2003

Gender and Personality in Media Rich Interfaces: Do Birds of a Feather Flock Together?

Traci J. Hess
Washington State University, thess@cbe.wsu.edu

Mark A. Fuller
Washington State University, mark@wsu.edu

John Mathew
Washington State University, jmathew@cbe.wsu.edu

Gender and Personality in Media Rich Interfaces: Do Birds of a Feather Flock Together?

Traci J. Hess
Washington State University
thess@cbe.wsu.edu

Mark A. Fuller
Washington State University
mark@wsu.edu

John Mathew
Washington State University
jmathew@cbe.wsu.edu

ABSTRACT

This research explores how user and interface characteristics can interact to influence decision performance. Specifically, this research examines the effects of gender, personality similarity, and increased levels of information cues on user involvement with a computer-based decision aid. In addition, this research explores the downstream effects of user involvement on decision time, effort, satisfaction, confidence, and quality. Findings indicate that gender has a significant influence on user involvement, and that involvement and the level of information cues provided by the decision aid have a direct influence on decision performance.

Keywords

Gender, Involvement, Decision-Making, Decision Performance, Personality, Information Cues

INTRODUCTION

Advancements in computing technology, particularly in the area of interface design, have provided end-users with rich, highly interactive online environments. Various forms of multimedia (e.g., voice, animated graphics) have been leveraged to create innovative software applications that facilitate user interaction, as evidenced by the emergence of animated interface agents in both professsional and commercial environments. Yet research into the underlying behavioral impacts of these rich interaction environments has not kept pace with these advancements in interface design. The effect of these richer, more engaging interfaces on user behavior and decision-making performance warrants more focused exploration.

Understanding how humans and computers interact has been the subject of research from a variety of perspectives. Early research on the presentation of information focused on how information was represented to the user, and how a particular representation 'fit' with the requirements of the task (Vessey, 1991; Vessey and Galletta, 1991). This research was extended into the task technology fit (TTF) framework that not only considered characteristics of the task and the technology, but also incorporated characteristics of the user (Goodhue, 1995; Goodhue and Thompson, 1995). This model inherently implies that user characteristics (such as personality and gender) can influence human computer interaction.

Further research on human computer interactions (HCI) has shown that users will respond in a social manner to interfaces that exhibit social cues, either through text, voice, or animations. Similarly, communication research has focused on how the user interface design may influence communication processes and related constructs. Researchers in the HCI and communications areas have begun investigating how advanced interfaces interact with characteristics of the user. Given the recent advances in our ability to design these types of complex interfaces, this research is necessarily in its early stages.

The purpose of this research is to investigate how gender, personality similarity, and the multiplicity of information cues provided in the interface affect the user's involvement with the system and subsequent decision-making performance. Research on consumer information-processing and involvement provide the theoretical foundation for the study. An experiment that manipulates computer-based personality and interface information cues has been designed and carried out to assess the impact of increased involvement on decision-making outcomes in a computer-based decision support environment.

The paper is organized in the following sections. First, the theoretical framework and hypotheses are presented. The research design, a 2x2 between subjects experiment, is then described, and results from the completed experiment are briefly summarized. A full discussion of the experimental findings will be presented at the workshop.

THEORETICAL FRAMEWORK

The theoretical framework for this paper focuses on the concept of involvement in the context of consumer information processing and decision-making. First, the involvement construct is reviewed and relevant IS research is identified. Determinants of involvement in the context of computer-based decision support are then discussed. Gender, personality similarity of the decision aid and the decision-maker, and media richness are reviewed for the potential influence on involvement. Hypotheses for each determinant of involvement are presented as the relevant literature is reviewed. The impact of involvement and communication levels on

decision-making performance is then described and related hypotheses are presented. The hypotheses supported below are visually represented in the research model shown in figure 1.

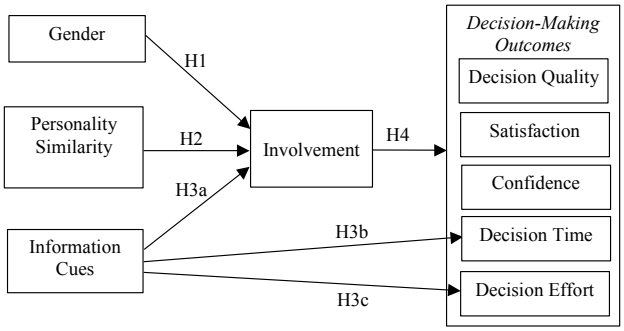

Figure 1. Research Model: the Impact of Gender, Personality Similarity, and Cues on Performance.

