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THE IMPACTS OF HOMEPAGE SCREEN DENSITY ON WEBSITE EVALUATIONS: THE MODERATING ROLE OF PERSONALITY TYPE

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We investigated whether or not a user's personality affects his or her attitude and behavioral intention towards a website. Results of an experiment in which the density of the homepage screen was manipulated show that participants prefer homepages with a moderate screen density, that homepage screen density significantly influences the website evaluations of intuiting and feeling types, but not of sensing and thinking types, and that the influence of homepage screen density on website evaluation varies according to individual cognitive style. The practical implications of the findings are that although a moderate-density homepage design is a condition for general positive website evaluations, the influence of individual difference in relation to personality types must also be considered.

Keywords: personality type, cognitive style, MBTI, homepage screen density, website evaluation.

The homepage is the most important page for every website because it is a company's face to the world of the Internet. Visitors who gain a bad initial impression of a homepage may choose to go to other websites (Nielsen & Tahir, 2002). From a marketing perspective, the immediate impact of a poor homepage

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design is not only a lost opportunity to attract potential customers, but also a damaged company image (Singh & Dalal, 1999).

Many homepages are crowded with information and advertisements (Rau, Gao, & Liu, 2007). This crowding may be caused by designers who believe that users should see as much information as possible immediately when they visit a website. To date, however, little experimental evidence of how people evaluate a website with a high-density homepage has been collected. Therefore, in this study we empirically investigated the effects of homepage screen density on users' attitudes and behavioral intentions towards a website.

In addition, we investigated the role of individuals' personality types in regard to the extent to which homepage screen density influences website evaluations. In previous studies personality has been identified as a critical factor in the design of information systems (e.g., Benbasat & Taylor, 1978; Wheeler, Hunton, & Bryant, 2004), and an important factor in determining users' behavior on the Internet (Huang & Chang 2008). Thus, we argue that individual preferences for the design of homepage may be influenced by personality. This knowledge will assist designers in creating homepages that suit the personality types of their target audiences.

THEORETICAL BACKGROUND AND HYPOTHESES

The Effects of Screen Density

One of the fundamental issues affecting designers' decisions about how much information should be put on the homepage is screen density (Williams, 2000). This is defined as the percentage of the number of characters divided by the total amount of spaces available on a computer screen (Staggers, 1993). Homepage screen density is defined here as a percentage of the total available browser space that is occupied by texts, links, graphics, and animations.

Previous research on screen density has been focused on users' visual search performance, and its effects on subjective screen satisfaction (e.g., Rau et al., 2007; Staggers, 1993). The findings appear to be contradictory. In some studies it was found that participants preferred high-density screens (Spool, Schroeder, Scanlon, & Snyder, 1998), while others preferred a lower density (Ross, Morrison, & O'Dell, 1988). In other studies the relationship was found to follow an inverted U-shaped curve, with too little or too much information on a screen depressing preference and performance (Coll & Wingertsman, 1990). Besides the inconsistent findings, most research has been focused on text-only screens, and the monitors used were monochrome or low-resolution color CRT terminals. As technology has changed dramatically since these studies were carried out, it is questionable whether past findings can be generalized to include homepages that contain visual elements other than text, or to Internet surfing activities other than

searching. Consequently, in this study we investigated the influence of homepage screen density on users' website evaluations.

The Moderating Role of Personality Types

It has long been assumed that the design of information systems (IS) should consider the psychological characteristics of users (Shneiderman, 1980). One such individual personality difference that has received considerable attention in IS research is cognitive style (e.g., Benbasat & Taylor, 1978; Wheeler et al., 2004). *Cognitive style* is defined as "*consistent individual differences in preferred ways of organizing and processing information and experience*" (Messick, 1976, p. 5). Although several classifications of cognitive style exist, the most widely adopted is based on Jung's (1923) theory of psychological types as operationalized by the Myers-Briggs Type Indicator (MBTI). The MBTI consists of four bipolar psychological dimensions: Introversion/Extroversion (I/E), Sensing/Intuiting (S/N), Thinking/Feeling (T/F), and Judging/Perceiving (J/P) (Myers & McCaulley, 1985). Researchers can use the individual dimensions or combinations of these to investigate specific characteristics of individuals in relation to unique situations (Wheeler et al., 2004). Since there is no literature to support an association between the I/E dimension and the evaluation tasks in this study, we did not examine it. Nor did we investigate the J/P dimension, as it is correlated with the T/F dimension (Carlyn, 1977), and does not contribute independently to the understanding of personality (Abrahamian, Weinberg, Grady, & Stanton, 2003). Therefore, we focused on two dimensions, S/N and T/F, that relate directly to people's preferences for information gathering and processing. They could, therefore, also be expected to affect a person's perception and evaluation of the design of a homepage.

