

Effects of Visual Priming on Improving Web Disclosure to Investors

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This research used online experiments to examine how different types of visual priming affect less knowledgeable and knowledgeable online investors' processing and understanding of disclosure information. It also aimed at addressing what types of visual priming of online disclosure information are most effective at affecting less knowledgeable versus knowledgeable investors regarding their processing and understanding of disclosure information. The results revealed online investors perceived that categorical and semantic priming helped them process and understand the disclosure information better than feature priming. This result was confirmed when investors' knowledge levels did not change how knowledgeable and less knowledgeable investors perceived different types of visual priming. The results concluded that knowledge level did not interact with visual priming to influence investors' processing and understanding of disclosure information.

Keywords: Web disclosure information, Visual priming, Investor knowledge

INTRODUCTION

The Securities and Exchange Commission (SEC) initiated an iterative research and design effort to develop suggested language and format for the disclosure of certain fees and conflicts of interest information by broker-dealers in 2004. Additional investigations employed the same iterative research and design methodology to test the adaptability of the form to cover fees for variable annuities and further explore variations in the point-of-sale form for mutual funds. These further investigations described the results of five additional rounds of investor interviews conducted in five major metropolitan areas in 2005.

During the interviews, investors were asked to comment on each form's usefulness, assess its importance to their investment decisions, and provide suggestions for improvement. Overall, these investigations determined whether investors understood, over the telephone, certain portions of the same information presented in the mutual fund point of sale disclosure forms including conflict of interest disclosure. Investors felt the information provided over the telephone was useful but the information could be overwhelming and

difficult to understand over the telephone. Moreover, investors would like to have disclosure information in writing, either in digital or printed form. These results warrant this study's investigations in the effectiveness of online disclosure information.

Because the Internet puts investors in control of the information, online investing gains popularity and induces a state of information flow that could help them process investment information. However, overload of information may hinder their ability to process information more easily. Thus, understanding how investors process disclosure information is an important step in assuring that investors will understand disclosure information to benefit fully from the information. Specifically, the goals of this study were:

1. Can visual priming improve investors' processing and understanding of disclosure information?
2. How effective are different types of visual priming of online disclosure information in affecting less knowledgeable versus knowledgeable investors' processing and understanding of disclosure information?

This study used an experiment to manipulate visual displays of disclosure information in a Web page for the purpose of influencing investors' processing and understanding of disclosure information. Moreover, this study examined differences between knowledgeable versus less knowledgeable

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online investors. Enhancing display of disclosure information is an important step in assuring that investors will process and understand disclosure information to benefit fully from the protections offered by federal securities regulations. This research can identify theoretical and practical implications as how less knowledgeable and knowledgeable investors will be more likely to process and understand disclosure information online to make informed judgments about their investments.

LITERATURE REVIEW

Visual Priming

Priming refers to changes in a person's ability to identify an object as a result of a specific prior encounter with the object (Schacter, Badgaiyan, and Alpert [1999]). Thus, visual priming refers to changes in a person's ability to identify an object as a result of a specific prior encounter with the visual displays associated with the object. In other words, visual priming enhances a person's awareness of an object by making the object more noticeable visually.

In the same line of reasoning, visual priming can make investors notice important information regarding an investment more than just plain text. Because of an increased awareness of information, visual priming can influence investors' information processing regarding investment information (Mandel and Johnson [2002]). For example, by making disclosure information more noticeable, visual priming increases investors' awareness in processing the disclosure information (Iyengar and Kinder [1987], Iyengar and Simon [1993]). This type of visual priming operates in a manner similar to visual readiness, which produces a readiness to respond to disclosure information designed to help investors make informed investment decisions.

In addition to increase awareness of disclosure information, visual priming can influence how a person understands the disclosure information primed visually. This is because awareness can activate previously learned knowledge about similar disclosure information, thereby influencing the understanding of the disclosure information (Iyengar and Simon [1993]). When disclosure information is primed visually, the disclosure information becomes more accessible and more likely to play a role in the subsequent understanding of the disclosure information (Wyer and Srull [1989]). Research also found that people often used a shortcut strategy, processing information based on the pieces of information most easily retrieved from previous knowledge (Krosnick and Brannon [1993]). The heightened awareness and transferable knowledge increase the likelihood that investors will understand the disclosure information (Sheafer and Weimann [2005]).

There are different types of visual priming that share the same underlying mechanism: semantic, feature, and categorical priming (Mandel and Johnson [2002]). Exposure to these

types of visual priming increases the awareness of a primed object. For example, categorical priming focuses on categorical selections of disclosure information that prime awareness of disclosure information (Figure 1). Feature priming uses signs that prime awareness of disclosure information (Figure 2). Semantic priming uses words that prime awareness of disclosure information (Figure 3). These are the three types of visual priming, tested in this study and explained later in the methodology section, to prime online investors to process disclosure information.

