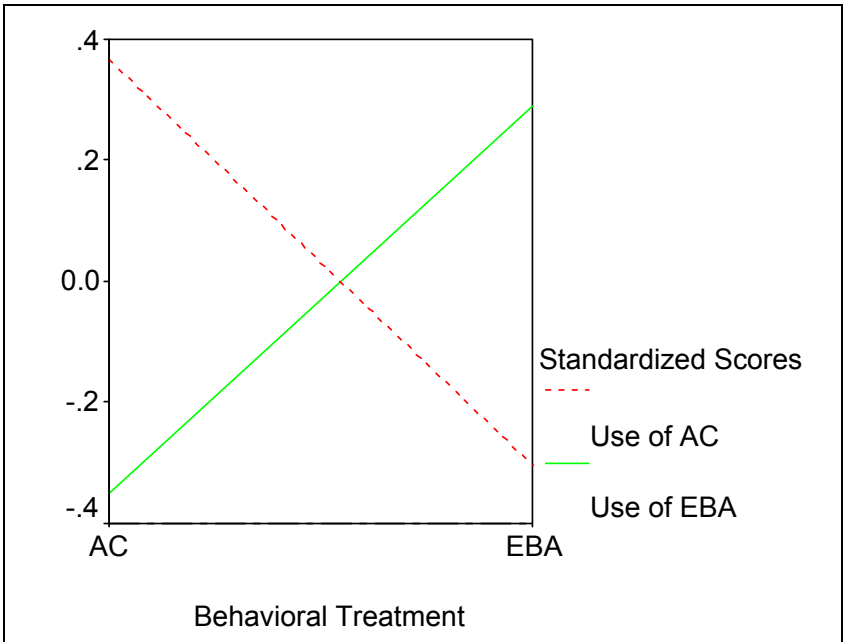


Figure 2: Decision Strategy Standardized Scores

The effects of the separate assessments on Perceived Similarity

Hypotheses 3 and 4 propose that the interaction of the separate assessments of the assistant's and the customer's personality and behaviors will interact to affect the customer's perceived personality and behavioral similarity to the assistant. Due to the known methodological problems with the use of difference scores (Edwards, 2001), we computed dyadic personality and behavioral similarity 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 measurements is used, as well as a common standard deviation about that mean.[8] The ICCs were calculated using Fisher's original formula (1925, p. 178). Intraclass correlations have been formalized more recently (Griffin and Gonzalez, 1995) for the analysis of dyad-level data, and used to test for personality similarity (Neyer and Voigt, 2004).

We computed dyadic personality similarity score for each subject as an intraclass correlation between the subject's self-assessed dominance and that of the assistant. Similarly, two additional ICCs were calculated for each subject measuring the dyadic

[8] An ICC measures absolute similarity, whereas the Pearson intraclass 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 and 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 and Gonzalez, 1995).

similarity between the subject's assessment of her use, and the assistant's use, of each of the two decision strategies.

We conducted an Analysis of Variance (ANOVA) to investigate whether the computed dyadic personality similarity does in fact predict the perceived personality similarity. To run the ANOVA, a dummy variable representing the extent of computed personality similarity between the subject and the assistant was computed. The cutoff point was obtained by (1) standardizing the intraclass correlation scores measuring computed personality similarity, and (2) coding the dummy variable as 2 for evaluations greater than zero and as a 1 otherwise (Sirdeshmukh et al., 2002). We created similar dummy variable to represent the extent of the subject and assistant similarity in terms of their reliance on an EBA strategy. Only ICCs that were computed using the EBA scores were considered in this analysis, because the EBA score as well as the ICC scores had higher variance.[9] This factor was used as a covariate together with modality and a new dummy variable representing gender match. Generalized least square estimates for the perceived similarity latent factor were computed and used as the dependent measure. Originally developed by Bartlett (1937), these scores are the case-by-case regression coefficients, where the GLS estimator minimizes the sum of squared residuals between observations and predicted values, weighted by the uniqueness associated with that assessment. GLS estimates are conditionally unbiased (Anderson and Rubin, 1956; McDonald and Burr, 1967), and are most suitable to be used as criteria variables (Randall and Rayner, 1990).

