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What Makes a Helpful Online Review When Information Overload Exists?

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Abstract: With the increasing of online reviews, information overload has become a major problem in online community. What makes a helpful online review when information overload exists? In this study, the research model is developed to examine the helpfulness of online consumer reviews when information overload exists. Information quality is measured by review length and pictures in the model. The result is showed the relationship between review length and review helpfulness is usually described as an inverted U curve. The impact of review length and picture review on helpfulness is stronger when information overload exists. The impact of is also stronger with negative reviews than without negative reviews. As a result, our findings help extend the literature on information diagnosticity within the context of information overload.

Keywords: Online Review, Information Overload, Negative Review

1. INTRODUCTION

A large number of studies have analysed the relationships between information overload, information processing, and decision quality at the individual level when purchasing online^[1]. Inconsistent results have been found in the relationships about the buying process online. Several studies found negative effects from online information overload, while others obtained opposite results^[2]. At each step of the search process, the consumer trades off search costs with the likelihood of getting useful product information, which may eventually lead to a purchase or to stopping the search process without purchase. So there is an intermediate amount of information that maximizes the consumer's expected utility from the search problem. The previous studies showed that a user's effectiveness suffers when consumers are provided with too much information in a limited amount of time, such that it exceeds their processing limits^[3]. However, what makes a helpful online review when information overload exists? What should the platform do so that online reviews will get more prominent and be more helpful for consumers?

The paper is structured as follows. The next section outlines the background and literature of this study. Then the research hypotheses and model are developed. After that the data and methodology of this study are discussed. Subsequently, data analysis and empirical results are examined. Finally, the paper ends with conclusions.

2. LITERATURE REVIEW AND HYPOTHESIS

The information quality of online reviews can be determined by several factors including persuasive strength, review length, valence and so on. The persuasive strength of arguments embedded in an informational message plays an important part in information quality. In order to enhance the persuasive strength, long reviews which provide more detailed information are more helpful. Longer reviews include detailed product

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information regarding how and where the product was purchased and used in specific contexts. So it has been confirmed by several recent studies that long reviews are more helpful in the consumer decision-making process.

However, longer reviews may lead to higher reading costs so the review helpfulness becomes lower after a certain point. People may find themselves fast in losing interest and focus when they read the same type of information online because the endless stream of unlimited text makes it difficult to stay on one task for a long time^[4]. The increase in the utility presented in the review may be offset if a review is too long and increases demand of reader's mental capacity. When this occurs, readers could choose to skim through the message or totally abandoned it and give the message less chance to be helpful.

So there is an intermediate amount of information that maximizes the likelihood people want to read and perceive them as helpful. If too much information is provided and some of it is not useful for the purchase decision, consumers will end up choosing not to purchase the product^[5]. In contrast, if too little information is provided, consumers may end up not having sufficient information to decide to purchase the product. Thus both the absence and excess of information result in a lack of attention towards purchasing online. The relationship between information load and information processing effect is usually described as an inverted U curve^[6]. According to how the amount of online information influences users' cognitive responses in an online environment, Sicilia and Ruiz confirmed an inverted U curve relationship between information load and information processing because the volume of information about many products is too great for consumers to read. Since decision quality is positively associated with information processing, the relationship between review length and review helpfulness has been considered as an inverted U curve. Therefore, we propose the following hypothesis:

H1: The review helpfulness will increase when review length increases. After a certain point the helpfulness will decrease when review length continues to increase.

In contrast with plain text in a review, pictures are the easiest to observe which can differ in many aspects. The pictures about a product may draw greater attention to the reviews and most product reviews are brief and easy to understand, thus unlikely to demand a high level of perspective resources for processing. Including a picture in a review enhances the credibility even if it's negative product information^[7], and it makes most picture reviews easily understandable with that additional information. The increased availability of decision makes the readers more confident^[8]. When the product is with picture reviews the reviewer's attention can be drawn to the visual of the product rather than the plain text itself. Uploading pictures can also provide further evidence for review viewers to show all kinds of characters of a product. So we propose the following hypothesis:

H2: The review helpfulness will increase when the number of pictures in the review increases.

