Creating More Credible and Persuasive Recommender Systems: The Influence of Source Characteristics on Recommender System Evaluations

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Abstract
Whether users are likely to accept the recommendations provided by a recommender system is of utmost importance to system designers and the marketers who implement them. By conceptualizing the advice seeking and giving relationship as a fundamentally social process, important avenues for understanding the persuasiveness of recommender systems open up. Specifically, research regarding the influence of source characteristics, which is abundant in the context of human-human relationships, can provide an important framework for identifying potential influence factors. This chapter reviews the existing literature on source characteristics in the context of human-human, human-computer, and human-recommender system interactions. It concludes that many social cues that have been identified as influential in other contexts have yet to be implemented and tested with respect to recommender systems. Implications for recommender system research and design are discussed.

1. Introduction

Recommender systems are taking on an important role in supporting online users during complex decision-making processes by providing personalized advice (Barwise, Hammond, & Elberse, 2002; Kim & Kim, 2001). Yet, although recommender systems make recommendations based on often sophisticated data mining and analysis techniques, it cannot be automatically implied that the advice provided by a system will always be accepted by its users. Whether a recommendation is seen as credible advice and actually taken into account not only depends on users' perceptions of the recommendation but also of the system as the advice-giver. The traditional persuasion literature suggests that people are more likely to accept recommendations from credible sources (O'Keefe, 2002). Accordingly, it has recently been argued that considering the credibility of recommender systems is important in increasing the likelihood of recommendation acceptance (Yoo & Gretzel, 2008; Fogg, 2003; Dijkstra et al., 1998; Jiang et al., 2000; Nguyen et al., 2007).

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The question is how the credibility of recommender systems can be enhanced.

Recent research regarding the persuasiveness of technology suggests that technologies can be more credible and persuasive when leveraging social aspects that elicit social responses from their human users (Nass & Moon, 2000; Fogg, 2003). This notion emphasizes the role of recommender systems as quasi-social actors, and thus, persuasive sources of advice whose characteristics influence the perceptions of their users. Various influential source characteristics have been investigated in the traditional persuasion literature based on human-human communication. Most importantly, recent research in the context of human-computer interaction found that these source characteristics are also important when humans interact with technologies (Fogg, 2003, Fogg et al., 2002; Reeves & Nass, 1996; Nass & Moon, 2000). With regards to recommender systems, some studies exist that have investigated the various influences of system characteristics when users evaluate systems as well as recommendations (e.g. Qiu, 2006; McNee et al., 2003; Nguyen et al., 2007; Cosley et al., 2003; Pu & Chen, 2007). While these findings provide good examples of source characteristics that help to develop more credible recommender systems, still many possibly influential source characteristics have not been examined.

Consequently, this chapter seeks to provide a synopsis of credibility-related research to draw attention to source characteristics which likely play a role in recommender system credibility evaluations. For that purpose, this chapter will first give an overview of the source characteristics found influential in traditional interpersonal advice seeking relationships. Then, source characteristics which have been studied in the context of human and computer interaction and, in particular, in the recommender systems realm will be discussed. Finally, the chapter identifies research gaps in terms of source characteristics that have yet to be examined in the context of recommender systems. Overall, by exploring existing findings and identifying important knowledge gaps, this chapter seeks to provide insights for recommender system researchers as far as future research needs are concerned. It also aims at providing practical implications for recommender system designers who seek to enhance the credibility of the recommender systems they build.

2. Recommender Systems as Social Actors

Most existing recommender system studies have viewed recommender systems as software tools and have largely neglected their social role in the interaction with users. More recent studies, however, argue that computer applications like recommender systems need to be understood as "social actors" (Reeves & Nass, 1996). Nass and Moon (2000) urged that people construct social relationships with machines including computers, and apply social rules in their interactions with technology. Indeed, a good number of past empirical studies have shown that individuals form social relationships with technology and that these social relationships form the basis for interactions with the technology (Fogg & Nass, 1997; Moon & Nass, 1996; Nass, Fogg & Moon, 1996; Nass, Moon & Carney, 1999; Parise et al., 1999; Quintanar et al., 1982).

Recent recommender system studies also support this "Computers as Social Actors" paradigm. Wang and Benbasat (2005), for instance, found that users not only perceive recommender systems as having human characteristics and, consequently, treat systems as social actors, but that such social perceptions influence system evaluations. Specifically, their experiment demonstrated that recommender system users perceived human characteristics such as benevolence and integrity when they interacted with online recommendation agents. Benevolence and integrity are important dimensions of trust and the users' trust in agents was found to significantly affect perceived usefulness of agents as well as intentions to adopt the agents. Al-Natour, Benbasat and Cenfetelli (2006) also argued that online shopping assistants are perceived as social actors, and that users attribute personality and behavioral traits to them. Similarly, Bonhard and Sasse (2006) insisted that understanding the social embedding of a recommendation can be a key to generating more useful, trustworthy and understandable recommendations. In addition, the findings by Aksoy et al. (2006) suggest that the similarity rule is also applied when humans interact with recommender systems. The study found that a user is more likely to use a recommender agent when it generates recommendations in a way similar to the user's decision-making process. These studies all support the need for a so-

cial focus in recommender system research. Recommender systems need to be understood as communication sources to which theories developed for human–human communication apply. One set of such theories relates to the impact of source characteristics on persuasion likelihood and outcomes. The fundamental assumption of these theories is that credible sources are more effective persuaders.

3. Source Credibility

Credibility is not an intrinsic characteristic of a source; rather, the decision regarding a communicator's credibility depends on how the message recipient perceives the source (O'Keefe, 2002; Michener et al, 2004, Self, 1996). Thus, source credibility can be defined as judgments made by a message receiver concerning the believability of a communicator (Fogg, Lee, & Marshall, 2002). Reviews of source credibility studies by Anderson and Clevenger (1963) and McGuire (1968) concluded that a more credible source is preferred and also more persuasive. A good number of past studies confirm that source credibility is positively correlated with influence on message recipients' attitudes and behavioral intentions as well as behaviors (Gilly et al., 1998; Harmon & Coney, 1982; Lascu et al., 1995; Senecal & Nantel, 2003, 2004).

Credibility is generally described as comprising multiple dimensions (Buller & Burgoon, 1996; Gatignon & Robertson, 1991; Petty & Cacioppo, 1981; Self, 1996). Although the literature suggests various dimensions of credibility, most researchers agree that it is comprised of two key elements: trustworthiness and expertise (Fogg, 2003; Fogg et al., 2002; O'Keefe, 2002; Rhoads & Cialdini, 2002). Both trustworthiness and expertise have been studied extensively and have also been addressed in the context of recommender systems (Yoo and Gretzel, 2008).

3.1. Trustworthiness

Trustworthiness of a source refers to aspects such as character or personal integrity (O'Keefe, 2002). Intentions are also seen as instrumental in determining the trustworthiness of a source. A source whose intent it is to persuade is perceived as less trustworthy than one without persuasive intent (Petty & Cacioppo, 1981). Conse-

quently, trustworthiness is often described by terms such as well-intentioned, truthful, and unbiased (Fogg et al., 2002). Mayer, Davis, and Schoorman (1995) conceptualized benevolence and integrity as dimensions of trustworthiness. Delgado-Ballester (2004) identified reliability and intentions as important trustworthiness dimensions. Fogg (2003) identified key points that affect the perceptions of trustworthiness: 1) a source is fair and unbiased; 2) a source would argue against their own interest; and 3) a source has perceived similarity. In the context of recommender systems, Xiao and Benbasat (2007) propose to test benevolence and integrity of recommender systems, with benevolence being defined as the recommender system's caring about the user and acting in the user's interest, and integrity being described as the recommender system's adherence to a set of principles (e.g. honesty) that the user finds acceptable.

