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Comparative Reviews vs. Regular Consumer Reviews:
Effects of Presentation Format and Review Valence

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ABSTRACT

This study proposes and evaluates the effect of "mixed" comparative reviews on review value and compares the results with "separate" comparative and regular reviews. A total of 201 subjects have participated in the experiment conducted in this study. Results indicate that mixed comparative reviews in text format are perceived as less valuable than separate comparative reviews in text format. However, mixed comparative reviews in tabular format have more review value than those in text format and are perceived as more valuable than regular reviews of one product in either format. Unsurprisingly, the positive reviews of the target product lead to higher product attitude than negative reviews. However, this effect is weak in mixed (vs. separate) comparative reviews.

KEYWORDS

Consumer Review, Mixed Comparative Review, Presentation Format, Product Attitude, Regular Review, Review Type, Review Valence, Review Value, Separate Comparative Review

INTRODUCTION

Online consumer reviews have been accepted as one of the primary sources of product information (Chen et al. 2016) and commonly used by global online shoppers (Yin et al. 2016). Global online marketplaces, such as Alibaba and Amazon, provide ways for consumers to write online reviews about their product usage experience. Regular online reviews written by consumers commonly provide information on single products and are referred to as regular reviews in this study. In a competitive market where alternative products are introduced to satisfy customer requirements, potential buyers typically research for alternative products and select the one that provides the maximum value for the allocated budget. As such, multiple reviews are read (Park et al. 2007). However, differences among user preferences and associated shared information may confuse potential buyers and lead to inappropriate purchases (Vali et al. 2015). For example, consider that a professional photographer rates camera A with above-average features as weak, whereas an amateur photographer rates camera B with few features as strong. Due to inconsistent consumer preferences, a buyer may make an incorrect purchase by selecting camera B with a strong rating but few features.

To address the issues of reviews written by different consumers, we propose a new type of online review, the mixed comparative review, which is a single review written by one consumer to compare two products on the same product attributes. Below are examples of a regular review and a mixed comparative review found on Amazon.com.

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Regular review: "Recreational, uses a phone as a communication device and for fun: iPhone. The camera and social apps are fun to use on the iPhone."

Mixed comparative review: "Photographer, blogger, foodie: iPhone 8 still has the best selection of apps and arguably the best camera. Samsung's camera is slow, and the company is known to really bog down its stellar devices with bloatware that ruins or significantly slows down your phone after one year of use."

Apart from mixed comparative and regular reviews, buyers can access another type of review, that is, two regular reviews written by two different people about two different products (Park et al. 2007). We name this combination as separate comparative reviews. However, different from the mixed comparative reviews written by one consumer, separate comparative reviews written by two consumers with different preferences may result in potential buyer confusion. We include this type of review in our study because in normal circumstances, a buyer likely uses this approach to access consumer reviews about two different products (Park et al. 2007). Marketing literature has proposed comparative advertisements; however, no study has evaluated the effect of this type of comparative message in the online review context.

We compare three types of consumer reviews (mixed comparative, separate comparative, and regular reviews) in terms of review value for three reasons. First, reports on product-return costs, warranty costs, and low-star-rating reviews posted on online marketplaces indicate the need to improve review value (Christozov et al. 2009). As the number of assessed products may increase the overall informativeness of consumer reviews (Decker and Trusov 2010), we examine whether further information provided will translate into increased review value. Second, although the effects of online review properties, such as volume, valence, length, and date of submission, have been investigated in terms of their impact on sellers' sale (Guo and Zhou 2016) and buyers' purchase intention (Park et al. 2007) and decision (Bag et al. 2019), limited studies have focused on how the value of posted reviews can be improved from the perspective of buyers. Sellers are more interested in purchase behavior, whereas consumers are more interested in review value. Our approach is aligned with previous researchers' call to conduct additional consumer-focused research for consumers' welfare, rather than sellers' (Bazerman 2001). Third, review value is a more immediate outcome for different types of reviews than distal outcomes, such as purchase intention and behavior. Evaluating a high review value provided by a website does not necessarily guarantee that a reviewed product will be purchased from the website. Users may merely search for online product information, compare different products online, and/or eventually purchase a different product at a physical store. Users may also consider a review that provides a good review value by summarizing the downsides of the interested products and decide to give up their purchase intention. Thus, rather than examining purchase intention that is related remotely to review type, focusing on review value allows us to observe their direct causal effect.

In addition to investigating the three types of consumer reviews, we study two other moderating factors, namely, review presentation format and review valence. Review presentation format (text vs. tabular) is considered to moderate the relationship between review type and review value. Categorizing and organizing information about a phenomenon can increase the impact of the delivered information (Segel and Heer 2010). However, vast prior research has only considered written reviews as the main presentation format. With the growth of image reviews, some scholars have started looking at other presentation formats, which may affect review helpfulness. Compared with written reviews, image-based reviews provide higher product understanding (Liu and Du 2019). Inspired by this research, we aim to examine whether presentation format can enhance the effect of mixed comparative reviews.

The other factor, review valence, indicates the theme of an online review and conveys either a generally negative or positive sentiment of the reviewer toward the product or service (Pan et al. 2018). Valence contains product or service descriptions (desirable or undesirable) (Vermeulen and Seegers 2009). A positive review has been argued and accepted to result in high product attitude (Lee et al. 2008). However, its effect also depends on other factors, such as review skepticism, source

credibility, etc. (Xiao et al. 2019). In this study, we propose that the effect of review valence may depend on the review type (i.e., mixed vs. separate comparative review). Review readers may discount mixed comparative reviews' positive evaluation of the target product and consider it less sincere as the alternative product is attacked (Jain and Posavac 2004).

The study provides the following contributions: First, we propose the mixed comparative review and examine its effects on review value. Thus, this study contributes to existing online consumer review literature and comparative content literature. Second, we examine the moderating role of presentation format in influencing the effect of review type on review value. Accordingly, we contribute to existing visualization literature and cognitive load theory. Finally, we extend attribution theory to the context of comparative consumer reviews by studying the role of review valence in influencing product attitude.

THEORETICAL BACKGROUND

Mixed Comparative, Separate Comparative, and Regular Consumer Reviews

Sellers had used advertisements to promote their products long before consumer reviews were introduced. In the 1970s, comparative advertising was introduced and became popular. The increased popularity might be partly due to the Federal Trade Commission's informal encouragement of explicit comparisons (Wilkie and Farris 1975). Comparative reviews have three features. First, such reviews explicitly (e.g., Wilkie and Farris 1975) or implicitly (e.g., Jackson et al. 1979) evaluate at least two brands in the same generic product or service class. Second, comparative reviews evaluate brands on the basis of specific product/service attributes (Wilkie and Farris, 1975). Third, a mixed comparative review may be perceived as a negative comparison as it may include positive information about a sponsored brand and negative information about the competing brand (i.e., "You are bad, but we are good.") (Jain and Posavac 2004; Wu and Wen 2019).

Various studies are then conducted to study the effect of comparative advertising on generating attention, message, and brand awareness; message processing level; favorable sponsored brand attitude; purchase intention and behavior; source believability; attitude toward an advertisement (Grewal et al. .1997). Comparative advertisements are generally found more effective than noncomparative advertisements. However, attitude toward an advertisement is negatively affected when the advertisement is a negative comparative (Jain and Posavac 2004; Wu and Wen 2019). Although extensive literature evaluates the performance of comparative advertisements, to our knowledge, no study has focused on the value of comparative consumer reviews.

Review Value and Product Attitude

The adoption of review value and product attitude as our dependent variables is based on advertisement literature. Advertising objectives can be classified into two types, namely, cognitive and affective (Lavidge and Steiner 1961). The cognitive function provides information and facts to inform and educate consumers about sponsored brands. This definition implies that high informative content regarding target products increases the value of advertisements. By adopting this function into the consumer review context, valuable online reviews are those that provide highly relevant information about target products and motivate buyers to make appropriate purchase decisions. Customers attempt to understand the justifications of reviewers behind their shared opinions and subsequently assess review value based on their understanding (Singh et al. 2017).

