Effects of Attribute Framing Varying with the Elaboration in Online Shopping: An Eye-Tracking Approach

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Abstract

This study uses eye tracking and the Elaboration Likelihood Model (ELM) to explore the framing effect moderated by elaborations, hence resulting in the observed eye movement and purchase intention in online shopping. The results show that high elaboration is more susceptible to the framing effect on purchase intention, while low elaboration is more susceptible to the framing effect on eye movement. Our study also discovers that eye movements are capable of predicting purchase intention when customers are under high elaboration and low elaboration. Furthermore, under high elaboration, eye movement induced by negative framing had higher predictive power, while under low elaboration, eye movement induced by positive framing showed higher predictive power. These findings have important practical implications for e-sellers to identify the characteristics of consumers' elaboration using eye movements and to deliver different framing messages and product information corresponding to different elaboration levels.

1. Introduction

Characteristics of human information processing such as selective perception and limited attention can cause cognitive biases which in turn will lead to irrational decisions [1]. In online shopping, particularly, consumers process tremendous amounts of information and then make purchase from a vast market of e-sellers. Regarding human attention mechanisms, the amount of information transmitted through the optic nerve often exceeds what the brain can process, so the brain has evolved mechanisms that only select a subset of relevant information for further processing [2].

Two factors, namely bottom-up (stimulus) and top-down (person) factors can attract or influence consumers' attention, information processing, preferences and final decisions [2]. The former, bottom-up factors are features of the stimulus that consumers are exposed to, such as perceptual features (e.g., color or size of objects) and marketing messages. This study focuses on the marketing messages aspect. To be specific, consumers' judgments and final decisions can be affected by the manner a message is labelled or framed, which is called the framing effect. For example, an advertisement of a facial cleanser may claim that "98% of women showed significantly deeper pore cleansing." as a positive stimulus, rather than stating that "2% of women showed non-significantly deeper pore cleansing." The latter, top-down factors such as involvement, familiarity, goals, and memory may all originate from the consumer's personality traits and states. The theory which explains the top-down factors on individual information processing is the Elaboration Likelihood Model (ELM). The core concept of ELM is that the elaboration continuum is based on a person's motivation and ability to think about and assess the qualities of the issue-relevant information in the persuasion context [3]. Under high motivation and high ability, elaboration likelihood is high, i.e., consumers tend to make a deeper and a more conscious analysis of the issue-relevant information, directly relating to his/her behaviour. On the contrary, under low motivation and/or low ability, elaboration likelihood is low and consumers usually form their attitude or decision by some simple cues.

Most of the attribute framing research on the exploration of the moderating effect considered one moderator at a time without delving into the background of the cognitive mode [4-6]. As such, this study explores the moderators of elaboration influencing the framing effect. Also, the background of the cognitive mode is included in this study - based on the ELM, elaboration which is composed of processing motivation and ability not only affects attitudes and predicts behaviours, but also explains the type, depth and intensity of the cognitive activities.

Traditionally, a self-reporting questionnaire is used to measure the perception of cognition, but it cannot accurately reflect the cognitive processing of the moment when a decision maker is being exposed to a stimulus. On the contrary, eye tracking can be a more accurate instrument – it not only reveals cognitive processing but also helps in detecting potentially more subtle information-salience effects. For example, a recall or thought listing is used to measure the levels of elaboration in previous studies [7-9], but the eye movement which reflects cognitive processing is capable of identifying elaboration levels and acquiring the consumers' attention on specific information. Besides, in previous attribute framing studies, most of the experimental context uses simple manipulation with the frame/label-only condition. By setting up an online shopping environment where additional product information is available for evaluation, this study examines whether the framing effect still exists in a more complex online shopping environment. Meanwhile, this study also uses eye movement data to lay the groundwork for examining the relationship among framing message, eye movement, and purchase behaviour under different elaborations.