Investor Knowledge

Knowledge is information that is learned, organized, represented, and stored in memory (Alba and Hutchinson [1987]). Investors' knowledge on investing can be retrieved, used, and updated to create inherent, meaningful, and useful property of the knowledge itself and make analogy, inference, reasoning, and elaboration regarding investment information (Alba and Hutchinson [2000], Celsi and Olson [1988]). Investors' knowledge on investing can facilitate investment information processing (Bettman and Park [1980], Brucks [1985]). However, knowledgeable investors and less knowledgeable investors differ in how they process information (Park and Lessig [1981]). Thus, how capable investors are to process disclosure information may depend on how knowledgeable they are (Sujan [1985]).

The processing differences for knowledgeable and less knowledgeable investors can be explained by the completeness and complexity of investors' knowledge structures (Park and Lessig [1981]). In contrast to less knowledgeable investors, knowledgeable investors have better-developed and more complex knowledge structures. This is to say they have well-formulated criteria to identify, categorize, and process information (Marks and Olson [1981]). Due to these differences, when knowledgeable investors process investment information, available and relevant knowledge can be retrieved automatically, resulting in the availability of evaluation criteria for processing the information (Alba and Hutchinson [2000], Campbell and Kirmani [2000]).

Knowledgeable investors also have well-structured categorization of knowledge. Their capabilities of using category-based processing ease their efforts in processing information since they can process information at categorical level rather than based on individual pieces of information (Chang [2004], Cohen [1982], Fiske [1982]). For example, knowledgeable investors can identify different pieces of disclosure information into different categories such as fees and conflicts of interests. With fees category, they can also anticipate different fees based on their previous knowledge about fees. Consequently, a higher level of knowledge facilitates understanding of the information (Chang [2004]).

Alternatively, investors with lower levels of knowledge may see disclosure information as made up of discrete

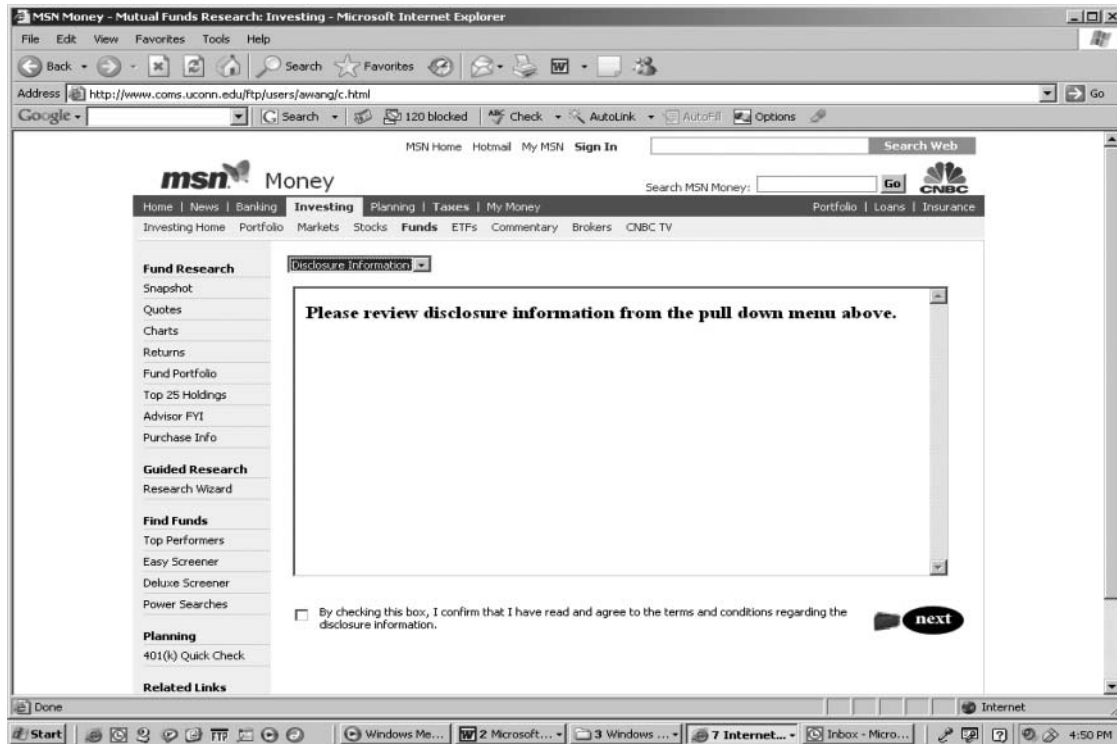


FIGURE 1 Categorical priming of disclosure information.