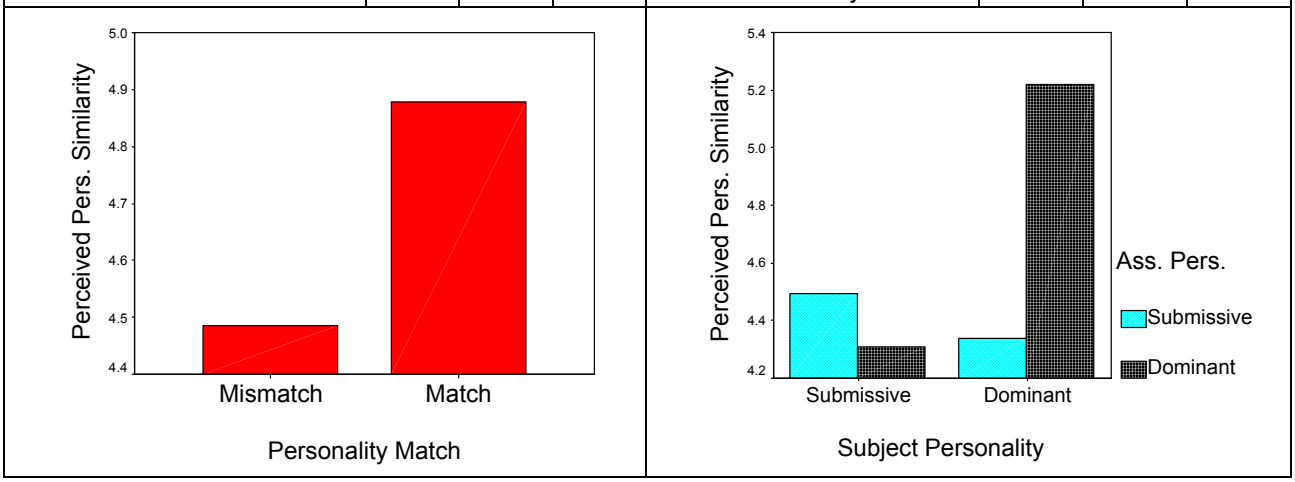
The results, shown in Table 5, indicated that dyadic personality similarity indeed has a main effect on the perceived personality similarity ($F(1, 168) = 6.03$, $p < 0.05$), thus supporting Hypothesis 3. This conclusion was further confirmed with another ANOVA that we computed using the subject's and assistant's personality classifications were used as two factors, replacing the dummy variable representing personality match, with the same covariates as before. A statistically significant 2-way interaction ($F(1, 167) = 7.48$, $p < 0.01$) 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). 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.[10]

[9] The low variance in AC ICC scores is believed to be the result of social desirability and demand characteristics bias (Orne, 1962).

[10] Similar results were obtained for the above two ANOVAs when continuous variables were used in place of the dummy variables to represent computed personality and behavioral similarity. Furthermore, the same results were obtained when perceived personality similarity (the dependent measure) was represented by an average of the scores on its items.

Table 5: Predicting Perceived Personality Similarity

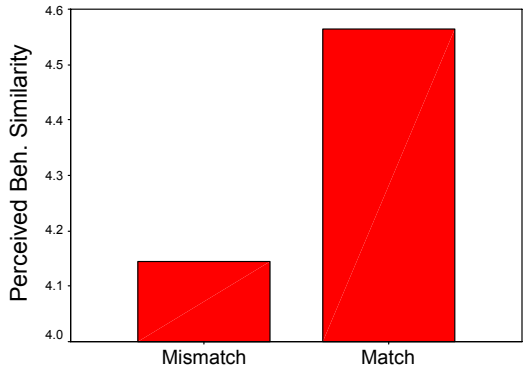
	MS	F	Sig.		MS	F	Sig.
Modality	0.57	0.59	0.44	Modality	0.06	0.06	0.81
Gender Match	0.40	0.41	0.52	Gender Match	0.34	0.37	0.54
Dyadic EBA Use Match	1.06	1.10	0.30	Dyadic EBA Use Match	1.88	2.06	0.15
Dyadic Personality Match	5.84	6.03	0.01	Assistant Personality	3.13	3.43	0.07
				Subject Personality	4.83	5.29	0.02
				Asst. Pers. * Subj. Pers.	6.83	7.48	< 0.01

