

The Effects of Image-Based Online Reviews on Customers' Perception Across Product Type and Gender

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ABSTRACT

Online vendors consider image online reviews as an important format to improve customers' buying decision. Prior research examined the influence of review presentation format, but did not focus on image format. Little is known about customers' perception on image online reviews. This study developed a theoretical model to analyze the effect of image reviews across product type and gender. The 2×2×2 between-subject experimental design was conducted to test hypotheses. The results demonstrated that compared to text review, the influence of image format on customers' perception was more significant, but in varying degrees across product type and gender. This study found that image format had more positive impact for experience product's understanding compared to search product. The result also showed that the effect of image format on experience product was not significant greater for females than males, but the perception improvement degree from text to image reviews was saliently different between genders. This study discussed theoretical and managerial contributions of these results.

KEYWORDS

Moderation Effect, Perceived Helpfulness, Perceived Product Understanding, Presentation Format

INTRODUCTION

Online reviews, one form of e-WOM, are having significant influences on customers' product valuation (Mudambi & Schuff, 2010) and vendors' product sales (Duan et al., 2008). As a new format of online review, image reviews are making their presence on some leading vendor websites around globe. In practice, image reviews were considered as an important marketing strategy to attract potential customers for online vendors and as a key source of product information for future customers. BuzzFeed reported that one vendor selling Bikini swimsuit on Amazon.com had reached great high sales in 2015 because this vendor encouraged its customers to post text review and upload product images simultaneously (Probus, 2015). In China, some vendors try to stimuli their buyers to post customers' image by cash rewards in order to attract more customers and reach more great sales. Most vendor websites, including Amazon.com and Taobao.com, have listed "customer image"

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as a search keyword independently, which is convenient for customer to identify all image reviews of one product. Alike practitioners, scholars are also concerned how image reviews are perceived helpful and what that depends on.

Review helpfulness can be seen as a reflection of review diagnosticity. Scholars have extensively examined the area that is what makes online reviews helpful to customers (Mudambi & Schuff, 2010; Filieri, 2014; Huang et al., 2015). However, vast prior researches have only focused on a text-based review, which is main presentation format on vendor websites in the past years. Previous studies have primarily identified perceived helpfulness of various text-based review characteristics such as review extremity, star rating and review depth (Mudambi & Schuff, 2010), and discrete emotional content in a seller review (Yin et al., 2014). With the popularity of an image review growing fast, some scholars turned to put an eye on the influence of image reviews on customers (Xu et al., 2015). But their finding was that the effects of text and image reviews on customers' perceived helpfulness are not distinguished from each other significantly. Obviously, this conclusion could not explain why image review format is increasingly popular on most vendor websites, such as Amazon.com and taobao.com, and especially for the Bikini swimsuit case mentioned above. To narrow the gap between theory and practice, this area needs further research to examine this important question as to whether an image review is more helpful to customers than commonly used text review.

The effect of image reviews on customer perceptions is unclear without adequate examinations. This study adds to a growing body of online reviews highlighting the effect of presentation format. Based on discussion above, this research focuses on the first question: (1) Whether image-based online reviews provide higher perceived product understanding for customers than text-based online reviews?

Most research of online reviews considered different effect between experience products and search products (Mudambi & Schuff, 2010; Xu et al., 2015). For different product type, customers would seek different kind of information to diagnostic online products (Jiang & Benbasat, 2007). Image reviews present visual information depicting experience attributes (e.g. appearance). So the authors consider: (2) whether image-based online reviews have greater positive effect on customers' perceived product understanding for experience products compared with search products?

Actually, past research found that gender is different in online information processing (Shaouf et al., 2016). So the authors also are interested in: (3) Whether image-based reviews on experience products have greater positive effect on customers' perceived product understanding for female customers compared to male customers? This study uses cognitive fit theory to explain the different influence of review presentation format, and the moderation effect of gender and product type.

Finally, this study suggests that customers will perceive reviews more helpful if the reviews give them more clear product understanding. Thus, the final question the authors want to explore is: (4) Whether perceived product understanding positively influences customers' perceived review helpfulness.

The authors organize this paper as follows. First, the authors present cognitive fit theory as theoretical background, and develop hypotheses and theoretical model. Then the authors use experiment method to test those hypotheses. Next, the authors discuss the results and findings. Finally, this study discusses theoretical and managerial contributions, limitations and directions for further research.

THEORETICAL BACKGROUND AND HYPOTHESES

Effects of Online Reviews

Scholars have identified the effects of various online reviews on customers' perceived review helpfulness (Mudamb & Schuff, 2010; Forman et al., 2008; Yue & Zhang, 2011; Yin et al., 2014; Filieri, 2014). Perceived reviews helpfulness is as the extent to which product evaluations is perceived by customers depending on relevant review information to facilitate their purchase intention (Mudamb

&Schuff, 2010, Yin et al., 2014). Most research focused on the influence of review content attributes on perceived review helpfulness. For example, Mudamb and Schuff (2010) suggested that review depth had a greater positive effect on perceived helpfulness for search products than for experience products. However, some researches focused on the reviews source effect on perceived helpfulness, such as reviewer disclosure of identity descriptive information (Forman et al., 2008). Li et al. (2013) also examined the interaction effect of source and content features of online reviews on perceived review helpfulness. Moreover, Davis and Agrawal (2018) tried to understand the role of interpersonal identification in online review evaluation. In addition, Chen (2017) are interested in some rating systems type (i.e., five-star, binary-visual, and binary-textual).