Involvement

Researchers in consumer information processing have long recognized the importance of involvement, or focused attention, on decision-making performance (Celci and Olson 1988; Payne, Bettman, Johnson 1993; Mishra, Umesh, and Stem 1993). Involvement affects information processing at a fundamental level as greater levels of involvement can lead to greater information acquisition, improved comprehension/understanding, increased effort, and overall decision performance. In this context, a person's level of involvement with a task has been defined as the degree to which the person finds the task to be personally relevant and is motivated to complete the task (Celci and Olson 1988). Involvement is believed to come from two broad sources: 1) intrinsic or stable sources due to individual differences and 2) situational sources, those that may be manipulated within the immediate environment (Celci & Olson 1988). Increased information cues in an interface (richer media) are believed to impact the situational form of involvement.

Recent MIS research has investigated involvement-related constructs in the context of the technology acceptance model (TAM). Agarwal and Karahanna note that current IS often employ richer media that provide an " increasingly riveting and engaging experience" (2000, p. 667). Focused attention/immersion is one of the dimensions of the cognitive absorption (CA) construct that they developed and studied in the context of TAM (Agarwal and Karahanna 2000). This notion of focused attention, where a user's attention is completely focused on an activity, is closely related to the construct of involvement advanced in the consumer information processing literature. Similarly, Koufaris has applied the concept of flow from the psychology literature to online consumer behavior in the context of TAM (2002). A state of flow occurs when an individual is absorbed in a task and acts with complete involvement (Csikszentmihalyi 1988).

The MIS research community has thus recently recognized the importance of focused involvement with an IS on user acceptance of an IS. From a decision-making perspective, however, the impact of greater involvement on performance outcomes has received little attention. One study in the communications literature, with limited sample size, investigated involvement, some decision-making outcomes, along with other communication measures in an experimental communication task (Burgoon, Bonito, Bengtsson, Ramirez, Dunbar, and Miczo 2000). Additional research is needed to identify the relevant influences on involvement and the subsequent effect on decision-making performance in the context of computer-based decision aids and information processing.

Gender and Technology

Gender researchers in social behavior (Skitka and Maslach 1996), communication (Dennis, Kinney, and Hung 1999; Spangler 1995), and IS acceptance (Gefen and Straub 1997; Venkatesh and Morris 2000) have noted differences in how men and women interact with each other and technology. Women are perceived to be more socially focused than men are as they are more aware of other's feelings and concerned with group harmony, consensus building, and interrelationships. Men, on the other hand, are viewed as being more independent, assertive, and unemotional.

In the context of technology acceptance, this more socially focused view of women has been empirically supported. Gefen and Straub found that women perceived a higher level of social presence in email than did men (2000). Dennis et al. found support for the premise that women were more sensitive, or aware, of non-verbal social cues in computer-mediated conditions (1999). Greater awareness of non-verbal social cues and perceptions of greater social presence suggest that women may be more involved or attentive in social interactions. While gender research has found differences between men and women in communication patterns and in initial beliefs or expectations with regard to technology, there has been less support for gender differences in actual performance with technology.

Based upon these findings, women appear to be more socially focused than men, and more observant of social cues in general. In addition, women have been found to perceive a greater social presence in electronic communication (Geffen and Straub 1997). Therefore, in the context of a computer-based decision aid,

Hypothesis 1. Women will be more involved than men.

Personality Similarity and Computers

Researchers in communication and HCI have demonstrated that users respond in a human-like manner to social cues exhibited by computing applications (Nass and Lee 2001; Nass and Moon 2000; Burgoon et al. 2000; Moon and Nass 2000). This application of social rules to computing applications is referred to as the Computers as

Social Actors (CSA) paradigm. This paradigm asserts that users respond to social cues from computers with social behaviors, but that this conditioned response occurs despite the user knowing that the computer is not human. One important finding of this research is that users can accurately assess personality traits in computing applications and respond differently to the application depending upon their own personality. In this manner, a computing application that exhibits personality traits is providing additional information cues. Personality theories offer explanations for these responses.