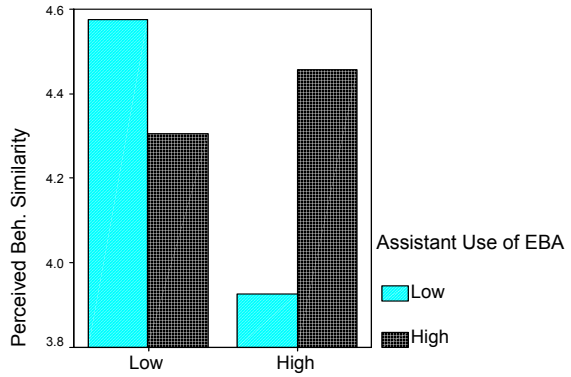


We computed another ANOVA to investigate the relationship between perceived behavioral similarity and dyadic behavioral similarity scores using the EBA scale. This ANOVA used behavioral match, represented by a dummy variable obtained from the standardized scores of the EBA-based intraclass correlation, as a fixed factor, and used gender match, modality and personality match as covariates. Generalized least square estimates of the perceived behavioral similarity latent factor were used as the dependent variable (Anderson and Rubin, 1956; McDonald and Burr, 1967). The results, shown in Table 6, revealed that the computed behavioral match predicts perceived behavioral similarity ($F(1, 168) = 5.29$, $p < 0.05$), hence, supporting Hypothesis 4. Furthermore, the results also revealed that personality match has a positive main effect on perceived behavioral similarity ($F(1, 168) = 10.54$, $p < 0.01$). This indicates that in addition to perceived personality similarity (Al-Natour et al., 2005), computed personality similarity has an effect on perceived behavioral similarity (albeit not on computed behavioral similarity because the two had an insignificant correlation, $r = -0.02$, $p > 0.1$).

Table 6: Predicting Perceived Behavioral Similarity (EBA)

	MS	F	Sig.		MS	F	Sig.
Modality	1.53	1.77	0.19	Modality	2.68	1.53	0.22
Gender Match	0.86	1.00	0.32	Gender Match	0.19	0.11	0.74
Computed Personality Match	9.07	10.54	< 0.01	Computed Personality Match	17.65	10.06	< 0.01
Computed EBA Use Match	4.55	5.29	0.02	Assistant Use of EBA	0.73	0.42	0.52
				Subject Use of EBA	2.61	1.49	0.22
				Ass. EBA * Sub. EBA	6.64	3.79	0.05





We computed second ANOVA 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, with the generalized least square estimates of the perceived behavioral similarity latent factor used as the dependent variable. The results further confirmed the effects of computed behavioral match on perceived behavioral similarity, through a statistically significant 2-way interaction ($F(1, 172) = 3.79$, $p < 0.06$) that emerged between the subject's extent of use of an EBA strategy and the assistant's use of an EBA strategy. An effect of personality match on perceived behavioral similarity ($F(1, 172) = 10.06$, $p < 0.01$) was also observed.[11]

Discussion

The results of this study supported an assertion that through IT design, it is possible to not only manifest social attributes in technological artifacts, but that these attributions will interact with a customer's own characteristics. These manifestations can be created only by manipulating the message content, regardless of the way the message is communicated and the gender of the communicator. With respect to personality, these IT design characteristics can be formed through the application of speech act theory and decisional guidance, where dominance can be manifested through the use of suggestive guidance, directive speech acts, and assertive words. With respect to behavior, IT design can incorporate decision rules that promote either a normative or heuristic

[11] Similar results were obtained when continuous variables were used in place of the dummy variables to represent computed personality and behavioral similarity in the above two ANOVAs. Furthermore, the same results were obtained when perceived behavioral similarity (the dependent measure) was represented by an average of the scores on its items.

decision strategy, where specific decision strategies, such as AC and EBA, can be manifested through manipulating the decision rules followed by the assistant in arriving at a decision. Both types of manifestation were shown to be equally possible when communication occurred through text or voice, and when the assistant was male or female.

