



Online Information Review

The credibility and attribution of online reviews: Differences between high and low product knowledge consumers

Jyh-Shen Chiou, Cheng-Chieh Hsiao, Tien-Yi Chiu,

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The credibility and attribution of online reviews

Differences between high and low product knowledge consumers

Jyh-Shen Chiou

*Department of International Business,
National Chengchi University, Taipei, Taiwan*

Cheng-Chieh Hsiao

*Department of Public Relations and Advertising,
Shih Hsin University, Taipei, Taiwan, and*

Tien-Yi Chiu

*Department of International Business,
National Chengchi University, Taipei, Taiwan*

Abstract

Purpose – To understand the effectiveness of electronic word of mouth, the purpose of this paper is to examine how high- vs low-knowledge consumers judge and attribute the credibility of positive and negative online reviews by drawing upon accessibility–diagnosticity theory and attribution theory.

Design/methodology/approach – This study conducts an observation-based study in an online forum and a 2 (review valence) × 2 (consumer knowledge) between-participants factorial experiment to examine the proposed hypotheses.

Findings – High-knowledge consumers elicit less perceived credibility and make more non-product-relevant attribution than low-knowledge consumers in negative online reviews. Consumer attribution is also found to mediate the effects of the review valence by consumer knowledge interaction on review credibility.

Originality/value – This study adds to extant research by examining how consumer knowledge plays a key role in determining consumer perception of online review credibility. This study also advances the understanding of different casual inferences about online reviews between high- and low-knowledge consumers.

Keywords Attribution, Electronic word of mouth, Consumer knowledge, Review credibility

Paper type Research paper

1. Introduction

With the advance of Web 2.0 technologies, electronic word of mouth (eWOM) has become more and more influential in internet marketing communication (Abubakar *et al.*, 2016; Luo *et al.*, 2013; Hennig-Thurau *et al.*, 2004). For example, approximately 79 percent of consumers are likely to trust online reviews as much as personal recommendations (BrightLocal, 2013). From an internet marketing perspective, effective management of online consumer reviews helps companies maintain a preferred brand image and eventually increase product sales.

Although online consumer reviews may present either positive or negative comments about a product or brand, consumers typically put more weight on the negative information than the positive one (Kanouse and Hanson, 1972; Skowronski and Carlston, 1989). Because negative eWOM information appears to be more diagnostic and influential than positive information (Chiou and Cheng, 2003; Qiu *et al.*, 2012; Sparks *et al.*, 2016), the former cannot be easily offset by the latter on the internet. Negative eWOM is found to exert stronger influences on overall product evaluation (Lee *et al.*, 2008), review trustworthiness (Pan and Chiou, 2011), review attitude (Sen and Lerman, 2007) and purchase intention (Park and Lee, 2009). As online reviews become more and more accessible to internet users, managers not



only need to promote positive online information of their brands/products but also need to alleviate the undesirable impact of negative online information on their brands/products.

Since most consumer-generated reviews on the internet are often posted by anonymous reviewers, this may cause the online information recipient's suspicions about the reviewers' true intention to write online reviews. According to attribution theory (Folkes, 1988; Kelley, 1967, 1973), these casual inferences are likely to influence consumer judgment toward the credibility of online reviews regardless of the accuracy of the inferences. Past research has suggested that the persuasiveness of online reviews is affected by the review and reviewer factors, such as review valence (Lim and van Der Heide, 2015), argument quality (Cheung *et al.*, 2012; Shan, 2016), reviewer expertise (Chiou *et al.*, 2014) and perceived reviewers' social relationship (Pan and Chiou, 2011). However, less attention has paid to how review credibility is influenced by the information recipient's attribution toward positive or negative online reviews.

Furthermore, consumer judgment toward an online review depends not only on external eWOM information but also on internal cognitive resources (Kim *et al.*, 1991; Sujan, 1985). When reading and evaluating online reviews, high vs low product knowledge consumers may possess different cognitive abilities and utilize dissimilar information-processing strategies (Alba and Hutchinson, 1987; Brucks, 1985; Sujan, 1985). Consumers with high product knowledge normally have higher cognitive capability in discerning the contents of the online information than consumers with low product knowledge. Therefore, this study further considers consumer knowledge in the model to explore how consumer product knowledge interacts with online review valence on the credibility and attribution of the online review information.

Only a few past studies have examined the moderating role of consumer product knowledge in evaluating online reviews (Cheung *et al.*, 2012; Park and Kim, 2008). Importantly, little research has focused on the impact of consumer knowledge on consumer causal attribution about different online reviews. This study argues that, when encountering eWOM information, high- vs low-knowledge consumers are very likely to make dissimilar casual inferences regarding a reviewer's motivation of posting an online review, which, in turn, affects their judgment toward the credibility of the review.

In sum, this study intends to draw upon accessibility–diagnosticity theory (Feldman and Lynch, 1988; Herr *et al.*, 1991) and attribution theory (Folkes, 1988; Jones and Nisbett, 1972; Kelley, 1967, 1973) to examine the interplay between review valence (positive vs negative) and consumer knowledge (high- vs low-knowledge) on online review credibility and consumer attribution about the online reviews.

