

HOW DO PRODUCT REVIEWS HELP REDUCE UNCERTAINTY IN ONLINE TRANSACTIONS? A DISCUSSION IN THE CONTEXT OF ELECTRONIC DEVICE PURCHASE

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ABSTRACT

Products reviews have long been viewed as an important source of information for people to assess product quality in electronic business (e-business). Following a literature review of related constructs, we propose a research model and collect data from a mid-western university in US. After testing hypotheses by running a structural equation model and several ANOVAs, we find that 1) the concerns on potential losses have a significant impact on the overall risk perception toward online transactions; 2) the average rating on products has a stronger impact on risk perceptions than the volume of reviews; 3) risk perception is an important antecedent of the uncertainty in online transactions.

Keywords: Product Reviews, Risk Perceptions, Uncertainty, Online Transactions

INTRODUCTION

Online transactions are featured by the temporal and spatial separation between vendors and buyers. In the normal conditions, buyers seldom have chance to physically touch and feel products before completing transactions. This characteristic of online transactions fosters uncertainty and associated risks in online transactions, and is viewed as a barrier for the development of e-business. A plethora of research, particularly in marketing and MIS discipline, has been conducted to study the impact of uncertainty and risks in online transactions (Laroche, Yang, McDougall, & Bergeron, 2005). Customer reviews (or eWOM) have long been viewed as an important source of information for potential customers to assess the quality of products and/or services. For example, the factors - such as information vividness, review content, review valence, brand reputation, purchase involvement, and readers' personality - have been found to be important in product judgment (Dellarocas, 2006; Herr, Kardes, & Kim, 1991; Lee, Park, & Han, 2008; Vermeulen & Seegers, 2009). For instance, comparing the WOMs without pictures with those with pictures, Herr et al. (1991) find that the WOMs with vivid information have a greater impact on product judgment than those less-vivid reviews (Herr et al., 1991). High quality negative reviews have been concluded to have a stronger impact on customers' attitude toward products than low quality negative reviews do (Lee et al., 2008). Positive reviews incurs positive attitude changes, whereas negative reviews yield negative attitude changes (Vermeulen

& Seegers, 2009). Moreover, negative reviews are found to be more informative than positive reviews in the sense that it helps consumers discriminate low- and high- quality products (Herr et al., 1991; Lee et al., 2008).

As part of the nature of online transactions, uncertainty has long attracted researchers' interests. For example, Gefen (2000) shows that knowledge-based familiarity fosters trust belief in vendors – a broadly admitted influential factor in online transactions, which can also help lower the uncertainty in online transactions and simplify the buyer-seller relationship as well as trust belief (Gefen, 2000). Meanwhile, Kim et al. (2008) also find that trust belief can reduce customers' risk perception and additionally trigger the intention to purchase (Kim, Ferrin, & Rao, 2008). Moreover, Gregg and Walczak (2008) find that with the increase of e-image quality on webpages, both uncertainty and perceived risk involved in online transactions can be weakened (Gregg & Walczak, 2008).

Nevertheless, most of the prior studies simply treated uncertainty as a background concept, lacking a direct measurement. A few studies have noticed this gap and attempted to fill it in. For instance, based on principal agent theory, Pavlou et al. (2007) proposed four uncertainty mitigating factors in online transactions: trust, website informativeness, product diagnosticity, and social presence. They empirically tested their hypotheses by studying online book purchase and online prescription filling and found a significant impact. Regarding to customer reviews, there are also several studies on exploring its effect on uncertainty reduction. For example, Weathers et al. (2007) discussed the effect of information vividness on reducing uncertainty based on the comparison of the reviews with no picture, picture, third party evaluation, and high control over information. It turns out that the reviews written by a third-party source are reported to be a critical approach to reduce uncertainty and enhance information credibility for searching products. On the contrary, regarding to experience products, the pictures in the reviews and the retailer-provided product reviews are the most important information to lower the uncertainty (Weathers, Sharma, & Wood, 2007). Overall, there are several interesting findings in the past studies. However, current findings still cannot explicitly explain the phenomenon related to the uncertainty. There is still a need to better understand the relationship between uncertainty and its related risks, and additionally their effect in online transactions.