3.2. Expertise

Mayer et al. (1995) describe expertise as the ability of a source to have influence in a certain domain. Fogg et al. (2002) conceptualize it using terms such as knowledgeable, experienced, and competent; thus, this dimension seems to capture the perceived knowledge and skill of the source. Similarly, O'Keefe (2002) referred to expertise as competence, expertness, or qualification. Fogg (2003) provides many examples for cues that lead to perceptions of expertise such as labels that proclaim one as an expert, appearance cues, and documentation of accomplishments. Xiao and Benbasat (2007) describe the competence of a recommender system as the system's ability, skills, and expertise to perform effectively.

3.3. Influences on Source Credibility

Whether a source is perceived as having expertise and being trustworthy depends to a great extent on its characteristics. Thus, source characteristics serve as important cues in human judgment. Humans are often not aware of the influence of such cues, as they are typically processed through the peripheral rather than the central route of cognitive processing and are, therefore, not elaborated on (Petty & Cacioppo, 1986).

4. Source Characteristics Studied in Human-Human Interactions

Hoveland argued that one of the main classes of stimuli that determine the success of persuasive attempts can be summarized as the observable characteristics of the perceived message source (Hoveland, 1953). Hovland, Janis & Kelley (1953) specifically identified perceptions of source credibility as a direct result of the observations of particular source cues. Not surprisingly, many researchers have since investigated various communicator characteristics which influence source credibility judgments in human-human interactions.

4-1. Similarity

It is unquestionably the case that perceived similarities or dissimilarities between source and audience can influence the audience's judgment of source credibility (O'Keefe, 2002). In general, homophily theory (Lazarsfeld & Merton, 1954) states that humans like similar others. However, the relation between similarity and the dimensions of credibility appears to be complex.

4-1.1. Expertise Judgments

Past empirical studies show contradicting results with respect to similarity and source expertise judgments. For example, Mills and Kimble (1973) found that similar others are seen as having greater expertise than dissimilar others. However, Delia (1975) observed that similarity between the source and the message receiver makes the receiver see the source less as an expert. In contrast, some studies found that similarity does not make any difference in source expertise judgments (e.g., Swartz, 1984; Atkinson, Winzelberg & Holland, 1985).

4-1.1. Trustworthiness Judgments

The perceived similarity of the message source also has varying effects on perceived trustworthiness of the communicator. O'Keefe (2002) suggested that perceived attitudinal similarities can influence the receivers' liking for the source, and enhanced liking for the source is commonly accompanied by enhanced judgments of the communicator's trustworthiness. However, Atkinson et al. (1985)

found that ethnic similarity and dissimilarity did not influence the perceived trustworthiness of the source, while Delia (1975) observed that similarity sometimes diminished trustworthiness perceptions.

Reflecting on the complex nature of the relationship between similarity and judgments of the communicator's credibility, O'Keefe (2002) noted that the effects of perceived similarities on judgments of communicator credibility depend on whether, and how, the receiver perceives these as relevant to the issue at hand. Thus, different types of similarity likely have different effects in different communication contexts.

4-2. Likeability

People mindlessly tend to agree with those who are seen as likable (Burgoon et al., 2002). Liking refers to the affective bond that an individual may feel toward another person (Smith et al., 2005). Research generally supports the assumption that liked communicators are more effective influence agents than are disliked communicators (Eagly & Chaiken, 1975; Giffen & Ehrlich, 1963; Sampson & Insko, 1964) and likability has been labeled a persuasion tactic and a scheme of self-presentation (Cialdini, 1994). O'Keefe (2002) stressed enhanced liking for the source is commonly accompanied by enhanced judgments of the communicator's trustworthiness. Further, a number of studies found that similarity increases likeability (Byrne, 1971; Carli et al., 1991; Hogg et al., 1993).

There is also some evidence indicating that the receiver's liking of the communicator can influence judgments of the communicator's trustworthiness, although not judgments of the communicator's expertise (O'Keefe, 2002; Levine, 2003).

4-3. Symbols of Authority

Evidence presented in the persuasion literature indicates that we often embrace the mental shortcut of assuming that people who simply display symbols of authority such as titles, tailors and tone should be listened to (Rhoads & Cialdini, 2002, Bickman, 1974, Hofling et al., 1966, Giles & Coupland, 1991, Pittam, 1994). Hofling e al. (1966) found that something simple as the title "Dr." made subjects perceive a source as credible and was surprisingly effective as a compliance-gaining device. Similarly, a number of studies re-

ported that cues like the communicator's education, occupation, training, and amount of experience influence a message receiver's perceptions of source credibility. For example, Hewgill & Miller (1965) manipulated the occupations of the communicator (Professor vs. High school sophomore) for the same message and found that those subjects who were informed that the message had been written by a professor evaluated both the source and the message as significantly more credible.

Uniforms and well-tailored business suits are another recognized symbol of authority that can influence credibility judgment and bring about mindless compliance (Rhoads & Cialdini, 2002; Cialdini, 1994). The findings of Bickman (1974) indicate that a person wearing a security guard's uniform who asks strangers to do things could produce significantly more compliance than a person wearing street clothes. Sebastian and Bristow (2008) revealed that formally dressed individuals achieved greater credibility ratings than individuals who dressed informally.

4-4. Styles of Speech

A number of studies exist which suggest that the style of speech can influence speaker credibility judgments. For instance, several studies have demonstrated that communicators can enhance their trustworthiness when they provide both sides of the argument – the pros and the cons - rather than arguing only in their own favor (Eagly, Wood, & Chaiken, 1978, Smith & Hunt, 1978). Cooper, Bennett and Sukel (1996) suggest that people evaluate the speaker's expertise higher when he/she spoke in complex, difficult-to-understand terms. This indicates that experts may be most persuasive when non-experts cannot understand the details of what they are saying (Rhoads & Cialdini, 2002). Several investigators have found that with increasing numbers of nonfluencies in a speech, speakers are rated significantly lower on expertise judgments (Burgoon et al., 1990, Engstrom, 1994, McCroskey & Mehrley, 1969, Schliesser, 1968) and the speaking rate can also influence credibility judgments, although the evidence for this effect is not as clear as for others (Addington, 1971, Gundersen & Hopper, 1976, MacLachlan, 1982, Lautman & Dean, 1983). Also, citing sources of evidence appears to enhance perceptions of the communicator's expertise and trustwor-

thiness (e.g., Fleshler, Ilardo & Demoretcky, 1974, McCroskey, 1970, O'Keefe, 1998).

4-5. Physical Attractiveness

A number of studies have found that physically attractive communicators are more persuasive (Horai et al., 1974, Snyder & Rothbart, 1971, for a review, see Eagly et al., 1991). Eagly et al. (1991) explained that there appears to be a positive reaction to good physical appearance that generalizes to favorable trait perceptions such as a talent, kindness, honesty and intelligence. The effects of physical attractiveness are seen as influencing indirectly, especially by means of influence on the receiver's liking for the communicator (O'Keefe, 2002).

4-6. Humor

Previous studies found effects of humor when message receivers evaluate the communicator's credibility. However, the specific effects varied across different studies. A number of studies found positive effects of humor on communicator trustworthiness judgments but rarely on judgments of expertise (Chang & Gruner, 1981, Gruner & Lampton, 1972, Tamborini & Zillmann, 1981). When positive effects of humor were found, the effects tended to enhance the audience's liking of the communicator and this liking helped increase perceptions of trustworthiness. In contrast, some researchers found that the use of humor can decrease the audience's liking for the communicator, the perceived trustworthiness, and even the perceived expertise of the source when the use of humor is perceived as excessive or inappropriate for the context (Bryant et al., 1981, Munn & Gruner, 1981, Taylor, 1974).

5. Source Characteristics in Human-Computer Interactions

It seems obvious that a computer is a tool or medium and not an actor in social life. However, media equation theory suggests that individuals' interactions with computers, television sets, and new media are fundamentally social and natural, just like interactions in real life (Reeves & Nass, 1996). This theory thus argues that the technologies should be understood as social actors not just tools or

media. Based on this new paradigm, a growing number of studies have investigated how certain social characteristics of the technologies influence their users' perceptions and behaviors.