While most studies that have examined personality attributions in relation to interactive technological artifacts used additional personality cues available through voice to strengthen their personality type manipulations, this study showed that manipulating the message content is sufficient to obtain the desired personality type. Additional personality or behavioral cues that could be made available through text or voice, nevertheless, can potentially enhance/suppress the cues manifested through the message content. Furthermore, the results of this study supported the notion that specific decision strategies can be manifested regardless of the specific recommendation made. This lends support to the argument made by Wang and Benbasat (2005) asserting the importance of "how" explanations in influencing customers' evaluations of decision support aids. In other words, holding the outcome constant, "how" explanations can be used to manifest a desired decision strategy, which subsequently will be evaluated by the user for its similarity with her own decision-making strategy.

The notion of how the customer's perceptions of the artifact and those of herself interact is a complex issue. While much of the previous research conducted on the effects of similarity in relation to computer interfaces was limited to testing one type of similarity or another, this study investigated two types of similarity measures and the relationship between them. First, perceived similarity, which was shown to be an important antecedent of adoption-relevant beliefs, was measured directly. Second, dyadic measures of similarity, calculated from the separate personality and behavior assessments of the assistant and the customer, were shown to only partially predict perceived similarity. The partial support found gives rise to two distinct issues. First, it points out the existence of similarity bases other than the ones manipulated and measured. For example, while only two of the 12 decision strategies were considered in the study, manipulating and measuring perceptions regarding the use of other strategies will likely allow us to better understand the bases on which perceptions of behavioral similarity are formed. Second, it indicates that many factors other than actual similarity do give rise to perceived similarity. For example, as the results of this study show, computed dyadic measures of personality similarity were not only highly predictive of the perceived personality similarity, but also of the perceived behavioral similarity. This points out the possibility that the different similarity indicia interact with each other, where, potentially, perceptions of similarity on surface traits, such as personality types, are subsequently used in similarity evaluations relating to deeper characteristics. This idea has been supported in traditional literature exploring the similarity-attraction hypothesis, where information about similarity (dissimilarity) has been shown to act as a positive (negative) reinforcer that affects subsequent similarity evaluations (Clore and Byrne, 1974). This holds true mainly because individuals tend to evaluate others on a progressively more specialized and specific set of criteria as a relationship develops (Duck, 1973).

Limitations and Future Research

The generalizability of this study is enhanced by the use of real-life e-commerce shoppers, allowed to complete the shopping task at their own pace[12]. However, conducting the experiment outside the laboratory environment though strengthens its experimental realism, it may diminish its internal validity. Another limitation to this study is the utilitarian nature of the task, which, more than likely, made the cues regarding behaviors more salient. The cooperative nature of the task might limit the generalizability of the results obtained in this study. Furthermore, even when engaged in cooperative tasks (i.e., tasks in which both parties cooperate to achieve a common goal), the nature of the relationship (e.g., is it a peer relationship or a customer-to-assistant relationship) as well as its tenure (e.g., how well does the customer know the assistant) may further affect the customer's evaluation of the assistant and their level of similarity. Finally, because in this study subjects were asked to purchase a laptop for a friend, their evaluations of the assistant were likely to have been influenced by what they understood the needs of the friend to be. Nonetheless, even if the subjects were actually asked to purchase a laptop for themselves, we would expect to see yet a stronger bias in their evaluations of the assistant, because in this case, the subjects would understandably view the assistant as possessing less knowledge about their own preferences and needs. Furthermore, by asking participants to shop for a friend (instead of themselves), we wanted to balance their desire for accuracy and ease of justification with that of minimizing cognitive effort, without introducing any of the potential confounding effects of negative emotions that occur when making attribute trade-offs when they shop for themselves (Bettman, et al., 1998).