Past researches also have examined the role of language style in online reviews. For example, Yin et al. (2014) showed that customers perceived anxiety-embedded online reviews more helpfulness than anger-embedded reviews. However, Antico and Coussement (2018) suggested that expressions of positive and negative emotions in reviews did not significantly affect managers' readings of negative reviews, whereas some judgment information on the cognitive and behavioral components had significant effect on customers' perception. All those conclusions were based on verbal description of text reviews.

In particular, those findings were targeted to the dimensions (e.g. contents, emotion, customer ratings, source effects and posting time) of text-based online reviews. However, with information technology improved, online reviews have changed from text-based to image-based presentation format. At the present time, most customers' online reviews are posted in different formats: text or image. Past research has shown that product presentation format influences customers' attitudes toward products and perceived usefulness (Jiang & Benbasat, 2007). However, little research focused on the effect of customers' images, a new presentation format of online reviews. Although Xu et al. (2015) indicated that video-based online reviews were perceived more helpfulness than text-based online reviews, this study did not clarify the influence of image-based online reviews on customers' perception. In practice, an image-based online review has been an important and popular presentation format of review. It will be hot topic in future research. This study tries to deepen research about image reviews.

Cognitive Fit Theory

Cognitive fit theory (CFT) was developed to examine the mechanisms by which problem solving takes place, and to explain the effect of cognitive fit between technology (e.g. information presentation format) and task type on problem solving performances (Vessey, 1991). Based on information processing theory, customers prefer looking for ways to reduce their cognitive load of problem solving because human only has limited information processors (Newell&Simon, 1972). Customer cognitive load is the amount of mental effort that imposed to individual cognitive system (Pantoja et al., 2016). According to CFT, cognitive fit will occur when information type matches customer information processing needs. And cognitive fit can decrease customers' cognitive effort, and enhance customers' information processing ability and performance (Huang et al., 2006).

In the information processing literatures, CFT was drawn on to explain the effects of a map-based presentation on decision making (Dennis&Carte, 1998), individual visual task taxonomy performance of expertise visualization (Huang et.al, 2006) and moderation effect of cognitive fit on the relationship of software comprehension and modification (Shaft & Vessey, 2006). CFT is also used to examine information acquisition and simple evaluation. For example, Gillespie et al. (2018) found that cognitive fit is one of determinants of customer evaluations of placed brands.

To date, some scholars shifted their interest to employ CFT to analyze some questions in e-commerce research, such as the effects of information format on online shopping performance (Hong et al., 2004), customer channel preference (Brunelle,2009) and mobile users' reading behavior (Tsai et al., 2013). In addition, Park and Kim (2008) has explained how the level of customer expertise, the review type (attribute-centric versus benefit-centric) and the review number influenced customers'

purchase intention using CFT. Chen (2017) examined the influence of rating system types on users' perception based on CFT. According to CFT, the elementary spatial decision-making tasks, including simple information acquisition and evaluation (Vessey, 1991; Vessey & Galletta, 1991), require a customer to make cognitive comparisons among perceived product understandings from online reviews. This study would like to extend CFT to explain the influence of review presentation format on customers' perception. This study also expects that cognitive fit will cause different impact of product type and the moderation effect of gender.

Presentation Format

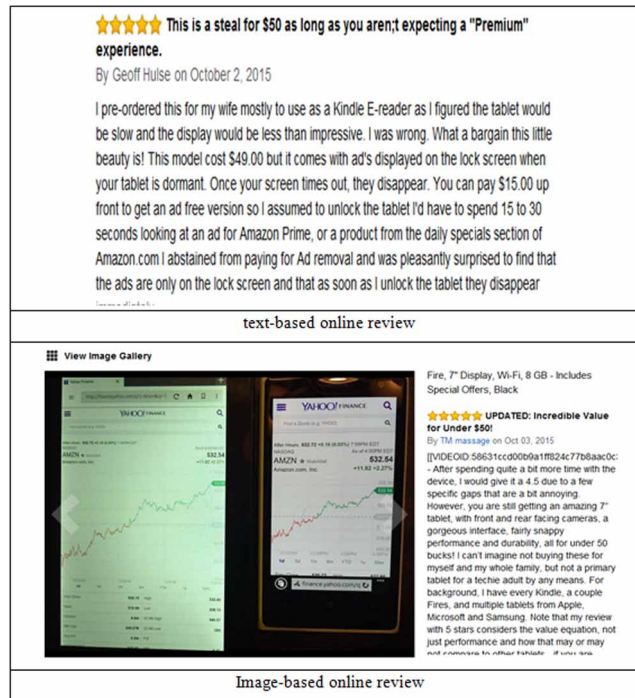
Information presentation format refers to the method used to disseminate to users, and "are designed to introduce products to customers, to help customers to form a clear understanding of products" (Hoch & Deighton, 1989; Jiang & Benbasat, 2007). As an important source of product information, online reviews refer to product or service evaluations generated by former customers and posted on vendor websites in the form of text, image or video presentation format (Mudamb & Schuff, 2010; Xu et al., 2015). For the purpose of this research, a text online review refers to purely textual information. An image online review is made up of both text and images, that is, textual and visual information included in one product review. Currently, most online reviews are text format (Xu et al., 2015). However, many popular vendor websites have started to encourage their customers to post image reviews. So an image-based review is increasing rapidly in the quantity. This is based on two reasons. First, customer images convey visual cues of a product to potential customers, and more importantly, are more realistic than product images provided by online vendors. Especially, it is called that "where there is a customer image, there is the truth". In other words, no truth stands without customer images. In addition, customers often require cost less time and energy to make a better buying decision (Hennig-Thurau & Wash, 2003; Dabholkar, 2006).