Advertising's affective function induces liking and preference for sponsored brands; preference presumably refers to highly favorable attitude. This function can be evaluated by measuring consumers' attitude toward a product. In the advertisement application, such an attitude denotes consumers' feelings and overall attitude toward the target product. In this study, product attitude is adopted as a dependent variable to analyze the moderating effect of review type (i.e., mixed vs. separate comparative) with review valence as the independent variable. When the product information source

is a seller advertisement, comparative advertisements generate fewer favorable attitudinal responses toward the product than noncomparative advertisements (Gorn and Weinberg 1984). This context may be due to the perception of the comparison as the sellers' attack to the alternative brand, thereby causing users to derogate from the advertising source of the message (Wu and Wen 2019; Hsu 2018; Jain and Posavac 2004; Gotlieb and Sarel 1991; Wilkie and Farris 1975).

Review Presentation Format

Using presentation tools to organize content can positively affect the overall information delivered and increase the ease for readers to capture a considerable amount of data with less effort (Segel and Heer 2010). Visualization has long been used to support the delivered information, commonly in the form of diagrams, tables, and charts inserted into a large body of the text. By adopting Segel and Heer's (2010) proposed data visualization into online consumer reviews, visualized information in online reviews is expected to help potential buyers read through online reviews faster and obtain information more effectively than text information. As a result, we propose that categorizing product attributes and corresponding differences in tabular format can help potential buyers capture information more effectively than reading plain text with no visual categorization. Table 1 presents a mixed comparative review in tabular format.

Table 1. Proposed Mixed Comparative Reviews in Tabular Format

Attribute	iPhone	Galaxy
Camera software	Behind the scenes software for digitally capturing images is definitely the strongest sell for the iPhone. This feature was one of the reasons why I switched over from Galaxy S6 because I have started to dabble with photography and wanted a really good camera in my smartphone. ☺	Although the Galaxy S6 camera is amazing, the overall quality of pictures from the iPhone is higher. ☹
Processor reliability	I believe that the iPhone is more reliable than the Galaxy. I never experienced any crashes while using iPhone 6 for two months. ☺	I used a Galaxy S6 for the same amount of time and a similar application, and my cellphone crashed several times, so I had to restart it. ☹

Similarity and Difference With Extant Literature

Table 2 provides a summary of the major studies in the literature of online consumer reviews and advertisements and reveals that review value and attitude toward a product are two commonly consequently variables adopted in the online consumer review and advertisement literature to investigate the different types of online consumer reviews and advertisements (D'acunto et al. 2020; Filieri et al. 2019; Chen et al. 2016; Liu et al. 2015; Chen and Lurie 2013; Lee et al. 2008). Table 2 demonstrates that a couple of studies have investigated the effects of comparative advertisements on message value and product attitude. However, only few studies have examined the effects of comparative online reviews and review presentation formats in the context of online consumer reviews. Advertisements are produced by sellers, yet online reviews are generated by consumers. Thus, whether the prior findings in the advertisement literature can directly be applied to the online review context is unclear, which necessitates this current research. This study draws upon the cognitive load in multimedia learning (Mayer and Moreno 2003; Sorden 2012) and visualization research (Segel and Heer 2010) to shed light on the effects of comparative reviews and review presentation formats.

HYPOTHESIS DEVELOPMENT

Interaction Effect of Review Type and Presentation Format

We expect that presentation format (tabular vs. text) can moderate the effects of mixed comparative reviews (vs. regular reviews) on perceived review value. When the reviews are presented in pure text format, we predict no difference between mixed comparative reviews and regular reviews about one product. According to cognitive load and cognitive theory in multimedia learning, people have limited working memory to process incoming information. Thus, if a person's working memory is overloaded, then the learning process is negatively affected (Xu et al. 2013). When mixed comparative reviews are presented in text format, a buyer reads many words and sentences, analyzes the unorganized information, makes connections between text and product attributes, and decides which product is more favorable. This level of information processing may require high working memory and result in a brain overload condition. Meanwhile, regular reviews about one product have less complexity and therefore require less working memory. In sum, although mixed comparative reviews provide additional information about alternative products, the reviews are unorganized and may overload users; thus, mixed comparative reviews have limited added benefits over regular reviews.

When the reviews are presented in tabular format, although mixed reviews still push more information to buyers to process and therefore higher working memory is required, the tabular format of the reviews makes the analysis of product attribute information easier and more effective (Segel and Heer 2010), resulting in being more valuable than regular reviews. The cognitive theory of multimedia learning posits that "multiple-channel communications appear to be superior to single-channel communications when relevant cues are summated across channels" (Severin 1967, p. 397). That is, effective learning occurs when the number of available cues or stimuli increases (Moore et al. 2004; Severin 1967). In the online review context, visual cues, such as tabular format, may complement text cues to help users understand review contents. In this scenario, mixed comparative reviews provide additional information about alternative products but in an organized manner, which helps buyers capture information more effectively with less short-term memory involved. Therefore, tabular mixed comparative reviews can have more review value than regular reviews. We propose the following hypothesis:

H1a: The effect of review type on review value is moderated by the review presentation format, such that the mixed comparative review of two products is perceived to be more valuable when it is presented in tabular (vs. text) format than a regular review for a single product.

We then examine the moderating role of presentation format between mixed (vs. separate) comparative reviews and review value. When these reviews are presented in text format, the information of separate comparative reviews is already organized by the product because each of its reviews is written separately by a different reviewer about one of the two comparing products. Such categorized information can be analyzed faster than non-categorized information (Segel and Heer 2010) because online shoppers can easily identify the product information that they are interested in and obtain the information more effectively than the mixed comparative review about two alternatives (Appendix 1 Website 1). By contrast, the information in the mixed comparative reviews about a particular product is not easily separated and requires more short-term memory to process and digest the provided reviews. Thus, shoppers perceive mixed comparative reviews to have less review value than separate comparative reviews.

We expect that the positive effect of tabular (vs. text) presentation format will be more prominent for mixed comparative reviews but less salient for separate comparative reviews. On the one hand, simply adding a table surrounding the text content for each review does not lead to much difference for separate comparative reviews in text format. On the other hand, when mixed comparative reviews are presented in tabular format, the review comments about each product and its attributes are well

Table 2. Selected Consumer Review and Advertisement Literatures

Literature	Year	Context	Key constructs studied				
			Mixed comparative review	Review presentation format	Review valence	Review value	Attitude toward a product
D'acunto et al.	2020	Online reviews				X	
Filieri et. al	2019	Online reviews			X	X	
Bag et al.	2019	Online reviews					
Pan et al.	2018	Online reviews			X		X
Chen et al.	2016	Online reviews				X	X
Yin et al.	2016	Online reviews			X		
Liu et al.	2015	Online reviews					X
Paharia et al.	2014	Advertisements	X				X
Chen and Lurie	2013	Online reviews			X	X	
Sorden	2012	Multimedia learning		X			
Korfiatis et al.	2012	Online reviews			X	X	
Connors et al.	2011	Online reviews				X	
Decker and Trusov	2010	Online reviews				X	
Segel and Heer	2010	Visualization and learning		X			
Mudambi and Schuff	2010	Online reviews				X	
Vermeulen and Seegers	2009	Online reviews			X		
Lee et al.	2008	Online reviews			X		X
Park et al.	2007	Online reviews				X	
Mayer	2003	Multimedia learning		X			
Grewal et al.	1997	Advertisements	X				
Gotlieb and Sarel	1991	Advertisements	X				
Gorn and Weinberg	1984	Advertisements	X				X
Kelly	1972	Advertisements					X
Current study	2020	Online reviews	X	X	X	X	X

organized (Appendix 1 Website 7). Thus, the required cognitive memory to process each of the product's information is less than mixed comparative reviews in text. In addition, a mixed comparative review is written by one person and thus avoids inconsistent consumer preferences that may exist between separate comparative reviews about two alternative products written by two consumers, which, in turn, result in review readers' confusion. Thus,

H1b: The effect of review type on review value is moderated by the review presentation format, such that mixed comparative reviews are perceived to be more valuable if presented in tabular (vs. text) format than separate comparative reviews.