2. Literature review

This study is based on accessibility–diagnosticity theory and attribution theory. Accessibility–diagnosticity theory suggests that the possibility that any piece of information is likely to serve as an input for judgment or choice depends on the accessibility of the input, the accessibility of alternative input and the diagnosticity or perceived relevance of the inputs (Feldman and Lynch, 1988; Herr *et al.*, 1991). In other words, consumer judgment is influenced by factors that increase or decrease the levels of the accessibility and diagnosticity of particular information used for the judgment. The accessibility becomes high whenever particular information is easy for a consumer to retrieve, and the diagnosticity is high when certain information helps the consumer to assign a product to a specific cognitive category or form a specific overall evaluation of a target (Feldman and Lynch, 1988; Filieri, 2015).

Furthermore, attribution theory suggests that people often make causal inferences by using their common sense explanations of the world when facing a particular situation (Kelley, 1967, 1973). Regardless of the accuracy of causal inferences, they are very likely to

influence an individual's judgment toward one's specific behavior. Due to the anonymity of eWOM reviewers, an information recipient's evaluation of eWOM information may be affected by his or her causal inferences about the reasons why these reviewers post eWOM information. Eagly *et al.* (1978) found that a recipient is likely to generate inference bias about a communicator's accuracy in knowledge and reporting and affecting the persuasiveness of communication messages, such as eWOM information (Sen and Lerman, 2007; Sparks *et al.*, 2016).

Because a consumer's evaluation of online reviews often requires cognitive abilities that relate strongly to his or her product knowledge, this study believes that the accessibility–diagnosticity theory can provide a helpful foundation to explain how consumers with different levels of product knowledge process differently in determining the credibility of an online information review. Meanwhile, attribution theory is used to understand the casual inferences these consumers make when encountering negative or positive eWOM information.

2.1 Review valence

When consumers search product information on the web, online consumer reviews appear to be more vivid than other marketer-generated content. Because online reviews are often made to describe the strengths or weaknesses of products and the valence of eWOM information has been discovered as an important factor that affects the effectiveness of online reviews (Chiou and Cheng, 2003; Pan and Chiou, 2011; Park and Lee, 2009), this study defines review valence as the positive vs negative evaluation of a product in an online review (Park and Lee, 2009; Qiu *et al.*, 2012).

2.2 Consumer knowledge

Product knowledge of a consumer plays an important role in the inference process (Alba and Hutchinson, 1987; Lee and Olshavsky, 1994). Past research has shown that there are different information-processing strategies existing between high- and low-knowledge consumers (Brucks, 1985; Park and Kim, 2008; Sujan, 1985). Consumer knowledge is often considered either objective or subjective (Carlson *et al.*, 2009; Park *et al.*, 1994). Objective knowledge reflects the accuracy of information stored in a consumer's memory about a target (e.g. a digital camera) (Brucks, 1985; Sujan, 1985), whereas subjective knowledge involves a consumer's perception of how much he or she knows (Bettman and Park, 1980; Park *et al.*, 1994). The former reflects what a consumer knows, and the latter reflects what the consumer believes he or she knows (Carlson *et al.*, 2009). In order to capture an overall consumer knowledge about a product in an online review, this study will take both types of consumer product knowledge into account in the definition.

2.3 Review credibility

An important element required to judge the persuasiveness of eWOM information is credibility (Cheung *et al.*, 2012; Luo *et al.*, 2013; Ma and Atkin, 2017; Matute *et al.*, 2016; Shan, 2016; Qiu *et al.*, 2012). Online reviews are normally perceived as more credible than advertisement because the reviewers are often fellow consumers (Price *et al.*, 1989), especially if one consumer finds that other consumers experience similar product/service, he or she will feel more confident in these consumer-generated reviews. According to prior studies (Luo *et al.*, 2013; Tseng and Fogg, 1999), this study refers review credibility as to the extent to which a consumer perceives an online review as real, trustworthy and believable.

This study expects an interaction effect between review valence and consumer product knowledge on review credibility. Past research has suggested that consumers often place more weight on negative information than positive information (Kanouse and Hanson, 1972;

Skowronski and Carlston, 1989). However, a consumer's evaluation of negative online reviews is dependent on the accessibility of the consumer's cognitive resources. According to accessibility–diagnosticity theory (Feldman and Lynch, 1988), when one piece of information is more accessible for a consumer than another, the consumer is more likely to use this information to form an overall evaluation of a target (Filiari, 2015; Qiu *et al.*, 2012). Herr *et al.* (1991) indicated that the effect of vivid and accessible WOM information may be attenuated when more diagnostic information becomes available. High-knowledge consumers who tend to use internal information search often have more cognitive resources to process online review information than low-knowledge consumers (Kim *et al.*, 1991; Sujar, 1985). For high-knowledge consumers, their high accessibility of product knowledge may discount the negative effect of the unfavorable eWOM information.

That is, high-knowledge consumers are likely to scrutinize negative eWOM information more thoroughly than positive information, leading to the decrease of its credibility (Abelson, 1959; Ahluwalia, 2000). On the other hand, because discounting the influence of negative information appears to be a deliberate and effort process (Abelson, 1959), low-knowledge consumers are more susceptible to inferential biases (Kim *et al.*, 1991) and have less ability to refute the information than high-knowledge consumers (Ahluwalia, 2000). In addition, low-knowledge consumers are more likely to be persuaded by negative online reviews because online reviews are heuristically recognized as a credible type of eWOM.