2. Literature review and research questions

2.1. Eye movement and cognitive processing

Any strategy for performing a cognitive task such as consumer decision making will exhibit a characteristic pattern of human cognitive processing [10]. In order to identify the consumer's strategy and to infer the underlying cognitive strategy, eye tracking provides the means to observe user cognitive processes and to find out how specific visual features influence eye movements [11]. Cognitive processing can be identified by tracking eye movements based on eye-mind hypotheses, as proposed by Just and Carpenter [12]. The eye-mind hypothesis assumes that no appreciable lag exists between what is being fixated and what is being processed. Therefore, the time taken to process a newly fixated word is directly indicated by the gaze duration [12]. In other words, the assumption posits that what a person is looking at indicates that a person is currently thinking about or attending to.

Our eyes remain relatively still during fixations [13]. During a fixation, a contiguous area of the scene is projected onto the fovea for detailed visual processing [2]. One of the main measurements in eye-tracking research is fixation duration, which is further linked to the processing time. Longer fixations indicate more time spent interpreting or relating the component representations in the interface to internalized representations; in addition, longer fixation duration on each area of interest (AOI) implies that it is difficult to extract or interpret information from the display element of the AOI, or the object in the AOI is more engaging or needs further investigation in some way [14-16]. Furthermore, information extracted during fixations leads to consumers' memory, preference, and choice [2]; for example, the product information or the feature advertisement characteristics lead to attitude or purchase outcomes via their effect on consumers' attention [17-19].

2.2. Framing effect

Framing effect can be categorized into three different types: risky choice, attribute, and goal [20]. This research focuses on attribute framing because it is the simplest case among these three framing effects and the easiest to understand how descriptive valence influences information processing [20]. In attribute framing, characteristics of an object or event are described with a single attribute, and this description is manipulated in one of the two logically equivalent forms—positive or negative; for example, Zhang and Buda [6] presented a new product as either positively framed information -- "85% of the users of this product were satisfied with its performance" -- or negatively framed information -- "15 % of the customers were dissatisfied with the product." The dependent measure of attribute framing is a measure of the basic process of evaluation [20]. Generally, the research results indicated that a positively framed message yields a more favourable rating of the event or object than a negatively framed one [5, 6, 8, 21, 22].

Moreover, to explain the framing effect on cognitive mechanism, negatively framed message accentuates the possibility of potential losses or the perceptions of discrepant conditions, or it evokes unfavorable associations in memory, therefore negative framing might promote controlled cognitive mode which is more rigorous, deliberate, detailed, or systematic evaluation or analysis to avoid a loss or to prevent a potential failure [8, 9, 20]. Conversely, when the incoming information is positive, cognitive processing tends to be less thorough and systematic because it promotes a more automatic cognitive mode. On the experimental aspect, Just and Carpenter's eye tracking results showed that an implicitly negative sentence which is represented as a negation consumes extra time to process [23]; Kuvaas and Selart's experiment showed that decision makers receiving negatively framed information have significantly better recall than those receiving positively framed information [9].

2.3. Elaboration Likelihood Model

Elaboration likelihood model (ELM) is a multi-process theory of persuasion about the processes underlying changes in attitudes; at the core of the ELM, the elaboration continuum is based on a person's motivation and ability to think about and assess qualities of the issue-relevant information in the persuasion context [3, 24]. The processing motivation refers to the perceived personal relevance or importance of the issues or objects [25, 26] which can affect the intensity of message processing. The processing ability, on the other hand, refers to the fact that people have the requisite knowledge to understand, interpret, and scrutinize available information [25, 26] which can determine the capability of elaborating upon the message.

When motivation and ability to think are high, the high elaboration (central route) is taken and people tend to carefully and thoroughly scrutinize all issue-relevant information in order to gain confidence in the correctness of one's view. On the other hand, when motivation and/or ability to think is low, the low elaboration (peripheral route) is followed and people might attain sufficient confidence by some simple cues (also known as peripheral cues) [3, 24]. Peripheral cues refer to stimuli that can affect attitudes without necessitating processing of the message arguments, such as expert sources, number of arguments, and so on. Peripheral cues become relatively more important determinants of persuasion when issue-relevant message scrutiny is decreased. Conversely, as message scrutiny is increased, the impact of peripheral cues is decreased [3].

Moreover, elaboration would be distinguished by the aspect of cognitive processing. Under the high elaboration condition, the allocation of cognitive resources to consider the issue is a controlled process. People will expend more cognitive effort on evaluating the issue-relevant information [3]. On the other hand, the low elaboration would rely on an automatic process. People will expend less cognitive effort on evaluating the issue-relevant information but will expend more cognitive effort on simple rules [3].