The S/N dimension relates to ways in which a person perceives information. Sensing types prefer to acquire and verify information through their physical senses. These people tend to focus on objective facts and details. Intuiting types prefer to receive information as it exists in totality, and are impatient with details. According to Jung's type theory (Gould, 1991; Myers, 1987), sensing types are more patient with details and even seek some repetition of information. Thus, they like a high-density homepage which contains more information. However, intuiting types dislike devoting time to precision and become impatient with routine details. Therefore, they would avoid a high-density homepage. This led us to the following hypothesis:

Hypothesis 1: The homepage screen density will have a greater influence on website evaluations for Intuiting types than for sensing types.

The T/F dimension relates to ways in which a person processes information or makes decisions. Thinking types tend to be more analytical, impersonal, and objective. In contrast, feeling types tend to make decisions based on personal and

group values. According to Jahng, Jain, and Ramamurthy (2002, p. 184) "Rather than seeking precision they prefer more persuasive information and are generally more empathetic". According to Jung's type theory (Gould, 1991; Myers, 1987; Nutt, 1993). In the context of website browsing, a moderate-density homepage is expected to be better suited to the information preferences of feeling types. However, thinking types seek more precise information and engage in analytical processing. Therefore, they would be less influenced by the differences between high- and moderate-density homepages. Hence it is proposed that:

Hypothesis 2: The homepage screen density will have a greater influence on website evaluations for feeling types than for thinking types.

The perceiving mental function (S/N), which contains sensing and intuiting functions, and the judging mental function (T/F), which contains feeling and thinking functions, can be combined into four cognitive styles: sensing-thinking (ST), sensing-feeling (SF), intuiting-thinking (NT), and intuiting-feeling (NF) (Mitroff, 1981). In some sense, ST and NF types are extremes in term of their information perceiving, processing, and decision making (Jahng et al., 2002). It has been demonstrated that a person's cognitive style may influence his or her preferences and decision making (Haley & Stumpf, 1989). In e-commerce environments, Jahng et al. found that the effectiveness of a product's information presentation varied according to consumers' cognitive styles. Accordingly, an individual's cognitive style may help explain the effects of homepage screen density on his or her website evaluations. Thus, we propose that:

Hypothesis 3: The effect of homepage screen density on website evaluations will vary according to users' cognitive styles.

METHOD

Experimental Design

A controlled laboratory experiment was used to test the study hypotheses. The design of the experiment involved one within-subject variable: homepage screen density. In the past, a wide range of density levels have been used. In this study, two conditions only of homepage screen density (moderate and high) were manipulated. Using previous studies (Coll & Wingertsman, 1990; Staggers, 1993) and the design patterns of several commercial homepages, we set 75% as high-density and 50% as moderate-density. Two versions of a homepage were constructed. They were based on a professionally developed homepage in order to maintain external validity. This homepage was selected for two reasons. First, it was a typical high-density commercial homepage. Second, we expected that few users in Taiwan would have visited this website previously, as it is located in China. This could eliminate any influence of previous experience. The moderate-density homepage was manipulated by decreasing the amount of detailed

information and the number of banner advertisements. The two versions were identical except for the amount of information displayed on them.

Participants and Procedures

Participants (129) were junior and senior undergraduates, aged between 18 and 24 years, enrolled at the National United University in Taiwan. The numbers of male (47%) and female (53%) participants were roughly equal and all were familiar with Internet browsing.

Participants were tested while in class, typically in groups of 30-40, during 30-minute testing sessions. All computers in the laboratory were Intel-based Pentiums with identical configurations and the same version of Microsoft IE. The tested homepages were presented on a 17 inch LCD monitor set at a resolution of 1024×768 pixels. Upon entering the laboratory, participants were given detailed verbal instructions and were then asked to view and evaluate the two versions of the tested homepages sequentially. In order to control for the potential order effect, the sequence of the two versions was randomized for each participant. After evaluating the website, participants were asked to fill out a questionnaire, which included the MBTI and demographic information. When they had completed the laboratory experiment, participants were thanked for taking part and debriefed.