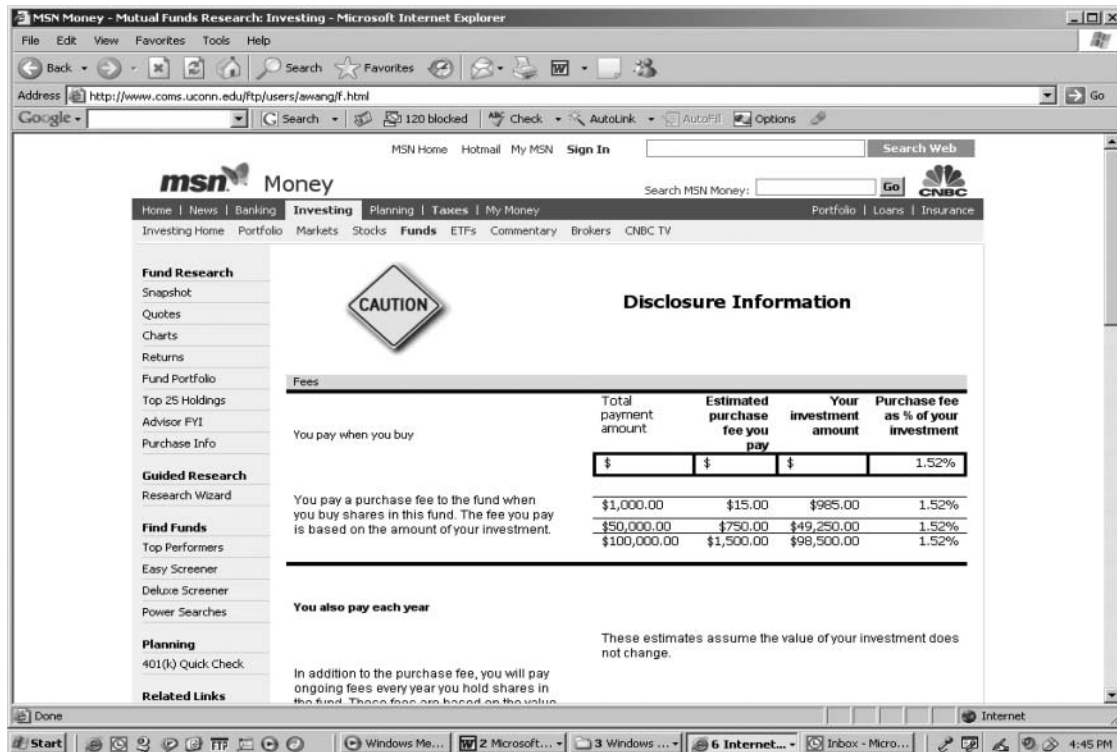


FIGURE 2 Feature priming of disclosure information.