Similarity between a computer and its users was found to be important when computer users evaluated the computer and its contents (Nass & Moon, 2000; Fogg, 2003). For example, Nass and Moon (2000) report that computers that convey similar personality types are more persuasive. In their study, dominant participants were more attracted to, assigned greater intelligence to, and conformed more with a dominant computer compared to a submissive computer. Submissive participants reacted the same way to the submissive computer as opposed to the dominant computer, despite the essentially identical content. Nass, Isbister and Lee (2000) also revealed the effects of demographic similarity. Their study found that computer users perceived computer agents as more attractive, trustworthy, persuasive and intelligent when same-ethnicity agents were presented.

Presenting authority symbols has also been identified as an influential factor when people interact with technology. Nass & Moon (2000) found that a television set labeled as a specialist was perceived as providing better content than a television set labeled as a generalist. Fogg (2003) also posited that computing technology that assumes roles of authority is more persuasive. He argued that websites displaying awards or third-party endorsements such as seals of approval will be perceived as more credible.

A number of studies (Nass, Moon & Green, 1997; Nass, Isbister & Lee 2000) argue that the demographic characteristics of computer agents influence users' perceptions. Nass, Moon and Green (1997) illustrated that people apply gender and ethnicity stereotypes to computers. Specifically, their study found that people evaluated the tutor computer as significantly more competent and likeable when it was equipped with a male voice than a female voice. They also found that the female-voiced computer was perceived as a better teacher of love and relationships and a worse teacher of computing than a male-voiced computer, even though they performed identically.

In addition, the use of language such as flattery (Fogg & Nass, 1997), apology (Tzeng, 2004) and politeness (Mayer et al., 2006)

has been identified as factors which make a difference in computer users' perceptions and behaviors. Further, the physical attractiveness of computer agents was found to matter. The findings by Nass, Isbister and Lee (2000) indicate that computer users prefer to look at and interact with computer agents that are more attractive.

Finally, humor has also been tested in the human-computer interaction context. Morkes, Kernal and Nass (1999) found that computers which display humor are rated as more likeable. Yet, findings related to greater perceptions of similarity based on humor and greater length of interaction that were found for human-human interactions could not be replicated in the human-computer context.

6. Source Characteristics in Human-Recommender System Interactions

If computers are seen as social actors, interactions with recommender systems should also be conceptualized as interactions that are fundamentally social. Especially systems that provide direct feedback based on explicit user inputs exhibit qualities that are generally associated with social exchanges.

In the existing recommender system literature, a number of previous studies have investigated how specific characteristics of recommender systems influence users' system evaluations. Xiao & Benbasat (2007) classified the various characteristics that have been studied as being associated with either recommender system type, input, process or output design. Also with the increasing interest in and use of embodied agents in recommender systems, a growing number of studies have investigated the effects of embodied agents' characteristics. Thus, in the following subsections, these previously identified influential source characteristics will be reviewed.

6-1. Recommender system type

Recommender systems come in different shapes and forms and can be classified based on filtering methods, decision strategies or amount of support provided by the recommender systems for consumer purchase (Xiao & Benbasat, 2007). A number of previous studies have discussed the advantages and disadvantages of these different types of recommender systems (e.g. Ansari et al., 2000;

Maes et al., 1999; Burke, 2002). Different filtering methods were compared and it was found that meta-recommender systems that combine collaborative filtering and content filtering are evaluated as more helpful than traditional systems that use a pure collaborative filtering technique (Schafer et al., 2002, 2004). Burke (2002) also confirmed that hybrid recommender systems provide more accurate predictions of users' preferences. Regarding the different decision strategies used in recommender systems, compensatory recommender systems have been suggested to lead to greater trust, perceived usefulness and satisfaction than non-compensatory recommender systems (Xiao & Benbasat, 2007). They have also been found to increase users' confidence in their product choices (Fasolo et al., 2005). As far as the amount of support provided by recommender system is concerned, Xiao and Benbasat (2007) argued that needs-based systems rather than feature-based systems help users better recognize their needs and more accurately answer the preference-elicitation questions, thus resulting in better decision quality. Needs-based systems are therefore recommended for novice users (Felix et al., 2001).

6-2. Input characteristics

Input characteristics of recommender systems include those cues that are related with the preference elicitation method, ease of generating new/additional recommendations and the amount of control users have when interacting with the recommender systems' preference elicitation interface (Xiao & Benbasat, 2007). A number of previous findings suggest that characteristics associated with recommender system input design influence system users' evaluations. Xiao and Benbasat (2007) specifically argued that the preference elicitation method (implicit vs. explicit) influences users' evaluation of the system. They proposed that an implicit preference elicitation method leads to greater perceived ease of use of and satisfaction with the recommender system while explicit elicitation is considered to be more transparent by users and leads to better decision quality.

Allowing users more control was also found to be an influential factor when evaluating systems. West et al. (1999) posited that giving more control to system users will increase their trust and satisfaction with the system. Indeed a study conducted by McNee, Lam,

Konstan and Riedl (2003) found that users who used user-controlled interfaces reported higher user satisfaction than users who interacted with system-controlled and mixed-initiative recommender systems. In addition, users of user-controlled interfaces felt that the recommender systems more accurately represented their tastes and showed the greatest loyalty to the systems. Similarly, Pereira (2000) demonstrated that users showed more positive affective reactions to recommender systems when they had increased control over the interaction with the recommender system. Komiak et al. (2005) also found that control over the process was one of the top contributors to users' trust in a virtual agent. Supporting the importance of user control, Wang (2005) noted that more restrictive recommender systems were considered as less trustworthy and useful by their users.

In addition to control, the structural characteristics of the preference elicitation process (relevance, transparency and effort) have also been found to influence users' perceptions of the recommender system (Gretzel & Fesenmaier, 2007). The specific study by Gretzel and Fesenmaier found that topic relevance, transparency in the elicitation process and the effort required by users to provide inputs positively influence users' perceptions of the value of the elicitation process. The findings suggest that by asking questions, the system takes on a social role and communicates interest in the user's preferences, which is seen as valuable. The more questions it asks, the greater its potential to provide valuable feedback. Also, making intentions explicit in this interaction is important. Although trust was not specifically measured, benevolence and intentions are important drivers of trust and can be implied from the importance based on transparency. Further, McGinty and Smyth (2002) suggested that the conversation style of recommender systems during the input process matters. In contrast to Gretzel and Fesenmaier (2007), they argued that the comparison-based recommendation approach which asks users to choose a preferred item from a list of recommended items instead of a current deep dialogue approach that asks users a series of direct questions about the importance of product features would minimize the cost to the user and maintain recommendation quality.

6-3 .Process characteristics

Characteristics of recommender systems displayed during the recommendation calculation process appear to influence users' perceptions of the systems (Xiao & Benbasat, 2007). Such process factors include information about the search process and about the system response time. Mohr and Bitner (1995) noted that system users use various cues or indicators to assess the amount of effort saved by decision aids. Indicators that inform users about the search progress help users become aware of the efforts saved by the system. The higher users' perceptions of the effort saved by decision aids the greater their satisfaction with the decision process (Bechwati and Xia, 2003). Sutcliffe et al. (2000) found that users reported usability/comprehension problems with information retrieval systems that did not provide a search progress indicator.

Influences of system response time, i.e. the time between the user's input and the system's response, have also been identified as important in a number of studies. Basartan (2001) varied the response time from a simulated shopbot and found that users prefer those shopbots less that make them wait a long time before receiving recommendations. In contrast, Swearingen and Sinha (2001, 2002) found that the time taken by users to register and to receive recommendations from recommender systems did not have a significant effect on users' perceptions of the system. In the study by McNee et al. (2003), the lengthier sign up process increased users' satisfaction with and loyalty toward the system. Xiao and Benbasat (2007) explained that the contradicting findings of previous studies regarding response time may depend on users cost-benefit assessments. They suggest that users do not form negative evaluations of the recommender systems when they perceive the benefits of waiting as leading to high quality recommendations. The findings of Gretzel and Fesenmaier (2007) regarding the relationship between elicitation effort and the perceived value of the elicitation process support this assumption.