Measures

Personality type The traditional Chinese version of the MBTI Form M was used to measure participants' personality types. There is strong support for the reliability and validity of the MBTI (see review by Murray, 1990). In order to decrease respondent fatigue, items related to a person's S/N and T/F scores only were included. The items were then scored to classify participants' personality types for each of the two dimensions.

Attitude The attitude toward the website was measured with three 6-point semantic differential questions (good/bad, favorable/unfavorable, and like/dislike) adopted from Coyle and Thorson (2001). The reliability coefficient for this measure was .84.

Behavioral intention Adopted from Coyle and Thorson (2001), this measure addressed intention to return to the website by asking participants to indicate their agreement or disagreement with the following two 6-point Likert items: (1) It is very likely that I will return to this website; and (2) I will return to this website the next time I want to buy a digital camera. The reliability for this measure was .75.

RESULTS

One-way repeated measures analysis of variance (ANOVA) was conducted to examine the manipulation. The results revealed a significant difference in the expected direction. Participants exposed to the high-density homepages (M = 4.33) were significantly more likely to agree that the homepages were crowded with information than were those who had been exposed to the moderate-density homepages (M = 2.91, F = 132.96, $p < .001$).

A repeated measures multivariate analysis of variance (MANOVA) was conducted to examine the effects of homepage screen density on website evaluations. This analysis revealed a significant main effect for homepage screen density (F = 25.99, $p < .001$, Wilks's λ = .71) across two dependent variables: website attitude and behavioral intention. Both the mean levels of website attitudes and behavioral intentions for moderate-density homepages (M = 4.15; M = 4.48, respectively) were significantly higher than for the high-density homepages (M = 3.25, F = 52.28, $p < .001$; M = 3.77, F = 37.13, $p < .001$, respectively). This suggests that most participants preferred websites with a moderate-density homepage.

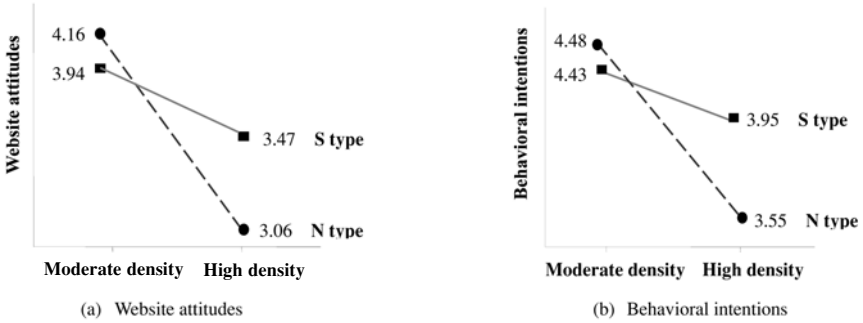

Figure 1. Interaction effects of S/N type and density on attitudes and intentions.

A series of MANOVAs were then conducted to test the three hypotheses. In Hypothesis 1 we predicted that the levels of homepage screen density would have a greater influence on website evaluations for intuiting types than for sensing types. As anticipated, the 2 (density: high vs. moderate) × 2 (personality type: sensing vs. intuiting) repeated measures MANOVA revealed a significant interaction effect (F = 3.55, $p < .05$, Wilks's λ = .95) across two dependent variables: website attitude (F = 6.91, $p < .01$, partial η^2 = .05), and behavioral intention (F = 5.88, $p < .05$, partial η^2 = .04). The main effect for S/N personality type was not significant (F = .45, $p > .6$). As shown in Figure 1, there were substantially greater differences in attitude and intention between high- and

moderate-density for intuiting types than for sensing types. This suggests that levels of homepage screen density significantly affect the website evaluations of intuiting types, but it does not have the same substantial effect for sensing types. Therefore, Hypothesis 1 was supported.

To test Hypothesis 2, a 2 (density: high vs. moderate) × 2 (personality type: thinking vs. feeling) repeated measures MANOVA was conducted. The main effect for T/F personality type did not reach significance (F = 1.73, $p > .1$). As expected, the results indicated a significant interaction effect (F = 4.42, $p < .05$, Wilks's $\lambda = .93$) for website attitude (F = 6.88, $p < .01$, partial η^2 = .05), but not for behavioral intention (F = 1.79, $p > .18$). Figure 2 indicates a substantially larger difference in website attitude between high- and moderate-density for feeling types than for thinking types. It also suggests that levels of homepage screen density significantly affect the website attitudes of feeling types, but it does not have the same substantial effect for thinking types. Thus, Hypothesis 2 was partially supported.