This study differentiates itself by the following points. First, a direct measure of risk perception and uncertainty in the context of an electronic device purchase is applied. Second, we deepen the studies of risks in online transactions by exploring their potential antecedents. Following Laroche et al.'s understanding of risks in online transactions (Laroche et al., 2005), we test the impact of the specific risks - such as financial risk, social risk, time risk and so on - on the overall risk perception and uncertainty. Third, we test the impact of the evidence embedded in reviews on risk perceptions, based on the assumption that each review consists of both statistical evidence and narrative evidence. Specifically, statistical evidence refers to numerical description in the format of proportion, rate, frequency etc. (Allen & Preiss, 1997; Kopfman, Smith, Ah Yun, & Hodges, 1998). Narrative evidence refers to testimonial assertion and pertains to the anecdotal vividness of the arguments in the format of stories, examples etc. (Allen & Preiss, 1997; Kopfman et al., 1998). Regarding to customer reviews, statistical evidence is reflected by cues such as review quantity, average ratings, and the graphical distribution of ratings. Narrative evidence is associated with the content and the valence of arguments on product attributes. In

the study that follow, part of the discussion is based on this consideration of statistical and narrative evidence in reviews.

The remainder of this paper first discusses the literature by reviewing associated findings centered at risk and uncertainty in online transactions. Second, the major constructs and their related hypotheses in the study are introduced. Third, the research model and their related experiment design are presented. Finally, the effects of reviews are examined in light of the discussion on statistical and narrative evidence. The paper ends with a discussion on the findings and the flaws in the study.

CONCEPTUAL BACKGROUND

Uncertainty

Due to the nature of e-business, uncertainty has been viewed as a barrier to e-commerce adoption (Pavlou & Fygenon, 2006). The uncertainty is believed to arise from the possibility that the transaction may not be finished due to the reasons, such as fraud, counterfeit product, or prolonged product delivery and so on (Pavlou, Huigang, & Yajiong, 2007). Particularly, highly perceived uncertainty is believed to likely result in highly perceived risk, and the associated risk perceptions hinder consumers' intention to adopt e-commerce and purchase products (Pavlou et al., 2007). There is a demanding need to improve current e-business system to weaken this uncertainty and foster the development of e-business.

Substantial researchers have devoted effort to investigate the approaches to reducing the uncertainty in online transactions. Prior studies uncover that the factors such as knowledge-based familiarity (Gefen, 2000), trust (Gefen, 2000; Kim et al., 2008) and high quality e-image (Gregg & Walczak, 2008), can help reduce the uncertainty and simplify the buyer-seller relationship in online transactions. However, most studies simply treat uncertainty as a background concept without directly measuring it. A few researchers have attempted to fill in this gap. For instance, Pavlou et al. (2007) proposed four uncertainty mitigating factors: trust, website informativeness, product diagnosticity, and social presence. In the context of customer reviews, Weathers et al. (2007) test the effect of information vividness in customer reviews on reducing uncertainty. Product type is found to be a moderating factor. Particularly, the reviews written by a third-party source are found to be the most important information to reduce uncertainty and enhance information credibility for searching products. In contrast, regarding to experience products, the reviews with pictures and the retailer-supplied product reviews are more important to lower uncertainty (Weathers et al., 2007). Nevertheless, the currently existing findings still cannot explicitly explain the uncertainty in online transactions, and there is a need to better understand it.

Risk Perceptions

Like uncertainty, risk perception is another broadly discussed factor in the studies of e-commerce. Despite of substantial studies working on risk perceptions in online transactions, there are no commonly agreed antecedents of perceived risk, unlike the three antecedents of trust – benevolence, competence and integrity. The measurement of risks varies as the circumstances change. Some studies simply measure the overall perception of risk without specifying risk types. For example, some researchers directly ask the subjects to rate the extent to which they think that the transaction is risky, or will cause lots of trouble in the future, or is associated with a good chance the decision maker will make a mistake (Laroche et al., 2005). In contrast, some researchers prefer to examine the effect of risks based on their potential source. For example, some researchers proposed to measure the risks on the basis of financial risk, time risk, performance risk and social risk (Chen, 2010; Featherman & Wells, 2010; Laroche et al., 2005), while some suggested measuring it from the perspective of perceived information asymmetry, fear of seller opportunism, information privacy concerns, and information security concerns (Pavlou et al., 2007). After all, the measurement of risks in online transactions is contextually different.

After reviewing the related literature, we decide to measure the risks in two approaches. First, we measure the overall risk perception, simply called perceived risk. Besides, we measure the risk perceptions based on the source they derive from in the customer review context. Therefore, there are five specific types of risk concerns – financial risk, time risk, performance risk, psychological risk, and social risk - being measured respectively in the study.