In contrast, positive information is closer to normative expectancy than negative information (Skowronski and Carlston, 1989). People tend to perceive most life outcomes as moderately positive. Thus, positive or neutral cues appear to be ambiguous in judging a product than negative cues in general (Herr *et al.*, 1991). Past research showed that positive eWOM information is less diagnostic than negative eWOM information (Chiou and Cheng, 2003; Qiu *et al.*, 2012). It is expected that positive online reviews are unlikely to yield significant differences in perceived review credibility between high- and low-knowledge consumers. Thus:

- H1.* There will be a review valence by consumer knowledge interaction on review credibility. For a negative online review, low-knowledge consumers will elicit greater review credibility than high-knowledge consumers. For a positive online review, the differences in review credibility will be nonsignificant between high- and low-knowledge consumers.

2.4 Consumer attribution about the reviewer

Attribution theory explains how individuals arrive at casual inferences about why an actor behaves in a certain manner (Kelley, 1967, 1973). The organization of casual inferences is often based on two sources of causes: environmental and personal causes (Folkes, 1988; Heider, 1958). When reading an online review, a consumer may attribute a reviewer's eWOM to product-relevant problems, or consider that the reviewer is motivated by self-serving or other non-product-relevant reasons (Sen and Lerman, 2007; Sparks *et al.*, 2016). Such inference is likely to affect the consumer's affective and behavioral reactions whether or not the inference is accurate. Therefore, this study defines consumer attribution about a reviewer as the cognition a consumer generates to infer the cause of a reviewer's motivation of posting an online review (Sen and Lerman, 2007).

This study also expects an interaction effect between review valence and consumer knowledge on consumer attribution. In general, consumers have different casual inferences when encountering positive vs negative information (Mizerski *et al.*, 1979). Positive information appears to be expected and consistent with social norms while negative information is often considered socially undesirable. Correspondence inference theory suggests that socially undesirable behavior is more likely to inform an observer about

distinctive attributes of an actor (Jones and Davis, 1965). Thus, negative eWOM information has more dispositional value about the reviewer than positive eWOM information (Qiu *et al.*, 2012; Sparks *et al.*, 2016). Jones and Nisbett (1972) also point out the inference bias between an actor and observer, indicating that the actor tends to attribute his or her action to environmental causes, whereas the observer is inclined to attribute the same behavior to the actor's personal dispositions.

High-knowledge consumers often have more cognitive resources than low-knowledge consumers in the inference process (Alba and Hutchinson, 1987; Kim *et al.*, 1991). When reading negative eWOM information, high-knowledge consumers tend to have more cognitive abilities and product-related thoughts to form personal inferential beliefs about the information (Lee and Olshavsky, 1994; Park and Kim, 2008). They are more likely than low-knowledge consumers to believe that they have knowledge in most of the product-related attributes (Alba and Hutchinson, 1987), thus, their inferences may be strengthened by the accessibility of existing product knowledge. Therefore, high-knowledge consumers are more likely to attribute this negative information to the reviewer's self-serving purpose or other non-product-relevant reasons than low-knowledge consumers (Jones and Davis, 1965).

In contrast, low-knowledge consumers have less ability to evaluate and deny the importance of negative eWOM information (Ahluwalia, 2000). They are very likely to accept a reviewer's viewpoints and attribute the unfavorable situation to product-related reasons. Alba and Hutchinson (1987) indicate that low-knowledge consumers are more likely to rely on nonanalytic inferences than high-knowledge, thus, leading to greater possibilities of inferential errors. Similarly, past research has indicated that people are likely to view an actor's judgment as typical behavior when prior knowledge about the actor's motives is absent (Hilton *et al.*, 1988). Thus, high-knowledge consumers are expected to elicit more non-product-relevant attribution than low-knowledge consumers when exposed to a negative online review.

In comparison with negative eWOM information, positive information is less diagnostic in helping consumers to judge whether a product is high or low quality (Herr *et al.*, 1991; Chiou and Cheng, 2003). Because positive information is often socially expected, it is difficult for an observer to make a corresponding inference about the predisposition of the actor if one behaved in a way closed to normative expectancy (Kelley, 1973). We predict that the differences in attribution between high- and low-knowledge consumers appear to be less obvious in positive eWOM information than in negative eWOM information. Thus:

- H2. There will be a review valence by consumer knowledge interaction on consumer attribution. For a negative review, high-knowledge consumers will be likely to make more non-product-relevant attribution than low-knowledge consumers. For a positive review, the differences in consumer attribution will be nonsignificant between high- and low-knowledge consumers.

2.5 *The mediating role of consumer attribution*

Attribution is regarded as a psychological mechanism mediating between a communication message and a receiver's evaluation of the focal object (Kelley and Michela, 1980; Mizerski *et al.*, 1979). Folkes (1988) suggests that consumer attitude and behavior often relies on the casual attribution consumers make between a product and its desirable benefits. When encountering negative and positive online reviews, consumers with different levels of product knowledge are likely to generate different causal inferences about eWOM information. These inferences about the reviewer's motivation may further influence consumers' subsequent actions (Mizerski *et al.*, 1979; Sen and Lerman, 2007). Past research has examined the mediating role of causal attribution in the

relationship between eWOM information and consumer evaluation of its effectiveness (Qiu *et al.*, 2012; Sen and Lerman, 2007). Thus:

H3. Consumer attribution about the reviewer will mediate the effects of the review valence by consumer knowledge interaction on review credibility.

3. Research design

Two studies were conducted to examine the credibility and attribution of online reviews. Study 1 was an observation-based study for exploring the relationship between consumer knowledge and casual attribution in an online forum, and Study 2 was an experiment-based study which was conducted to test our research hypotheses.