2.4. Research questions

As mentioned above, positively framed messages yield more favourable ratings of the event or object than negatively framed ones, but negatively framed messages would induce more cognitive processing than positively framed ones. If framing messages are to be treated as a peripheral cue, the low elaboration would be more susceptible to framing messages than the high

elaboration. Zhang and Buda's research showed that the framing effect is more salient for subjects who are in low processing motivation than in high processing motivation; further, subjects in the condition of low processing motivation are influenced more by negatively framed messages than by positively framed messages [6]. However, one question arises: May framing messages be equally treated as a peripheral cue in all levels of elaboration? The ELM has not provided an exhaustive list of variables that serve as peripheral cues and variables that affect information processing in message elaboration, therefore manipulation of some variables in messages may affect information processing under certain conditions, or it may serve as peripheral cues in other contexts [3]. Besides, no concrete results on eye movement have been reported in the literature. The following research questions (RQs) remain to be answered:

RQ1: What is the influence of elaboration on framing messages that affects participants' purchase intention?

RQ2: What is the influence of elaboration on framing messages that affects participants' eye movement?

Besides these two questions, based on the postulate of ELM, the high elaboration is known to show greater behaviour prediction than the low elaboration. Therefore, the more cognitive effort that is involved in attitude formation, the greater the utility of the attitude in predicting behaviour [3]. As mentioned above, the high elaboration could be associated with controlled processes, and the low elaboration could be associated with automatic processes [3]; negative framing would trigger controlled modes to systematically process information, but positive framing would lead to prevalent automatic modes [8, 9, 20]. Information processed in automatic processing tend to have less predictive power for subsequent behaviors in comparison with information processed in systematic processing [8, 27]. Therefore, another question arises: What would the difference of behavior prediction be when the participants are exposed to framing messages under different levels of elaboration? No concrete directions for formulating hypotheses have been provided in the literature. So, the following research question remains to be answered:

RQ3: What is the influence of elaboration on eye movement that affects participants' purchase intention?

3. Method

The research framework in Figure 1 illustrates that the moderator of elaboration affects the relationship among framing, fixation duration, and intention to buy now.
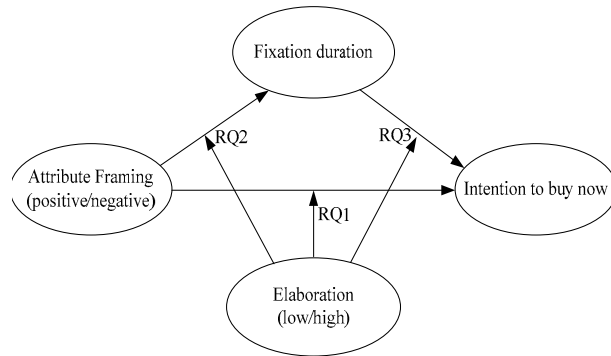
Figure 1. Research framework

3.1. Design and measurements

In the measurement of dependent variable, the participants rated their intention to buy now for products on a 7-point Likert scale. In the manipulation of framing messages, there were six key attributes with both positively and negatively framed messages for six products respectively. For example, in the case of the semi-automatic espresso machine, the positively framed message was described as: "a majority of Baristas agree that this coffee machine gets the most flavour from coffee beans." The negatively framed message was described as: "a minority of Baristas disagree that this coffee machine gets the most flavour from coffee beans."

According to the ELM, elaboration is composed of processing motivation and ability-- the high elaboration likelihood (central route) corresponds to high-motivation and high-ability; on the contrary, the low elaboration likelihood (peripheral route) corresponds to low motivation and/or low ability. To compare two routes, this study selected the polar combinations of the processing motivation and the processing ability. Personal relevance is one of the variables affecting the motivation in most empirical research, and prior knowledge is one of the most important variables affecting the ability [3]. Therefore, the processing motivation was manipulated by issue involvement or personal relevance, the extent to which people perceive that an issue is of intrinsic importance, personal meaning or relevance, or significant consequences for lives [3, 28]. This study revised the manipulation of issue involvement [27] to fit the online-shopping scenario. For example, for subjects in the high processing motivation, the scenario is stated as "the old product was broken, so you are eager to buy a new one in one month." In the low processing motivation, the scenario is stated as "your friend would like to buy a product, and he/she will buy it six month