Interaction Effect of Review Type and Review Valence

In this section, we investigate how the effect of positive (vs. negative) review valence on product attitude is moderated by review type (mixed vs. separate comparative review). Consumers form beliefs about a product on the basis of the information they receive. In product attitude literature, positive information provided by an advertisement results in a positive product attitude, whereas negative product information degrades perceived product attitude (Lee et al. 2008). Such conformity is the tendency of opinions to establish a group norm and the tendency of individuals to comply with that norm.

Consistent with this line of literature, we also expect that positive review valance improves product attitude regardless of the review type; however, we predict that this impact is less when reviews are mixed (vs. separate) comparative. Advertising literature suggests that comparative advertisements do not necessarily improve consumers' attitude toward a target product. That is, negative information about an alternative product in an advertisement can be interpreted as a seller's attack against the competing product. This comparison can cause a lack of trust toward the advertisement and therefore less favorability for the target product (Gorn and Weinberg 1984; Gotlieb and Sarel 1991; Jain and Posavac 2004; Hsu 2018; We and Wen 2019). By adopting this concept to the context of comparative consumer reviews, when positive information about the target product is posted along with negative opinions regarding the competing product in a mixed comparative review, the positive review valence of the target product can be mitigated. Separate comparative reviews will not have such issues as the reviewers are provided by two different writers.

Our prediction can also be supported by attribution theory. According to this theory, consumers form attributions about an advertisement and a sponsored product on the basis of their evaluation of reasons why a claim has been made (Kelly 1972; Gotlieb and Sarel 1991; Jain and Posavac 2004; Hsu 2018; Wu and Wen 2019). In the context of comparative advertisements, Jain and Posavac (2004) found that users had a negative impression on advertisement believability about the sponsored brand of jeans when the advertiser disseminated negative information about a competitor. Such negative comparisons are discounted by advertisement viewers because consumers consider spreading competitors' negative information as acting in the interest of the advertiser (Jain and Posavac 2004). Thus, viewers will have less trust in the advertiser. We apply attribution theory and Jain and Posavac (2004)'s reasoning to our context. When readers are exposed to a negative comparison (i.e., negative review for an alternative product) in a mixed comparative review, they will perceive a higher manipulative intent from the review writer (Chang 2007). They form attributions about the target product with positive review valence and suspect the credibility level of the positive message (Wu and Wen 2019; Hsu 2018; Jain and Posavac 2004; Fein et al. 1993) in the mixed comparative review written by the review writer. As the credibility of the review about the target product is discounted, so does the product attitude. Thus, we propose the following:

H2: The effect of positive online review valence on product attitude toward a target product attenuates when the review is mixed (vs. separate) comparative.

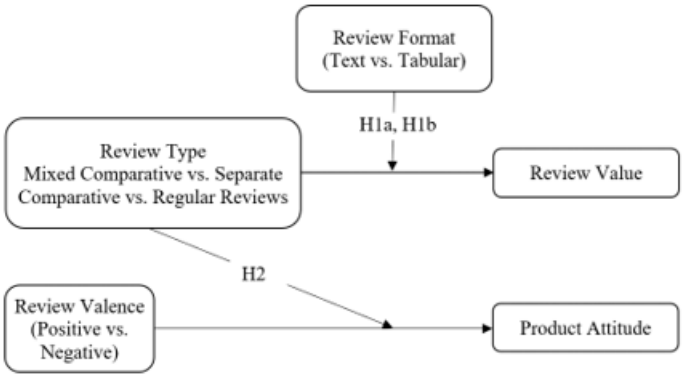
Figure 1 illustrates the research model summarizing the proposed hypotheses.

Study Setting

We tested the aforementioned hypotheses through a laboratory experiment with a 3 (mixed comparative vs. separate comparative vs. regular review) x 2 (text vs. tabular presentation format) x 2 (positive vs.

negative review valence) between-subject design. Accordingly, 12 different websites were built, each with seller-provided information about the products followed by either one or two reviews. The websites differed in the types of reviews, review presentation formats, and review valences. Table 3 presents the experimental designs and manipulations. Appendix 1 shows the screenshots of all 12 websites.

Figure 1. Research Model



Prior to the main laboratory experimentation sessions, a pilot study was conducted wherein we first presented the survey to five participants, including professors and graduate students. This process helped us identify several opportunities for improvements. First, we confirmed that the product (i.e., mobile phone) presented on the websites is of interest to most people. Second, the participants suggested removing distracting items from the websites that may confound the results among the

Table 3. Experimental Designs and Manipulations

Website Group	Review type	Format	Product	iPhone valence	Samsung valence	Group size
1	Mixed comparative	**Text**	iPhone and Samsung	Positive	Negative	15
2	Mixed comparative			Negative	Positive	18
3	Separate comparative			Positive	Negative	18
4	Separate comparative			Negative	Positive	16
5	Regular review		iPhone only	Positive	NA	17
6	Regular review			Negative	NA	17
7	Mixed comparative	**Tabular**	iPhone and Samsung	Positive	Negative	18
8	Mixed comparative			Negative	Positive	17
9	Separate comparative			Positive	Negative	17
10	Separate comparative			Negative	Positive	16
11	Regular review		iPhone only	Positive	NA	16
12	Regular review			Negative	NA	16

different experimental groups. Last, we refined the wording of ambiguous items and eliminated the redundant or confusing ones.

We advertised the experiment in four different classes representing students from three different colleges. Subjects were informed that they would receive extra credit for their participation. As an additional incentive, a $50 Best Buy gift card was offered through a raffle drawing. We recruited 201 students from a large public university in Midwestern United States. All sessions were facilitated by the first author. The participants started by answering a demographic questionnaire. They were then assigned randomly to an experimental website. The experimental task for the participants was to read sellers' product information, followed by online reviews. Subsequently, the participants completed the experiment survey by answering the questions with measurement items for the dependent variables (e.g., review value and product attitude) and manipulation checks. On average, the participants spent 19 minutes to complete the experiment.

Manipulation Checks and Measurement

All variables in this study, such as valence, review value, attitude toward a product, review type, and review format, were measured using a seven-point Likert scale (1 = strongly disagree; 7 = strongly agree). Table 4 shows the adopted measures and corresponding sources.

As a manipulation check for review type, subjects were asked to determine whether the assigned reviews were comparative by using a seven-point scale, with 1 for "not comparative" and 7 for "very comparative." Evidently, the subjects could distinguish regular reviews about one product, separate comparative reviews about two products, and mixed comparative reviews with averages of 2.92, 4.06, and 6.19, respectively.

We also asked the participants to specify whether they can distinguish tabular-format reviews from text-format reviews, wherein "7" denotes tabular, and "1" denotes text. We used a Likert scale, rather than a dichotomous scale (which asks for "yes" or "no" only), given that each tabular review also includes text. The results are consistent with the study design, with average values of 5.70 for tabular reviews and 2.47 for text reviews. Finally, we checked the review valence regarding the study products, where "7" ("1") denotes "very positive" ("negative") reviews. Subjects rated the positive reviews about iPhone as 5.97 and negative reviews as 2.81. Similarly, the average values for positive Samsung reviews were 5.70 and 2.61 for negative reviews.

