2005

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ABSTRACT

This research proposes that technological artifacts are perceived as *social actor*s, and that users can make personality and behavioral attributions towards them. These formed perceptions interact with the user's own characteristics in the form of an evaluation of similarity. Using an automated shopping assistant, the study investigates the effects of two types of perceived similarity on a number of dependent variables. The results show that both, perceived personality similarity, as well as perceived behavioral similarity, between the user and the decision aid positively affect users' evaluations of the technological artifact. Furthermore, the study investigates the role of design characteristics in forming social perceptions about the shopping assistant. The results indicate that design characteristics, namely content, can be used to manifest desired personalities and behaviors, allowing us to compute measures of "actual" similarity, which were found to predict perceived similarity.

Keywords

Online Relationships, Personality similarity, similarity.

INTRODUCTION

In recent studies, researchers have argued that websites should be designed with the goal of *relationship-building*. A substantial amount of relationship-building research has focused on one or more types of social qualities that customers attribute either to the technological artifacts or to the human entities involved in online shopping. For example, *trustworthiness*, a social attribution often confined to human-like entities, has been studied in regards to technological artifacts, such as websites (Gefen, Karahanna and Straub, 2003), recommendation agents (Komiak and Benbasat, 2004), and automated service personnel (Qiu and Benbasat, 2005).

A major concern with the studies conducted to date is that while many of them have focused on relationship-building, the theories they have utilized, such as the Theory of Planned Behavior, or the Technology Acceptance Model, focus on the *extrinsic* determinants of adoption of Information Technology (IT) artifacts, and do not consider relationships as social systems, in which a given relationship is continuously influenced by the properties that individuals bring to their interactions, by the social and physical environments in which their interactions occur, and by the type and nature of these

interactions. This research takes a different approach by proposing that technological artifacts are perceived by their users as social actors, and consequently, interactions in e-commerce relationships are social and interdependent processes, which cannot be completely comprehended solely from an examination of the dispositions of only one of the members of the relationship.

Based on this assumption, we propose that perceptions of technological artifacts can take the form of social attributions regarding *behavior* (e.g., decision-making style), or *personality* (e.g., personality type). These attributions can then be evaluated by the artifact's users in terms of their similarity to the user's own characteristics.

The objectives of this study are twofold. First, this study investigates how different types of similarity influence customer's evaluations of a technological artifact. Second, the study investigates the role of design characteristics in cueing technological artifacts' personalities and behavioral types, through shaping customers' perceptions of the artifact as a social actor.

THEORETICAL BACKGROUND

Technological Artifacts as Social Actors

Under the "Computers are Social Actors" paradigm (Nass, Moon, Fogg, Reeves, and Dryer, 1995), researchers have consistently demonstrated that individuals unconsciously attribute human-like characteristics to technology and media representations, and apply social rules and expectations when they interact with technologies. The application of these social categories and rules was found to affect judgments about, and processing of the artifact. In an e-commerce context, customers are also likely to form perceptions about technological artifacts as social actors in the form of behavioral and personality attributions.

Behavioral attributions can range from attributions of particular tastes or beliefs (e.g., likes and dislikes of particular products) to attributions of decision-making styles when choosing among alternatives (e.g., elimination by aspect). Although many personality studies have assumed that humans are the objects of study, attempts have been made to extend the concepts underlying human personalities to non-human objects. An example of utilizing concepts of human personality to measure personalities of non-human objects is found in Nass et al. (1995). Nass et al. conducted a number of

experiments endowing computers (or software agents) with human-like personalities. Their experiments demonstrate that personality attributions can be based on voice, text, or physical representation.

The Similarity-Attraction Hypothesis

The *similarity-attraction* theory postulates that individuals are attracted to others who are similar to themselves. Byrne and Stefaniak (1967) have provided evidence that attraction toward another individual is a positive linear function of the proportion of similar characteristics, were relationships with similar others are proposed to provide positive reinforcement. Reinforcement theories emphasize the role of rewards and punishment in attraction. Three relevant reinforcement-based explanations are effectance-arousal, uncertainty reduction, and pleasurable and enjoyable interactions.
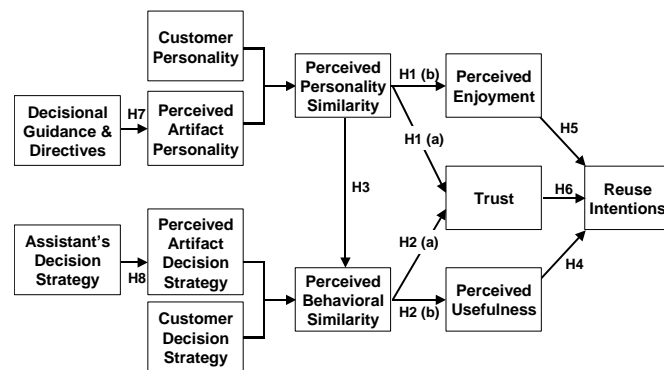
RESEARCH MODEL AND HYPOTHESES