later." Besides, the semantic-differential involvement scale of the Revised Personal Involvement Inventory (RPII) [29] was adopted to check the processing motivation manipulation. The processing ability was measured by the level of subjective knowledge [30] and the self-perceived level of familiarity, knowledge and prior experience on the product. The participants responded on a 5-point scale for the above measurements. A composite score was created for each participant by averaging the measurements on each product, where a higher score implies more processing ability for the product.

The experiment was a 2 (attribute framing: positive/negative) × 2 (processing motivation: high/low) × 2 (processing ability: high/low) incomplete within-subject design. The attribute framing and processing motivation were manipulated in the experiment, but the participants' levels of processing ability were measured by questionnaires before the experiment. Participants were randomly assigned to two of the four conditions resulting from a combination of positive/negative framing messages and high/low processing motivation instructions.

3.2. Apparatus and materials

The participants' eye movements were tracked and recorded by the EyeLink 1000 Desktop Mount eye-tracking system (http://sr-research.com). This system has a sampling rate of 1000Hz. This study incorporated an analysis of eye-tracking metrics, total fixation duration, in order to explore the determinants of ocular behaviour on the product information page.

The target products of this experiment were six utilitarian products which emphasize functions or performances, including a body fat analyzer, a desk lamp, a semi-automatic espresso machine, an earphone, an air purifier, and a digital SLR camera. Each participant randomly viewed two different products out of the six. For each product, five blocks of information were provided on one screen page, which included a product name, a product picture, non-functionality attributes, function attributes, and one framing message. The five blocks were the Areas of Interest (AOI) for further analysis. Figure 2 illustrates an example of the AOI on the product information page [1]. The selling price and the brand name were removed in order to avoid the influence of price and participants' subjective preferences or stereotypes on brand names.

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[1] The original language of the product information pages is in Traditional Chinese.

Figure 2. Product information page with the five AOIs

3.3. Procedure and participants

Each participant was randomly assigned to high and low motivation conditions with positively or negatively framed message for two of the six products. Before the experiment, the participants were asked to answer the questionnaire of processing ability. After the experimenter calibrated and validated the eye tracker, the formal experiment began. The participant's eye movements were then recorded while he or she viewed the webpage on the product after the drift correction of eye movement. The participant was allowed to look at the webpage for as long as he or she needed, after which he or she was asked to click the mouse and rate his or her intention to buy now for the product; at this time, the eye tracker stopped recording. Finally, the participants completed the involvement scale of RPII. The whole experiment took about 15 minutes to complete.

The participants were 130 students recruited from the College of Management at one of the universities in Taiwan. Among them, 22 participants were eliminated due to incorrect calibration. The final participants included 59 males and 49 females. Three participants were over the age of 30 years old, while the remaining participants were between the ages of 22 and 29 years old. Only four participants had no online shopping experiences. The samples are a total of 216 eye movement data (each participants were assigned two product). Among them, 8 samples were further removed due to corrupted eye movement data.

4. Data analysis and results

Before examining the research questions, some tests were performed as follows: To check the difference in the six utilitarian products, the results indicated no significant differences in the dependent variables of intention to buy now (F = 1.511, p > .10) and total fixation duration (F = 0.593, p > .10) in the six experimental products. To check the effect of participants' purchase experience, the results showed that no significant differences in intention to buying now (t = 0.233, p > .10) and total fixation duration (t = 0.572, p > .10). To check whether the processing motivation had been manipulated successfully, a manipulation check index was created by splitting the samples into the high motivation group and the low motivation group according to the participants' RPII scores (Cronbach's α = 0.937). Participants in the high processing motivation group had significantly higher RPII scores than those in the low processing motivation group, M_{high} = 4.13 vs. M_{low} = 3.37, t(206) = 6.4151, p < .00, which suggests the manipulation of processing motivation was successful. Besides, using the median of each product to split the participants' knowledge scores, 107 samples were classified as low in product knowledge (M = 2.13), and another 101 samples as high in product knowledge (M = 3.37). Two means were significantly different (t(208) = 11.353, p < .00), demonstrating that the participants from two groups indeed have different levels of processing ability. In the following analyses, the elaboration level is based on the polar combinations of the group of processing motivation and the group of processing ability, i.e.,