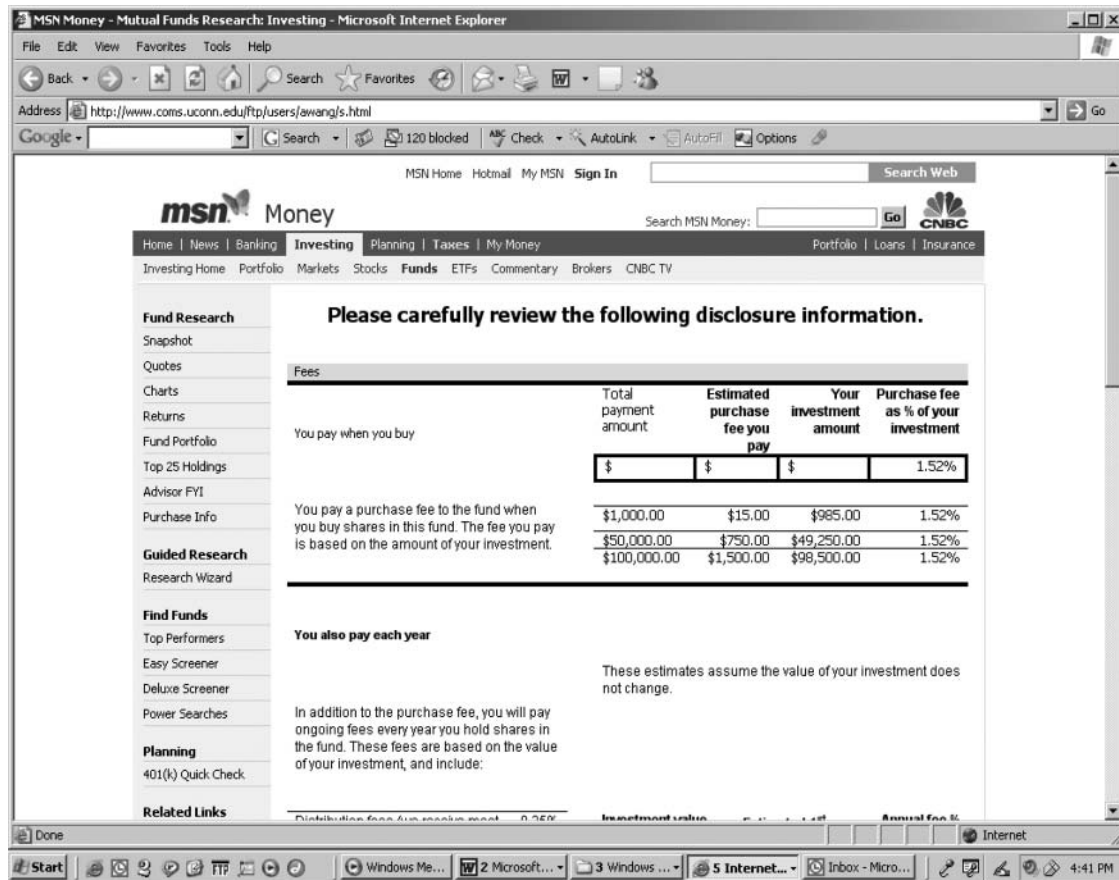


FIGURE 3 Semantic priming of disclosure information.

pieces of information. They use a piece-by-piece processing approach to process the disclosure of information (Wang [2006]). Because of insufficient knowledge, their knowledge usually is not well developed and structured. In this case, less knowledgeable investors may not be able to process the disclosure information regarding a mutual fund easily.

Interplay of Investor Knowledge and Visual Priming

In addition to examining the increase in awareness and understanding of disclosure information by one of three types of visual priming, this study also investigates whether the effects of visual priming will be different among knowledgeable versus less knowledgeable investors. Research offers two opposing possibilities. Investors who are knowledgeable about investing can process investment information more efficiently than less knowledgeable investors. Knowledgeable investors are likely to engage in more than superficial processing because of their higher knowledge levels about investing. Thus, knowledgeable investors' information processing is unlikely to be limited to elementary meaning analysis (Alba and Hutchinson [2000]).

Less knowledgeable investors may process investment information based on external factors such as visual priming since they are inexperienced and more susceptible to contextual manipulations. Less knowledgeable investors may be susceptible to the effects of visual priming when they process disclosure information. Also, less knowledgeable investors may be influenced more by visual priming than knowledgeable investors because people with less knowledge about a subject have been found to weigh relevant information more heavily when they are made noticeable through visual priming (Mandel and Johnson [2002]).

An alternative proposition suggests that visual priming affects knowledgeable investors but through a different persuasion route. The key distinction here is how memory-based search is used by knowledgeable and less knowledgeable investors. Because knowledgeable investors tend to have a surfeit of relevant knowledge, their processing and understanding of information may actually be more susceptible to visual priming of disclosure information than those of less knowledgeable investors. Since knowledgeable investors are more likely than less knowledgeable investors to use their previous knowledge to process disclosure information, they may pay more attention to the disclosure information primed. Thus, the effect of visual priming on processing and

understanding of disclosure information may be stronger for knowledgeable investors than less knowledgeable investors.

Since there are no available studies that specifically compare different types of visual priming on processing disclosure information, this research posits the following research questions:

RQ1: What is the effect of different types of visual priming on investors' processing and understanding of online disclosure information?

RQ2: How does less knowledgeable versus knowledgeable investors' processing and understanding of online disclosure information differ based on different types of visual priming?

METHODOLOGY

Procedures

A 3 (categorical priming, feature priming, semantic priming) by 2 (less knowledgeable and knowledgeable investors) experimental design was used for this study. According to Galante [1998], investors in their late 20s to mid 40s comprise the bulk of those making online trades. Moreover, a new boom in online investing is taking place among those 25 years old and younger. Thus, this study recruited online investors ages 18–45. This methodology focused the research on testing the effectiveness of online disclosure information by capturing representative online investors.

To recruit participants and identify their knowledge levels, this study used a screening survey to recruit and identify participants. Recruiting advertisements were posted on several tri-state listservs, finance-related blogs, and Web sites that targeted financial professionals and online investors. Financial professionals and online investors interested in participating in the study clicked on the screening survey link that directed them to answer questions that measured their knowledge about investing in mutual funds. The online survey was self-administered with participants recording an identifier code in place of their names to ensure confidentiality and promote confidence in providing sensitive information accurately.

A total of 459 participants eventually completed the screening survey. It is important to acknowledge that the screening survey sample was not randomly selected. However, the advertisement used to recruit the sample covered a wide range of groups whose members specialized in finance and online investing. Based on the average of 459 participants' knowledge scores, the study identified participants with lower than average knowledge scores as less knowledgeable investors and participants with higher than average knowledge scores as knowledgeable investors. They were invited to come to a computer lab to complete the study.

TABLE 1
Experimental Procedure.

Step	Procedure
1	Participants were seated in front of a computer in the laboratory.
2	Participants were explained the purpose of this study.
3	Participants reviewed the mutual fund and the disclosure information.
4	Participants had a 10-minute break.
5	Participants answered a questionnaire online.
6	The administrator briefed participants about the study.
7	Participants were given their compensation.