Although text reviews also can help customers evaluate alternatives and reduce uncertainty of buying decisions, it is difficult for customers to deal with too much verbal information in a short time. That is because hundreds of text-based reviews were presented for one product and created information overload (Park et al., 2006; Park & Lee, 2008; Furner & Zinko, 2016). However, image-based online reviews provide more visual product information to customers. So they could capture customers' attention in review overload context to help customers make a quick judgment. Obviously, image-based online reviews are becoming a key source of product information and also an important support tool for future customers to understand product and further make smart purchase decisions. A video-based review is not popular and a customer is not familiar with this format. Therefore, the study focuses on online reviews in text and image presentation formats (see Figure1).

Researches in IS field have recognized significant influences of product presentation formats on consumers' attitudes and purchase decision-making. Szymanski and Hise (2000) showed that presentation format of an e-retailer product information is one of dominant factors to improve customer satisfaction. Likewise, Jiang and Benbasat (2007) also found that online vendors' four different product presentation formats had different influences on customers' product understanding. Therefore, this study holds that different presentation format of online reviews provides customers with perceived product understanding at different levels.

According to CFT, two different formats of information presentation, visual information and textual information, both benefit customers' mental representation (Chen, 2017; Paivio, 1971). Past research has explained why cognitive fit exists at biological level. Childers and Jiang (2008) revealed that verbal information(words) activate left frontal cortex of brain, whereas non-verbal (face) generate more activation in the right frontal cortex. Buckner et al. (1999) also suggested that information (including both pictures and words) "activate both right and left frontal cortex". Thus, the authors think that image review would generate more activation in brain region than text reviews. At cognitive level, cognitive effort would be lower for customer to understand products based on image reviews. That is because image reviews have extra visual information compared to text reviews. Individuals

Figure 1. Review presentation format



have limited cognitive processing capacity. Without visual information of products, customers have to make extra cognitive effort to perceive products' appearance or style. So the study suggests that cognitive fit was more easily generated when customers receive image online reviews.

Moreover, media richness theory also posits that multiplicity of information cues, such as the combination of verbal and non-verbal cues, may make messages more accurate, fast and easy to understand than only verbal format (Dennis & Kinney, 1998). And messages in multiple cues, which are made up of words and pictures, can catch more customers' attention and facilitate their better understanding (Sadoski & Paivio, 2002). The study also argues that multiplicity of information cues (image reviews) can be stronger as single cue (text reviews).

As definition of review presentation format above, this study holds that image-based online reviews are more informative and diagnostic to customers compared to text-based online reviews because image review format includes two information cues, that is, words and pictures. Therefore, this study argues that image cues can provide more effective perception about products to their customers. As an old Chinese proverb goes, a picture is worth a thousand words. The study defines perceived product understanding as customers' understanding on product attributes (e.g. performance, quality, appearance and style) based on online reviews before purchasing. Hence, this study hypothesizes:

H₁: Image-based online reviews provide higher perceived product understanding for consumers than text-based online reviews.

Impact of Product Type

IS researchers often divided products into two types: search goods and experience goods on the basis of information asymmetry level (Nelson, 1970; 1974). Product type is widely noted as a contingent variable from easy to difficult to evaluate before purchase (Mudambi & Schuff, 2010). Most products

are at the different location of the line between pure search and pure experience attributes, including both search attributes and experience attributes simultaneously (Huang et al., 2009). The dominant attributes of search products are easily described by product features, such as size, weight, and warranty, and can be objectively evaluated by customers before actual purchase, while the dominant attributes of experience products are intangible, such as feel, and more difficultly obtained and evaluated before interaction with a product (Nelson, 1974; Mudambi & Schuff, 2010).

For different product type, diagnostic information that a customer needs is significantly different (Hassanein & Head, 2005). Text information is exactly used to describe a product's search attribute (Nelson, 1974). Some verbal cues (e.g. product size, weight) is more easily expressed and understood by using text-based information (Jiang & Benbasat, 2007); while image information is normally used to depict a product's experience attributes, which is visual perception of products and usually more difficult to describe by verbal cues alone (Baggett, 1989; Jiang & Benbasat, 2007), such as style and appearance. Thus, customers have different information requirement for different product type (Mudambi & Schuff, 2010; Xu et al., 2015) because customers prefer appropriate diagnostic product information to reduce uncertainty before making final purchase decision. For experience product, such as clothing, a customer prefers image information about appearance. For search product, such as cell phone, a customer cares about text information on performance.

This study extends CFT to explain moderation effect of product type on perceived product understandings. Different presentation format of online review provides distinctive information cues about product attributes to customers (Jiang & Benbasat, 2007; Baggett, 1989). Image-based online reviews provide product images, whereas text-based online reviews do not. When a customer processes text content of online review for buying search products, cognitive fit will take place, which decreases cognitive effort and subsequently leads to more quick and informed purchase decision-making (Hong et al., 2004). However, image format only can help a customer know about a few non-dominant experience attributes of a search product, such as appearance. Similarly, when a customer processes image content of online review for buying experience products, cognitive fit will match between information format and task needs, which will not require a customer to expend more cognitive effort to transform information of some mental representation from verbal to visual.