Table 1. Means (standard deviations) of intention to buy now and fixation duration of AOI

		High elaboration		Low elaboration		Significant effects	F-value
		NF	PF	NF	PF		
N		25	27	25	26		
Intention to buy now		4.24 (1.36)	4.93 (1.41)	4.00 (1.50)	4.08 (1.57)	Elaboration	3.557^{*}
t-value		-1.780^{*}		-0.179			
Fixation duration on AOI	Whole page	29.035 (8.440)	36.727 (16.702)	45.449 (19.467)	30.417 (13.857)	Framing×Elaboration[a]	12.727^{***}
	t-value	-1.953^{*}		3.210^{***}			
	Product name	0.686 (0.659)	1.006 (1.210)	1.908 (3.642)	1.103 (1.249)	ns. [a]	ns.
	t-value	-1.170		1.064			
	Picture	1.797 (1.836)	2.650 (2.028)	3.934 (3.421)	1.314 (2.025)	Framing Framing×Elaboration	3.479^{*} 13.438^{***}
	t-value	-1.585		3.343^{***}			
	Non-functionality attributes	6.879 (4.029)	8.846 (5.356)	9.060 (3.213)	8.712 (5.561)	ns.	ns.
	t-value	-1.487		0.272			
	Function attributes	12.364 (5.418)	17.226 (8.848)	22.365 (14.102)	12.534 (8.682)	Framing×Elaboration[a]	16.931^{***}
	t-value	-2.408^{**}		2.984^{***}			
	Framed-message	4.219 (2.081)	4.304 (3.312)	4.916 (3.180)	3.253 (1.607)	Framing[a]	2.736^{*}
	t-value	-0.110		2.342^{**}			

NF = negative framing; PF = Positive framing. $^{*}p<.10$; $^{**}p<.05$; $^{***}p<.01$
[a] *The dependent variable were natural log transformed to satisfy assumptions of normality and variance equality in ANOVA analysis.*

high elaboration is the combination of high processing motivation with high processing ability, and low elaboration is the combination of low processing motivation with low processing ability.

4.1. Framing effect varying with elaboration

A 2(attribute framing: positive vs. negative) × 2(elaboration: high vs. low) analysis of variance (ANOVA) was used to examine the research questions of RQ1 and RQ2 on the moderating effect of elaborations. Regarding intention, as indicated in Table 1, elaboration has a significant main effect on the dependent variable of intention to buy now (F = 3.557, p < .10) – the participants showed higher intention to buy now in the high elaboration (M = 4.60) condition than in the low elaboration condition (M = 4.04). Also, under the high elaboration condition, the t-test performed on the participants' intention to buy now revealed a significant framing effect (t = 1.78, p < .01) — those who received a positively framed message (M = 4.93) showed higher intention to buy

now than those who received a negatively framed message (M = 4.24).

Regarding eye movement, the results showed a significant framing by elaboration interaction effect on eye movement of fixation duration on the whole page (F = 12.727) and the AOIs related to the picture (F = 13.438) and function attributes (F = 16.931). These results indicated that the framing effect is moderated by elaboration on fixation duration of whole page and AOIs. Further examination of response differences between positive and negative framing for high and low elaboration showed that the participants revealed longer fixation duration on the whole page (M_{PF} = 36.727 vs. M_{NF} = 29.035) and the AOI of function attributes when receiving a positively framed message than negatively framed message under high elaboration. On the contrary, the participants revealed longer fixation duration on the whole page (M_{PF} = 30.417 vs. M_{NF} = 45.559) and three of four AOIs when receiving a negatively framed message than positively framed message under low elaboration. Only the AOI of the non-functionality attributes had no difference.