Similarity-attraction theory (Byrne & Griffitt 1969) states that individuals will be more attracted to individuals that exhibit similar characteristics. It has been applied to interactions with friends, business colleagues, partners, and computing applications. The theory asserts that people are more comfortable with people that exhibit personality traits that are similar to their own traits, especially in the early stages of a relationship. In human-computer interactions, the theory predicts that users will be more comfortable with computer-based personalities that exhibit personality traits that are similar to their own personality traits. Several studies that examined the personality traits exhibited by a computing application found support for similarity-attraction theory (Nass and Lee 2001; Burgoon et al 2000; Nass & Moon 2000).

The psychology literature and prior HCI studies provide support for the relationship between personality similarity and user perceptions of a computer-based decision aid that exhibits personality traits. Therefore, in the context of a decision-aid that exhibits personality traits and the known personality traits of the user,

Hypothesis 2. The similarity of personality traits will increase involvement.

Communication Levels and Media Richness

As noted previously, the development of more engaging, media-rich interfaces has been viewed as an improvement over simple, text interfaces. Theoretical support for this assumption, however, has been lacking. Media richness theory (Daft & Lengel 1986) is an obvious choice for investigating the effects of richer interfaces on user involvement and decision-making performance, but the empirical tests of this theory have provided disappointing results.

According to media richness theory, richer media should enable users to more quickly communicate and better understand equivocal information. Since media vary in their ability to support communication, richer media are thought to convey information better through a greater multiplicity of cues (visual information, tone of voice, etc.), by allowing greater personalization of the message, and by providing faster feedback.

Most of the early studies on media richness focused on media choice, however, not media use, and found only limited, if any, support for the theory (Daft, Lengel and Trevino 1987; Trevino, Lengel, and Daft 1987). Later studies focused on the performance effects of media use, but still did not find support for the theory (Dennis and Kinney 1998; Dennis et al 1999). The later studies did, however, find results that are applicable to general studies of richer versus leaner media. The use of leaner versus richer media resulted in slower performance overall, regardless of task equivocality (Dennis & Kinney 1998; Dennis et al 1999). Richer media supported the communication of more information cues, and thus reduced the time required to communicate information and make decisions. Similarly, richer media could be assumed to reduce decision-making effort, as the additional information cues should result in better comprehension from the delivery of the same message. The additional levels of information, or multiplicity of information cues, could also provide a means to alter the situational involvement of the user. The increased level of information cues should focus more of the user's attention on the interface. Therefore,

Hypothesis 3a. The multiplicity of information cues will increase involvement.

Hypothesis 3b. The multiplicity of information cues will decrease decision time.

Hypothesis 3c. The multiplicity of information cues will decrease effort.

Involvement and Decision Performance

The consumer information processing literature (Payne et al 1993; Celci and Olson 1988; Mishra et al 1993) provides theoretical support for the influence of involvement on various measures of decision-making performance. Multiple aspects of decision performance were investigated in this study to provide a more rich understanding of decision aid involvement and increased information cues. An individual, who is more involved in a decision-making task, is more committed to completing the task and is thus more likely to devote increased effort and time to the task. This involvement or motivation to complete a decision-making task may also translate into improved decision quality. A more committed, involved individual, who feels that a decision-making task is more personally relevant, would also feel higher levels of satisfaction with the task and be more confident in the accurate completion of the task. Therefore, in the context of a computer-based decision aid,

Hypothesis 4. Higher levels of involvement will increase decision-making outcomes (decision time, effort, decision quality, satisfaction, and decision confidence).

RESEARCH METHODOLOGY

A 2x2, between subjects research design was used, varying the communication levels (text only - T, text and voice -TV) and the personality of the decision aid (dominant, submission). Participants were 184 undergraduate students recruited from a sophomore-level

business course with a research study participation requirement. The average age of the students was 20.8, with 121 males and 67 females participating.

The subjects performed an apartment selection task similar to that employed by Todd & Benbasat (1999) and Payne et al. (1993) in prior decision-making studies. This task was chosen as it is a personally relevant choice problem for most college students. The subjects were presented with ten apartment alternatives that varied by eight attributes (rent, size, laundry, distance, high speed Internet access, facility age, parking, and noise.

Treatment Conditions

The communication levels (T, TV) were developed using the Microsoft® Agent Technology. In the T treatment, the decision aid provides subjects with instructions through text displayed in text balloons. In the TV treatment, the text balloons along with a computer-generated voice that reads the text in the balloons is provided.