The best cognitive fit depends on the match of product types and information types which customers are looking for (Brunelle, 2009). Customers prefer to adopt different information search processing for different product types (Hassanein & Head, 2005). Therefore, customers tend to favor text information for search products based on CFT. Product images are not most important information for customers to judge search products, just icing on the cake (making good thing better). In contrast, customers depend on image information to perceive quality for experience products according to CFT, just like "help a lame dog over stile". According to H_1 , image-based online reviews improve perception for all product understanding compared to text-based online reviews. However, the study also expects that:

H_2 : Image-based online reviews have greater positive effect on customers' perceived product understanding for experience products compared to search products.

The Role of Gender

In this research, the authors also consider gender role of a review reader to further study the relationship between review presentation format and product understanding. Gender differences are one important factor of human beings' overall sociocultural differences and have a significant impact on their perceptions and behaviors in a shopping process (Eisend et al., 2014). Gender is commonly used as an important segmentation variable that divides customers into two subgroups in marketing research.

Previous researches explained gender differences at biological level (Shaywitz et al., 1995; Lewis, 2013) and cognitive level (Zhang et al., 2014; Richard et al., 2010). At biological level, Lewis (2013)

found that males have “stronger connections within cerebral hemisphere”, but females have “stronger connection between hemisphere”. In addition, that research also suggested that females may be better at integrating analysis and intuitive thinking than males (Lewis, 2013). Females more likely value information-rich sources than males (Richard et al., 2010). Thus, biology suggested that brains of females and males process information differently (Lewis, 2013; Richard et al., 2010).

Those biological findings are biological basis of cognitive explanation, which is generally the focus and used to account for gender differences in IS research. Based on the biological findings above, past research has shown that females more likely assimilated all available cues, valued information-rich sources than males (Richard et al., 2010; Zhang et al., 2014), and processed information more deeply compared to males (Laroche et al., 2003). This is called “selectivity hypothesis” in IS literatures. Based on CFT, the study further argues that compared to males, females may need less cognitive effort to process verbal and visual information of image reviews. Then cognitive fit occurs for female customers when they process image reviews. Image presentation format of reviews should facilitate information processing for females to achieve better cognitive fit. Therefore, female customers may perceive better product understanding after processing image reviews than males.

Actually, gender differences have occurred in e-commerce context (Shaouf et al., 2016); Richard et al., 2010), and generated significant influences on the use of message cues and judgments (Barkley & Gabriel, 2007), such as online information processing (Meyers-levy & Stemthal, 1991) and products evaluation (Laroche et al., 2003). For example, Garbariono and Strahilevita (2004) concluded that females might be more heavily influenced by online reviews than males are. Furthermore, females and males differ in reaction to nonverbal stimuli (Sarlio et al., 2005), perception of images (Sabatinelli et al., 2004), and how they process visuo-spatial information (Noseworthy et al., 2011). Females usually are better at absorbing details of visual objects (Wesman, 1949), have a superior ability to judge visual characteristics (McKelvie, 1987) and make heightened product evaluations (Noseworthy, 2011).

Those findings motivate us to consider whether females have better product understanding from images-based online reviews than males do. Moreover, based on moderation effect of product type (H_2), the study suggests that although image format has greater positive effect for experience products, the effect degree is different between genders. Female customers have better understanding about experience products based on image format reviews than males do because dominant attributes of experience products are appropriate to be presented with image format and furthermore, female customers are better at dealing with image format information cues than males be. Therefore, the study suggests that:

H₃: Image-based online reviews on experience product have greater positive effect on customers’ perceived product understanding for female customers compared to male customers.

Impacts of Perceived Product Understandings

The motivation customers read online reviews is to understand more information about products and to facilitate their own buying decision process (Kim et al., 2011; Hennig-Thurau et al., 2004; Hennig-Thurau & Wash, 2003). Providing more product information, online reviews were perceived more significant information diagnosticity for customers (Filieri, 2014). Information diagnosticity was described as the ability to convey relevant product information so as to help customers in understanding and evaluating the quality and performance of products sold online (Mudambi & Schuff, 2010). Perceived diagnosticity was consistent with perceived helpfulness (Mudambi & Schuff, 2010; Jiang & Benbasat, 2007). Past research also has shown that customers’ product understanding positively influence perceived usefulness of websites (Jiang & Benbasat, 2007). Thus, the study considers that customers’ perception level of product understanding will have a positive impact on perceived review helpfulness. Therefore, the study suggests:

H₄: Perceived product understanding positively influences perceived review helpfulness.

Figure 2 depicts proposed theoretical model in this research.

METHODS

In this study, the authors conducted an experiment to manipulate different presentation format of online reviews in order to test the hypotheses in this research. The study adopted a between-subject experimental design that is 2(text-based vs. image-based online review) × 2 (search vs. experience product) × 2 (male vs. female).

Selection of Products

Reference to previous research, the authors selected two products to conduct experiments as shown in Table 1. Clothing was identified as experience good in the study based on two reasons. First, evaluating key clothing attributes need to use a customer’s own senses, and depends on subjective taste (Mudambi & Schuff, 2010). A customer cannot know about clothing’s full information of dominant attributes (i.e. warmth, thickness, and softness) without direct experience in the online shopping context (Klein, 1998). For example, clothing’s tactile sensation (e.g. warmth, thickness, and softness) is salient experience attributes for product understanding (Overmars & Poels, 2015). It is difficult to judge those attributes’ performance of clothing without personal trying. Second, it is also representative of experience good in prior studies (Overmars & Poels, 2015). In addition, cell phone was selected as search product in this research. First, key cell phone attributes, such as product dimensions and charge time, was objective (Overmars & Poels, 2015). Evaluating those key attributes did not need to use a customer’s own senses. The product quality information can be easily obtained prior to actual use. Moreover, it is also typical of search product used in past research (Bei et al., 2004; Mudambi & Schuff, 2010).