Figure 1: Research Model

The research model is shown in Figure 1. This study investigates the effects of two types of perceived similarity, personality and behavioral, on users' evaluations of an automated shopping assistant acting as a decision support aid. Furthermore, this study investigates the role of design characteristics in shaping perceptions of the technological artifact in terms of behaviors and personality. These perceptions are used to compute actual measures of similarity, that we propose, significantly relate to the user's perceived similarity with the assistant.

Similarity and Its Effects

Two primary indicia of similarity are behavior and personality. Personality-based similarity has been extensively studied in relation to technological artifacts. Most recently, Hess et al. (2005) have shown that not only are decision aids able to manifest certain personality types that are recognizable by human users, but these perceived personalities interact with those of the users' in a manner consistent with the similarity-attraction hypothesis.

The effects of personality similarity in addition to increasing attraction bases typically extend to affect feelings of trust (Zuckers, 1986), the level of interaction enjoyment, and the choice of future interactions (Newcomb, 1961). In the case of shopping assistants, we

hypothesize that personality similarity will positively affect participants level of trust, and allow them to enjoy their interaction with the assistant more.

H1a (b): Perceived personality similarity will positively affect trust (perceived enjoyment).

An important aspect of any decision aid's behavior, in addition to the nature of the recommendations that it makes, is the user's perception of how the aid reasons about its decisions. The similarity of an RA to a user can be evaluated on the basis of the process followed in making a decision or the explanations provided by the RA. These behavioral similarities lead users to view the agent as an in-group member, giving rise to identification-based trust and unit-grouping-based trust, both cognitively and emotionally (Komiak and Benbasat, 2004), and hence impacting the RA's perceived usefulness (Nass et al., 1995).

H2a (b): Perceived behavioral similarity will positively affect trust (perceived usefulness).

Types and Measures of Similarity

Similarity can be measured in two different ways. Perceived subjective similarity is measured by directly asking the user to assess her similarity with the shopping assistant. Alternatively, an "actual" similarity measure can be computed from the two separate assessments of the user's and the assistant's personality and behaviors.

This study directly measures the perceived personality and behavioral similarity using two Likert scales. While we do not expect the subject's assessment of the shopping assistant's dominance to be related to their ratings of the assistant's decision strategy, we, however, expect that the perceived *behavioral* similarity to be strengthened by the perceived *personality* similarity. Since the personality treatment will precede the behavioral one in the experimental task, we expect that personality similarity will increase perceptions of behavioral similarity.

H3: Perceived personality similarity will increase perceptions of behavioral similarity.

Relationship Among the Dependent Variables

Perceived Usefulness (PU), a central construct in TAM, has been found to be a strong predictor of technological artifacts' reuse intention. *Perceived Enjoyment (PE)*, proposed as an addition to TAM, was hypothesized to have a direct effect on reuse intentions (Van der Heijden, 2004). Following Gefen et al. (2003), we hypothesize that trust is yet another antecedent of reuse intentions.

H4: Higher perceptions of the assistant's perceived usefulness will positively affect its reuse intention.

H5: Perceptions of higher interaction enjoyment will lead to higher reuse intentions.

H6: Trust will positively affect its reuse intentions.

MANIFESTING PERSONALITIES AND BEHAVIORS

It is not enough to show that perceived similarity does in fact influence customers' evaluations of technological artifacts, but we also need to address the question regarding the role of IT design characteristics in shaping these perceptions, an equally, if not a more, important question in HCI research (Benbasat and Zmud, 2003).

The role of design characteristics, we believe, resides in shaping the social perceptions formed regarding technological artifacts. The present study focuses on the dominance factor of the interpersonal circumplex theory of personality, and investigates the effects of behavioral similarity in terms of the decision strategy followed by the shopping assistant to arrive at a recommendation.

Manifesting Dominance

Dominance is behaviorally marked by the following: 1) the ability to give orders, 2) the ability to make decisions and talking others into following them, and 3) often assuming responsibility (Kiesler, 1983). In this study, dominance will be cued through: 1) the use of suggestive guidance, 2) the use of directives, and 3) expressing higher confidence levels and using assertive words.

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" (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. In this study, *only dominant assistants will offer suggestive guidance*, while both dominant and submissive assistants will offer informative guidance.