6-4 .Output characteristics

Recommender system characteristics portrayed in the output stage of the recommendation process are related to the content and the format of the recommendations presented to users. Previous findings indicate that the content and the format of recommendations

can have significant impact on users' evaluations of recommender systems (e.g. Xiao & Benbasat, 2007, Sinha & Swearingen, 2001, Wang & Benbasat, 2007, Cosley et al., 2003). Xiao and Benbasat (2007) noted that three aspects of recommendation contents – the familiarity of the recommended option, the amount of information on recommended products, and the explanation on how the recommendation was generated - are especially relevant when users evaluate recommender systems.

Some studies found that more familiar recommendations increase users' trust in the recommender system. Sinha and Swearingen (2001) found that recommended products that were familiar to users were helpful in establishing users' trust in recommender systems. A study by Cooke et al. (2002) also observed that unfamiliar recommendations lowered users' evaluations of recommender systems. Further, the availability of product information appeared to positively influence users' perceptions of recommender systems. Sinha and Swearingen (2001) suggest that detailed product information available on the recommendation page enhances users' trust in the recommender system. Cooke et al. (2002) also explained that the attractiveness of unfamiliar recommendations can be increased if recommender systems provide detailed information about the new product.

The impacts of explanations on users' evaluations of recommender systems have been investigated in a considerable number of studies. Wang and Benbasat (2007) found that explanations of the recommender system's reasoning logic strengthened users' beliefs in the recommender system's competence and benevolence. Herlocker et al. (2000) also reported that explanations were important in establishing trust in systems since users were less likely to trust recommendations when they did not understand why certain items were recommended to them. Bonhared & Sasse (2005) emphasized that recommender systems must establish a connection between the advice seeker and the system through explanation interfaces in order to enhance the user's level of trust in the system. Similarly, studies by Pu and Chen (2007) and Tintarev and Masthoff (2007) showed that system users exhibited more trust in the case of explanation interfaces.

The format in which recommendations are presented to the user also appear to influence users' evaluation of recommender systems. Sinha and Swearingen (2001) found that navigation and layout of recommendation presentation interfaces significantly influence users' satisfaction with the systems. Swearingen and Sinha (2001) further found that interface navigation and layout influenced users' overall rating of the systems. Consistent with these findings, Yoon and Lee (2004) showed that interface design and display format influenced system users' behaviors. However, a study conducted by Bharti and Chaudhury (2004) did not find any significant influence of navigational efficiency on users' satisfaction.

In addition, Schafer (2005) suggested that merging the preferences interface and the recommendation elicitation interface within a single interface can make the recommender system be seen as more helpful since this new "dynamic query" interface can provide immediate feedback regarding the effect caused by individual's preference changes. Since this merges the input with the output interface, this suggestion touches upon cues such as transparency already discussed in the context of input characteristics.

6-5 .Characteristics of embodied agents

Recommender systems often include virtual personas guiding the user through the process. It can be assumed that social responses are even more prevalent if the system is personified. Indeed, the important role and impacts of embodied interface agents in the context of recommender systems have recently been emphasized in a number of studies. For example, the presence of a humanoid virtual agent in the system interface was found to increase system credibility (Moundridou & Virvou, 2002), to augment social interactions (Qiu, 2006), to enhance the online shopping experience (Holzwarth et al., 2006), as well as to induce trust (Wang & Emurian, 2005). With growing interests in such interface agents, a number of studies have started investigating if and how certain characteristics of the interface agent influence recommender system users' perceptions and evaluations.

One of the important identified characteristics of agents is anthropomorphism. Anthropomorphism is defined as the extent to which a character has either the appearance or behavioral attributes of a

human being (Koda, 1996; Nowak, 2004; Nowak & Biocca, 2003; Nowak & Rauh, 2005). Many researchers have found that anthropomorphism of embodied agents influences people's interactions with computers (e.g. Koda, 1996, Nowak & Biocca, 2003; Nowak, 2004) and specifically with recommender systems (Qiu, 2006). Yet, the benefits and costs of anthropomorphic agents are debatable. For example, more anthropomorphic interface agents were rated as being more credible, engaging, attractive and likeable than less anthropomorphic agents in some studies (Koda, 1996; Nowak & Rauh, 2005) while other studies found contrasting results (Nowak, 2004; Nowak & Biocca, 2003; Murano, 2003). The social cues communicated by the inclusion of such agents might create expectations in the users that cannot be met by the actual system functionalities.

Human voice is a very strong social cue that has been found to profoundly shape human-technology interactions (Nass & Brave, 2005). However, findings in the context of embodied interface agents are not widely available and are currently inconclusive. The voice output of interface agents was found to be helpful in inducing social and affective responses from users in some studies (Qiu, 2006; Moreno et al, 2001) but other studies found that sociability is higher when the system avatar only communicated with text (Sproull et al., 1996).

The demographic characteristics of interface agents have also been found to influence system users' perceptions and behaviors. Qiu (2006) reports that system users evaluated the system as more sociable, competent, and enjoyable when the agents were matched with them in terms of ethnicity and gender, thus supporting the homophily hypothesis. Cowell and Stanny (2005) also observed that system users prefer to interact with interface characters that matched their ethnicity and were young looking. A study by Nowak and Rauh (2005) indicated that people showed a clear preference for characters that matched their gender.

In addition to similarity cues, other source characteristics have also been investigated in the context of embodied interface agents. The effects of attractiveness and expertise of interface agents were tested by Holzwarth et al. (2006). They found that an attractive avatar is a more effective sales agent at moderate levels of product involvement while an expert agent is a more effective persuader at

high levels of product involvement. Further, the potential impacts of non verbal behavior cues including facial expression, eye contact, gestures, para-language and posture of interface agents were emphasized by Cowell and Stanney (2005). However, research in this area is currently very limited.

7. Discussion

Swearingen and Sinha (2001) noted that the ultimate effectiveness of a recommender system depends on factors that go beyond the quality of the algorithm. Nevertheless, recommender system features are oftentimes implemented because they can be implemented. They might be tested in the course of overall system evaluations or usability studies but are rarely assessed in terms of their persuasiveness. Häubl and Murray (2003) demonstrated that recommender systems can indeed have profound impacts on consumer preferences and choice beyond the immediate recommendation. Thus, conceptualizing recommender systems not only as social but also as persuasive actors is crucial in understanding their potential impacts.

The above review of the literature suggests a wide array of recommender system characteristics which could be influential. Following the paradigm of "Computers as Social Actors" (Reeves & Nass, 1996, Fogg, 2003), recent recommender system studies have started emphasizing the social aspects of recommender systems and stress the importance of integrating social cues to create more credible and persuasive systems (Qiu, 2006, Wang & Benbasat, 2005, Al-Natour, Benbasat & Cenfetelli, 2006). This recognition of recommender systems as social actors has important implications for recommender systems research and design. Most importantly, conceptualizing human-recommender system interactions as social exchanges means that important source characteristics identified as influential in traditional advice seeking relationships can also be seen as potentially influential in human-recommender system interactions.

8. Implications

Understanding the influence of source characteristics when evaluating recommender systems has many implications of theoretical and practical importance. From a theoretical perspective, the classic interpersonal communication theories need to be expanded in scope and applied to understand human-recommender system relationships. By applying classic theories, researchers can test and examine various aspects of human-recommender system interactions. However, the unique qualities of human-recommender interactions should be considered when applying these theories and when developing methodologies to test them. Further, while some recommender system-related research exists with respect to source characteristics, the efforts are currently not very systematic and sometimes inconclusive. Clearly, more research is needed in this area so that a strong theoretical framework can be built.