Stimulus Materials

This study targeted online reviews posted by actual customers at Taobao shopping website. That is because Taobao accumulated thousands of image-based reviews for almost every product. To make treatment reviews similar with actual consumer reviews, the authors selected three historical image-

Figure 2. Theoretical framework

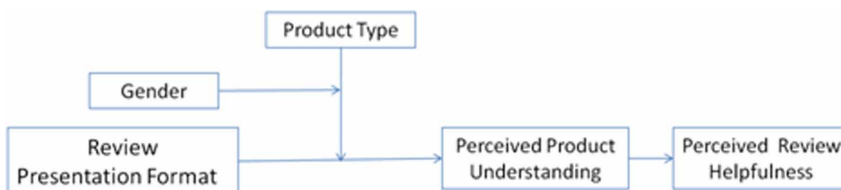


Table 1. Products used in the study

Product	Description	Type	Sources
Clothing	Women’s Long Boiled Wool Coat by Global Discovery	Experience	Overmars & Poels, 2015
Cell Phone	iPhone 6s by Apple	Search	Mudambi & Schuff, 2010

based reviews for each product type from at least one thousand reviews posted by prior customers on Taobao.com. The reviews in this dataset had a clear product picture from prior customer in image part, and had not too long or short literal description in text part. The authors pretested to verify that participants had clear and correct comprehensions to those selected reviews. Eleven participants were required to read those three reviews and then answer questions. Based on this result, the authors selected one image review for each product as treatment review and revised some words to make sentences understood easier and clearly. Each review had about 300 words. The text-based online review was simply textual content. The image-based online review had the same textual content with the text-based reviews for each one product type, but followed by three product images in addition. So this study used total four online reviews in the experiment. For each product type, one is a text-based online review, and another is an image-based online review.

Experimental Procedures

Participants were undergraduate students from Economic and Management School at Xidian University. Participants got some bonus as a reward via “red envelope lucky draw”, a mobile application offered by WeChat. This App allows researchers to assign a lump sum to red envelopes posted in the participants group chat and then randomly assigns the amount in each smaller red envelopes to each participants. No participants failed to follow this experiment. The average age of participants was 21. 140 were females, and 140 were males. Participants had 4 years of online shopping experience at least. Participants preferred to read online review when they shopped online.

The experiment was conducted online. First, the authors instructed participants seat randomly and ensured that they would not have ability to see other’s screen or discuss with each other. Next, the authors introduced participants to a popular online survey website (www.sojump.com) in China, via which the authors provided product descriptions cited from an online vendor, then followed by those treated online review above. And, sojump.com can randomize the appearance of different format of online reviews (text vs. image) for each product type. If each participant reads online review in two presentation formats for one product, learning effect might be created (Xu et al., 2015). Moreover, in the condition that a participant views an image-based online review firstly, and then reads a text-based online review about same product, product images emerging in the before-measurement might have an influence on participants’ product perception in the after-measurement. Each participant randomly received each presentation formats of online review for each product type.

After reading a treatment online review, participants were required to answer main questionnaire about their perceptions on product understandings and on review helpfulness via the Sojump website, and then subsequently about their background demographic information. Perceived product understanding was measured by the three items from Jiang & Benbasat (2005) and Kempf & Smith (1998). Perceived review helpfulness measures, using three items, were adopted from Yin et al. (2014). All responses were measured on a seven-point Likert scale ranging from 1 (extremely disagree) to 7 (extremely agree). Measurement used in this study was shown in Table 2.

RESULTS

Manipulation Check

The authors conducted a pilot study to ensure the efficacy of manipulation on product type evaluation. 35 participants were required to rate their agreement on the following questions: “how likely could you assess product performance (quality, style and appearance) before you interact with the product” for mobile and clothing product separately. These four items were used to evaluate participants’ perceptions on product attributes. They were adopted from Xu et al. (2015) and measured on a seven-point Likert scale. The authors calculated the average of the four items about product attributes. If participants perceive clothing as experience product, the score would be below 4. At the same time,

Table 2. Measurement used in the study

Perceived product understanding	This review is helpful for me to evaluate the product	Jiang & Benbasat (2005) Kempf & Smith (1998)
	This review is helpful in familiarizing me with the product	
	This review is helpful for me to understand the performance of the product	
Perceived review helpfulness	This review is helpful	Yin, et al. (2014)
	This review is useful	
	This review is informative	

if participants perceive cell phone as search product, the score would be over 4. The result showed that a cell phone was perceived as search products for the score of 5.46, and clothing as experience product for the score of 3.71 (Table 3). Participants’ perception on product attributes was as the authors expected. So in this research, the manipulation on product type is successful. Moreover, this product classification kept in line with prior research (Xu et al., 2015; Overmars & Poels, 2015; Mudambi & Schuff, 2010).