Future research could be directed toward testing the ability of other design characteristics to cue different dimensions of shopping assistants' personalities and behaviors, as well as replicating the findings of this study using other e-commerce technological artifacts or other types of tasks (hedonic, uncooperative). For example, it is likely 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 clothes), or even choosing a voice that is charming and likeable. This study relied upon directive speech acts to promote perceptions of an artifact as dominant. Given the alternative types of speech acts (e.g. commissives), future research would benefit from studying how these other speech acts promote perceived personality or other social attributes.

While the results of this study showed that perceptions of similarity are largely based on the level of actual similarity that exists, it was also clear that other factors might be responsible for shaping these perceptions of similarity. Future studies could be directed towards investigating some of the factors that could contribute to higher perceptions of similarity. Finally, an important future research direction might investigate the ways in which we can capture customers' characteristics, and the ways in which we can personalize the message and behaviors.

[12] Time-pressured decision-makers were shown to rely more on attribute-based heuristics (Bettman et al., 1998).

Alternative Models and Hypotheses

The model tested in this study proposes the existence of an indirect causal link between design characteristics and perceived personality and behavioral similarity. The latter have been shown to be antecedents of perceived enjoyment, trust, and perceived usefulness, which in turn affect the behavioral intention of reuse (Al-Natour et al., 2005). A valid criticism of the model presented in this paper is that when combined together, the causal path from design characteristics to behavioral intention is a long one with four mediators linking the two constructs. This raises two important issues that need to be addressed: 1) such a highly specific causal path is susceptible to small abnormalities introduced in the specification, 2) a number of alternative models could be conceived that eliminate one or more of the mediators.

The first issue comes as another limitation to the generalizability of the theoretical model used in this study when applied to other contexts, where other types of design characteristics, and consequently, other social attributions are examined. In such instances, it is important to note that establishing the relationship between the two ends of the path (i.e., the link between design characteristics and subsequent evaluative responses or reuse intentions) requires that the standardized coefficients along the path are all very large and significant. For example, a standardized path coefficient smaller than 0.1 is considered to be too weak to be meaningful in most practical settings because the independent variable uniquely accounts for less than 1% of the variance in the dependent variable (Chin et al., 2003; Kirk, 1996).

On the other hand, the long causal path proposed in this paper gives rise to a number of alternative models. For example, an obvious alternative to the model proposed and tested in this study is a model that includes a direct link from design characteristics to reuse intentions. While testing such a model is perhaps a valid alternative, there are two main reasons that such an exercise is likely to be fruitless: 1) the effects of individual design characteristics on evaluative responses and reuse intentions may not be clear or straightforward, and 2) such a condensed model will no longer give us any insights into the relational issues of the adoption process. First, the effects of the assistant's use of suggestive guidance and directive speech acts, and to a lesser degree, the differing decision rules on subsequent evaluative responses, such as trust, are not clear. For example, it is possible that the customer could view the assistant's use of suggestive guidance as evidence of the assistant's lack of integrity, or conversely, a confirmation of its competence. Thus, the effects of suggestive guidance on trust cannot be clearly delineated. Second, limiting our investigation to the effects of design characteristics on evaluative responses, without accounting for the customer's characteristics, is in complete contradiction to the relational view adopted not only in this study, but also in related similarity studies. As discussed in earlier sections of this paper, while many traditional studies of IS adoption have focused on the cognitive antecedents of adoption, recent research has been advocating a relational view, with an increased focus on the relational factors affecting the adoption processes. Because similarity has been consistently shown to be an influential antecedent to relationship success and satisfaction, and a mediator of the effects of individual characteristics on evaluative responses, a model that overlooks such a construct may be incomplete and lacking.

On the other hand, even within a relational framework anchored in similarity, one compelling alternative model could assert that although similarity-attraction does occur, the similarity is actually between the assistant's characteristics (i.e., use of decisional

guidance, directives, and decision rules) and the customer's own. That is, rather than having personality and behavioral similarity act as antecedents to evaluative responses, this alternative model implies that similarities based on the individual characteristics of the assistant and the customer are what influence subsequent evaluative responses. In addition to the theoretical implications of this explanation, there are also practical implications. For example, should one measure the customer's personality with questionnaires and adapt the assistant to that personality, or should one instead measure the customer's characteristics in terms of her use of directives and the nature of her reliance on decisional guidance and decision rules?