Data Analysis

In this study, subjects were recruited from a large public university in the United States, including three colleges and 10 majors, thereby representing diverse backgrounds. After scanning through responses, nine subjects were excluded as their survey completion time was not long enough to assure enough attention to the survey questions. Among the 201 subjects, 155 were males, and 46 were females. The average age was 24.3. No significant difference was observed in age ($p = 0.38$) and gender ($p = 0.28$) distribution across the 12 groups. The Cronbach's alphas of 0.82 for familiarity with online reviews and 0.87 for familiarity with mobile phone attributes (product knowledge) attested to construct reliability (Fornell and Larcker 1981). To aid in interpreting the results, we report the average of the measurement items (Appendix 2) used in the scale for users' familiarity with online reviews and product knowledge, which have obtained 5.4 and 5.3, respectively, on a seven-point Likert scale.

We tested the proposed hypotheses by using statistical models, including covariance tests.

To support the reliability of individual items and the internal consistency of the constructs,

the Cronbach's alpha for each construct was calculated. All variables met the suggested tolerances (> .70, Fornell and Larcker 1981). Table 5 reports the results. To test the construct validity, the exploratory factor analysis of the review value and attitude toward the study products was performed with varimax rotation (Table 6). Without exception, all items loaded highly (loading ^{3} 0.70) on their associated factors, confirming the convergent validity of the factors. Two factors emerged with no cross-construct loadings exceeding 0.10. That is, the loadings of a given construct's indicators were

Table 4. Construct Definitions and Sample Measurements

Variable	Variable definition	Survey question	Reference
Valence	Theme of an online review that conveys either a generally negative or positive sentiment of a reviewer toward a product or service	• Do the provided reviews deliver positive information about iPhone 6/ Samsung Galaxy? • How positive or negative did you perceive the iPhone 6/Samsung Galaxy reviews?	Chen and Lurie (2013)
Review value	Usefulness of the information provided by a consumer review	• How helpful was this review? • Do you think the provided review is helpful in making a purchase decision?	Chen and Lurie (2013)
Review type	1) Mixed comparative reviews: reviews written by one person containing comparisons among the attributes of two products. 2) Separate comparative reviews: two reviews written by two different individuals. Each review is about one different product. 3) Regular reviews: reviews written by one individual focusing on one product only, common type in current marketplaces	Comparative reviews are those written by one user to compare two different products at the same time. Based on this definition, do you think the website has any comparative review? • The consumer reviewed one cellphone only. • The consumer reviewed one cellphone in relation to the other cellphone. • The consumer reviewed two cellphones separately.	Based on advertisement literature (e.g., Wilkie and Farris 1975)
Review format (tabular or text)	In a tabular review, all attributes are listed in table format, along with the reviewer's comments for each attribute. In a text review, the attributes are discussed in text format.	• The website presented the consumer review in tabular format. • The consumer review was represented in a table that contains the review. • The consumer review was represented in the form of several short paragraphs that contain the relevant review.	Based on advertisement literature (Segel and Heer 2010)
Product attitude	Beliefs consumers form about a product on the basis of the information they receive	• I like the iPhone 6/Samsung Galaxy better after reading the review. • After reading the review, I have formed a favorable impression toward iPhone 6/ Samsung Galaxy.	Jiang and Benbasat (2007), and Lee et al. (2008)

higher than the loadings of any other. In all cases among the cross-loadings, the differences were greater than .80. These findings had further supported the discriminant validity of these variables.

Analysis of Proposed Hypotheses

To test H1a and H1b, we conducted two ANCOVAs with review value as the dependent variable to examine the interaction effect between review type and presentation format. The following variables were controlled in this study: participants' age, gender, product knowledge, and product importance. Table 7 and Figure 2 present the results. None of the control variables were significant ($p > 0.05$), but the interaction effect was significant ($p < 0.05$), thus supporting H1a. As illustrated in Figure 2, the y-axis shows the perceived review value, whereas the x-axis shows the review type. When reviews are in text format (solid line), regular reviews were not statistically different from mixed comparative reviews in terms of perceived review value ($p > 0.05$); however, when reviews are presented in tabular format (dashed line), mixed comparative reviews were perceived to be more valuable than regular reviews ($p < 0.05$, one-tailed). Figure 2 shows that tabular mixed comparative reviews were significantly better than text regular reviews ($p < 0.05$). The difference between text

Table 5. Internal Consistency of Constructs

Construct	Cronbach's Alpha
iPhone Valence	.93
Samsung Valence	.97
Review Value	.98
Review Type	.76
Review Format	.78
Product Attitude- iPhone	.92
Product Attitude- Samsung	.97

Table 6. Loading and Cross *Loading of Measures*

	Review Value	Product Attitude
Review Value 1	**0.976**	0.034
Review Value 2	**0.985**	0.018
Review Value 3	**0.981**	0.026
Product Attitude 1	0.027	**0.959**
Product Attitude 2	0.045	**0.922**
Product Attitude 3	0.003	**0.913**

versus tabular format for regular reviews was not significant ($p > 0.05$). By contrast, the difference between text versus tabular format for comparative reviews was large ($p < 0.001$).

Solid line: text format.

Dashed line: tabular format

Note: Effect of review type on review value with the format as moderating factor

Another ANCOVA was performed to test H1b. Table 8 and Figure 3 report the analysis results. Table 8 reveals that the interaction effect between review type and presentation format was significant. Similar to Figure 2, the y- and x-axes in Figure 3 represent review value and type, respectively. In the text format (solid line in Figure 3), separate comparative reviews were perceived to be more valuable than mixed comparative reviews ($p < 0.01$); however, in tabular format (dashed line), no difference existed between mixed and separate comparative reviews ($p > 0.05$). In summary, the effect of review type on review value is moderated by the review presentation format, such that mixed comparative reviews in text (vs. tabular) format are perceived to be less valuable than separate comparative reviews, thereby supporting H1b. In addition, we observed that the review value difference between text and tabular format for separate comparative review was small, indicating no significant difference ($p > 0.05$). By contrast, when reviews are mixed, the tabular format was found better than text format in review value ($p < 0.01$).

To test H2, we ran two separate regressions as we have two dependent variables (one for product attitude toward iPhone, the other for Samsung). Tables 9 and 10 illustrate the regression results for iPhone and Samsung, respectively. Review valence had a significant main effect on product attitudes for both products ($p < 0.001$). That is, regardless of review type, positivity in review valence results in high product favorability. The interaction effect between review valence and review type was significant for both products ($p < 0.05$). In mixed comparative reviews, the negative information on

Table 7. ANCOVA Summary Table for Review Value H1a

Dependent variable: review value					
Source	**Sum of squares**	**df**	**Mean square**	**F**	**Sig.**
Corrected Model	65.800[a]	7	9.400	4.093	0.000
Intercept	6.085	1	6.085	2.650	0.106
Product Knowledge	0.330	1	0.330	0.144	0.705
Gender	1.354	1	1.354	0.589	0.444
Age	3.461	1	3.461	1.507	0.222
Product Importance	3.702	1	3.702	1.612	0.207
Review Type	0.002	1	0.002	0.001	0.977
Review Format	29.951	1	29.951	13.040	0.000
Review Type * Format	10.650	1	10.650	4.637	0.033
Error	289.395	126	2.297		
Total	3038.778	134			
Corrected Total	355.195	133			

Note: H1a was tested on the basis of the subjects assigned to groups with regular reviews about one product and groups with mixed comparative reviews