The Constructs Reliability and Validity

Perceived product understanding and perceived review helpfulness were first-order constructs with reflective indicators. This research examined Cronbach’s alphas and composite reliability (CR) to test reliability of two constructs, as shown in Table 4. First, all the Cronbach’s alphas (CA) for two factors were 0.870 and 0.903, respectively, demonstrating adequate reliability (Nunnally, 1967). The CR were 0.784 and 0.878, respectively, higher than above 0.7 (Hair et al., 2009) Next, the study conducted a confirmatory factor analysis (CFA), performing principal-axis method with Varimax rotation procedure, to examine convergent and discriminant validity separately for construct validity of these constructs. The factor loadings were higher than 0.7 and significant at $p < 0.05$ (Straub,1989). The average variance extracted (AVEs) for product understanding and review helpfulness were 0.645 and 0.708, respectively, higher than above 0.5 (Fornell & Larcker, 1981). Thus, convergent

Table 3. Manipulation check

Product	Performance	Quality	Style	Appearance	Overall
Cell phone	5.03	5.21	5.71	5.88	5.46
Clothing	3.68	3.79	3.74	3.62	3.71

Table 4. Constructs of reliability and validity

Constructs	CA	CR	AVE	Correlation Matrix	
				PPU	PRH
PPU	0.870	0.784	0.645	0.803	
PRH	0.903	0.878	0.708	0.281	0.841

Note: The diagonal elements on correlation matrix were the square root of AVE.
 CA: Cronbach’s alphas; CR: composite reliability; AVE: the average variance extracted
 PPU: perceived Product Understanding; PRH: perceived Review Helpfulness

validity was demonstrated. Furthermore, the square root of AVE for each construct was higher than the correlations between two factors, demonstrating discriminant validity (Jap & Ganesan, 2000).

Test of Hypotheses

The study applied ANOVA (Analysis of Variance) to test the first three hypotheses. The results of fix effect were shown in Table 5. Then the study further used simple effect test to identify an interaction effect between review presentation format and product type. In this research, review presentation format, gender and product type are categorical variables. Therefore, an ANOVA is more appropriate method to test the first three hypotheses. Additionally, using AMOS, the study developed a structural equation model (SEM) to test hypothesis 4.

The first important question in this study focused on the difference in perceived product understanding across different presentation format of online reviews. ANOVA was applied to test hypotheses for examining this question. The results showed that main effect of review presentation format was significant on perceived product understanding ($F(1,272) = 138.15, p < 0.001$), indicating that participants viewing treatment image review perceived a higher product understanding ($M_{image} = 5.11$ versus $M_{text} = 4.33, t(278) = 10.337, p < 0.001$) than did those viewing text review. This result strongly supported H_1 , as illustrated in Figure 3.

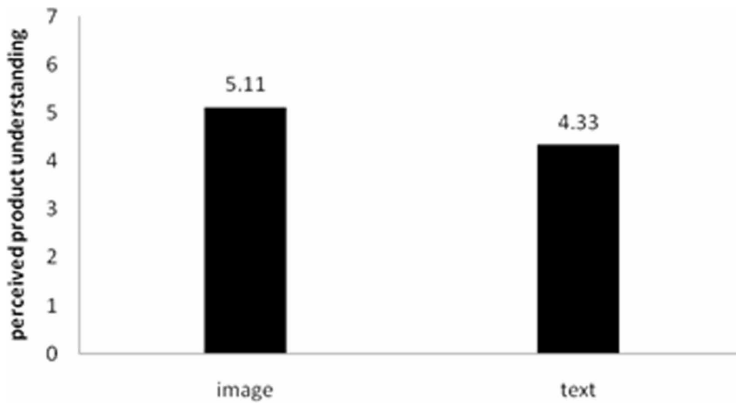
Next, the study conducted another analyses at product type (search / experience) level to test H_2 . The interaction results supported for the moderation effect of product type. The interaction between product type and product understanding was strongly significant ($F(1,272) = 44.01, p < 0.001$). This result strongly supported H_2 . When product type is experience, image reviews have greater positive effect on perceived product understanding, compared to search product ($M_{experience} = 5.24$ versus $M_{search} = 4.98, t(138) = 2.73, p = 0.007$). In contrast, the study also found that text reviews have greater positive influence on perceived product understanding for search product compared to experience product ($M_{search} = 4.64$ versus $M_{experience} = 4.02, t(114) = 6.05, p < 0.001$). For H_2 , the authors also compared the improvement degree on perceived product understanding between search and experience product when an online review was presented from text to image format. Customers had greater perception improvement for experience product (30.35%) when they read online review from text to image format, compared to search product (7.33%). This result suggested that image-based online review improved customers' perception for two product types, but the improvement for

Table 5. Type III test of fixed effects

	Variable	Type III Sum of Squares	Df*	Mean Square	F	Sig
Intercept	PPU	6235.435	1	6235.435	19679.150	0.000
Review Presentation format	PPU	42.173	1	42.173	138.147	0.000
Product type	PPU	2.173	1	2.173	7.118	0.008
Gender	PPU	1.073	1	1.073	3.515	0.062
Review Presentation formatxProduct Type	PPU	13.435	1	13.435	44.009	0.000
Review Presentation formatxGender	PPU	0.840	1	0.840	2.751	0.098
Review Presentation formatxGenderxproduct type	PPU	6.502	1	6.502	21.927	0.000

*Degree of freedom for errors was 272 PPU: perceived product understandings

Figure 3. Perceived influence of review presentation format



experience product was greatly higher search product. This result also showed that product type was a key factor to influence customers' perception, illustrated in Figure 4.