While a valid alternative, such an approach is likely to produce models that include a much larger number of constructs and fail to make use of extensive research examining how individuals process and organize information perceived from the external environment, especially about others within the context of interactions. Simply put, social psychology researchers have consistently shown that individuals tend to organize information they perceive about others within a manageable set of dimensions, even at early stages of the relationship. Prime examples of this are studies conducted on the Big Five dimensions of personality (e.g., Cattell et al., 1970; McCrae and Costa, 1989), and self-categorization theory (Turner, 1982), the latter asserting that individuals categorize themselves and others into groups based on characteristics that are salient to them. On the other hand, even when information about the individual characteristics (e.g., use of directives) is perceived and evaluated for similarity, the effects of such similarity evaluations on any evaluative responses will likely be negligible. For example, Nass and Lee (2001) compared the effects of the similarity of voice characteristics (e.g., pitch), and those of the similarity of the personality manifested through the voice on attraction. Their results indicated that while personality-based similarity had significant effects on attraction, similarity based on the voice characteristics produced no effects. This comes as no surprise because researchers have repeatedly shown that individuals evaluate their similarity to others based on a progressively more idiosyncratic and specific set of criteria, as that information becomes available (Duck, 1973).

Theoretical Implications

The results of this study provide further support for the notion that technological artifacts are perceived by their users as social actors that can manifest specific personalities and behaviors. This idea has important theoretical contributions because it suggests that in studies of IS adoption, we need to pay equal attention to the social and relational perceptions, as well as those that are cognitive in nature. Furthermore, this idea asserts the importance of controlling for manifestations of social characteristics, because these manifestations are likely to occur whether they are intended or not. On the other hand, this study highlights a number of ways that can be used to manifest desired social characteristics in the artifact. Using previously established theories, this study shows that these manifestations are controllable, and more importantly, can be created using a set of specific design choices.

Explicating the relationship between perceived and dyadic measures of similarity has some important theoretical implications. While traditional studies investigating IS adoption factors were limited to focusing on either psychologically-oriented beliefs, or conversely, experimental manipulations, this study illustrates the relationship between design characteristics and the psychologically-oriented beliefs that these design choices can influence. When studied within the context of similarity, this becomes even more

interesting, because in this case, design characteristics can only influence certain perceptions about the artifact, and not the customer's. These perceptions interact with the customer's perceptions of herself to shape the psychologically-oriented perception of similarity.

Existing theories of technological artifact adoption can benefit from the results of this study in two distinct ways. First, this study provides evidence that speech acts, decisional guidance, and decision rules can be used to manifest clear and distinguishable personality and behavioral characteristics. Hence, traditional models of adoption, such as TAM, can benefit from the use of these theoretical bases to endow interfaces with different characteristics. Subsequent studies can investigate the effects of such perceptions on their existing constructs. In other words, both personality and behavioral perceptions that can be manipulated through the use of speech acts, decisional guidance, and rules can be used as antecedents to some of the constructs included in the traditional models of adoption (e.g., perceived usefulness). Even if such social characteristics are not used as antecedents of traditional belief constructs, researchers should be aware of, and attempt to control for, their effects, because these manifestations are likely to be influential factors, whether intended or not. Second, the results of this study suggest that customers form perceptions about technological artifacts that go beyond those that are extrinsic and utilitarian in nature (e.g., perceptions of dominance), and which are then used in similarity evaluations. Hence, traditional adoption models can benefit from investigating alternative ways of manifesting differing social characteristics (thus creating differing similarity bases), and investigating the effects of subsequent similarity evaluations on the traditional belief constructs included in these models.