Figure 2. Mixed Comparative Reviews vs. Regular Reviews about One Product

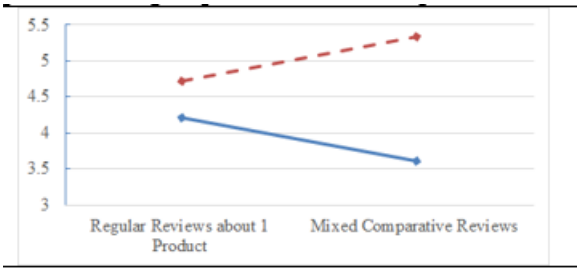


Figure 3. Mixed vs. Separate Comparative Reviews

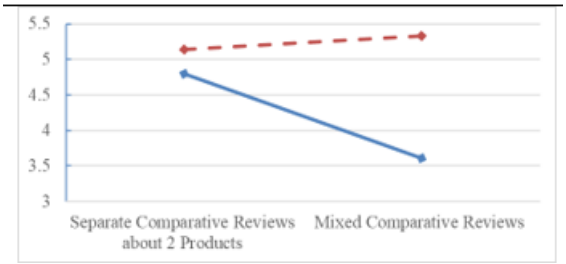


Table 8. ANCOVA Summary Table for Review Value H1b

Dependent variable: review value					
Source	**Sum of squares**	**df**	**Mean square**	**F**	**Sig.**
Corrected Model	74.393[a]	7	10.628	4.457	0.000
Intercept	14.408	1	14.408	6.043	0.015
Product Knowledge	1.219	1	1.219	0.511	0.476
Gender	1.104	1	1.104	0.463	0.497
Age	0.155	1	0.155	0.065	0.799
Produce Importance	11.596	1	11.596	4.863	0.029
Review Type	10.299	1	10.299	4.319	0.040
Review Format	25.325	1	25.325	10.621	0.001
Review Type*Format	13.544	1	13.544	5.680	0.019
Error	302.828	127	2.384		
Total	3398.667	135			
Corrected Total	377.221	134			

Note: H1b was tested on the basis of the subjects assigned to groups with separate comparative reviews and groups with mixed comparative reviews.

Table 9. Regression Model for H2 (product attitude for iPhone)

		Unstandardized Coefficients		Standardized Coefficients		
Model		**B**	**Std. Error**	**Beta**	**t**	**Sig.**
1	(Constant)	1.300	1.291		1.006	0.316
	Age	0.023	0.176	0.009	0.128	0.898
	Gender	-0.023	0.323	-0.005	-0.073	0.942
	Product Importance	-0.021	0.122	-0.012	-0.172	0.864
	Product Knowledge	0.256	0.126	0.145	2.036	0.044
	Review Type	0.609	0.354	0.158	1.719	0.088
	iPhone Valence	3.103	0.364	0.804	8.525	0.000
	iPhone Valence* Review Type	-1.276	0.521	-0.284	-2.448	0.016
a. Dependent variable: iPhone Product Attitude						

the alternative product induces a potential buyer to feel biased regarding the target product; therefore, product favorability still increases but not as much as in the case of separate comparative reviews (Figures 4 and 5). The negative coefficients for the interaction terms in both models support this argument.

DISCUSSION

Overall, the results supported all the hypothesized relationships in our proposed model.

Table 10. Regression Model for H2 (product attitude for Samsung)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.038	1.104		1.845	0.067
	Age	0.127	0.148	0.055	0.861	0.391
	Gender	-0.055	0.271	-0.014	-0.204	0.839
	Product Importance	-0.010	0.103	-0.006	-0.097	0.923
	Product Knowledge	-0.069	0.106	-0.043	-0.654	0.514
	Review Type	0.787	0.320	0.226	2.462	0.015
	Samsung Valence	2.899	0.306	0.832	9.478	0.000
	Samsung Valence* Review Type	-0.897	0.438	-0.226	-2.047	0.043
a. Dependent Variable: Samsung Product Attitude						

Figure 4. Moderating Effecct of Review Valence on Product Attitude toward iPhone

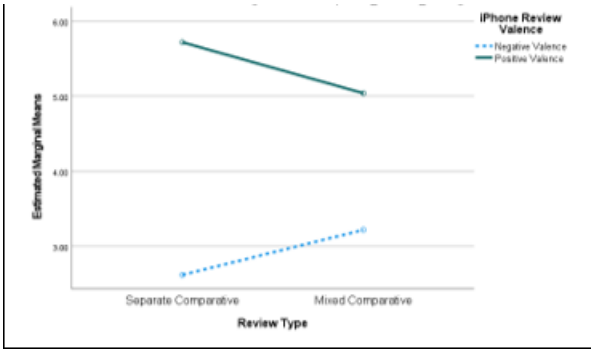
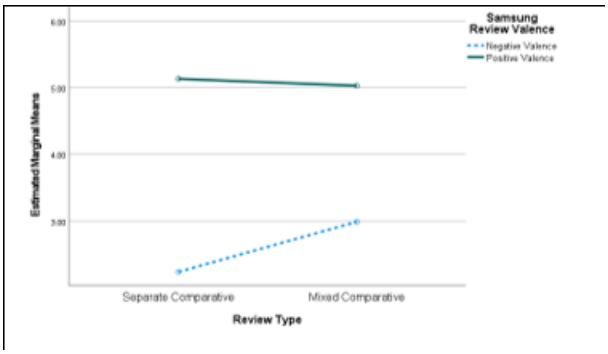


Figure 5. Moderating Effect of Review Valence on Product Atitude toward Samsung



As one of the main objectives of this study, we introduce a new method of recording and presenting online reviews that can increase review value. The results of H1a and H1b, which focused on interactions between review types and presentation formats, are consistent with the consolidation of visualization effects (Segel and Heer 2010), cognitive load (Sweller 1988), and cognitive theory of multimedia learning (Mayer and Moreno 2003; Sorden 2012). A textual mixed comparative review does not lead to higher review value than a regular or separate comparative review, given that the former contains more unorganized information and requires more cognitive load than the latter. Meanwhile, categorizing information in tabular format, predicted by the cognitive theory of multimedia learning, was confirmed to help a buyer capture highly informative content with less memory load. Therefore, valuable review information can be delivered to the buyer by providing a mixed comparative review in tabular format.

The proposed mixed comparative review in tabular format is an innovative online review presentation. The closest field of study to this research is comparative advertisements in various media, such as television and radio (Grewal et al. 1997; Byun and Jang 2018; Soscia et al. 2010). Advertisement and online reviews are different as one's content is generated by sellers, and the other is created by consumers. When comparative online reviews are presented in tabular format, their positive effects are similar to those of comparative advertisements (Hill et al. 2004). By contrast, when mixed comparative reviews are presented in plain text format, their superior effects weaken. These results are different from advertisement literature, which shows that comparative advertisements are more persuasive than noncomparative advertisements.

Although not hypothesized, a direct relationship between presentation format and review value was found ($p < 0.001$), as shown in Tables 7 and 8. These findings imply the importance of the proposed tabular format used in presenting online reviews, given the reduction of the cognitive load with the tabular format based on cognitive load theory. This outcome is consistent with prior studies found in other contexts, such as learning and education (Segel and Heer 2010; Sorden 2012). However, to the best of our knowledge, our study is one of the pioneers to introduce this tabular format to the online review context and examine its significance.

H2 proposes that the positive valence of online reviews results in high product favorability regardless of review type; however, in a mixed comparative review, negative information about an alternative product induces a buyer to perceive that the review is biased toward the target product. Thus, product favorability still increases, but not as much as regular or separate comparative reviews. In this study, we adopted attribution theory (Kelly 1972) in comparative advertisement literature as a theoretical lens to examine the effect of review valence on product attitude when reviews are mixed comparative. When a potential buyer reads an online review with positive valence about the target product and negative information about the competing product, the entire message is considered a negative comparison (Jain and Posavac 2004). In the case of negative comparisons, which have been introduced in this study as mixed comparative reviews, readers attribute the target product's positive message as manipulated and accordingly suspect the reviewer's sincerity (We and Wen 2019; Hsu 2018; Jain and Posavac 2004; Fein et al. 1993). They may suspect that the review writer has a biased view of the product or opted not to report or disclose certain factors or points of view. Such suspicion can negatively affect readers' attitude toward the target product.