Information overload usually refers to the notion of receiving too much information at any given time so that it exceeds the processing limits^[9]. Individuals are struggling to process information for contemporary knowledge intensive organizations because it can adversely affect decision making^[10]. It has been argued that consumers may prefer not to choose or make poorer selections with too many alternatives. Information overload can be especially prominent in product categories such as consumer electronics and software because they tend to involve many different features some of which are less important Information load has usually been measured by the number of product alternatives and attributes presented to consumers. In this study, we use the review quantity to measure information overload and it is a frank way to show online information volume available to readers. The formalization of overload effect has been considered deeply by several researchers. It is supported by some study that information overload has relationship with all kinds of negative decision outcomes, including lower decision quality, less confidence in the decision process and longer time needed. Increases in

information quantity are negatively associated with decision accuracy without variation of information quality^[11]. Excessive searching complexity makes it difficult for customers to locate the needed information, thus negatively affecting customers' decision quality^[12]. The biggest driver of consumer stickiness is kind of decision simplicity and the easier consumers can gather information about a product the more dramatically consumer stickiness increases. But some studies argue there is no decrease in decision quality as the information load increased. One of the reasons is that information overload does not systematically influence consumer purchase behavior. That means information processing efficiency increases when the decision maker is subjected to information insufficiency, while it decreases when they are experiencing information overload.

In the study, we shed light on the influence of information overload on the decision maker's efficiency and the information overload is regarded as a context in which readers pay attention to the useful online reviews based on their cognitive ability. When more and more online reviews are produced, the length of review becomes prominent. The length structure of all review below a certain product reflects the format in which reviews have been provided. We denote the length structure by the ratio of the number of reviews with more than 10 characters in the total reviews because the review usually conveys information about a product in detail when it is with more 10 characters. According to these studies above, the moderate ratio of long reviews below a certain product will be modest for readers and has more effect on the review helpfulness. When information overload exists, the review length structure will be prominent and play a more important role to persuade the consumers and the reviews with the modest length ratio in the total reviews will be more helpful. With the same logic, reviews with pictures will catch more eyes in the context of information overload and will be more helpful compared with information insufficiency. So information overload make the review length structure and picture review more prominent even if it increases the burden for readers to distinguish a large number of online reviews. So we propose the following hypothesis:

H3a: The effect of review length on helpfulness is stronger when information overload exists.

H3b: The positive effect of picture review on helpfulness is stronger when information overload exists.

The negative reviews have been discussed and attached more importance than positive reviews in a lot of studies. Negativity effect has been demonstrated for a wide range of outcomes including trust perceptions, product evaluations, product choice, and purchase behaviors^[14]. The valence of reviews has been found to influence consumer product judgments. Extreme opinions both positive and negative will be more likely helpful than moderate opinions. Negative reviews have a stronger effect on behavior and judgment than the positive reviews does^[15]. Negative opinions receive more consideration by recipients than positive opinion because negative bias means that consumers used to pay more attention to negative information rather than positive one^[16].

There are several reasons that negative reviews outweigh positive ones in terms of its effectiveness. Previous research has argued that negative information is typically more diagnostic in categorizing the target into a certain category than positive information. The new information incorporated in negative comments may help reduce the uncertainty of the consumer's decision making^[17]. Even if positive reviews will increase sales, the impact from a negative review has a larger magnitude. Consumers tend to search for negative WOM in a situation in which they lack information and experience because negative reviews are more likely viewed as intelligent and valuable in terms of providing useful information than positive reviews. Bad things would produce larger, more consistent, more multifaceted, or more lasting effects than good things. However, East et al shows that positive reviews have a stronger impact than the negative ones do. So several recent studies have attempted to identify the relationship between negative reviews and review helpfulness and have generated mixing findings.

In a word, negative opinions receive more consideration by recipients and are more helpful than positive opinion. The effect will be outstanding in the context of information overload because negative opinions are perceived as more credible and easier to generalize than positive opinions. The discipline that negative information has a stronger impact than positive information on evaluations can explain the mechanism of how review length structure and picture review have influence on the helpfulness of online reviews. For example, in the context of consumer reviews, negative reviews about a product help consumers categorize the product into a low-quality product more so than positive reviews help them categorize the product into a high-quality product. Specifically, in the context of information overload, the modest review length structure will play more important role with negative reviews than without negative reviews, because that negative reviews had a greater impact on sales than positive reviews^[18]. On the basic logic, the reviews with pictures will be attached more importance by readers when the pictures are attached to negative reviews. So the interaction of negative reviews and pictures has more notable impact on the helpfulness of online reviews, in particularly, when information overload exists. We therefore hypothesized that:

H4a: When information overload exists, the effect of review length on helpfulness is stronger with negative reviews than without negative reviews.