From the practical perspective, understanding recommender systems as social actors whose characteristics influence user perceptions helps system developers and designers to better understand user interactions with systems. Social interactions thrive on trust and are also subject to persuasion. The way in which preferences are elicited, the way recommendations are derived, and the more insight users have in these processes, the greater perceptions of credibility and the greater the likelihood for a recommendation to be accepted (Gretzel & Fesenmaier, 2007). Hybrid systems, explicit elicitation and generally giving users control over the process seem to be highly effective strategies (Xiao & Benbasat, 2007; Schafer et al., 2002; 2004; Burke, 2002; West et al., 1999; McNee et al., 2003; Konstan & Riedl, 2003; Pereira, 2000). The dynamic query interface suggested by Schafer (2005), which merges the preferences interface and the recommendation elicitation interface within a single interface, may be one way to help users feel that they have control over the system since the interface can provide immediate feedback regarding the effect caused by individuals' preference changes. During interaction with recommender systems, response times needs to be kept short (Basartan, 2001) and the specifics of the search process should be communicated to users (Mohr and Bitner, 1995; Bechwati and Xia, 2003; Sutcliffe et al., 2000) to demonstrate the system's efforts as this will influence credibility perceptions. When generating recommendations, more familiar recommendations with detailed

product descriptions (Shinha & Swearingen, 2001; Cooke et al., 2002) and explanations regarding the underlying logic of how the recommendation was generated (Wang & Benbasat, 2004; Herlocker et al., 2000) would increase users' perceived credibility of the system. A good understanding of users' system use history and patterns using a sophisticated data mining technique would help the systems generate more familiar recommendations to users. Along with the text descriptions of recommended products, recommender system designers may consider providing virtual product experiences. Jiang and Benbasat (2005) noted that a virtual product experience enhances consumers' product understanding, brand attitude, purchase intention as well as decreases the perceived risks. Adding virtual experiences of products enables the users not only to have a better understanding of the recommended products but also to inspire greater attention, interest and enjoyment. Recommender system designers should also pay attention to the display format of the recommendations (Swearingen & Sinha, 2001; Yoon & Lee, 2004). Navigational efficacy and design familiarity and attractiveness need to be considered when the recommendations are presented to users.

Most importantly, research regarding source characteristics in the context of recommender systems provides implications regarding the design of credible and persuasive recommender systems. The challenge for design is to find ways in which source characteristics such as similarity, likeability and authority can be manipulated and translated into concrete design features that fit within the context of recommender systems. For instance, presenting third party seals signaling the authority of the system can increase the overall credibility of systems. Similarity between recommender systems and users can be implemented by the use of needs-based questions that elicit users' product preferences and their choices of the decision strategies the users prefer (Xiao and Benbasat, 2007). Manipulating personalities (e.g. extraversion or introversion) of recommender systems to match with users' by varying communication style and voice characteristics was also suggested by Hess et al. (2005) and Moon (2002). One way in which some characteristics can be more easily implemented is by adding an embodied agent to the system interface. The embodied agent serves as the representative of the system and, thus, emphasizes the social role of the system as the advice giver (Yoo &

Gretzel, 2009). Voice interfaces can be another way to translate source characteristics into credibility-evoking recommender system design.

From the marketing point of view, creating credible and persuasive recommender systems is important since the recommender systems play similar roles as human salespersons in physical stores who interact with consumers and advise consumers in terms of what to buy (Komiak & Benbasat, 2004, Komiak, Wang & Benbasat, 2005). Thus creating more sociable and credible recommender systems will help marketers to enhance their e-services.

9. Directions for future research

While existing studies have identified and tested a number of influential source characteristics in human-recommender system advice seeking relationships, many potential characteristics suggested by general communication theories such as authority, caring, non verbal behaviors like facial expression and gestures, and humor have not been examined. Those unexamined characteristics need to be successfully implemented and also empirically tested in future recommender system studies.

The identified and tested source characteristics also need to be more precisely examined. The effects of source characteristics on judgments of source credibility are often found to be complex rather than linear in previous studies conducted in human-human advice seeking contexts (O'Keefe, 2002). Since situational factors, individual differences and product type can also play a significant role in determining the recommender system credibility, relationships will have to be specifically tested for specific recommender systems to provide accurate input for design considerations.

In addition, there can be additional source characteristics that might not be prominent in influencing advice seeking relationships among human actors but are important aspects to be considered in the realm of recommender systems. For instance, anthropomorphism of the technology has been identified as an important characteristic that influences interactions with technologies (Koda, 1996, Nowak & Biocca, 2003) while it is of course not a critical characteristic in interactions among human actors. The realness of interface agents

can also be considered as a potentially influential source cue. There is some evidence that users are less likely to respond socially to a poor implementation of a human-like software character than to a good implementation of a dog-like character (Kiesler, Sproull, & Waters, 1996). In future research, such additional source cues need to be identified and tested.

Some of the source characteristics have been tested in isolation from another. In order to investigate interaction effects, different source cues should be tested simultaneously if it is possible to implement them at the same time. This will help with understanding the relationships among various source factors.

Overall, the research presented in this chapter suggests that there is a great need for research in this area. It also suggests that new methodologies might have to be developed to investigate influences that happen at a sub-conscious level. Especially a greater emphasis on behavioral measures of recommendation acceptance seems to be warranted if the persuasiveness of recommender systems is to be evaluated.

References

Addington, D.W. (1971). The effect of vocal variations on ratings of source credibility. *Speech Monographs*, *38*, 242-247.

Aksoy, L., Bloom, P. N., Lurie, N. H., & Cooil, B. (2006). Should recommendation agents think like people? *Journal of Service Research, 8*(4), 297-315.

Al-Natour, S., Benbasat, I., & Cenfetelli, R. T. (2006). The role of design characteristics in shaping perceptions of similarity: The case of online shopping assistants. *Journal of Association for Information Systems, 7* (12), 821-861.

Andersen, K.E., & Clevenger, T., Jr. (1963). A summary of experimental research in ethos. *Speech Monographs, 30*, 59-78.

Ansari, A., Essegaier, S. and Kohli, R. (2000). Internet Recommendation Systems. *Journal of Marketing Research, 37(3),* 363-375

Atkinson, D.R., Winzelberg, A., & Holland, A. (1985). Ethnicity, locus of control for family planning, and pregnancy counselor credibility. *Journal of Counseling Psychology, 32,* 417-421.

Barwise, P., Elberse, A. and Hammond, K. (2002). Marketing and the internet: a research review. In B, Weitz, & R. Wensley (Eds), *Handbook of Marketing* (pp. 3-7), New York, NY, Russell Sage.

Basartan, Y. (2001). *Amazon Versus the Shopbot: An Experiment About How to Improve the Shopbots*. Ph.D. Summer Paper, Carnegie Mellon University, Pittsburgh, PA.

Bechwati, N. N., & Xia, L. (2003). Do computers sweat? The impact of perceived effort of online decision aids on consumers' satisfaction with the decision process. *Journal of Consumer Psychology, 13,* 1-2, 139-148.

Bharti,P., & Chaudhury, A. (2004). An Empirical Investigation of Decision-Making Satisfaction in Web-Based Decision Support Systems. *Decision Support Systems, 37* (2), 187-197.

Bickman, L. (1974). The social power of a uniform. *Journal of Applied Social Psychology, 4,* 47-61.

Bonhard P., & Sasse M. A. (2005). I thought it was terrible and everyone else loved it – A New Perspective for Effective Recommender System Design, in *Proceedings of the 19th British HCI Group Annual Conference* (pp. 251-261), Napier University, Edinburgh, UK 5-9 September 2005.

Buller, D. B., & Burgoon, J. K. (1996). Interpersonal deception theory. *Communication Theory, 6,* 203–242.