Although the effect of review valence on product attitude is examined in the context of comparative reviews for the first time in this research, the results are consistent with comparative advertisement literature where negative information about an alternative product does not necessarily improve the attitude toward the target product (Gotlieb and Sarel 1991; Jain and Posavac 2004; Chang 2007; Hsu 2018; Wu and Wen 2019). For example, Gotlieb and Sarel (1991) empirically found that users doubt the advertisement credibility of a sponsored brand when another brand of video cassette is bad-mouthed. Similarly, Hsu (2018) revealed that viewers have less trust in the sponsored brands of a mobile phone carrier when negative messages about its competitor are also stated. Their attitude

toward the target product is reduced due to the lack of trust in advertisement credibility when negative information about the competing product is disseminated.

THEORETICAL CONTRIBUTIONS

This study provides several theoretical contributions. First, we advance the online consumer review literature by proposing the mixed comparative review and examining its effect on review value. Extant consumer review literature has mainly investigated the influences of review volume (Guo and Zhou 2016), review length (Mudambi and Schuff 2010), review valance (Filieri et al. 2019; Chen and Lurie 2013), and review star rating (Li et al. 2020). To the best of our knowledge, this study is the first to propose the review type of mixed comparative reviews. We contribute to the literature by proposing mixed comparative reviews and subsequently categorizing product attributes in tabular format as a new type of marketing tool, which can be used to improve the value of online reviews. The results of this study expand the values of comparative ads into consumer reviews.

Second, this study contributes to the understanding of comparative content literature. Advertisement literature shows that comparative advertisements are generally more valuable (Grewal et al. 1997; Byun and Jang 2018; Soscia et al. 2010) than noncomparative advertisements. However, by applying this notion to online consumer reviews, comparative reviews are found not necessarily more valuable than noncomparative reviews. When reviews are presented in text format, separate comparative reviews are perceived to be more valuable than mixed comparative reviews. By contrast, mixed comparative reviews presented in tabular format with categorized information about product attributes are perceived to be more valuable than text reviews with unorganized information about product attributes.

Third, we draw upon and contribute back to the cognitive theory of multimedia learning (Mayer and Moreno 2003). Comparative reviews help buyers extract more information than regular online reviews, and the tabular format helps buyers reduce their cognitive load in digesting review information. Thus, we study the interaction between an innovative review type and presentation format. The findings contribute to these theories by extending the application to the context of contemporary online consumer review, particularly with mixed comparative reviews.

Finally, we extend attribution theory to the context of comparative consumer reviews by studying the effect of review valence of the target product (vs. competing alternative product) on product attitude. Negative information about the alternative product in mixed comparative reviews reduces the positive effect of review valence on product attitude toward the target product. This finding is supported by attribution theory (Kelly 1972; Gotlieb and Sarel 1991; Jain and Posavac 2004; Chang 2007; Hsu 2018; Wu and Wen 2019). However, this finding challenges previous research asserting that positive valence in reviews always results in high product attitude (Lee at al. 2008). Our finding is reasonable, given that the negative review valence about the alternative product may trigger buyers' suspicion on reviewers' motive in writing the reviews.

PRACTICAL CONTRIBUTIONS

This study also has several implications for practitioners. For many years, comparative advertisements have been used to convince buyers to choose supported products, and the majority of studies in academia and business sectors have shown the effectiveness of such advertisements. After introducing consumer reviews as a new and well-accepted marketing tool, we felt the need to study this field to determine the value of comparative consumer reviews.

The findings of this research can be used by business model developers in online marketplaces to create a new online review infrastructure. Consequently, businesses can convince consumers with experience on alternative products to share their opinions by using mixed comparative reviews in tabular format if they experience using target and alternative products. Although certain online

websites, such as CNET, have already performed this strategy, they obtain the opinions of experts and not those of regular users. Our study results reveal that such comparative reviews in tabular format provide the most review value.

The results likewise indicate that the presence of a negative opinion about an alternative product negatively affects a buyer's attitude toward the competing product that has a positive valence. That is, negative information about one product in mixed comparative reviews reduces the creation of a positive attitude toward the competing product that has a positive valence. This finding can help marketing experts decide when mixed comparative reviews are more appropriate than regular reviews. When a consumer wants to express his/her opinions about alternative products on two sides of the satisfaction spectrum, regular reviews about either one or two products can be more appropriate in terms of product attitude. However, when the consumer's opinions about alternative products are only slightly different and cannot be distinguished, mixed comparative reviews should be more valuable and can simultaneously create greater product attitude than regular reviews.

LIMITATIONS AND FUTURE RESEARCH

The limitations of this research are acknowledged, and possible future research suggestions are indicated as follows: First, the parsimony of our proposed model suggests that certain additional variables may help explain key variables and moderate the strength of relationships within the model. For example, product type, product knowledge (Xu et al. 2011), and personal relevance may moderate the impacts of review type and format. Second, consumers' actual purchase behavior is not examined in this study. Such research can further advance toward recognizing the values of review type and format in online marketing. Therefore, future researchers should study the effect of value on consumers' actual purchase behavior. Third, our proposed review format is lacking in existing sellers' websites. Although our new review presentation format is the main contribution of this study, this limitation hinders us from validating our research by using existing real reviews. Field experiments are necessary when online merchants adopt our proposed review presentation.

Fourth, the participants were mostly university students. Among the 201 participants, 195 had smartphones; 159 had either an iPhone or Samsung. Thus, reading online reviews and shopping for smartphones were common occurrences and a natural fit for our research design. Over 60% of the students in the university had full- or part-time jobs. In addition, 32.3% of the participants were over 26 years old, whereas 10.4% were over 31 years old. Nevertheless, readers should exercise caution in generalizing the results of this study to other demographic groups. To generalize the experimental results, conducting additional studies with different subject demographics and settings may be necessary.

The final limitation lies within the failure of the study to control for the review length in the manipulation of the positive versus negative reviews of products. Prior research indicated that review length does not have a significant effect on certain dependent variables, such as satisfaction with review (Adewoyin et al. 2016), purchase intention (Lin et al. 2007), attitude toward review (Lui et al. 2015), and review helpfulness (Korfiatis et al. 2012). However, review length may likely affect users' judgment on review value and buyers' attitude toward a product. Thus, rigorously including this factor in the experiment design to verify its role will be prudent for future research.

CONCLUSION

Guided by cognitive load theory and visualization literature, this study proposes a new and effective method for collecting and presenting online consumer reviews, namely, mixed comparative online reviews in tabular format. We compare this review type to separate comparative and regular reviews. We develop 12 websites containing different types of reviews and analyze the data collected from 201 participants. The results show that mixed comparative reviews do not create any advantage over

separate comparative or regular reviews when reviews are presented in text format. However, when reviews are in tabular format, mixed comparative reviews exhibit a greater review value to potential buyers than regular reviews. Moreover, although positive review valence results in high product attitude, this effect weakens in mixed comparative reviews when one product has a positive valence, whereas the alternative product has a negative valence.

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APPENDIX 1.

Screenshots of Websites Showing Various Treatments

Figure 6.

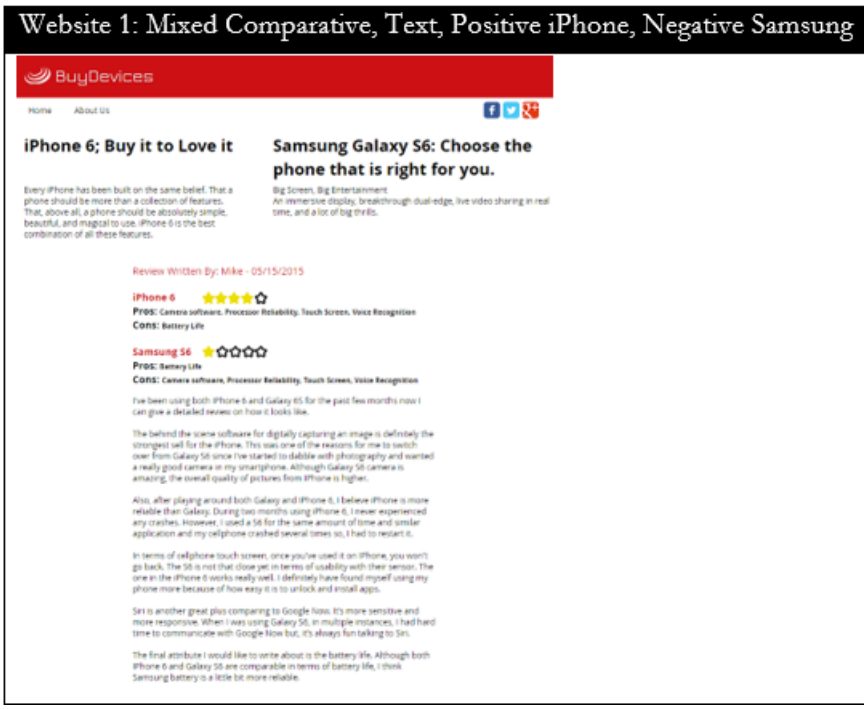


Figure 7.