Experimental sections in a computer laboratory exposed different types of visual priming to participants.

Table 1 summarizes the experimental procedure. Participants' qualifications were verified by their drivers' licenses and proof of their online investment accounts when checking into the computer lab. Participants were not allowed to take part in the study without their qualifications confirmed. Once confirmed, the experiment administrator asked participants to log on to a Web site to review information about a mutual fund. By following the instructions, participants would review the disclosure information regarding the mutual fund. Upon completion of the study, participants received \$150 as their compensation. A total of 178 participants completed the study, and their responses were used for data analysis.

Stimuli

The contents of the disclosure information adopted the disclosure information from an iterative research and design effort initiated in 2005 by the SEC. Overall, the SEC's research determined whether investors understood, over the telephone, certain portions of the fee information presented in the mutual fund point of sale disclosure forms. Investors interviewed also considered the disclosure information about conflicts of interest as important information. Thus, the contents of the disclosure information used in this study were the conflicts of interest disclosure and fee information.

Since the purpose of this study was to test effects of different types of visual priming using disclosure information, knowledgeable and less knowledgeable investors were randomly assigned to one of the three conditions. In the categorical priming condition, participants were prompted to review disclosure information but not with any special emphasis on the language (Figure 1). They were provided with a drop-down box with links to fee information or conflict of interest disclosure. The participants must click for more information and must choose what to review. In the feature priming condition, participants were exposed to a warning symbol directly beside the details of disclosure information that was associated with the disclosure information (Figure 2). In the semantic priming condition, participants were presented header-style textual information directly above the

details of disclosure information reminding them to note the disclosure information (Figure 3).

Measures

This study measured several variables. Thirty-seven questions were used to measure participants' knowledge regarding investing in mutual funds in the screening survey. Ten multiple-choice questions were used to reflect participants' knowledge regarding investing in mutual funds (Celsi and Olson [1988]), and 27 true-false questions were used to measure participants' knowledge about investing in mutual funds (Moreau et al. [2001]). Each correct answer was worth one point, and the mean of knowledge was 23.88 ($SD = 3.85$). The highest knowledge score was 33, and the lowest score was 15. The results revealed that a range of participants' knowledge scores was captured.

This study measured two dependent variables related to the effectiveness of visual priming on processing and understanding of disclosure information. Two bipolar 7-point semantic differential scales ranging from 1 (not at all) to 7 (extremely) were used to measure the dependent variables. The two dependent variables measured after participants reviewed the mutual fund and the disclosure information were:

1. Did the visual priming help process the disclosure information?
2. Did the visual priming help understand the disclosure information?

Statistical Analysis

Bivariate correlations tests were conducted to test the relationship between the two dependent variables. The results determined the dependent variables were correlated with each other ($p < .000$). Thus, this study used *MANCOVA* as the statistical procedure for data analysis. An advantage of the *MANCOVA* procedure is that the set of dependent variables are considered simultaneously. That is, the test considers the correlations among the set of dependent variables. If there were main effects for the independent variables, differences in conditions with respect to the dependent variables would materialize. Consequently, this study can determine on which dependent variables the conditions differ.

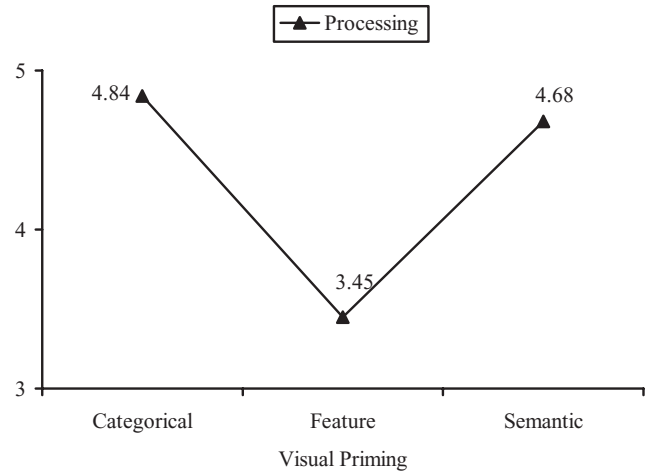


FIGURE 4 Processing of disclosure information.

RESULTS

A 3 by 2 *MANCOVA* was run on processing and understanding of disclosure information as the dependent variables. Visual priming (categorical, feature, and semantic priming) and knowledge level (knowledgeable and less knowledgeable investors) were used as the fixed factors (or independent variables). The results revealed that visual priming, Wilks' $\lambda = .841$, $F(4, 342) = 7.731$, $p < .000$, $\eta^2 = .08$, had a significant main effect on the dependent variables. However, knowledge level did not have a significant main effect on the dependent variables, Wilks' $\lambda = .989$, $F(2, 171) = .984$, $p < .376$, $\eta^2 = .011$. The tests of between-subject effects further revealed that visual priming had main effects on both processing of disclosure information, $F(2, 172) = 9.983$, $p < .000$, $\eta^2 = .104$, and understanding of disclosure information, $F(2, 172) = 15.825$, $p < .000$, $\eta^2 = .155$.