The dominant-submissive dimension from the five-factor personality model (Trapnell & Wiggins 1990) was used to assess the impact of personality similarity. This dimension represents the degree to which an individual is assertive and willing to exercise control over others, and was represented in the treatments by varying word choice and voice characteristics in keeping with the personality literature and similar experiments on personality traits (Nass & Moon 2000, Burgoon et. al. 1999). The information content was kept the same in all treatments, but the script used in the dominant treatment included more assertive, commanding statements, while the submissive treatment script used more timid, unassuming statements. The voice used in the TV treatments was also varied to represent dominant and submissive traits. Based upon the personality literature and previous studies, the dominant voice was given a higher overall frequency, a larger range of pitch during speech, and greater speed than the submissive voice.

Procedure

A pre-experiment survey was first administered to ascertain the subjects' perceptions of their own personality traits (dominant or submission). The subjects were then randomly assigned to one of the four treatment conditions (dominant text, dominant text and voice, submissive text, submissive text and voice).

The computer-based decision aid provided the user with instructions on how to use the tool and then guided the user through the actual use of the tool. The delivery of the instructions was in keeping with the subjects' assigned treatment condition. The decision aid first requested the subjects to specify their preference for each apartment attribute by allocating 100 points among the eight attributes. The decision aid then provided a spreadsheet-based interface with several functions to facilitate the subject's selection of an apartment. These functions include hiding/showing apartment alternatives (rows) and features (columns), changing the order of the apartments and features, and sorting by one or two of the apartment features. The subjects were instructed to rank order the apartments according to their preference and then select their preferred apartment. After the students selected an apartment, a post-experiment survey was administered.

Measures

The measurement of the subject's personality on the dominant-submissive dimension of extraversion and the manipulation check on the dominant-submissive nature of the decision aid was obtained using a 16-item adjective scale (Trapnell & Wiggins 1990). Personality difference scores were calculated from the subject's mean response to the dominant-submissive scale items and the dominance of the treatment assigned. These raw scores were then converted to z scores, to facilitate comparison among the different treatments.

The involvement scale was developed from an existing 5-item scale that measures a user's focused attention (immersion) with an information system (Agarwal & Karahanna 2000). This scale was comparable to marketing scales used to measure involvement or attention in non-IS settings and more reliable than comparable communication scales (Burgoon et al. 2000).

Decision-making performance was measured by several common decision-making outcomes. Subject effort was evaluated by the number of decision aid features used during the experiment, as tracked by the experimental application. Decision time was measured in minutes and seconds by the experimental application. Satisfaction with the decision aid was measured with a 4-item scale adapted from other IS satisfaction scales (Doll & Torkzadeh 1988). The subjects' confidence in their decision choice was measured with a 4-item scale adapted from the decision support literature (Ghosh and Ray 1997). Decision quality was measured by comparing the subjects' final selections to their normative choice using a weighted-additive calculation.

RESULTS

Analysis of the experimental results has been completed and a summary of the hypotheses testing is shown in Table 1. Due to space limitations, statistical analysis and discussion of the results is not included in the proceedings, but will be presented at the workshop.

Hypotheses	Findings
H1. Gender ⇒ Involvement, Women > Men	√
H2. Personality similarity ⇑ Involvement	x
H3a. Communication levels ⇑ Involvement	x
H3b. Communication levels ⇓ Decision time	√
H3c. Communication levels ⇓ Decision effort	√

H4a. Involvement ⇑ Decision time	√
H4b. Involvement ⇑ Decision effort	√
H4c. Involvement ⇑ Decision quality	x
H4d. Involvement ⇑ satisfaction	√
H4e. Involvement ⇑ Decision confidence	√