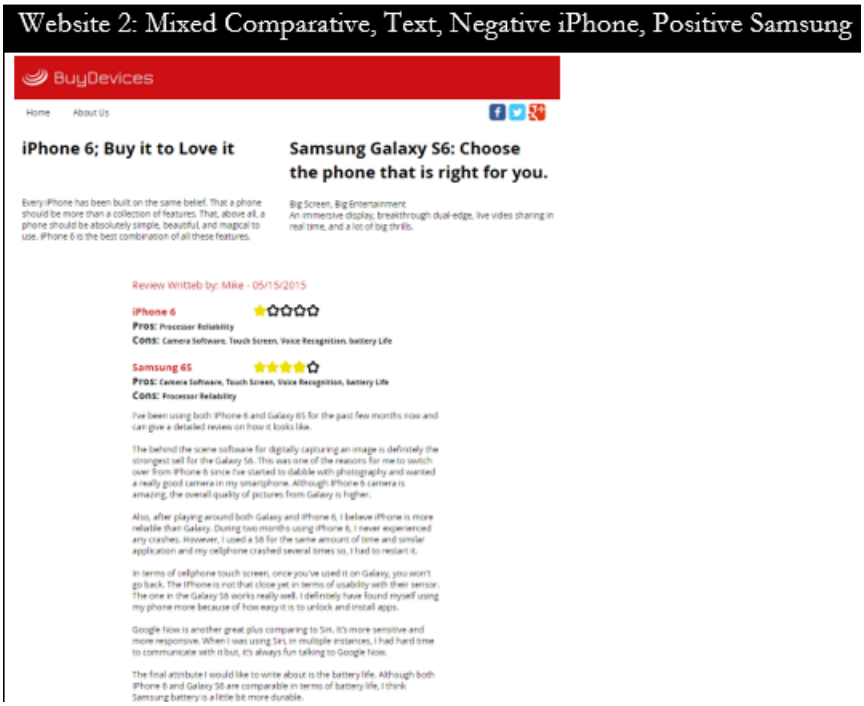


Figure 8.

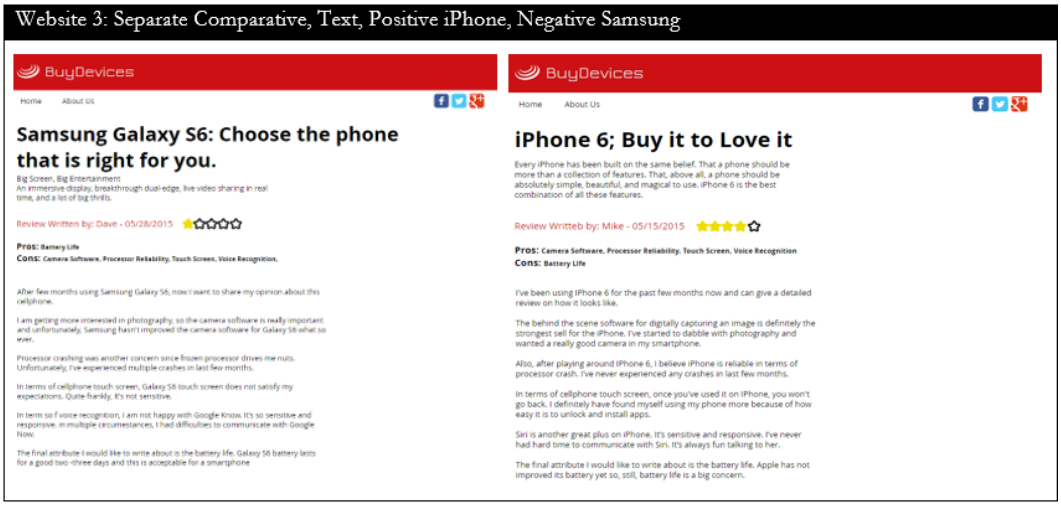


Figure 9.

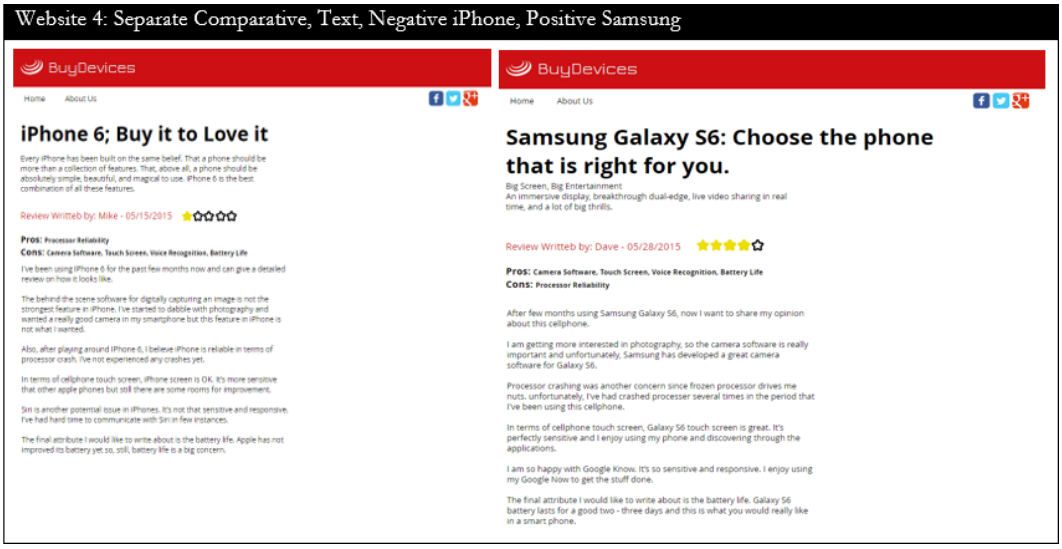
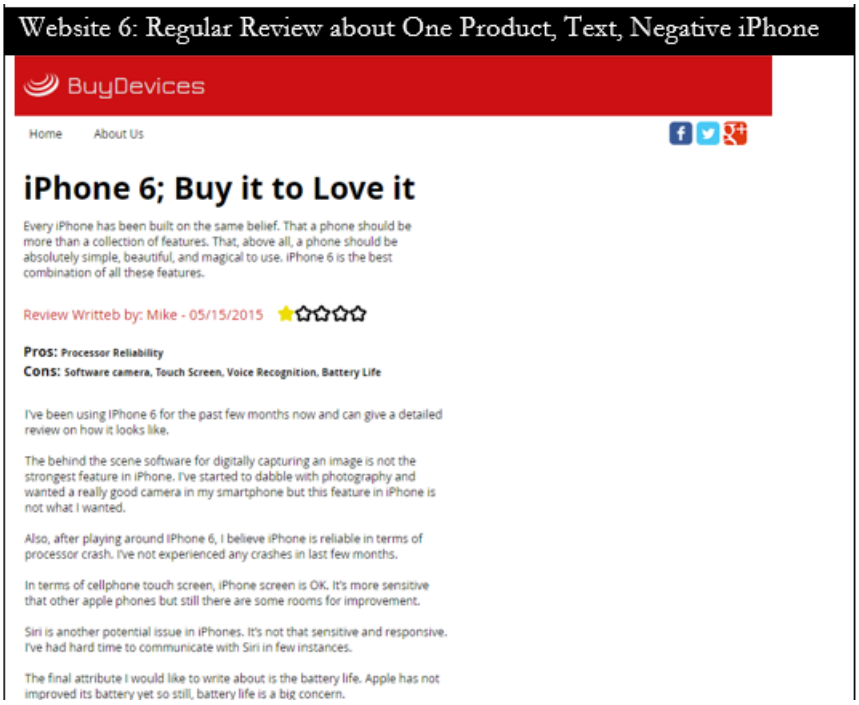


Figure 10.