This study selected a DSLR camera as the target product for two reasons. First, consumer electronics are recognized as the top one of products that consumers would not buy without consulting online reviews (Nielson, 2010). Second, in order to effectively classify our participant as high- or low-knowledge, the intensity of knowledge underlying a product was also taken into account (cf. Sujan, 1985). Consumers normally need to spend significant time of learning regarding shooting modes, aperture, shutter, balance, ISO, etc., to gradually master a DSLR camera. Therefore, DSLR camera is a suitable study object for the current study.

4. Study 1: field observation

The purpose of Study 1 is to explore different consumers' inference strategies in response to positive and negative online consumer reviews in an online DSLR forum.

4.1 Methodology

4.1.1 Data collection. In Study 1, the data were collected from a famous online forum related to DSLR cameras in four months before conducting Study 2. After scrutinizing all online reviews in the studied period, we collected more than 1,000 consumer responses from 113 online reviews with a great number of responses. Then, we eliminated those responses which were either irrelevant to their corresponding reviews or lack of any attributional statements. Therefore, a total of 735 consumer responses were identified for further analyses, including 199 responses for negative reviews and 536 responses for positive reviews.

4.1.2 Response classification. In order to explore different consumers' inference strategies, 735 consumer responses were further classified based on consumer type and attribution type.

Consumer type. Based on Bettman and Park (1980) and Alba and Hutchinson (1987), consumer knowledge may be determined by their past experiences of posting full-length reviews (i.e. detailed descriptions of product functions and user experiences) in an online forum. After observing the behavior of the participants in the studied forum, knowledgeable consumers are more likely to initiate and post full-length product reviews. Therefore, we considered both the number and the comprehensiveness of online reviews posted by the particular consumer. The former indicates the consumer's active participation in the forum, and the latter indicates his or her product expertise about DSLR cameras. In an exploratory manner, high-knowledge consumers were operationalized as those who have initiated and posted more than three full-length reviews of DSLR cameras in the online forum in the past four months, whereas low-knowledge consumers were those who have posted less than three full-length reviews. Thus, we identified 361 responses made by high-knowledge consumers and 374 responses made by low-knowledge consumers.

Attribution type about the reviewer. Similar to prior research (Ellen *et al.*, 2006; Meuter *et al.*, 2000), consumers' responses may include those statements that they attributed behind a reviewer posting the review. After reading all responses collected, possible attributional statements were identified and used to categorize these responses into either non-product-relevant or product-relevant. On the one hand, 247 responses in which consumers attributed the reasons to the reviewer himself/herself were classified into the non-product-relevant attribution group. An example statement was "As a beginner, I think that the camera may meet your needs (positive)." On the other hand, 488 responses in which consumers attributed the posting reasons to the product itself were classified into the product-relevant attribution group. An example statement was "Now I understand that the camera is awkward to use (negative)."

Response classification was conducted by two independent research assistants. The average of inter-coder reliability was 0.90. Disagreements were resolved by consensus in order to classify all responses.

4.2 Results and discussion

We used a contingency table (see Table I) to compare the proportions of inference responses (PIR) between high-knowledge and low-knowledge consumers in the positive and negative online review conditions separately. For 199 negative online reviews, the results showed that non-product-relevant attribution responses are made more by high-knowledge consumers ($PIR_{\text{high-knowledge}} = 32.66$ percent) than low-knowledge consumers ($PIR_{\text{low-knowledge}} = 5.02$ percent), respectively ($p < 0.01$). Meanwhile, product-relevant attribution responses were likely to come from low-knowledge consumers more than high-knowledge consumers ($PIR_{\text{low-knowledge}} = 46.73$ percent; $PIR_{\text{high-knowledge}} = 15.58$ percent, $p < 0.01$). For 536 positive online reviews, the results showed that non-product-relevant attribution responses were made more by high-knowledge consumers ($PIR_{\text{high-knowledge}} = 19.40$ percent) than low-knowledge consumers ($PIR_{\text{low-knowledge}} = 12.69$ percent), respectively ($p < 0.05$). However, the differences in product-relevant attribution responses were not significant between high-knowledge and low-knowledge consumers ($PIR_{\text{high-knowledge}} = 30.04$ percent; $PIR_{\text{low-knowledge}} = 37.87$ percent, $p > 0.05$).

Study 1 indicates the differences in casual inference strategies between high-knowledge and low-knowledge consumers. When encountering negative online reviews, high-knowledge consumers are likely to make more non-product-relevant attribution than low-knowledge consumers, and low-knowledge consumers tend to make more product-relevant attribution than high-knowledge consumers. However, the pattern appears to be less obvious in the positive review condition.

5. Study 2: experiments

The purpose of Study 2 is to examine the relationship between review valence and consumer knowledge on both review credibility and consumer attribution. To test our hypotheses, a 2×2 between-participants factorial design was conducted. One factor was review valence,

	Responses to positive reviews ($n = 536$)		Responses to negative reviews ($n = 199$)	
	Low-knowledge consumer	High-knowledge consumer	Low-knowledge consumer	High-knowledge consumer
Non-product-relevant attribution	68 (12.69%)	104 (19.40%)	10 (5.02%)	65 (32.66%)
Product-relevant attribution	203 (37.87%)	161 (30.04%)	93 (46.73%)	31 (15.58%)

Table I.
The analysis of
consumer responses

which was manipulated as the positive or negative online review. Another factor was a measured variable, consumer knowledge, which was used to classify participants into high- or low-knowledge consumers.