Table 2. Regression analysis of predictors of intention to buy now

Predictor Variable/ Standardized Estimate		High elaboration			Low elaboration		
		NF+PF	NF	PF	NF+PF	NF	PF
Fixation duration on AOI	Picture	-0.082	0.016	-0.013	-0.264	-0.309	-0.144
	Non-functionality attributes	0.398**	0.508***	0.330	-0.456***	-0.233	-0.496**
	Function attributes	-0.157	0.195	-0.503*	0.277	0.456	-0.036
	Framed-message	0.272*	0.331*	0.484**	-0.015	-0.263	0.318*
	R^2	0.202	0.393	0.285	0.195	0.215	0.348
	F	2.968**	3.241**	2.191*	2.79**	1.367	2.806**
	dfs	4, 47	4, 20	4, 22	4, 46	4, 20	4, 21

NF = negative framing; PF = Positive framing. $^*p<.10; ^{**}p<.05; ^{***}p<.01$

4.2. Predictive power of eye movement varying with elaboration

To answer research question RQ3 to see how eye movement data is related to purchase intention in the conditions of high and low elaboration, two independent multiple regression analysis were used. The dependent variable of intention to buy now was regressed on fixation duration of four AOIs[2]. As indicated in Table 2, a breakdown of data on AOIs showed that the conditions of high elaboration and low elaboration accounted for 20.2% and 19.5% of the variance in intention to buy now, respectively and the predictions were statistically significant ($F_{high}(4,47) = 2.968$, $p < .05$; F_{low} (4,46) = 2.79, $p < .05$). Furthermore, under the high elaboration, the information blocks of the non-functionality attributes and framed- message were significant positive predictors of intention to buy now. Also, the condition of negative framing accounted for 39.3% of the variance in intention to buy now (F(4,20) = 3.241, $p < .05$) where the AOIs of the non-functionality attributes and framed-message were positive predictors, and the condition of positive framing accounted for 28.5% of the variance in intention to buy now (F (4,22) = 2.191, $p < .10$) where the AOI of function attributes and that of framed-message served as negative and positive predictors, respectively. Under low elaboration, only one AOI of the non-functionality attributes was a significant negative predictor of intention to buy now; also, only the condition of positive framing accounted for 34.8% of the variance in intention to buy now (F (4,21) = 2.806, $p < .05$) where the AOI of non-functionality attributes and that of framed-message served as negative and positive predictors, respectively.

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[2] The observed fixation duration on AOI of product name was only around one second (0.686-1.908 sec.) and could not influence the participant's decision during information processing. Therefore, this analysis did not include the AOI of product name.

5. Discussion and conclusion

5.1. Discussions

First, the high elaboration condition showed the marginal framing effect on purchase intention where positively framed messages induced higher purchase intention than negatively framed messages, but the low elaboration did not. The results indicate that high elaboration is more susceptible to the framing effect on purchase intention than low elaboration. If framing messages is regarded as simple cue, this result is not consistent with ELM -- the postulate of ELM concerning cue effects is that peripheral cues become relatively more important determinants under low elaboration, but not under high elaboration [3]. It is possible that framing messages likewise may be treated as both argument and simple cue in this study. As mentioned above, the manipulation of some variables in messages may affect information processing under certain conditions, but serve as peripheral cues in other contexts; for example, the number of arguments could be treated as a peripheral cue under low involvement, but increasing the number of arguments could increase the amount of information processing activity when the involvement was high [31]. Besides, when engaging in processing of message arguments rather than peripheral cues, high involvement generated more favourable thoughts and fewer unfavourable thoughts to approve rather than to overrule the message argument; on the contrary, under low involvement, neither the number of favourable thoughts or unfavourable thoughts was affected by message argument [3]. Therefore, framing message could serve as a simple cue under low elaboration, and on the other hand, framing message could be an argument under high elaboration.

Second, both the high elaboration and the low elaboration have predictive power of eye movement for purchase intention. Besides, under the high elaboration, eye movements which were induced by negative

framing had slightly higher predictive power for purchase intention than by positive framing, but under the low elaboration, positive framing induced eye movements had significantly higher predictive power than negative framing induced ones. As mentioned in the literature review, the high elaboration would lead to a controlled process and the low elaboration would lead to an automatic process, and negative framing would trigger a controlled mode to systematically process information but positive framing would trigger prevalent automatic modes. Meyers-Levy and Maheswaran [32] argued that negatively framed messages should be more persuasive or favourable judgments than positively framed messages when people rely predominately on systematic processing; whereas messages framed positively should produce more persuasive or favourable judgments when conditions favour the dominant use of heuristic processing. In this study, eye movement induced by negative framing had higher predictive power for purchase intention than positive framing under the high elaboration, but positive framing revealed higher predictive power for purchase intention through eye movements than negative framing under the low elaboration.