Managerial Implications

A major implication of this study is that technological artifacts, and online shopping assistants in particular, manifest personalities and behaviors, even when these manifestations are not intended. From a managerial perspective, two questions are important: 1) How can we control these manifestations? and 2) How can we ensure that the manifested characteristics match those of our customers?

This study answered the first question by showing that some decision characteristics, namely, the type of decisional guidance, the type of speech acts, and the type of decision rules used can be controlled to manifest specific personalities and behaviors. More importantly, these manifestations were shown to be possibly independent of other design choices and of each other. Our results clearly indicate that when suggestive guidance is used to supplement informative guidance communicated by the shopping assistant (i.e., when the assistant makes suggestions or expresses opinions in addition to its main function of providing information), customers will likely view this assistant as dominant. Similarly, when the assertive statements made by the assistant, primarily to communicate product-related information, are supplemented by directives (whether direct or indirect), customers will perceive more dominance on the part of the assistant. On the other hand, the results of our study also indicate that explanations regarding how a decisional aid arrives at its recommendations can be used to manifest a desired decision-making strategy, regardless of the specific recommendation made. More specifically, both normative-based (AC) and heuristic-based (EBA) strategies can be manifested by manipulating the decision rules included in the description of the process through which the assistant arrived at its recommendation. The manifestation of the

differing strategies can be achieved by controlling: 1) the level of total amount of information processed 2) the selectivity in information processing, 3) the pattern of processing, and 4) whether or not a compensatory approach is used when evaluating the attributes of each alternative.

The second question regarding ways of automating the matching of customers to interfaces remains largely an open one that could be answered through future research efforts. From a practical point view, we propose that personalization mechanisms should be extended to take into account relevant customer characteristics, allowing for the personalization of the message content, the behavior of the artifact, and the communication techniques used to better suit each customer's personality, behavior, and communication preferences. For example, answers to just a few questions, such as the dominance scale items used in this study, can rapidly classify customers as dominant or submissive. Consequently, verbal and non-verbal actions of a 3D avatar can be customized to better suit those of the customer. In the case of repeat customers, 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. Because 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.

Conclusion

The increasing sophistication of technological artifacts has provided them with the ability to convey interactive and human-like characteristics that can encourage social attributions from their users (Reeves and Nass, 1996). These social attributions become important variables to consider in addition to other adoption-influencing salient beliefs (e.g., perceived usefulness). In this study, we investigated how to manifest such social attributions through the design of a technological artifact, and how these attributions interact with the customer's own attributes to create perceptions of similarity. In turn, perceptions of similarity have been shown to positively influence customers' evaluations of these artifacts. Using prior research on speech act theory, decisional guidance, and decision-making strategies, we were able to endow an online shopping assistant acting as a decision support aid with specific personality and behavioral characteristics that were correctly recognized by its users, who then formed clear perceptions regarding these characteristics. Subsequently, these perceptions were shown to interact with the user's perceptions of her own characteristics, creating the bases for the user to form new perceptions regarding how similar the assistant is to her.

This study complemented prior research highlighting the importance of similarity by offering insights into ways in which similarity can be created using design characteristics. Potentially, a large number of similarity indicia can affect evaluations of technological artifacts and can be manipulated through design characteristics. Future research efforts should focus on examining a variety of ways in which similarity can be created and investigating the degree to which perceptions of similarity affect actual behaviors. Such research can provide guidelines as to how technological artifacts can be designed to encourage perceptions of similarity by users interacting with these artifacts in a variety of contexts, as well as the types of similarity perceptions that are likely to induce these users to change their behaviors to those intended by the artifacts' providers.