5.1 Methodology

5.1.1 Stimuli. Similar to past research (Park and Lee, 2009; Qiu *et al.*, 2012), we developed one positive and one negative online reviews for the DSLR camera. Each review was made by one anonymous consumer who bought and used the target DSLR. The contents of the experimental reviews included review statements and camera photographs.

First, statements in these reviews were selected from actual consumer reviews for the target camera. The statements were revised in either a positive or a negative manner. Example statements used in our experiments are presented in Table AI.

Second, photographs for the target camera were selected from online camera forums. In order to avoid confounding effects, the logo of the DSLR camera was not revealed in both conditions, and the brand name of the camera was purposefully erased in the stimulus to eliminate any specific brand effect on the results. The review formats and camera photographs for two experimental conditions remained consistent. Finally, our pretest showed that the differences in valence evaluation between two experimental online reviews were significant.

5.1.2 Participants and procedures. For effective data collection, we posted a recruitment statement to invite voluntary participants in a famous online forum related to DSLR cameras. A total of 364 consumers who had recent forum use experiences participated in our experiments by clicking the hyperlink which directed to the experiment website. There were 28.02 percent male and 71.98 percent female. Most of them (78.30 percent) aged from 21 to 30 years old. There were 56.04 percent of respondents owning DSLR cameras. We used the χ^2 tests to examine whether profile differences existed between the positive and negative review experimental group. The results showed that there were no significant differences in gender ($\chi^2 = 0.04$, $df = 1$, $p > 0.10$), age ($\chi^2 = 4.32$, $df = 4$, $p > 0.10$), and camera ownership ($\chi^2 = 0.32$, $df = 1$, $p > 0.10$) between two experimental groups.

When entering our experiment website, participants first received a statement describing that this study was conducted for academic proposes and their responses would remain anonymous. Then, participants were randomly assigned to one of two experimental conditions. Before being exposed to the experimental stimuli, participants were instructed to imagine that they were searching information online for buying a DSLR camera and now reading an online review made by an anonymous reviewer on a DSLR-related forum. The experimental reviews were then presented.

Participants were asked to read the assigned reviews carefully. After reading the reviews, they were given an online questionnaire to express their review credibility, consumer attribution about the reviewer, consumer knowledge and demographic information, respectively. Once participants had started the questionnaire, they were not allowed to go back to re-read the experimental stimuli. When participants finished the questionnaire, debriefing information was presented online to inform them that our consumer reviews were made only for the experimental purpose.

5.1.3 Research variables. Review credibility. Based on Luo *et al.* (2013) and Chiou *et al.* (2014), online review credibility was operationalized by asking, "After reading the online review, how do you think about the review on the following items?" Responses were given on three 5-point semantic differential scales reflecting "not very real/very real," "not very trustworthy/very trustworthy" and "not very believable/very believable." The internal consistency for this scale was satisfactory (Cronbach's $\alpha = 0.89$).

Consumer attribution about the reviewer. Following Mizerski (1978) and Sen and Lerman (2007), four items were developed to measure a consumer's casual inference regarding the

reviewer's motivation of posting an online review. Items were: how do you think about the reviewer's motive to describe the functions of the DSLR camera? How do you think about the reviewer's motive to describe the operations of the DSLR camera? How do you feel that the reviewer's motive to evaluate the DSLR camera is based on personal subjective judgment or objective use experience? How do you think about the motive behind the reviewer posting the review accurately informs others about the quality of the DSLR camera? Responses of the first three items were anchored at five-point semantic differential scales from 1 = "absolutely non-product-relevant" to 5 = "absolutely product-relevant," whereas the last item was anchored at a five-point scale from 1 = "absolutely not" to 5 = "absolutely." The greater (smaller) scores of this construct indicated the tendency of product-relevant (non-product-relevant) attribution. The internal consistency for this scale was acceptable (Cronbach's $\alpha = 0.72$).

Consumer knowledge. This study measured a consumer's objective and subjective knowledge about a DSLR camera. Following Park *et al.* (1994) and Sujan (1985), objective knowledge was evaluated by using eight choice questions anchored on yes (1) and no (0). These questions were selected from professional DSLR magazines and online forums. Sample items are generally, aperture values for 35 mm cameras are 1, 3, 5, 7, 9, 11; and the amount of incoming light rays for $f/8$ is one quarter of $f/4$. Subjective knowledge was assessed by three items adapted from Park *et al.* (1994) and Chiou *et al.* (2002). These items were anchored at seven-point scales (1 = "not very much," 7 = "very much"). A sample item was "Compared with the average person, how do you know about DSLR cameras?" The internal consistency for the subject knowledge scale was excellent (Cronbach's $\alpha = 0.94$).

5.1.4 Participant classification. Participants were divided into high- or low-knowledge consumers according to their objective and subjective knowledge about a DSLR camera. By using a median-split approach, we classified our participants based on objective knowledge scores regarding the number of correct answers to the eight choice questions (median = 4) and the mean scores of subjective knowledge (median = 4.00). Our approach is consistent with past research (Alba and Hutchinson, 1987; Chiou *et al.*, 2002; Park and Kim, 2008). After dropping 18 participants in the median group, we identified 154 high-knowledge and 192 low-knowledge consumers in subsequent analyses. These subgroups differed significantly in objective knowledge scores ($M_{\text{high-knowledge}} = 5.64$ vs $M_{\text{low-knowledge}} = 1.64$, $p < 0.01$) and subjective knowledge scores ($M_{\text{high-knowledge}} = 4.79$ vs $M_{\text{low-knowledge}} = 2.84$, $p < 0.01$).