Figure 11.



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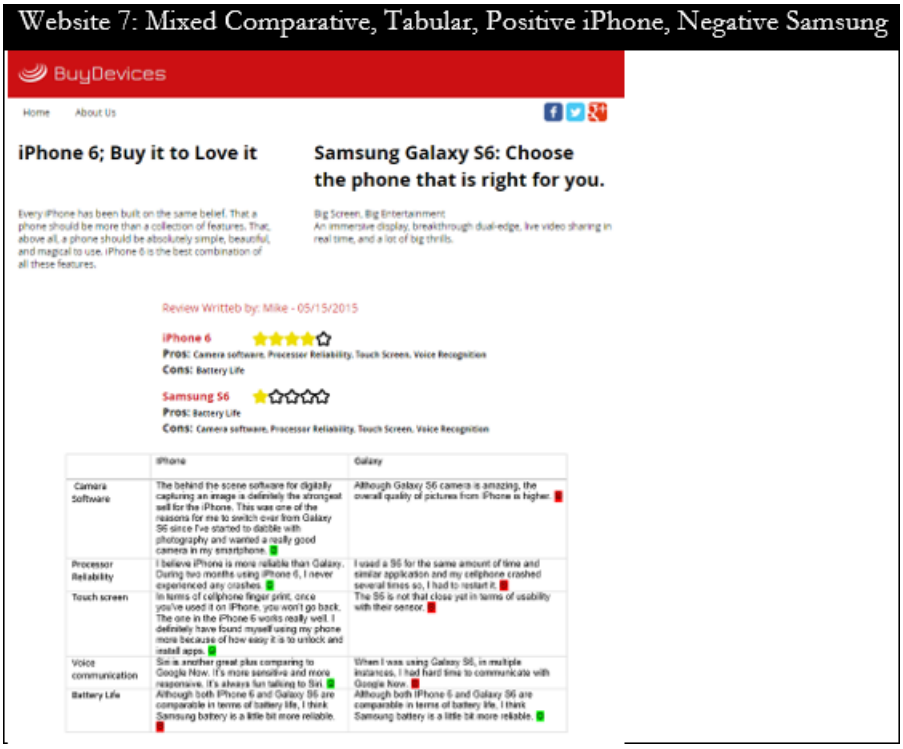

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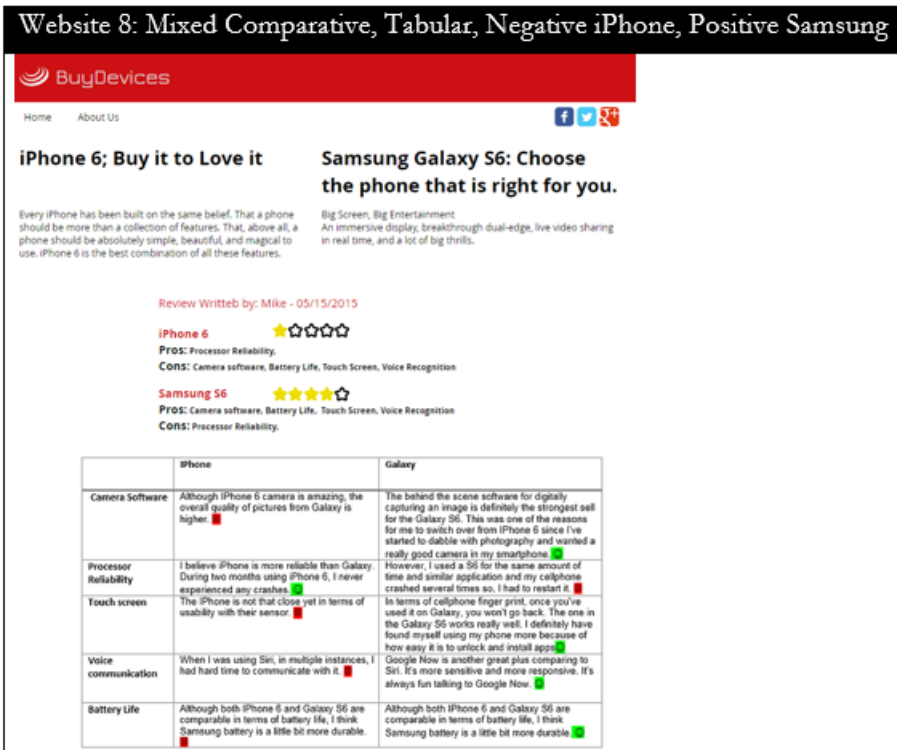

Figure 14.

Figure 15.

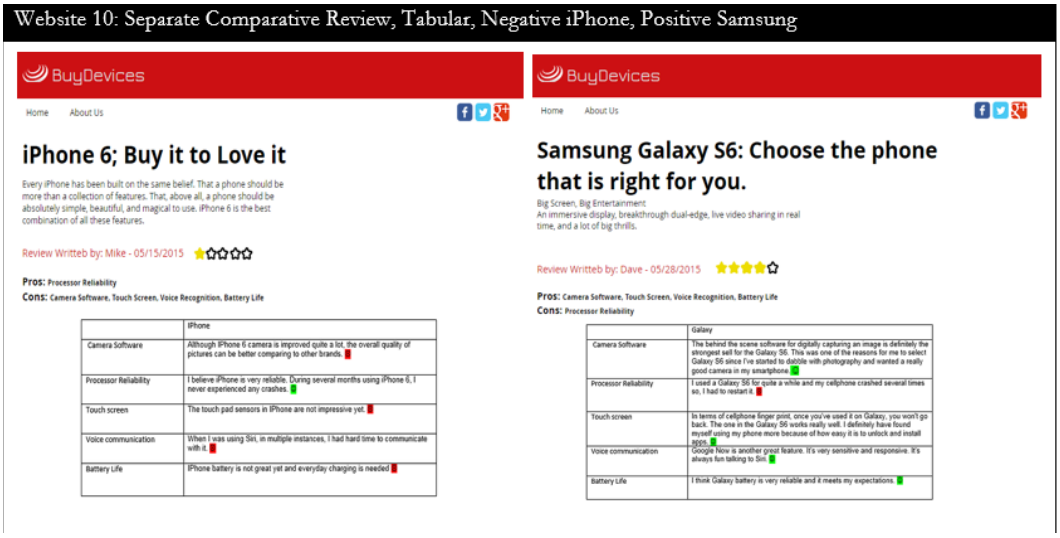

Figure 16.

Figure 17.

APPENDIX II.

Measures for Familiarity with Online Reviews and Product Knowledge

Table 11.

Variable	Measurement item
Familiarity with the online review	• When I buy a product online, I always read online reviews that are presented on web sites. • When I buy a product online, the online reviews presented on web sites are helpful for my decision making. • When I buy a product online, reading the online reviews presented on web sites provides me with benefits.
Product knowledge	• I am knowledgeable about cellphone attributes. • Compared with experts, to what degree would you say that you have a good knowledge about cellphones attributes? • I am familiar with cellphone attributes.

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