Table 1. Result Summary

REFERENCES

1. Agarwal, R. & Karahanna, E. (2000). Time flies when you're having fun: Cognitive absorption and beliefs about information technology usage. *MIS Quarterly*, 24,4, 665-694.
2. Burgoon, J., Bonito, J., Bengtsson, B., Ramirez, A., Dunbar, N. & Miczo, N. (1999). Testing the interactivity model: Communication processes, partner assessments, and the quality of collaborative work. *J. of Management Information Systems*, 16, 3, 33-56.
3. Byrne, D. & Griffitt, W. (1969). Similarity and awareness of similarity of personality characteristics as determinants of attraction. *Journal of Experimental Research in Personality*, 3, 179-186.
4. Celci, R. & Olson, J. (1988). The role of involvement in attention and comprehension processes. *Journal of Consumer Research*, 15, 1, 210-224.
5. Csikszentmihalyi, M. (1990). Flow: The Psychology of Optimal Experience, Harper and Row, New York.
6. Daft, R.L., & Lengel, R.H. (1986). Organizational information requirements, media richness and structural design. *Man. Science*, 32, 5, 554-571.
7. Daft, R.L., Lengel, R.H., & Trevino, L.K. (1987). Message equivocality, media selection and manager performance: Implications for information systems. *MIS Quarterly*, 11, 3, 355-366.
8. Dennis, A., Kinney, S., and Hung, Y. (1999). Gender differences in the effects of media richness. *Small Group Research*, 30, 4, p. 405-438.
9. Dennis, A. & Kinney, S. (1998). Testing media richness theory in the new media: The effects of cues, feedback, and task equivocality. *Information Systems Research*, 9, 3, 256-274.
10. Doll, W. & Torkzadeh, G. (1988). The measurement of end user computing satisfaction. *MIS Quarterly*, 12, 2, 259-274.
11. Gefen, D. & Straub, D. (1997). Gender differences in the perception & use of e-mail: Extension to the technology acceptance model. *MIS Quarterly* 21, 4, 389-400.
12. Ghosh, D. and Ray, M. (1997). Risk, ambiguity, and decision choice: Some additional evidence. *Decision Sciences*, 28, 1, 81-105.
13. Goodhue, D. (1995). Understanding user evaluations of IS. *Management Science*, 41, 12, 1827-1844.
14. Goodhue, D.L. & Thompson, R.L. (1995). Task-technology fit and individual performance. *MIS Quarterly*, 19, 2, 213-236.
15. Koufaris, M. (2002). Applying the technology acceptance model and flow theory to online consumer behavior. *Information Systems Research*, 13, 2, 205-223.
16. Mishra, S., Umesh, U., & Stem, D. (1993). Antecedents of the attraction effect: An information processsing approach. *J. of Marketing Research*, 30, 331-49.
17. Moon, Y. & Nass, C. (1998). Are computers scapegoats? *Int. J Human-Computer Studies*, 49, 79-94.
18. Nass, C. & Lee, K. M. (2001). Does computer-synthesized speech manifest personality? Experimental tests of recognition, similarity-attraction, and consistency-attraction. *Journal of Experimental Psychology: Applied* 7, 3, 171-181.
19. Nass, C. & Moon, Y. (2000). Machines and mindlessness: Social responses to computers. *Journal of Social Issues*, 56, 1, 81-103.
20. Payne, J., Bettman, J., & Johnson, E. (1993). The Adaptive Decision Maker, Cambridge University Press, New York, 1993.
21. Skitka, L.J. & Maslach, C. (1990). Gender roles and the categorization of gender-relevant behavior. *Sex Roles*, 22, 3-4, 133.
22. Spangler, L. (1995). Gender-specific nonverbal communication: Impact for speaker effectiveness. *Human Resource Development Quarterly*, 6, 4; 409-419.
23. Todd, P. & Benbasat, I. (1999). Evaluating the impact of DSS, cognitive effort, and incentives on strategy selection. *Information Systems Research*, 10, 4, 356-374.
24. Trapnell, P. & Wiggins, J. (1990). Extension of the interpersonal adjective scales to include the big five dimensions of personality. *Journal of Personality and Social Psychology*, 59, 4, 781-790.
25. Trevino, L., Lengel, R.H., & Daft, R.L. (1987). Media symbolism, media richness, and media choice in organizations. *Comm. Research*, 15, 5, 553-574.
26. Venkatesh, V. & Morris, M.G. (2000). Why don't men ever stop to ask for directions? Gender, social influence, and their role in technology acceptance and usage behavior. *MIS Quarterly*, 24, 1, 115-139.
27. Vessey, I. (1991). Cognitive fit: a theory-based analysis of the graphs versus tables literature. *Decision Sciences*, 22, 2, 219-241.
28. Vessey, I. & Galletta, D. (1991). Cognitive fit: an empirical study of information acquisition. *Information Systems Research*, 2, 1, 63-84.