H7 (a): High perceived level of suggestive guidance will increase the shopping assistant's perceived 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). Assertives are speech acts that inform the hearer of facts or states of nature. Directives are acts that request the hearer to do something. In this study, the assistant's utterances will take the form of assertives, followed by directives only in the case of dominant assistants.

H7 (b): High perceived directiveness of the shopping assistant will increase its perceived dominance.

Manifesting Shopping Assistant Behaviors

Among multi-alternative/multi-attribute choice problems, the Additive Compensatory (AC) strategy is considered to be closest to the normative strategy (Payne, Bettman and Johnson, 1993). AC is based on the evaluation of one alternative at a time along all relevant attributes, where each attribute is assigned a weight, and a score for each alternative is determined by adding the product of the attribute value and the weight. In contrast, the Elimination by Aspect (EBA) strategy, the most studied heuristics, compares attribute values against user-specified threshold levels across all alternatives. While these decision strategies are not completely orthogonal, it is likely, however, that the extent of use of one strategy will be higher (lower) than the use of a divergent strategy.

In this study, a shopping assistant relying on an AC decision strategy: 1) will allow all product attributes to factor into its decision, 2) will assign importance levels to each attribute, 3) will weigh each alternative's specifications against the importance level of each attribute, and 4) will use all of the information provided about the importance of each attribute. A shopping assistant relying on an EBA strategy: 1) will allow only some of the product attributes to factor into its decision, 2) will discard some alternatives after considering only some of their attributes, 3) will discard some alternatives primarily because they didn't meet the cut-off value for a certain attribute(s), and 4) will discard an alterative only because it is rated low on a certain important attribute.

H8: A shopping assistant in the AC manipulation will be perceived to employ an AC decision strategy, while a shopping assistant in the EBA manipulation will be perceived to employ EBA decision strategy.

RESEARCH METHODOLOGY

A 2 x 2 x 2 x 2 between subjects research design was used, varying the level of communication channel modality (text, voice), the shopping assistant personality (dominant, submissive), the shopping assistant decision strategy (AC, EBA), and the shopping assistant's gender (male, female). Subjects were randomly assigned to one of the sixteen conditions. The decision task in each treatment was identical, while the shopping assistant's recommendation depended on the subject's choice.

Participants were 181 e-commerce shoppers recruited from a nationwide marketing 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. The experimental procedure could be accessed online from any computer, for a period of one week. The average age of participants was 40. 91 were males. Participants made on average 13 online purchases in the last 12 months.

Participants performed an online shopping task for a laptop computer. Since participants' preferences for laptops and their components might vary, participants were told that they are buying the laptop for a friend, and were given a full description of his computer needs. 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 will be rewarded with

cash prizes. The treatment laptop store website offered six laptop alternatives that varied by 11 attributes. Laptop alternatives were specified so that all of the alternatives were non-dominated when price is taken into account.

The same information content was used in all treatments. The personality and behavioral treatments were manipulated as described earlier. In the Voice treatment, previously recorded computer-generated voice statements were read by an animated avatar representing the shopping assistant. In the text treatment, the same statements appeared below a still picture of the avatar. The two gender treatments were equivalent in all aspects with the exceptions of the gender of the voice and the avatar. To ensure that the face and voice used do not manifest unintended additional dominance, a pre-test was conducted to ensure that the shopping assistant's voice and physical representation used in the final data collection are neutral in terms of their dominance.

Once participants completed the task, they were directed to an online questionnaire that included the dependent measures, and two scales measuring their level of dominance and that of the shopping assistant (IAS-R, Wiggins et al., 1988). Furthermore, the participants answered two scales that measured the perceived behavioral and personality similarity between the shopping assistant and themselves, and used two scales each to evaluate their, as well as the assistant's, extent of use of the two decision strategies.

RESULTS

We conducted a reliability analysis to assure that item loadings on their intended constructs were adequate. The items reflecting the constructs of perceived shopping assistant's suggestive guidance, perceived extent of use of directives, perceived behavioral similarity and perceived personality similarity were reliable and unidimensional. Three items from the AC and EBA scales and two items from the dominance scale were removed from the analysis due to low loadings and/or cross-loadings.

The Effects of Perceived Similarity

To evaluate the discriminant validity of the perceived measures, we conducted a factor analysis in PLS-Graph using the items and the reflective constructs with no relationships specified between the constructs. Two items were removed (one from reuse intentions and one from perceived enjoyment) to ensure that the discriminant validity requirements were met. The values for internal consistency were all above the minimum of 0.70.