H4b: When information overload exists, the positive effect of picture review on helpfulness is stronger with negative reviews than without negative reviews.

Based on the relevant literature, a series of hypotheses were derived to empirically test the proposed research model. The theoretical framework of this study focuses on the helpfulness of online review in which there are mainly two factors, (1) review length, (2) picture review. This study chooses to research on the two factors because first of all, both factors do influence online review helpfulness. Secondly, even though there are existing researches on these two variables which is relatively helpful but with emerging of e-commerce platform together with the popularity of online shopping, the information quality of consumer reviews is lack in the context of information overload. Thereby we propose these two factors to deepen the knowledge on not only online review helpfulness but also information overload as it has been overlooked by most researchers.

These two moderating factors are measured by information overload and negative review, and from this measurement we posit whether the information overload exists or not. In addition, for consumers, online product reviews have become an important source for product-related information as they represent a beneficial addition to online sales websites. Due to the increasing amount of available product reviews, identifying the most helpful product reviews represents an important task in order to reduce the unfavorable effect of information overload. Therefore, the factors influencing review helpfulness have to be identified; thereby we propose the two new moderating factors including information overload and negative review. Our study chooses the two factors because they can eliminate any doubts potential customers may have about a product and can be able to help out with the product selections and purchasing.

3. DATA AND MODEL

We collected reviews related to household electrical appliances including audio and visual appliances, kitchen appliances, living appliances and large household appliances from taobao.com. To increase the credibility analysis, the selected sample included 18-80 year-old reviewers, and reviewers with more than 80 year-old and less than 18 year-old were excluded from the sample. Therefore the dataset includes 339,262 samples altogether. These reviews and comments contain the data of the buyer and seller information and product information etc. The aggregation process is mainly based on Taobao product classification system.

Some online review sites allow readers to evaluate the reviews and the most common one is to rate a review as “helpful” or “not helpful”. A helpfulness score is then calculated and reviews with a higher number of

helpfulness votes are found to have a higher correlation with sales. In Taobao platform, the online review system provides tool for consumers to evaluate the information quality of online reviews written by buyers. Just as Amazon, an option on whether the review is helpful is followed the review on the right bottom so readers can express their judgment about the review content by voting. The total number of votes that the review has got is also showed below the review, which means the total number of people who voted yes and agreed the review was helpful. The more votes the review gets, the more helpful the review is. So we collected the votes and use them to measure the helpfulness of online review. Other variables used in the model are described in Table 1.

Table 1 Variables Description In Model

Variable Name	Variable Measurement
Review helpfulness	Number of reviews voted helpful
Review length	Ratio of the number of reviews with more than 10 characters in the total reviews words
Picture	number of reviews with pictures
Overload	Whether or not the number of reviews belonging to a product exceed the mean number 1=yes 0=no
Negative	whether or not there is negative review 1=yes 0=no
Age	reviewer age (18-80 years old)
Gender	reviewer gender (0 Female, 1 Male)
Buyer credit	buyer credit rating
Seller reply	seller's reply times according to buyer's review
Appended review	appended review by buyers

In H1, we hypothesized that review helpfulness will increase when review length increases and after a certain point the helpfulness will decrease when review length continues to increase. We expect that reviews with extreme length structure are less helpful than reviews with moderate length structure. Therefore, we expect a nonlinear relationship between the review length structure and helpfulness and construct the model by the review length as both a linear term (Review length) and a quadratic term (Review length²). We expect the linear term to be positive and the quadratic term to be negative, indicating an inverted U-shaped relationship, and imply that extreme review length structure will be less helpful than moderate review length structure. In H1, it is relatively easy understood that pictures attached to reviews are more important and have positive effect on the helpfulness. The model is:

$$\text{Helpfulness} = \beta_1 \text{ Review length} + \beta_2 \text{ Review length}^2 + \beta_3 \text{ Picture} + \beta_4 \text{ Overload} + \beta_6 \text{ Control} + \varepsilon \quad (1)$$