Burgoon, J. K., Birk, T., & Pfau, M. (1990). Nonverbal behaviors, persuasion, and credibility. *Human Communication Research, 17*, 140-169.

Burgoon, J. K., Dunbar, N. E. & Segring, C. (2002). Nonverbal Influence. In J. P. Dillard, & M. Pfau (Eds)., *Persuasion Handbook: Developments in Theory and Practice* (pp.445-473). Thousand Oaks, CA: Sage Publications.

Burke, R. (2002). Hybrid Recommender Systems: Survey and Experiments. *User Modeling and User-Adapted Interaction*, 12(4), 331-370.

Bryant, J., Brown, D., Silberberg, A.R., & Elliott, S.M. (1981). Effects of humorous illustrations in college textbooks. *Human Communication Research, 8,* 43-57.

Byrne, D. (1971). *The attraction paradigm*. New York: Academic Press.

Carli, L. L., Ganley, R., & Pierce-Otay, A. (1991). Similarity and satisfaction in roommate relationships. *Personality and Social Psychology Bulletin, 17* (4), 419-426.

Chang, K.-J., & Gruner, C. R. (1981). Audience reaction to self-disparaging humor. *Southern Speech Communication Journal, 46,* 419-426.

Cialdini, R. B. (1994). Interpersonal Influence. In S. Shavitt, & T. C. Brock (Eds). *Persuasion: Psychological Insights and Perspective* (pp.195-217). Needhan Heights, Massachusetts, Allyn and Bacon

Cooke, A. D. J., Sujan, H., Sujan, M., & Weitz, B. A. (2002). Marketing the Unfamiliar: The Role of Context and Item-Specific Information in Electronic Agent Recommendations, *Journal of Marketing Research, 39* (4), 488-497.

Cooper, J., Bennett, E.A., & Sukel, H. L. (1996). Complex scientific testimony: How do jurors make decisions? *Law and Human Behavior, 20,* 379-394.

Cosley, D., Lam, S. K., Albert, I., Konstan, J., & Riedl, J. (2003). Is seeing believing? How recommender systems influence users' opinions. In *Proceedings of CHI 2003: Human Factorsin Computing Systems* (pp. 585-592). New York: ACM Press.

Cowell, A. J. & Stanney, K. M. (2005). Manipulation of non-verbal interaction style and demographic embodiment to increase anthropomorphic computer character credibility. *International Journal of Human-Computer Studies, 62,* 281-306.

Delgado-Ballester, E. (2004). Applicability of a brand trust scale across product categories: A multigroup invariance analysis. *European Journal of Marketing*, *38*(5/6), 573–592.

Delia, J. G. (1975). Regional dialect, message acceptance, and perceptions of the speaker. *Central States Speech Journal, 26,* 188-194.

Dijkstra, J. J., Liebrand, W. B. G., & Timminga, E. (1998). Persuasiveness of Expert Systems. *Behaviour & Information Technology*, *17*(3), 155-163.

Eagly, A. H., Ashmore, R. D., Makhijani, M. G., & Longo, L. C. (1991). What is beautiful is good, but…: A meta-analytic review of research on the physical attractiveness stereotype. *Psychological Bulletin, 110,* 109-128.

Eagly, A. H. & Chaiken, S. (1975). An attribution analysis of the effect of communicator characteristics on opinion change: The case of communicator attractiveness, *Journal of Personality and Social Psychology, 32*(1), 136-144.

Eagly, A.H., Wood, W., & Chaiken, S. (1978). Causal inferences about communicators and their effect on opinion change. *Journal of Personality and Social Psychology, 36,* 424, 435.

Engstrom, E. (1994). Effects of nonfluencies on speakers' credibility in newscast settings. *Perceptual and Motor Skills, 78*, 739-743.

Fasolo, B., McClelland, G. H., & Lange, K. A. (2005). The Effect of Site Design and Interattribute Correlations on Interactive Web-Based Decisions. In C. P. Haughvedt, K. Machleit, and R. Yalch (Eds.) *Online Consumer Psychology: Understanding and Influencing Behavior in the Virtual World* (pp. 325-344). Mahwah, NJ: Lawrence Erlbaum Associates.

Felix, D., Niederberger, C., Steiger, P., and Stolze, M. (2001). Featur-Oriented vs. Needs-Oriented Product Access for Non-expert Online Shoppers. In B. Schmid, K. Stanoevska-Slabeva, and V. Tschammer-Zurich (Eds.) *Towards the E-Society: E-Commerce, E-Business, and E-Government* (pp. 399-406). New York: Springer.

Fleshler, H., Ilardo, J., & Demoretcky, J. (1974). The influence of field dependence, speaker credibility set, and message documentation on evaluations of speaker and message credibility. *Southern Speech Communication Journal, 39*, 389-402.

Fogg, B. J. (2003). *Persuasive technology: Using computers to change what we think and do.* San Francisco: Morgan Kaufmann.

Fogg, B. J., Lee, E., & Marshall, J. (2002). Interactive technology and Persuasion. In J. P. Dillard, & M. Pfau (Eds). *Persuasion handbook: Developments in theory and practice* (pp.765-797). London, United Kingdom: Sage

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

Gatignon, H., & Robertson, T. S. (1991). *Innovative decision processes*. Englewood Cliffs, NJ: Prentice Hall.

Giffen, K., & Ehrlich, L. (1963). Attitudinal effects of a group discussion on a proposed change in company policy. *Speech Monographs, 30,* 377-379.

Giles, H., & Coupland, N. (1991). *Language: Contexts and consequences.* Pacific Grove, CA: Brooks/Cole.

Gilly, M. C., Graham, J. L., Wolfinbarger, M. F., & Yale, L. J. (1998). A dyadic study of personal information search. *Journal of the Academy of Marketing Science, 26*(2), 83–100.

Gretzel, U., & Fesenmaier, D. R. (2007). Persuasion in Recommender Systems. *International Journal of Electronic Commerce, 11*(2), 81-100.

Gruner, C. R., & Lampton, W. E. (1972). Effects of including humorous material in a persuasive sermon. *Southern Speech Communication Journal, 38,* 188-196.

Gundersen, D.F., & Hopper, R. (1976). Relationships between speech delivery and speech effectiveness. *Communication Monographs, 43,* 158-165.

Harmon, R. R., & Coney, K. A. (1982). The persuasive effects of source credibility in buy and lease situations. *Journal of Marketing Research, 19*(2), 255–260.

Häubl and Murray (2003). Preference Construction and Persistence in Digital Marketplaces: The Role of Electronic Recommendation Agents. *Journal of Consumer Psychology, 13* (1&2), 75-91.

Herlocker, J., Konstan, J. A., & Riedl, J. (2000). Explaining Collaborative Filtering Recommendations. *Proceedings of the*

2000 ACM Conference on Computer Supported Cooperative Work, Philadelphia, PA, 241-250.

Hess, T., J., Fuller, M. A. & Mathew, J. (2005). Involvement and Decision-Making Performance with a Decision Aid: The Influence of Social Multimedia, Gender, and *Playfulness. Journal of Management Information Systems, 22*(3), 15-54.

Hewgill, M. A., & Miller, G. R. (1965). Source credibility and response to fear-arousing communications. *Speech Monographs*, *32*, 95-101.

Hofling, C. K., Brotzman, E., Dalrymple, S., Graves, N., & Pierce, C. M. (1966). An experimental study of nurse-physician relationships. *Journal of Nervous and Mental Disease*, *143*, 171-180.

Hogg, M. A., CooperShaw, L., & Holzworth, D. W. (1993). Group prototypically and depersonalized attraction in small interactive groups. *Personality and Social Psychology Bulletin, 19* (4), 452-465.

Holzwarth, M., Janiszewski, C. & Neumann, M.M. (2006). The influence of avatars on online cosumer shopping behavior. *Journal of Marketing, 70*(October), 19-36.