5.1.5 Manipulation check. Our manipulation was checked by asking: "After reading the review, what are your evaluation and attitude toward the target camera?" Responses were given on two 5-point semantic differential scales reflecting overall evaluation (1 = "not very good," 5 = "very good") and overall attitude (1 = "not like it very much," 5 = "like it very much").

5.2 Results

5.2.1 Manipulation check. The results showed that the target camera in the positive review condition (mean = 3.65) was evaluated better than that in the negative review condition (mean = 2.99) ($t = 9.07$, $p < 0.01$). The camera also elicited more favorable attitude in the positive review condition (mean = 3.48) than the negative review condition (mean = 2.93) ($t = 6.96$, $p < 0.01$). Thus, our manipulation of the experimental reviews was successful.

5.2.2 Hypothesis testing. Our hypotheses were mainly tested via ANOVA. In general, the results showed that consumer knowledge had direct influences on review credibility and consumer attribution. The high-knowledge consumers are found to elicit less review credibility ($M_{\text{high-knowledge}} = 3.18$ vs $M_{\text{low-knowledge}} = 3.45$, $p < 0.01$) and more non-product-relevant attribution than low-knowledge consumers ($M_{\text{high-knowledge}} = 2.78$ vs $M_{\text{low-knowledge}} = 3.03$, $p < 0.01$), respectively.

The results confirmed a significant review valence by consumer knowledge interaction on review credibility ($F = 10.89, p < 0.01$) (see Table III). As presented in Figure 1, in the negative review condition, low-knowledge consumers ($M_{\text{low-knowledge}} = 3.56$) were likely to perceive more review credibility than high-knowledge consumers ($M_{\text{high-knowledge}} = 3.06$) ($t = 5.01, p < 0.01$). However, the differences in review credibility were not significant between the two knowledge subgroups in the positive review condition ($M_{\text{high-knowledge}} = 3.28$ vs $M_{\text{low-knowledge}} = 3.32, p > 0.10$) (see Table II). Thus, *H1* was supported.

The results also indicated a significant review valence by consumer knowledge interaction on consumer attribution ($F = 3.93, p < 0.05$) (see Table III). As presented in Figure 2, for the negative review, the differences in consumer attribution were significant between high- and low-knowledge consumers ($t = 4.05, p < 0.01$). High-knowledge

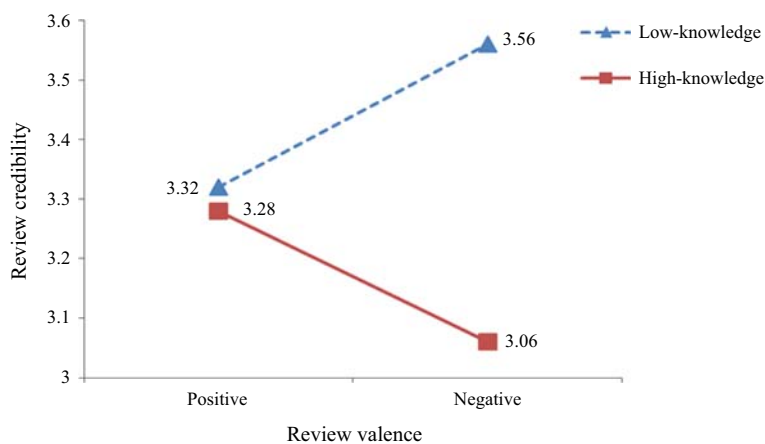


Figure 1. The review valence by consumer knowledge interaction on review credibility

	Review credibility		Consumer attribution	
	Positive review	Negative review	Positive review	Negative review
Low-knowledge consumer	$n = 90$ Mean = 3.32 SD = 0.60	$n = 102$ Mean = 3.56 SD = 0.54	$n = 90$ Mean = 2.99 SD = 0.62	$n = 102$ Mean = 3.06 SD = 0.56
High-knowledge consumer	$n = 87$ Mean = 3.28 SD = 0.67	$n = 67$ Mean = 3.06 SD = 0.73	$n = 87$ Mean = 2.87 SD = 0.73	$n = 67$ Mean = 2.66 SD = 0.74

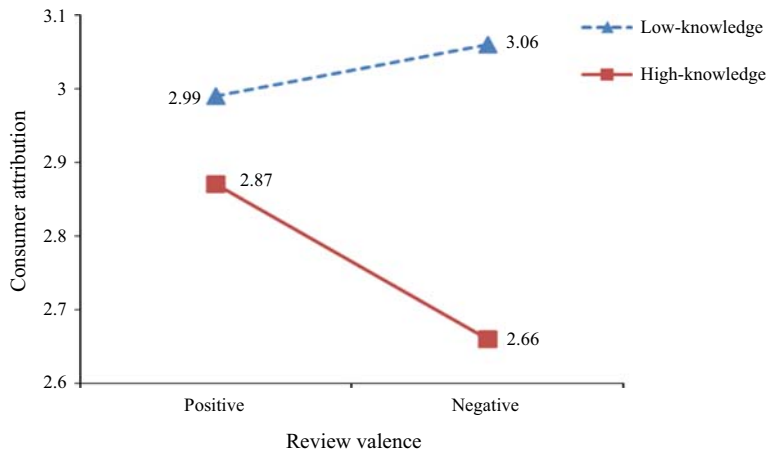
Table II. Descriptive statistics of review credibility and consumer attribution

	Model 1: review credibility	Model 2: consumer attribution	Model 3: review credibility
Review valence	0.01	1.10	0.39
Consumer knowledge	15.36**	13.48**	6.29*
Review valence \times consumer knowledge	10.89**	3.93*	7.20**
Covariate: consumer attribution			82.84**

Notes: * $p < 0.05$; ** $p < 0.01$

Table III. The results of ANOVA (F -values)

Figure 2.
The review valence by consumer knowledge interaction on consumer attribution



consumers ($M_{\text{high-knowledge}} = 2.66$) were likely to make more non-product-relevant attribution than low-knowledge consumers ($M_{\text{low-knowledge}} = 3.06$). However, the inference differences between high- and low-knowledge consumers were not significant for the positive review ($M_{\text{high-knowledge}} = 2.87$ vs $M_{\text{low-knowledge}} = 2.99$, $p > 0.10$) (see Table II). Thus, $H2$ was supported.