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Appendix A: Instrument and Item Loadings

Items	Loading
AC Strategy* (7-point Likert, from "extremely inaccurate" to "extremely accurate"): *In your opinion, how well does each of these statements describe the way the shopping assistant made its decision about which laptop to buy?*	
1. All laptop attributes factored into my (shopping assistant's) decision	0.802
2. My (the shopping assistant's) first step was to assign importance levels to every laptop attribute	0.814
3. To arrive at a choice, I (the shopping assistant) weighed each model's specifications against the specified importance level of each attribute	0.840
4. All of the information provided by John about the importance of each attribute was used to derive my (the shopping assistant's) final choice	0.798
5. No model was eliminated before I (the shopping assistant) considered all of its attributes	deleted
6. I (the shopping assistant) did not discard a model that was rated low on a certain attribute, if it was rated very high on an equally important attribute	deleted
7. The chosen (by the shopping assistant) model appears to be the best model on average when considering all attributes and John's assigned importance levels.	deleted
EBA Strategy* (7-point Likert, from "extremely inaccurate" to "extremely accurate"): *In your opinion, how well does each of these statements describe the way the shopping assistant made its decision about which laptop to buy?*	
1. Only some of the laptop attributes were used to arrive at my (the assistant's) choice	0.727
2. I (the assistant) discarded some models after I considered only some of their attributes	0.877
3. I (the assistant) discarded some models primarily because they didn't meet the cutoff value for a certain attribute(s)	0.819
4. It was unnecessary for me (the assistant) to use all of the information provided about the importance of each attribute to arrive at a decision	deleted
5. I (the assistant) evaluated the different laptop models based on one attribute at a time	deleted
6. It was enough for me (the assistant) to discard a model only because it was rated low on a certain important attribute	0.823
7. Each model that was not chosen by me (the assistant) did not meet the requirements of at least one attribute	deleted
Suggestive Guidance (7-point Likert, "extremely inaccurate" to "extremely accurate"): *How much do you agree or disagree with these statements about the shopping assistant?*	
1. The assistant makes judgmental recommendations.	0.633
2. The assistant provides suggestions in terms of what options to select.	0.782
3. The assistant suggests a specific course of action.	0.857
4. The assistant provides specific recommendations on what components to choose.	0.890
Directives (7-point Likert, from "extremely inaccurate" to "extremely accurate"): *How much do you agree or disagree with these statements about the shopping assistant?*	
1. The statements made by the assistant could be classified as requests.	0.629
2. The statements made by the assistant are attempts to make me act in a certain way	0.929
3. The statements made by the assistant attempt to direct my actions.	0.922
Dominance* (7-point Likert, "extremely inaccurate" to "extremely accurate"; Wiggins et al., 1988): *In your opinion, how well does each of these words describe the shopping assistant?*	
1. Dominant	0.811
2. Assertive	0.688
3. Domineering	0.871
4. Forceful	0.837
5. Self-confident	deleted
6. Self-assured	deleted
7. Firm	0.697
8. Persistent	0.694

Behavioral Similarity (7-point Likert, "very different" to "exactly the same"): *How similar or different do you think you and the shopping assistant are in terms of:*	
1. Your decision making style	0.907
2. The way you solve choice problems	0.936
3. How you arrived at a decision of which laptop to pick	0.899
Personality Similarity (7-point Likert, "very different" to "exactly the same"): *How similar or different do you think you and the shopping assistant are in terms of:*	
1. Your self-confidence level	0.926
2. Your self-assurance level	0.931
3. Your firmness level	0.944
4. Your persistence level	0.909
5. Your authorotativness level	0.938
6. Your level of dominance	0.898
* loadings shown for the shopping assistant measurement	

Appendix B: Laptop Alternatives

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

Appendix C: Experimental 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.

***Sample* Assistant Scripts** Note: Only sample scripts are included due to space limitations.		
	Dominant	**Submissive**
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.
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.
Pat Choice Intro (When the assistant's recommendation is different than the choice made by the subject)	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 (When the assistant is using EBA decision rules, and its recommendation is different than the choice made by the subject)	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	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

	9300 models are indeed much heavier and would be tough for John to 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. ***When Model 700 is recommended:*** 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.	discarded. The XPS and 9300 models are perhaps much heavier and would be not be 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. ***When Model 700 is recommended:*** 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 (When the assistant is using AC decision rules, and its recommendation is different than the choice made by the subject)	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	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

	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 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. ***When Model 700 is recommended:*** 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.	and the 700m models 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 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. ***When Model 700 is recommended:*** 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.

Appendix D: Experimental Interface Screenshot

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