Then, the study conducted analyses to explore the moderation effect of gender. When the study just considered effect of one-sided image format on perceived understanding for experience product, an image-based online review had not significantly different impact on perceived product understanding between genders for experience product ($F(1,279) = 0.31, p = 0.578$). Female customers were weakly higher than males, but not significantly ($M_{\text{female}} = 5.29$ versus $M_{\text{male}} = 5.19, t(68) = 0.669, p = 0.506$). However, when the authors deliberated relative effect of image format compared to text format, further analysis found that the effect of image review for females was more significant than males when a product is experience. The perception improvement ratio for females was 44%, but that for males was 18%. The interaction between perception improvement and gender was strongly significant ($F(1,68) = 17.936, p < 0.001$). The perception improvement for females were greatly higher than that of males ($M_{\text{female}} = 1.63$ versus $M_{\text{male}} = 0.80, t(68) = 4.235, p < 0.001$). Thus, the study suggested that H_3 was partially supported. As illustrated in Figure 5.

Finally, the study developed a SEM to test last hypothesis. The indicators of model fit indicated an acceptable level of goodness of fit. (Chi-square = 84.993, $df = 25, P < 0.001, RMSEA = 0.093, GFI = 0.939, NFI = 0.903, IFI = 0.930, TLI = 0.897, CFI = 0.929$). The coefficient between perceived

Figure 4. Interaction effect between review presentation format and product type

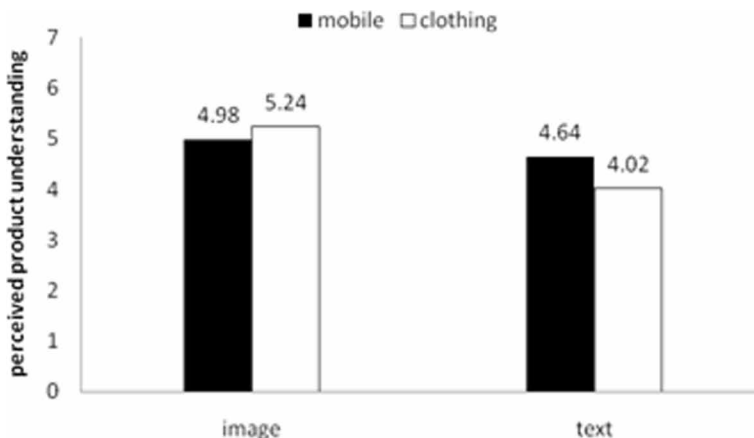
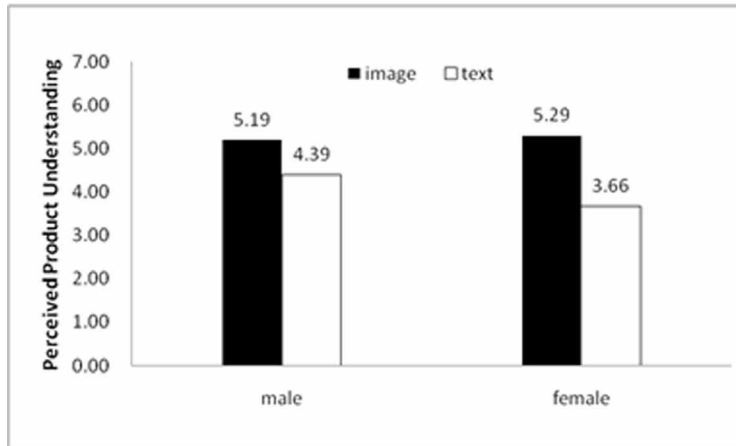


Figure 5. Interaction effect of gender for clothing



product understanding and perceived review helpfulness was 0.409 ($P < 0.001$), as illustrated in Figure 6. Additionally, a multi-group SEM was conducted to test different effect of product type and gender. All the regression coefficients in multi-group SEM were showed in Table 6, and the results supported H_4 for each product. The summarized results of hypotheses tests were in Table 7.

CONCLUSION AND DISCUSSION

A long stream of research on online review has demonstrated that the characteristics of consumer reviews have a significant impact on consumers’ perception on review helpfulness, such as review volume, valence, posting date, etc. However, past researches almost focused on text-based online reviews. And other presentation format of online review, image-based reviews, has not been sufficiently investigated. In this paper, the authors kept an eye on image-based online reviews and examined how image presentation format influenced on customer perceptions and moderation effect of gender and product type. Through experimental design, the study found that compared

Figure 6. Coefficients of structural equation model



Table 6. Four coefficients of multi-group SEM

Factor	Chi-Square	Df	Sig	Variables	Coefficient	Sig.
Mobile	66.386	25	***	PPU	0.516	***
Clothing	70.077	25	***	PPU	0.570	***
Summary	84.993	25	***	PPU	0.409	***