Table 2 reports the means and standard deviations of the dependent variables, whereas Figures 4 and 5 demonstrate the condition differences on two dependent variables in terms of visual priming. The two dependent variables are the participant's processing of the disclosure information (Figure 4) and their understanding of the disclosure information (Figure 5). The figures are set up so that the X-axis lists the types of priming as the independent variables: categorical, feature, and semantic. The Y-axis is the dependent variable that was

TABLE 2
Means (Standard Deviations) of Key Dependent Measures.

Visual priming	Categorical		Feature		Semantic	
	Knowledgeable	Less knowledgeable	Knowledgeable	Less knowledgeable	Knowledgeable	Less knowledgeable
N	30	28	30	30	32	28
Processing	4.73 (1.66)	4.96 (1.84)	3.4 (2.27)	3.5 (2.24)	4.63 (1.29)	4.75 (1.76)
Understanding	4.77 (1.68)	5.18 (1.77)	3.03 (2.17)	3.4 (2.11)	4.56 (1.32)	4.71 (1.68)

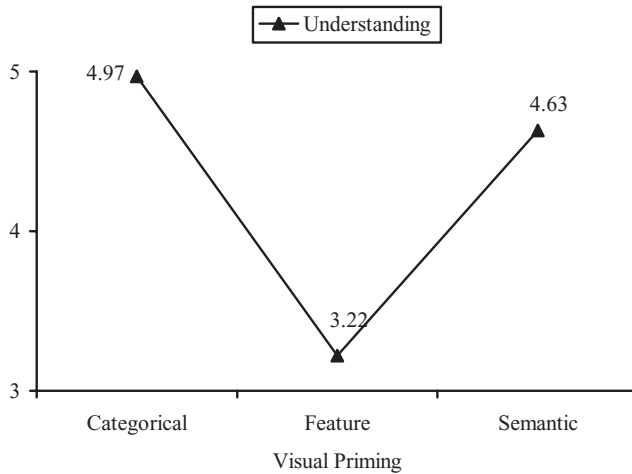


FIGURE 5 Understanding of disclosure information.

described in the Methodology section of this article. As can be seen in Figures 4 and 5, the categorical and semantic visual priming techniques were better than the feature priming technique across both dependent variables.

A post hoc LSD test on processing of disclosure information revealed that participants exposed to feature priming ($M = 3.45$, $SD = 2.24$) had perceived lower degree of helpfulness in processing the disclosure information than participants exposed to categorical priming ($M = 4.84$, $SD = 1.74$, $p < .000$) and participants exposed to semantic priming ($M = 4.68$, $SD = 1.51$, $p < .000$). A post hoc LSD test on understanding of disclosure information revealed that participants exposed to feature priming ($M = 3.22$, $SD = 2.13$) had perceived lower helpfulness in understanding the disclosure information than participants exposed to categorical priming ($M = 4.97$, $SD = 1.72$, $p < .000$) and participants exposed to semantic priming ($M = 4.63$, $SD = 1.48$, $p < .000$). These results confirm the patterns showed in Figures 4 and 5 statistically.

Based on the multivariate tests, there was no interaction effect between visual priming and knowledge level, Wilks' $\lambda = .997$, $F(4, 342) = .132$, $p < .97$, $\eta^2 = .002$. Figures 6 and 7 demonstrate the condition differences on two dependent variables in terms of visual priming as well as knowledge level. The two dependent variables are the participant's processing of the disclosure information (Figure 6) and their understanding of the disclosure information (Figure 7). As can be seen in the figures, the categorical and semantic visual priming techniques were better than the feature priming technique across both groups of participants (knowledgeable, less knowledgeable) as well as across both dependent variables. Statistically, knowledgeable and less knowledgeable participants shared similar responses to different modes of visual priming in terms of processing the disclosure information, $F(2, 172) = .02$, $p < .98$, $\eta^2 = .000$, and understanding the disclosure information, $F(2, 172) = .088$, $p < .916$, $\eta^2 = .001$. Regardless of participants' knowledge levels, feature

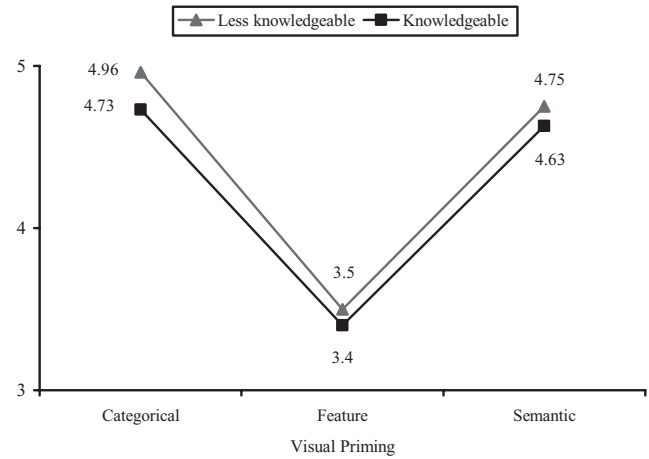


FIGURE 6 Visual priming and knowledge level on processing of disclosure information.

priming was the least helpful condition for participants to process and understand the disclosure information compared to categorical priming and semantic priming. These results were consistent with the main effects found for visual priming on processing and understanding of disclosure information.