To test $H3$, we followed Baron and Kenny's (1986) suggestion, indicating that three conditions must be met for mediation: independent variables affect the dependent variable; independent variables affect the mediator; and when independent variables and the mediator are regressed on the dependent variable, the mediating variable is significant, and the impacts of the independent variables are reduced. This approach has been used in past e-commerce and eWOM research (Jiang *et al.*, 2010; Qiu *et al.*, 2012).

As presented in Table III, the results of Model 1 showed that the interaction between review valence and consumer knowledge had a positive impact on review credibility ($F = 10.89$, $p < 0.01$). Meanwhile, the interaction between review valence and consumer knowledge influenced consumer attribution in Model 2, respectively ($F = 3.93$, $p < 0.05$). Third, when consumer attribution was included as a covariate, the results of Model 3 indicated that consumer attribution was significant ($F = 82.84$, $p < 0.01$), and the F -value of the review valence by consumer knowledge interaction was attenuated from 10.89 to 7.20. Thus, three conditions for mediation were satisfied.

Furthermore, we performed regression analysis to provide additional evidence for the mediating role of consumer attribution. As shown in Table IV, the results of Model 4 showed

Variables	Model 4: review credibility		Model 5: consumer attribution		Model 6: review credibility	
	Std. β	t -value	Std. β	t -value	Std. β	t -value
Review valence	-0.02	-0.46	0.04	0.84	-0.04	-0.93
Consumer knowledge	-0.20	-3.85**	-0.19**	-3.63**	-0.12	-2.45*
Review valence \times consumer knowledge	0.17	3.30**	0.11*	1.98*	0.13	2.68**
Consumer attribution					0.44	9.10**
R^2	0.07		0.05		0.25	
F -value	8.26**		5.67**		28.72**	

Notes: * $p < 0.05$; ** $p < 0.01$

Table IV.
The results of regression analysis

that the interaction between review valence and consumer knowledge had a positive impact on review credibility ($\beta = 0.17, p < 0.01$). In Model 5, the interaction between review valence and consumer knowledge was found to affect consumer attribution significantly ($\beta = 0.11, p < 0.05$). Third, when consumer attribution was added to Model 6, the results of Model 3 indicated that the effect of consumer attribution was significant ($\beta = 0.44, p < 0.01$), and the coefficient of the review valence by consumer knowledge interaction was reduced from 0.17 to 0.13. Therefore, *H3* was supported by the data.

6. General discussion

As an effective tool of internet marketing communication, online reviews are recognized as a credible source of information that influences one's purchasing decision. For internet marketers, the most important issue is how to effectively reduce the undesirable impact of negative online reviews because negative eWOM information is more vivid and influential than positive information (Chiou and Cheng, 2003; Qiu *et al.*, 2012).

First, our results show that the review valence by consumer knowledge interaction has a significant impact on review credibility. High-knowledge consumers tend to use internal information search (Brucks, 1985; Sujan, 1985) and have definite cognitive structures regarding a product (Alba and Hutchinson, 1987; Kim *et al.*, 1991; Park and Kim, 2008). They are likely to discount the reliability of negative eWOM information and elicit less perceived credibility than low-knowledge consumers. In contrast, low-knowledge consumers have less cognitive abilities to judge the argument quality of online reviews. They tend to be persuaded by negative eWOM information.

Second, this study supports the idea that there is a review valence by consumer knowledge interaction on consumer attribution. When receiving negative eWOM information, consumers with different levels of product knowledge are likely to generate diverse casual attributions about the information (Sparks *et al.*, 2016). High-knowledge consumers who have more cognitive resources are likely to form personal viewpoints in an analytical inference process (Alba and Hutchinson, 1987; Lee and Olshavsky, 1994). They do not simply believe negative eWOM information because it is inconsistent with their existing product knowledge. Thus, high-knowledge consumers tend to attribute the unfavorable outcomes to the reviewer or non-product-relevant causes. However, low-knowledge consumers are less able to deny the importance of negative eWOM information (Ahluwalia, 2000). These consumers are likely to attribute it to product-relevant reasons.

Finally, this study provides support for the mediating effect of consumer attribution on the relationship between the review valence by consumer knowledge interaction and review credibility. It is similar to past studies (Qiu *et al.*, 2012; Sen and Lerman, 2007). When encountering negative or positive eWOM information, high- and low-knowledge consumers are likely to have different causal attributions about the reviewer's motivation of posting such information. Thus, consumer attribution plays an important role in determining the credibility of the eWOM information.