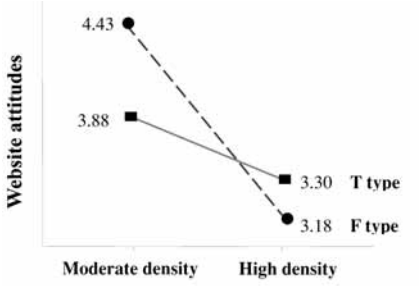

Figure 2. Interaction effects of T/F type and density on attitudes.

In Hypothesis 3 we predicted that the effect of homepage screen density on website evaluations could vary according to users' cognitive styles. As expected, the 2 (density: high vs. moderate) × 4 (cognitive style: ST, SF, NT, and NF) repeated measures MANOVA revealed a significant interaction effect (F = 2.93, $p < .01$, Wilks's $\lambda = .87$) across two dependent variables: website attitude (F = 5.18, $p < .01$, partial $\eta^2 = .30$), and, to a lesser degree, behavioral intention (F = 2.42, $p = .07$, partial $\eta^2 = .23$). The main effect for cognitive style was not significant (F = .97, $p > .44$). Table 1 displays the means and standard deviations across each treatment and dependent variable. Our findings suggest that the effect of homepage screen density on website evaluation differs according to users' cognitive style. Thus, Hypothesis 3 was supported.

TABLE 1
MEANS AND STANDARD DEVIATIONS FOR COGNITIVE STYLE AND DENSITY

Condition	High density				Moderate density			
Cognitive style	Website attitudes		Behavioral intentions		Website attitudes		Behavioral intentions	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
ST	3.58	.15	3.95	.17	3.74	.13	4.21	.14
SF	3.19	.22	3.92	.25	4.40	.19	4.63	.22
NT	3.23	.20	3.74	.23	4.01	.13	4.35	.14
NF	3.01	.18	3.48	.17	4.45	.18	4.67	.19

Note: All items scored on 6-point scales.

DISCUSSION

In this study we investigated the influence of screen density of commercial homepages on users' attitudes and behavioral intentions. In our study we supported the assertion that the density of the homepage screen does influence users' attitudes and behavioral intentions toward a website. A controlled laboratory experiment was conducted to examine how different levels of homepage screen density influence users' website evaluations. The findings indicate that participants prefer websites with a moderate-density homepage. This suggests that in order to achieve a more favorable website evaluation by users, designers should avoid cramming too much information onto a homepage of very limited size. Thus, website designers should carefully consider whether they need to limit the amount of detailed information or the number of advertisements displayed on the homepages.

We also examined the important role of personality in website evaluations. The findings offer additional support for the concept that Jung's personality type theory is useful in understanding and predicting how users may evaluate websites. As posited, the difference between moderate- and high-density homepages exerted less influence on sensing types and thinking types than it did on intuiting and feeling types. In addition, the effect of homepage screen density on website evaluations varied according to participants' cognitive styles. These findings corroborated the concept that there are individual differences in acquiring and processing information (Jung, 1923). The implication for website designers is that although a moderate-density homepage design may generally be a prerequisite for positive website evaluations by users, the influence of individual difference in personality types must also be considered. According to our findings, the sensing, feeling, and sensing-thinking (ST) types are less sensitive to the effects of homepage screen density. Thus, a high-density homepage can still be useful when targeting these types of users.

Although the findings from this study yield insights into the moderating role of Jung's personality types on website evaluations, several limitations should be noted when interpreting these results. One limitation of the current research is that only two levels (moderate and high) of screen density were examined. Our research could be widened by investigating the investigation of the influence of different levels of homepage screen density on website evaluations. Another potential limitation of the experiment is that we examined only one type of website. However, generalizing beyond this type of website may be problematic. For example, people with high product involvement might follow the central route and process the product information on the website differently (Elliott & Speck, 2005). Therefore, we recommend that in future studies the moderating effects of product involvement be considered in order to arrive at a better understanding of the impacts of homepage screen density on website evaluation. Finally, only one design feature and Jung's personality types were investigated. We suggest that future researchers consider the effects of other homepage design features, such as navigation structure, reading manipulation, and presentation style. In addition, other personality traits, such as tolerance of ambiguity (Frenkel-Brunswik, 1948) and need for closure (Kruglanski, 1980), that have been found to influence the manner in which people process information and form attitudes need to be explored in the future.

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