DISCUSSION

The results answered both research questions posited in this study. For the first research question, the results revealed that online investors preferred categorical and semantic priming instead of feature priming. Online investors perceived that categorical and semantic priming helped them process and understand disclosure information better than feature priming. This result was confirmed when investors' knowledge levels did not change how knowledgeable and less

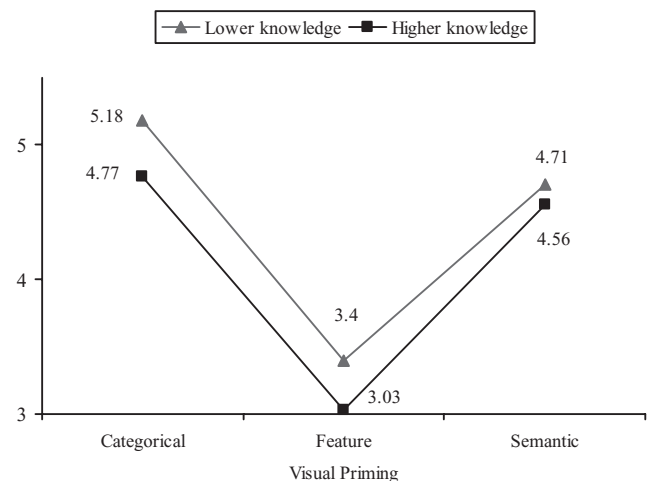


FIGURE 7 Visual priming and knowledge level on understanding of disclosure information.

knowledgeable investors perceived different types of visual priming. This helped address the second research question that knowledge level did not interact with visual priming to influence investors' processing and understanding of disclosure information.

The results did not disagree with either of the opposing possibilities regarding how the effects of visual priming would be different among knowledgeable and less knowledgeable investors. It seemed that both opposing propositions helped explain some of the results. On one hand, knowledgeable investors might be likely to engage in more than superficial processing because of their higher knowledge levels about investing. Thus, knowledgeable investors' information processing was unlikely to be primed by feature priming.

In addition, knowledgeable investors were more likely to operate on memory-based processing. This is because knowledgeable investors might have developed well-formulated processing criteria. In other words, knowledgeable investors could process disclosure information regarding a mutual fund effortlessly since an initial categorization is available to process the disclosure information. Due to their preferences in using category-based processing, categorical priming seemed to match well with their processing preferences.

On the other hand, less knowledgeable investors might perceive disclosure information as made up of discrete pieces of information. Categorical priming might have created a

piece-by-piece processing opportunity for less knowledgeable investors to process conflicts of interest disclosure and fee information as different pieces of information. Consequently, less knowledgeable investors might prefer categorical priming instead of feature priming.

Implications

Several key implications are available based on the study. In general, knowledge level did not affect investors' processing and understanding of the disclosure information, whereas visual priming affected investors' processing and understanding of the disclosure information. Categorical and semantic priming helped investors process and understand disclosure information. Thus, a combination of different visual primes should be employed to enhance the priming effect for both knowledgeable and less knowledgeable investors. For example, Figure 8 demonstrates that semantic priming should be used with categorical priming of disclosure information. Using this integration could help investors process and understand disclosure information better.

Study Limitations and Future Studies

When interpreting the study's findings, readers should take some of the limitations into consideration. This study found that categorical and semantic priming helped participants