Furthermore, Cacioppo and Petty [33] asserted that "elaboration likelihood refers to the likelihood one engages in issue-relevant thinking with the aim of determining the merits of the arguments rather than the total amount of thinking per se in which a person engages." The high or low elaboration is not represented by long or short fixation durations of eye movement, but is represented by the significant purchase intention prediction through fixation duration on information blocks. In this study, the low elaboration with negatively framed message had the longest fixation duration, but the prediction for purchase intention was not significant. On the contrary, the high elaboration with negatively framed message and the low elaboration with positively framed message had the shortest fixation duration, but engaging in the information of the non-functionality attributes and the framed message determined the purchase intention. Also, the information of non-functionality attributes had no significant difference in fixation duration when receiving positively or negatively framed message under both high and low elaboration conditions (see Table 1). However, the information of non-functionality attributes was a significant predictor of intention to buy now in the majority of conditions (see Table 2). These findings indicated that the information of non-functionality attributes was processed more intensively for people with higher purchase intention.

5.2. Implications

The findings of this study have some practical implications. First, e-sellers may use different framing messages for consumers with different levels of elaboration. For the low elaboration customers, e-sellers may employ positively framed messages to predict purchase intention. For the high elaboration customers, e-sellers can apply positively framed messages to stimulate higher purchase intention, or e-sellers can apply either negatively or positively framed messages to predict purchase intention.

Second, e-sellers may design different presentations of product information to suit different levels of elaboration. For example, the information of non-functionality attributes (such as shipping, payment, item condition and warranty, bundle items, and suggested accessories) is negatively related to the consumers' purchase intention under the low elaboration condition but positively related to that under the high elaboration condition. In other words, customers of high elaboration tend to meet more definite purchase goals and/or possess higher knowledge of products than those of low elaboration, therefore they would focus more on processing the information of non-functionality attributes rather than that of function attributes. Based on these results, a prolonged look at non-functionality attributes is associated with higher purchase intention, but a prolonged look at function attributes is associated with lower purchase intention under the high elaboration condition. Hence, e-sellers might emphasize more information related to non-functionality attributes such as longer warranty programs, more bundle items or gifts, or favourable shipping in order to catch customers' attention, and might condense the information of function attributes in order to reduce customers' cognitive effort under the condition of high elaboration.

Third, high cognitive efforts occurred under the low elaboration condition, especially when exposed to negatively framed messages. It indicated that consumers will spend more time to extract or interpret product information in order to reduce the uncertainty or risk when they are in low purchase motivation, unfamiliar with the product, or exposed to negatively framed messages. On the contrary, e-sellers can employ positively framed messages to reduce consumers' cognitive efforts, and then improve the prediction of eye movement for purchase intention.

5.3. Limitations

A few limitations should be noted for future research. First, generalization is a concern since all participants in the experiment were students. Second, this study addresses only the attribute framing effect. Third, this study measures the participants' purchase intention but not the actual purchase behaviors. Fourth, this study is a preliminary study of eye movement in e-commerce that analyzes only the fixation duration. Future research is encouraged to use more metrics for analysis (e.g., scan-path of eye movement) so as to better understand the cognitive processing involved in decision making. Besides, different from the perceptual measurement (such as recall) in previous research, the elaboration levels were inferred by eye movements in this study. Future research is considered to add on perceptual measurement or use fMRI to improve the validity of the research. Fifth, this study is based on ELM to manipulate processing motivation by personal relevance or issue involvement [27]. It is important to consider different manipulation or measurement of processing motivation based on the concept of involvement such as Angst and Agarwal's review [34]. Finally, this study is one of the few in the studies of framing and ELM that closely re-creates an online shopping environment and explores the cognitive processing in eye movements. More efforts should be placed on the eye movement behavior in e-commerce environment for a better communication between buyers and sellers.

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