*** $P < 0.001$

Table 7. Results of hypotheses tests

H ₁ : Image-based online reviews provide higher perceived product understanding for consumers than text-based online reviews	Supported
H ₂ : Image-based online reviews have greater positive effect on customers' perceived product understanding for experience products compared to search products	Supported
H ₃ : For experience product, image-based online reviews have greater positive effect on customers' perceived product understanding for female customers compared to male customers	Partially supported
H ₄ : Perceived product understanding positively influences perceived review helpfulness.	Supported

to text format, image format affected customers' perceptions more significantly (H₁). The result was inconsistent with prior research (Xu et al., 2015). Prior research found that the effect of image and text format on customers' perception had not distinguished difference. The study argued that main reason of inconsistent results was different product selection. Prior research selected digital camera as search product and videogame as experience product to examine moderation effect of product type. However, videogames belonged to virtual products and digital cameras were physical products. As a virtual product, a videogame was not appropriate to present its functions or sound attributes no matter through text or image format. So this generated no different effect of two review formats on customer's perception. In addition, a camera was similar with cell phone the study selected as search product. As the research results above, image online reviews had less influential on customers' perception for cell phone. In other words, the ratio of perception improvement from text to image format was not great for search product. Thus, taken together, the two reasons probably generated previous research conclusions that the effect of image and text format had not different influence on customers' perception. However, the study holds that clothing was more typical and popular experience product sold online. And in the other hand, clothing and cell phone both belong to physical product. So it was necessary to re-examine the distinguished effect of image and text format based on clothing and cell phone, and the study got a different interesting conclusion.

The perceived influence also depended on product type and gender. Image-based online reviews presented more product understanding to customers for experience products compared to search products (H₂). It was strongly supported. This result confirmed that product type as a key factor moderated the relationship between review format and customers' perception. Luan et al. (2016) conducted an empirical experiment to draw a conclusion that customers preferred to seek experience-based review to evaluate products when they wanted to purchase experience products. The image format could provide more experience information to potential customers and therefore had more salient influences on experience product. So H₂ is consistent with prior research. The study also assumed that image reviews on experience product had greater influence for female customers than males (H₃). But it was partially supported. Luan et al. (2016) also used eye-tracking as second method to do further research. The results showed that customers' fixations on experience-based review had not significant difference with attribute-based review when they purchased experience products. Luan owed the unexpected result to the natures of experience products and did not further analyze fixations differences between genders. However, in this research, female customers probably perceived more product understanding from product images (experience-based information), but that male customers' product perception was mainly from text description (attribute-based information). The level of product understanding between different genders just matched. That probably caused H₃ was partially supported. So this result also needed further investigation using other methods.

THEORETICAL AND MANAGERIAL CONTRIBUTIONS

With the development of information technology, online review format has changed from text to image. Image-based reviews are most popular on major online shopping websites, especially on taobao.com in China. However, previous studies primarily target to text reviews, and little research has focused on this new presentation format of image-based online review. The research is among the first to examine customers' perception of image format review on perceived product understanding and perceived review helpfulness. Further, by introducing product type and gender as moderate factor into the effect of review format on customers' perception, the conclusions drew in the research contributed to a better understanding on image reviews' perceived helpfulness. Moreover, the research also enriches antecedent variables and mechanism on review helpfulness.

The findings of this research have some managerial implications as following. First, the findings further confirm online vendors' practices that encourage actual customers to post image review because the positive perception effect of image format was more significant than text format. For example, some vendors try to stimuli their buyers to post customers' image by cash rewards, coupons or gifts in China. Second, online vendors also should consider product type they sold and then make a flexible strategy to stimulate customers' behavior on posting review. If an online vendor sells experience product, such as clothing, winter scarves, product image should be stimulated to post more as an important part so as to significantly improve product understandings of potential buyers. In contrast, if an online vendor sells search products, such as some electronic products-mobile, computer or modem, detailed text content also should be stimulated to post besides product images. That is because text-based content has a more significant effect on search products compared to experience products. Third, based on the findings, gender of customers targeted by online vendors should be considered to improve the effectiveness of their review marketing strategy. For instance, a vendor selling clothing for females should take more efforts to attract buyers to post clothing image than as it expected before. To improve product sales, vendors probably would hold the most beautiful customer images to stimuli their female customers to post image reviews. That is because females are significantly influenced by image format, and the effect degree is more than males.

LIMITATIONS AND DIRECTIONS FOR FURTHER RESEARCH

The current study also has some limitations. In this research, a text-based was separate from an image-based review in different experimental context. Moreover, this study conducted experiment only based on one single image-based (or text-based) online review for each experimental context. However, it is almost impossible to be only one text or image review in an online vendor's review system. In practical context of online shopping, text and image format reviews are mixed together to present for potential customers simultaneously. The results of this research indicated customers' perceived product understanding of image format is significantly higher than text format. Thus, that probably is an interesting question that how customers deal with text and image format in practical context. Customers read both text and image review or just read image format. Future research could consider another factor influencing customers' information processing motivation. For example, the level of customers' expertise in products might influence their motivation to read online reviews (Kim et al., 2011). Customers with high level of expertise require less information from external sources (Park&Kim2008; Raghunathan & Pham, 1999; Kim et al., 2011). Further research probably could explore the interaction effect between customers' expertise and review presentation formats.

Second, text and image format reviews in this study are positive. Negative image-based online reviews include both negative literal content and image. The persuasive effectiveness of negative image reviews on potential customers would probably be more significant than positive image format. The study suggests that these also are interesting issues. Therefore, further examination is needed to extend this research to explore the perception effect of negative content in text and image format.

Third, the research examined customers' different perception of review format among product type and gender, which both are variables frequently used to test moderation effect. Other factors may be induced to test moderation effect of review format on customer's perception, such as product involvement. Future research focusing on this question will enrich current understanding on the effect of review format.

Finally, this research used undergraduate students as participants in the experiment. If future research selects other actual customers as participants in experiments, its conclusion would probably be stronger than what this study drew.

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