Horai, J., Naccari, N., & Fatoullah, E. (1974). The effects of expertise and physical attractiveness upon opinion agreement and liking. *Sociometry*, *37*, 601-606.

Hovland, C.I., Janis, I.L., & Kelley, H.H. (1953). *Communication and Persuasion*. New Haven, CT: Yale University Press.

Jiang, J. J., Klein, G., & Vedder, R.G. (2000). Persuasive expert systems: The influence of confidence and discrepancy. *Computers in Human Behavior*, *16*. 99-109.

Jiang, Z. & Benbasat, I. (2005). Virtual Product Experience: Effects of Visual and Functional Control of Products on Perceived Diagnosticity and Flow in Electronic Shopping. *Journal of Management Information Systems, 21* (3), 111-148.

Kim, B.-D., & Kim, S.-O. (2001). A new recommender system to combine content-based and collaborative filtering systems. *Journal of Database Marketing, 8*(3), 244–252.

Kiesler, S., Sproull, L., & Waters, K. (1996). A prisoner's dilemma experiment on cooperation with people and human-like computers. *Journal of Personality and Social Psychology, 70*(1), 47-65.

Koda, T. (1996). *Agents with faces: A study on the effects of personification of software agents.* Master's Thesis, Massachusetts Institute of Technology, Boston, MA, USA.

Komiak, S. X. and Benbasat, I. (2004). Understanding customer trust in agent-mediated electronic commerce, web-mediated electronic commerce and traditional commerce. *Information Technology and Management, 5* (1&2), 181-207

Komiak, S. Y. X., Wang, W., & Benbasat, I. (2005). Trust Building in Virtual Salespersons Versus in Human Salespersons: Similarities and Differences. *e-Service Journal, 3*(3), 49-63.

Lautman, M. R., & Dean, K. J. (1983). Time compression of television advertising. In l. Percy & A. G. Woodside (Eds.), *Advertising and consumer psychology* (pp.219-236). Lexington, Ma: Lexington Books.

Lascu, D.-N., Bearden, W. O., & Rose, R. L. (1995). Norm extremity and personal influence on consumer conformity. *Journal of Business Research, 32*(3), 201–213.

Lazarsfeld, P., and R. K. Merton. (1954). Friendship as a Social Process: A Substantive and Methodological Analysis. In M.

Berger, T. Abel, and C. H. Page (Eds), *Freedom and Control in Modern* Society (pp. 18-66). New York: Van Nostrand.

Levine, R. V. (2003). Whom Do We Trust? Experts, Honesty, and Likability. In R. V. Levine (Ed.), *The Power of Persuasion*, pp.29-63. Hoboken, NJ: John Wiley & Sons.

Liao, Q. (2005). *Empirical findings on persuasiveness of recommender systems for customer decision support in electronic commerce.* Doctoral dissertation, Mississippi State University.

MacLachlan, J. (1982). Listener perception of time-compressed spokespersons. *Journal of Advertising Research, 22*(2), 47-51.

Maes, P., Guttman, R. H., & Moukas, A.G. (1999). Agents that Buy and Sell, *Communication of the ACM, 42(3),* 81-91.

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

Mayer, R. E., Johnson, W. L., Shaw, E. & Sandhu, S. (2006). Constructing computer-based tutors that are socially sensitive: Politeness in educational software. *International Journal of Human-Computer Studies, 64*(1), 36-42.

McCroskey, J. C. (1970). The effects of evidence as an inhibitor of counter-persuasion. *Speech Monographs, 37,* 188-194.

McCroskey, J. C., & Mehrley, R. S. (1969). The effects of disorganization and nonfluency on attitude change and source credibility. *Speech Monographs, 36,* 13-21.

McGinty, L. & Smyth. B. (2002). Deep Dialogue vs Casual Conversation in Recommender Systems. In F. Ricci and B. Smyth (Eds), *Proceedings of the Workshop on Personalization in eCommerce at the Second International Conference on*

Adaptive Hypermedia and Web-Based Systems (AH 2002), pp. 80–89. Universidad de Malaga, Malaga, Spain, Springer.

McGuire, W. J. (1968). The Nature of Attitudes and Attitude Change. In G. Lindzey and E. Aronson (Eds.). *Handbook of Social Psychology*. Reading, MA: Addison-Wesley.

McNee, S. M.; Lam, S. K.; Konstan, J. A.; and Riedl, J. (2003). Interfaces for eliciting new user preferences in recommender systems. In User Modeling 2003, *LNCS 2702*, 178–187. Springer.

Michener, H. A., DeLamater, J. D., & Myers, D. J. (2004). *Social Psychology*. Wadsworth: Thomson Learning, Inc.

Mills, J., & Kimble, C. E. (1973). Opinion change as a function of perceived similarity of the communicator and subjectivity of the issue. *Bulletin of the psychonomic society, 2,* 35-36.

Mohr, L. A., & Bitner, M. J. (1995). The Role of Employee Effort in Satisfaction with Service Transactions. *Journal of Business Research, 32*(3), 239-252.

Moon, Y. (2002). Personalization and Personality: Some Effects of Customizing Message Style Based on Consumer Personality. *Journal of Consumer Psychology*, *12*(4), 313-326.

Moon, Y., & Nass, C. (1996). How "real" are computer personalities? Psychological responses to personality types in human-computer interaction. *Communication Research, 23*(6), 651-674.

Moreno, R., Mayer, R. E., Spires, H. A., & Lester, J. C. (2001). The case for social agency in computer-based teaching: Do students learn more deeply when they interact with animated pedagogical agents? *Cognition and Instruction*, *19*(2), 177-213.

Morkes, J., Kernal, H. K., & Nass, C. (1999). Effects of humor in task-oriented human-computer interaction and computer-mediated communication: A direct test of SRCT theory. *Human – Computer Interaction*, *14*(4),395–435.

Moulin, B., Irandoust, H., Belanger, M., & Desbordes, G. (2002). Explanation and argumentation capabilities: Towards the creation of more persuasive agents. *Artificial Intelligence Review*, *17*, 169-222.

Moundridou, M., & Virvou, M. (2002). Evaluation the persona effect of an interface agent in a tutoring system. *Journal of Computer Assisted Learning*, *18*(3), 253-261.

Munn, W. C., & Gruner, C. R. (1981). "Sick" Jokes, speaker sex, and informative speech. *Southern Speech Communication Journal*, *46*, 411-418.

Murano, P. (2003). Anthropomorphic vs. Non-Anthropomorphic Software Interface Feedback for Online Factual Delivery. *Proceedings of the Seventh International Conference on Information Visualization*. Retrieved October, 1, 2008 from http://portal.acm.org/citation.cfm?id=939634&dl=ACM&coll=portal

Nass, C., & Brave, S. (2005). Wired for Speech: How Voice Activates and Advances the Human-Computer Relationship. Cambridge, MA: MIT Press.

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

Nass, C., Isbister, K., & Lee, E. –J. (2000). Truth is beauty: Researching embodied conversational agents. In J Cassell, J. Sullivan, S. Prevost, & E. Churchill (Eds), *Embodied conversational agents* (pp. 374-402). Cambridge, MA: MIT Pres

Nass, C. & Moon, Y. (2000). Machines and Mindlessness: Social Responses to Computers. *Journal of Social Issues*, *56* (1), 81-103.

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

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

Nguyen, H., Masthoff, J. & Edwards. P. (2007). Persuasive Effects of Embodied Conversational Agent Teams. *Proceedings of 12th International Conference on Human-Computer Interaction*, Beijing, China, Springer-Verlag, Berlin, 176-185

Nowak, K. (2004). The influence of anthropomorphism and agency on social judgment in virtual environments. *Journal of Computer-Mediated Communication*, *9* (2)

Nowak, K. L., & Biocca, F. (2003). The effect of the agency and anthropomorphism on user's sense of telepre4sence, copresence, and social presence in virtual environments. *Presence:Teleperators and Virtual Environments, 12*(5), 481-494.