In H3a and H3b, we expect that information overload moderates the effect of review length and picture review on the helpfulness of online reviews. We include an interaction term of review length and information overload to test H3a and expect that review length has a greater positive effect on the helpfulness with information overload than without information overload. Another interaction term of picture review and information overload is also included in the model to test the moderating effect. Thus the model is:

$$\text{Helpfulness} = \beta_1 \text{ Review length} + \beta_2 \text{ Review length}^2 + \beta_3 \text{ Picture} + \beta_4 \text{ Overload} + \beta_6 \text{ Review length} \times \text{Overload} + \beta_7 \text{ Review length}^2 \times \text{Overload} + \beta_8 \text{ Picture} \times \text{Overload} + \beta_9 \text{ Control} + \varepsilon \quad (2)$$

In H4a and H4b, we explore the moderates effect of negative comments when information overload exists. Because we believe that the relationship between review length and helpfulness changes depending on whether there are negative comments in the reviews, we include interaction terms between review length and negative review. Another interaction term of picture review and negative review is also included in the model. The model is:

$$\text{Helpfulness} = \beta_1 \text{ Review length} + \beta_2 \text{ Review length}^2 + \beta_3 \text{ Picture} + \beta_4 \text{ Negative} \\ + \beta_6 \text{ Review length} \times \text{Negative} + \beta_7 \text{ Review length}^2 \times \text{Negative} + \beta_8 \text{ Picture} \times \text{Negative} + \beta_9 \text{Control} + \varepsilon \quad (3)$$

4. RESEARCH RESULT

Regression analysis is showed in table 2. Based on model (1), the relation between review length and review helpfulness has been showed in column (1) in which review length has a significant positive effect on the helpfulness of online reviews (0.1282, $p < 0.01$). In contrast, review length² has a significant negative effect on the helpfulness of online reviews (-0.1251, $p < 0.01$). It means there exists an invert "U" relation between review length and review helpfulness. Considering review length is measured by the proportion of views with at least 10 characters out of the total review, the result shows that long review with moderate ratio is perceived to be more helpful than extreme ratio. We proposed the hypothesis in H1 because long reviews with moderate ratio are easy to read and have more significant effect on the reviews helpfulness. The buyer has no patient to read all the content if the review is too long with too many characters. On the contrary, the buyer can't catch the means of review and can't get valuable information about the merchandise if the review is too short even with only one character. The reviews with moderate length and characters can provide higher quality information and are more helpful for consumers. So H1 has been supported.

Uploading pictures is another most important factor influencing the information quality. More and more Taobao consumers dedicated to provide their experienced reviews even some pictures about goods they bought. Compared with pure texts, the online reviews with some colorful pictures would catch more eyes of consumers who want to search some valuable information about the goods they want to buy. In H2 we proposed that review helpfulness will increase when the number of pictures in the review increases. Based on the dataset from Taobao we discover that picture reviews have a significant positive role (0.1664, $p < 0.01$) in conveying the core information of the products. So H2 has been supported. Uploading picture with the review can enhance the product's intuitive perceptions and reduce the buying risks. The reason is that pictures can provide further evidence for consumer viewers and attention might be drawn to the visual of the product taken by experience customer rather than the plain text itself. Finally reviews with pictures contribute to increasing the persuasive of consumer purchasing.

There are different situations for how review length and picture reviews influence the review helpfulness. Base on model (2), we discuss the moderating effect of information overload by dividing the dataset into two groups based on the mean of review quantity. When all the online reviews below a product on website are overload then we use Overload=1 to denote it that means the quantity of the reviews surpasses the mean quantity. Otherwise we use Overload=0 to denote it when information overload doesn't exist. Column (2) shows the results of interactions of review length² and overload. The coefficient is negative and significant (-3.5901, $p < 0.01$). The coefficient of interactions of picture review and overload is also significant (0.1002, $p < 0.01$).

The result of picture reviews also has the same treat as the review length. Picture reviews have more effect when information overload exists (0.1554, $p < 0.01$) while the effect is smaller when information overload doesn't exist (0.0948, $p < 0.01$). A few researches show that when the product is with a picture review the reader's attention might be drawn to the visual of the product rather than the plain text itself. Uploading pictures can provide further evidence when pictures and comment contents are closely related, thus pictures contribute to increasing persuasive of consumer purchasing.

Base on model (3), we add the interaction into the model and the results can be showed in column (3) and column (4). According to our research, column (3) shows that the negative review has moderate effect between the review length² and the review helpfulness (-4.7034, $p < 0.01$), and between review length and the review helpfulness (1.6928, $p < 0.01$), while the negative review has no significant moderate effect showed in column

(4) (0.0125, $p > 0.1$).