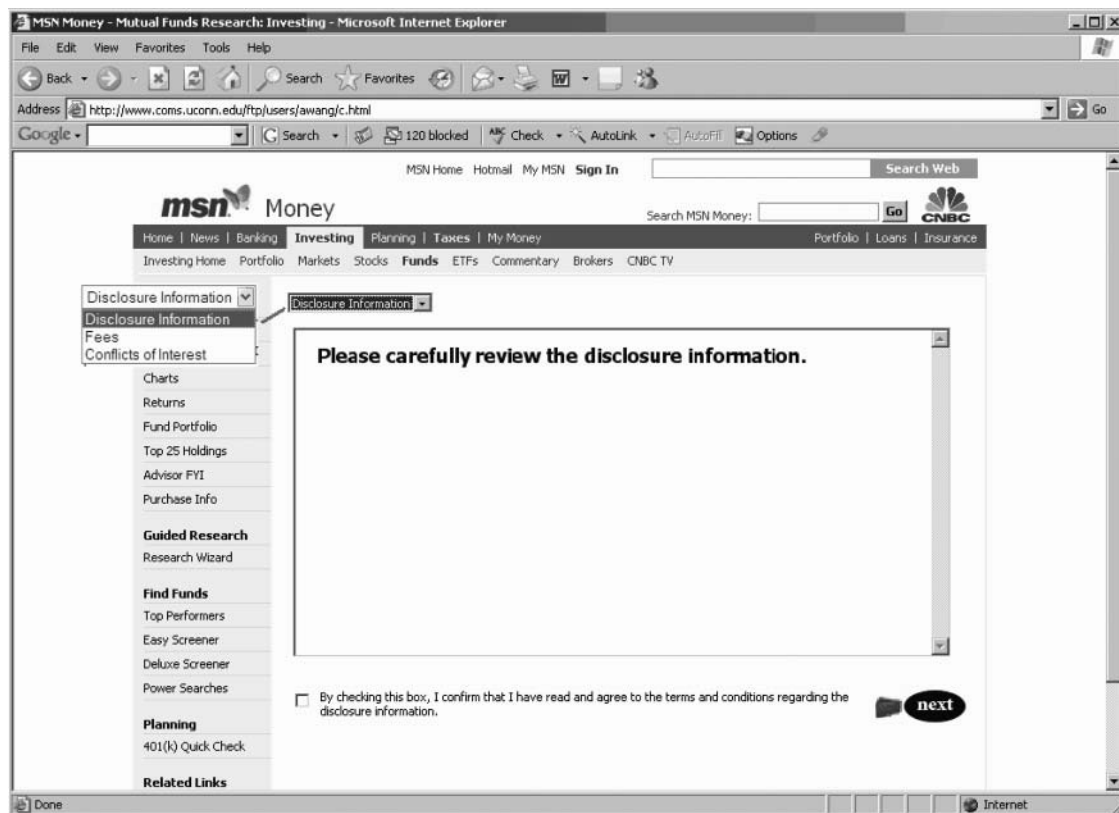


FIGURE 8 Integration of visual priming of disclosure information.

process and understand disclosure information. However, what drove these priming effects was not tested and could be a topic for future study. In other words, future studies should explore online investors' cognitive processing of disclosure information in greater depth.

Another limitation had to do with investors' motivation to process disclosure information. This study argues that whether the effects of priming occur depends on an investor's degree of motivation to process and understand disclosure information. The variation in the correspondence of motivation and knowledge could raise an important future research issue. For example, less knowledgeable investors may like to read about investment for fun when they are motivated to process investment information. This is because less knowledgeable investors may be less confident and more motivated to process disclosure information before making investment decisions (Alba and Hutchinson [2000]). On the other hand, knowledgeable investors may not be motivated to process disclosure information since they believe they already know what to do.

In either case, the interplay of motivation and knowledge level may become intertwined determinants of processing strategy for less knowledgeable and knowledgeable investors. If investors are overconfident and less motivated to process disclosure information, visual priming may not be useful at all. If knowledgeable investors are motivated to process disclosure information, visual priming may not be useful since they may process disclosure information easily. If less knowledgeable investors are motivated to process disclosure information, visual priming may be useful for them to reinforce their learning of disclosure information. The whole point of using visual primes to help investors process disclosure information is so important that future research should examine differences in priming effects by using investors' degrees of motivation as a factor.

Another area of future study lies in investors' product-related experiences. This study did not focus on the amount of investors' experiences with investment. The breadth of experience in the product class (e.g., buying stocks or bonds) may affect their knowledge levels. The evaluative nature or valence of the experience (e.g., whether it was a positive or negative experience) may also affect investors' processing. Since product-related experiences may offer unambiguous information about the product, knowledge assessments based on past product-related experiences may lead to knowledge assessments that may or may not coincide with the level of knowledge. Thus, the nature of product-related experiences may determine the extent of the processing and understanding of disclosure information (Chang [2004]).

The results of the present research must be viewed in light of a potential limitation such as measures of knowledge, since the measures may not fully tap the domain of information about the product tested. Moreover, this study only used one type of investment product. For example,

product-related experiences may also contain information about interrelationships among different types of investment products. Thus, the 37-item measure of objective knowledge used in this study certainly cannot represent the entire domain of product knowledge. Future research may have to develop the criteria and conditions that serve as guidelines for developing measures of knowledge based on different product types (Campbell and Kirmani [2000], Chang [2004]). Finally, study participants did not actually purchase the mutual fund. It is not clear whether conclusions reached by this study would apply to their own purchasing behavior. It might be that individuals with more at stake would be more motivated to evaluate the disclosure information. A study that tests participants' real purchase behavior will be much more desirable in the future.

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