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

O'Keefe, D. J. (1998). Justification explicitness and persuasive effect: A meta-analytic review of the effects of varying support articulation in persuasive messages. *Argumentation and advocacy, 35*, 61-75.

O'Keefe, D. J. (2002). *Persuasion: Theory & Research.* Thousand Oaks, CA: Sage Publications.

Parise S, Kiesler S, Sproull L, Waters K. (1999). Cooperating with life-like interface agents. *Computers in Human Behavior, 15,* 123-142.

Pereira, R. E. (2000). Optimizing Human-Computer Interaction for the Electronic Commerce Environment. *Journal of Electronic Commerce Research, 1* (1), 2000, 23-44.

Petty, R. E., & Cacioppo, J. T. (1981). *Attitudes and persuasion: Classic and contemporary approaches*. Dubuque, IA: William C. Brown.

Petty, R. E., & Cacioppo, J. T. (1986). *Communication and Persuasion: Central and Peripheral Routes to Attitude Change.* New York: Springer-Verlag.

Pittam, J. (1994). *Voice in social interaction: An interdisciplinary approach.* Thousand Oaks, CA: Sage.

Pu, P. & Chen, L. (2007). Trust-inspiring explanation interfaces for recommender systems. *Knowledge-Based Systems, 20,* 542-556

Qiu, L. (2006). *Designing social interaction with animated avatars and speech output for product recommendation agents in electronic commerce.* Doctoral Thesis, University of British Columbia, Vancouver.

Quintanar, L. R., Crowell, C. R., Pryor, J. B., & Adamopoulos, J. (1982). Human-computer interaction: A preliminary social psychological analysis. Behavior Research Methods & Instrumentation, *14* (2), 210-220.

Reeves, B. & Nass, C. (1996). *The media equation: how people treat computers, television, and new media like real people and places.* New York, NY: CSLI.

Rhoads, K. V., & Cialdini, R. B. (2002). The Business of Influence. J. P. Dillard & M. Pfau (Eds). *Persuasion handbook: Developments in theory and practice*. (pp.513-542). London, United Kingdom: Sage

Sampson, E. E., & Insko, C. A. (1964). Cognitive consistency and performance in the autokinetic situation. *Journal of Abnormal and Social Psychology, 68,* 184-192.

Schafer, J. B. (2005). DynamicLens: A Dynamic User-Interface for a Meta-Recommendation System. *Workshop: Beyond Personalization 2005*, IUI'05, San Diego, CA.

Schafer, J. B., Knostan, J.A., & Riedl, J. (2002). Meta-Recommendation Systems: User-Controlled Integration of Diverse Recommendations. Paper presented at the 11th international Conference on Information and Knowledge Management, McLean, VA, Novemeber 2002.

Schafer, J.B., Konstan, J.A., & Reidl, J. (2004). The View through MetaLens: Usage Patterns for a Meta Recommendation System. IEE Proceedings Software.

Schliesser, H. F. (1968). Informatio transmission and ethos of a speaker using normal and defective speech. *Central States Speech Journal, 19*, 169-174.

Sebastian, R. J., & Bristow, D. (2008). Formal or Informal? The Impact of Style of Dress and Forms of Address on Business Students' Perceptions of Professors. *Journal of Education for Business*, *83*(4), 196-201.

Self, C. S. (1996). Credibility. In M. B. Salwen & D. W. Stacks (Eds.), *An integrated approach to communication theory and research* (pp. 421–441). Mahwah, NJ: Lawrence Erlbaum.

Sénécal, S., & Nantel, J. (2003). Online influence of relevant others: A framework. *Proceedings of the Sixth International Conference on Electronic Commerce Research (ICECR-6)*, Dallas, Texas.

Sénécal, S., & Nantel, J. (2004). The influence of online product recommendations on consumers' online choices. *Journal of Retailing*, *80*(2), 159–169.

Sinha, R. & Swearingen, K. (2001). Comparing Recommendations Made by Online Systems and Friends. *Proceedings of the 2nd DELOS Network of Excellence Workshop on Personalization and Recommender Systems in Digital Libraries*, Dublin Ireland, June 18-20.

Smith, R. E., & Hunt, S. D. (1978). Attributional processers and effects in promotional situations. *Journal of Consumer Research*, *5*, 149-158.

Smith, D., Menon, S., & Sivakumar, K. (2005). Online peer and editorial recommendations, trust, and choice in virtual markets. *Journal of Interactive Marketing*, *19*(3), 15–37.

Snyder, M., & Rothbart, M. (1971). Communicator attractiveness and opinion change. *Canadian Journal of Behavioural Science, 3*, 377-387.

Sproull, L., Subramani, M., Kiesler, S., Walker, J. H., & Waters, K. (1996). When the interface is a face. *Human-Computer Interaction*, *11*(1), 97-124.

Sutcliffe, A.G., Ennis, M., Hu, J. (2000). Evaluating the Effectiveness of Visual User Interfaces for Information Retrieval. International Journal of Human-Computer Studies, *53*, 741–763

Swartz, T. A. (1984). Relationship between source expertise and source similarity in an advertising context. *Journal of Advertising, 13*(2), 49-55.

Swearingen, K., & Sinha, R. (2001). Beyond Algorithms:An HCI Perspective n Recommender Systems. *Proceedings of the ACM SIGIR 2001 Workshop on Recommender Systems*, New Orleans, Louisiana

Swearingen, K. & Sinha, R. (2002). Interaction design for recommender systems. *Designing Interactive Systems 2002*. ACM, 2002.

Tamborini, R., & Zillmann, D. (1981). College students' perceptions of lecturers using humor. *Perceptual and Motor Skills, 52,* 427-432.

Taylor, P.M. (1974). An experimental study of humor and ethos. *Southern Speech Communication Journal, 39,* 359-366.

Tintarev, N. and Masthoff, J. (2007). Effective explanations of recommendations: User-centered design. *Proceedings of the ACM Conference on Recommender Systems*, Minneapolis, US, 153-156.

Tzeng, J. –Y. (2004). Toward a more civilized design:" Studying the effects of computers that apologize. *International Journal of Human-Computer Studies, 61*(3), 319-345.

Wang, W. (2005). *Design of Trustworthy Online Recommendation Agents: Explanation Facilities and Decision Strategy Support*. Doctoral Thesis, University of British Columbia, Vancouver.

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

Wang, W., & Benbasat, I. (2007). Recommendation Agents for Electronic Commerce: Effects of Explanation Facilities on Trusting Beliefs, *Journal of Management Information Systems, 23* (4), 217-246.

Wang, Y. D. & Emurian, H. H. (2005). An overview of online trust: Concepts, Elements and Implications. *Computers in Human Behavior*, *21*(1), 105-125.

West, P. M., Ariely, D., Bellman, S., Bradlow, E., Huber, J., Johnson, E., Kahn, B., Little, J., & Schkade, D. (1999). Agents to the rescue? *Marketing Letters, 10* (3), 285-300

Xiao, B., & Benbasat, I. (2007). E-Commerce product recommendation agents: Use, characteristics, and impact. *MIS Quarterly, 31*(1), 137–209.

Yoo, K. -H. (2008). Creating more credible and likable recommender systems. Dissertation Proposal. Texas A&M University.

Yoo, K. -H. & Gretzel, U. (2008). The influence of perceived credibility on preferences for recommender systems as sources of advice. *Information Technology & Tourism*, *10*(2), 133-146.

Yoo, K. -H, & Gretzel, U. (2009). The Influence of Virtual Representatives on Recommender System Evaluation, *Proceedings of the 15th Americas Conference on Information Systems,* San Francisco, California

Yoon, S. N., & Lee, Z. (2004). The impact of the Web-based Product Recommendation Systems from Previous Buyers on Consumers' Purchasing Behavior. Paper presented at the tenth Americas Conference on Information Systems, New York, New York, August, 2004.