We then evaluated a structural model using PLS model to test hypotheses 1-6 with results shown in Figure 2. Perceived personality similarity had a significant positive effect on perceived enjoyment (H1 (b) is supported), but its effect on trust was insignificant, and seemed to be mediated by perceived behavioral similarity (H1 (a) is not supported). We believe this is due to the fact that in such a utilitarian task, behavioral similarity was viewed to be

more relevant. Perceived behavioral similarity had significant effects on trust and perceived usefulness as hypothesized (H2 (a) and (b) are supported). Perceived personality similarity had a significant effect on perceived behavioral similarity (H3 is supported). The three hypotheses regarding the relationship between the dependent variables were all supported (H4, 5, and 6).
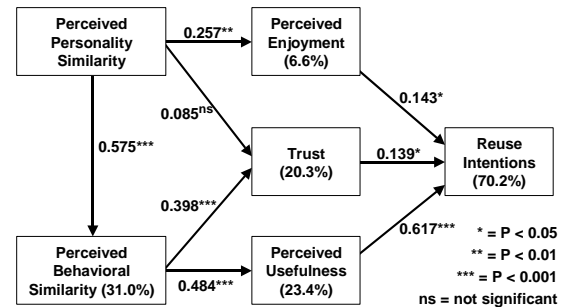

Figure 2: Model Results

The Role of Design characteristics

Due to known methodological problems with the use of difference scores, dyadic personality and behavioral similarity were computed using pairwise intraclass correlations (ICC) (Fisher, 1925) between the subject's assessments of her own personality and behaviors and those of the assistant. The correlation was calculated using Fisher's original formula (1925, p. 178). Interclass correlations have been formalized more recently (Griffin and Gonzalez, 1995) for the analysis of dyad-level data, and used to test for personality similarity.

A personality similarity, an AC similarity, and an EBA similarity scores were computed for each subject as an ICC between the subject's self-assessed ratings and those of the assistant. Since the two decision strategies are not orthogonal, they are separate indicia of behavioral similarity. Nevertheless, similarity based on the use of an EBA strategy was a better predictor of perceived similarity, due to high variance within its scores.

Two separate ANOVAs were conducted to investigate whether the computed personality and behavioral similarity scores do in fact predict the perceived ones. To run the ANOVAs two dummy variables representing the extent of personality match and behavioral match between the subject and the assistant were computed. The cutoff points were obtained by (1) standardizing the ICC scores, and (2) coding the dummy variable as 2 for evaluations greater than zero and as a 1 otherwise. Only EBA was considered in this analysis, since the EBA score as well as the intraclass correlation scores had more variance.

In the first ANOVA, the personality match was the fixed factor, with the behavioral match, together with modality and a new variable representing gender match, acting as covariates. The results indicated that the actual personality match indeed has a main effect on the perceived personality similarity ($F_{(1, 168)} = 4.149$, $p < 0.05$). The second ANOVA used the behavioral match as

a fixed factor, and all others as covariates. The results revealed that the computed behavioral match is predictive of perceived behavioral similarity (F (1, 168) = 4.236, p < 0.05). Furthermore, the results also revealed that personality match has a positive main effect on perceived behavioral similarity (F (1, 168) = 7.688, p < 0.01). This indicates that in addition to perceived personality similarity, computed actual personality similarity also has an effect on perceived behavioral similarity.

Due to space limitations, analysis examining the role of design characteristics (e.g., content, modality) in manifesting personalities and behaviors are not included in the proceedings, but will be presented at the workshop. In short, ANOVA analysis using the 4 treatment groups indicated that only the personality treatment affected perceptions of dominance. Regression analysis showed that this effect could be attributed to the perceived extent of the assistant's use of decisional guidance and directives. The result of a MANOVA show that only the behavioral treatment had an effect on the aggregate ratings of the use of both decision strategies.

DISCUSSION AND CONCLUDING REMARKS

This study had two main objectives. First, this study investigated the relationship between perceived similarity and customers' evaluations of a technological artifact, in the form of a shopping assistant. Results revealed that both personality and behavioral similarity positively influence customers' evaluations of automated shopping assistants. While much of the IS research conducted on the effects of similarity was limited to testing one type of similarity or another, this study differs in that it sheds light on the relative importance of two types of similarity. The second objective of this study was to investigate the role of design characteristics in shaping users' perceptions of the artifact's personality and behaviors. Manipulations of design characteristics, namely, the content, was shown to affect perceptions regarding the artifact's behaviors and personality. These perceptions were later found to interact with the user's own characteristics to affect the user's perceived similarity in terms of personality and behaviors.

This study investigated two types of similarity measures. Hence, another contribution of this study is the conclusion that while computed scores may be one way of investigating the effects of similarity, methodological problems surrounding their computation, and their relatively weaker predictive power, makes the use of perceived measures more constructive.

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