The same evidence can be provided by the coefficient of interaction of negative and picture. In H4b, we proposed the positive effect of picture reviews on helpfulness is stronger with negative reviews than without negative reviews when information overload exists. According to our research results, the interaction of negative and picture is positive and significant (0.0897, $p < 0.01$) when information overload exists as column (3) shows. In contrary, the coefficient is not significant (0.0141, $p > 0.1$) when information overload doesn't exist as shown in column (4). So a conclusion can be drawn that negative reviews give new information that may help in reducing the uncertainty of the consumer's decision making and the message becomes relevant with the piece of information provided. In fact, consumers tend to evolve in online reviews with negative comments that will be prominent and give them reliability as they select the information of more persuasive reviews and perceived helpful.

Table 2 Regression Analysis

	(1)	(2)	(3) overload=1	(4) overload=0
Review length	0.1282*** (0.0060)	0.2840*** (0.0123)	0.9027*** (0.0587)	0.0563*** (0.0054)
Review length ²	-0.1251*** (0.0064)	-0.7125*** (0.0624)	-2.1708*** (0.3190)	-0.0515*** (0.0060)
Picture	0.1664*** (0.0067)	0.0984*** (0.0072)	0.1050*** (0.0083)	0.0912*** (0.0088)
Overload	-0.0116*** (0.0019)	-0.0735*** (0.0074)		
Overload × Review length		1.3106*** (0.0600)		
Overload × Review length ²		-3.5901*** (0.3234)		
Overload × Picture		0.1002*** (0.0118)		
Negative			-0.0897*** (0.0195)	-0.0194*** (0.0021)
Negative × Review length			1.6928*** (0.1571)	-0.0125 (0.0282)
Negative × Review length ²			-4.7034*** (0.8298)	0.0125 (0.0354)
Negative × Picture			0.0897*** (0.0144)	0.0141 (0.0235)
Age	-0.00006*** (0.00001)	-0.00006*** (0.00002)	-0.0007*** (0.0002)	-3.67e-7 (0.0001)
Gender	-0.0074*** (0.0006)	-0.0081*** (0.0006)	-0.0410*** (0.0028)	-0.0007** (0.0004)
Buyer credit	-0.0003 (0.0001)	-0.0002 (0.0001)	0.0029*** (0.0007)	-0.0001** (0.00008)
Review count	-0.0070*** (0.0006)	0.0098*** (0.0006)	0.0101*** (0.0026)	0.0318*** (0.0017)
Seller reply	0.0927*** (0.0019)	0.0883*** (0.0019)	0.1111*** (0.0029)	0.0318*** (0.0017)
Appended review	0.0417*** (0.0020)	0.0365*** (0.0023)	0.0325*** (0.0031)	0.0130*** (0.0017)
Constant	0.0080*** (0.0016)	-0.0028** (0.0017)	0.0167 (0.0104)	0.0014 (0.0010)
R2	0.1523	0.1599	0.1494	0.0222
F	927.34	740.23	350.04	148.30
Prob > F	0.0000	0.0000	0.0000	0.0000
Num.	339262	339262	65122	274140

note: the dependent variable is taken log.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

5. CONCLUSIONS

Our examination of information quality involving review length and picture reveals several important research findings. As a result, our findings help extend the literature on information diagnosticity within the context of information overload.

First, information quality plays an important role in discovering product features to consumers. As consumers can be concerned about the product quality without being able to physically check products prior to purchase, transaction cost exists in buying online. Information quality of a review is closely relative with transaction cost because consumers in the transaction spend efforts and time in searching for information about products and services to reduce the uncertainty. Second, the effect of information format on the helpfulness of online reviews becomes more prominent in the context of information overload. The likelihood of information overload depends on multiple structural factors of information such as information formats or types, so overload usually occurs when the nature of the information is uncertain, ambiguous, novel, complex, or intense. Information overload comes earlier when the messages requiring more cognitive resources are offered. Information structure has important implications for information acquisition. In the study, we represent information structure by review length and picture, which also reflect the information quality, and information overload can moderate the relationships between information quality and review helpfulness. Third, negative comments help consumers to diagnose information more easily. Most online reviews are positive on Taobao's platform and the negative reviews will be considered more valuable because consumers may find useful valuation about product quality from the negative comments. According to the study, the negative comments can moderate the outcomes of information quality by determining the valence of the information. Consumers would post some critical evaluation for all kinds of reasons even some criticise are not the truth or deviate from the reality.

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