6.1 Research implications

This study contributes to extant literature in two aspects. First, this study adds to extant eWOM research by examining how consumer product knowledge moderates the relationship between review valence and online review credibility. Although prior studies have examined the moderating role of consumer product knowledge in determining eWOM effectiveness from the perspective of elaboration likelihood model (Cheung *et al.*, 2012; Park and Kim, 2008), this study provides another perspective to explain the influence of consumer knowledge. Consumers with different levels of product knowledge may reflect the extent to which they resist to be persuaded by online reviews (Abelson, 1959; Ahluwalia, 2000).

When encountering positive and negative eWOM information, high- vs low-knowledge consumers are likely to make different evaluations on review credibility due to their differences in cognitive resources and accessibility (Alba and Hutchinson, 1987; Lee and Olshavsky, 1994).

Second, this study advances the understanding of different casual inferences about online reviews between high- and low-knowledge consumers. Past research has investigated the influence of attribution in online reviews for different product types (utilitarian vs hedonic) (Sen and Lerman, 2007) and the presence of conflicting aggregated rating (with vs without) (Qiu *et al.*, 2012). Little research has placed emphasis on the role of consumer product knowledge. This study confirms that high-knowledge consumers tend to make non-product-relevant attributions about negative eWOM information, whereas low-knowledge consumers incline to make product-relevant attributions. Our findings are contributive to the extension of Jones and Nisbett's (1972) actor–observer inference bias in the online review context. When receiving negative eWOM information, such bias appears to be more salient for low-knowledge consumers than for high-knowledge consumers.

Finally, this study contributes to the operationalization of consumer knowledge in online review research. In this study, consumer knowledge reflects either a consumer's abilities to perform product-related tasks (Alba and Hutchinson, 1987; Bettman and Park, 1980; Park *et al.*, 1994) or accurate product information in memory (Brucks, 1985; Sujan, 1985). Our approaches are also helpful to classify consumers with different product knowledge as opinion leaders and lurkers in online forums (Nonnecke, Preece and Andrews, 2004). In comparison to lurkers (Nonnecke and Preece, 2001, 2003; Nonnecke, Preece, Andrews and Voutour, 2004; Preece *et al.*, 2004; Rafaeli *et al.*, 2004), opinion leaders often initiate and post several product reviews (Lyons and Henderson, 2005; Song *et al.*, 2017), and have more product knowledge to judge the credibility of eWOM information, leading to less product-relevant attributions.

6.2 Practical implications

Although negative online reviews are not all rumors, both negative online reviews and rumors are likely to stop at the wise. Promoting consumer product knowledge may diminish the credibility of negative eWOM information and significantly decrease a manager's effort in response to the undesirable impact of the negative information on consumer evaluation. Our findings can provide managers with practical implications to avoid the influence of negative online reviews.

First, our findings reveal that consumers with high product knowledge tend to attribute the unfavorable outcomes to the reviewer or non-product-relevant causes. Managers are recommended to encourage consumers to post reviews and comments in online professional forums instead of unprofessional forums. Because users in professional forums often have a higher level of product knowledge toward specific products (e.g. a DSLR camera), their discussion in the forum can significantly increase the product knowledge of all forum participants. When consumers have more product knowledge, they are more likely to scrutinize negative eWOM information more seriously instead of inferential errors of negative information. Therefore, the unfavorable impact of negative online reviews can be reduced unless the focal product is truly flawed.

Second, brand managers are suggested to promote product knowledge oriented forums on the internet. The practice of online product knowledge centered forums or communities is a useful way to share real-time product information and deepen brand consciousness among consumers. When consumers become well educated and more familiar with a product and a brand in brand communities, they are more likely to judge product quality by using internal information search (e.g. product knowledge) rather than external search (e.g. online reviews). According to our findings, high accessibility of product and brand

knowledge is likely to alleviate a consumer's attribution of negative online information to the product or the brand.

Third, this study also implies the importance of opinion leaders in online forums. The results of Study 1 show that opinion leaders who share more product evaluations with other consumers are often less susceptible to negative eWOM information. Thus, online forum managers are suggested to encourage high-knowledge consumers acting as opinion leaders in their forums. These opinion leaders are likely to not only provide highly credible online reviews actively, but also defend the brand image from being damaged by negative eWOM information.

6.3 Limitations and future research directions

Two limitations should be addressed in this study. First, we selected DSLR cameras as the target product. However, product type may yield different consumer evaluations toward a product (e.g. Mudambi and Schuff, 2010). Therefore, future research is suggested to empirically validate the external validity of our findings in other product contexts. Second, Study 2 manipulated review valence as positive vs negative. Although positive and neutral reviews often have no significant differences in consumer evaluation (Chiou and Cheng, 2003; Skowronski and Carlston, 1989), future research is encouraged to include neutral reviews as a helpful way to effectively match the real situation.

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Appendix

Positive review condition	Negative review condition
The quality of the DSLR camera is pretty good. The handle on the right-hand side is not plastic-like Besides, the focusing function of this camera is improved. The auto-focusing is quick and precise. The dynamic range is perfect It costs me almost NT\$40,000. Of course, I am extremely satisfied with the camera After using this camera, I decide to give it 5 stars. ★★★★★	The quality of the DSLR camera is just fine. The handle on the right-hand side is very plastic-like However, is the focusing function of this camera improved? The auto-focusing is time-consuming. Good scenes slip away quickly It costs me almost NT\$40,000. Too many expectations lead to more disappointment After using this camera, I can merely give it 1 star. ★

Table A1.
Example statements
used in the
experiments

Corresponding author

Cheng-Chieh Hsiao can be contacted at: jerrychsiao@gmail.com

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