RESEARCH MODEL AND HYPOTHESES

Perceived Risk

Perceived risk refers to the degree to which “the consumer feels the uncertainty and consequences associated with their actions and play a critical role in consumer decision-making” (p.1608) (Chen, 2010). Past research suggests that risks in online transactions could be broken into two types – the risk related to products and the risk derived from the behaviors of vendors. Principal agent theory indicates that the risk could be derived from the concerns over hidden information and hidden actions in a principal-agent relationship (Bergen, Dutta, & Walker, 1992; Mishra, Heide, & Cort, 1998; Pavlou et al., 2007; Singh & Sirdeshmukh, 2000). Researchers extended the theory to explain the buyer-seller relationship (Pavlou et al., 2007). In the context of online transactions, hidden information results from the behaviors that vendors intentionally hide the information about products and transactions, while hidden actions results from the activity that vendors break their promise by sending low quality or counterfeit products to customers. Yang et al. (2011) tested these two risks with consideration of the effect of customer reviews, and uncovered that in the context of electronic device purchase, hidden actions were the only significant concern (Yang, Sarathy, Lee, & Fang, 2011).

Regarding to products, the source of risk could be derived from the potential losses, such as finance, time, performance, social and psychological concerns (Laroche & Nepomuceno, 2010; Laroche et al., 2005). In particular, financial risk is defined as customer assessment of potential

financial losses due to the purchase of a product of low quality or potential internet-based fraud (Featherman & Wells, 2010; Salam, Rao, & Pegels, 2003). Time risk refers to customer assessment of potential losses to convenience, time and effort caused by wasting time researching and purchasing the product (Featherman & Wells, 2010). Performance risk is related to customer assessment of potential problems such as malfunctioning, transaction processing errors, and reliability problems, which cause products to not perform as expected (Featherman & Wells, 2010). Psychological risk is defined as customer assessment of potential losses to their self-esteem, peace of mind or self-ego due to worrying, feeling frustrated, or foolish as a result of buying the product (Featherman & Wells, 2010). And Social risk measures customer assessment of potential losses to their perceived status in their social group as a result of buying a product (Featherman & Wells, 2010). Past studies show that these five risk perceptions are important components forming the overall risk perception in online transactions (Chen, 2010; Featherman & Wells, 2010; Laroche & Nepomuceno, 2010). This study is aimed to test the impact of these five risk concerns in the customer review context. We formally hypothesize:

H1: Financial risk has a positive impact on overall risk perception in online transactions.

H2: Time risk has a positive impact on overall risk perception in online transactions.

H3: Performance risk has a positive impact on overall risk perception in online transactions.

H4: Psychological risk has a positive impact on overall risk perception in online transactions.

H5: Social risk has a positive impact on overall risk perception in online transactions.

Certainly, there might be the other concerns in online transaction, such as information privacy and security (Featherman & Wells, 2010; Pavlou et al., 2007). Since we believe that the content of product reviews seldom mention the information of these aspects, we simply exclude them from our consideration. To test the hypotheses above, we measure the overall perceived risk in addition to these five risk perceptions.

Perceived Uncertainty

Perceived uncertainty is defined as “the degree to which the outcome of a transaction cannot be accurately predicted by the buyer due to seller and product related factors” (p.107) (Pavlou et al., 2007). Many studies have investigated the approaches to reduce the uncertainty in online transactions. For example, Gefen argues that familiarity is a prerequisite of trust and trust is an important factor in economic transactions; both of them can help reduce the uncertainty and simplify the buyer-seller relationship in transactions (Gefen, 2000). Comparing two EBay businesses, Gregg shows that increasing the quality of e-image can reduce both the uncertainty and perceived risks surrounding the online transaction (Gregg & Walczak, 2008). However, most of them only treat uncertainty as a background concept without directly measurement. Uncertainty is associated with customers’ reluctances to engage in the transactions. Logically, less uncertainty triggers more intention to transact online (Pavlou et al., 2007). So we assume that the perception of uncertainty to some extent reflects customers’ purchase intention, and will not measure the purchase intention in this study. We formally hypothesize:

H6: Perceived risk has a positive impact on perceived uncertainty in online transactions.

To sum, the proposed research model is presented in Figure 1.

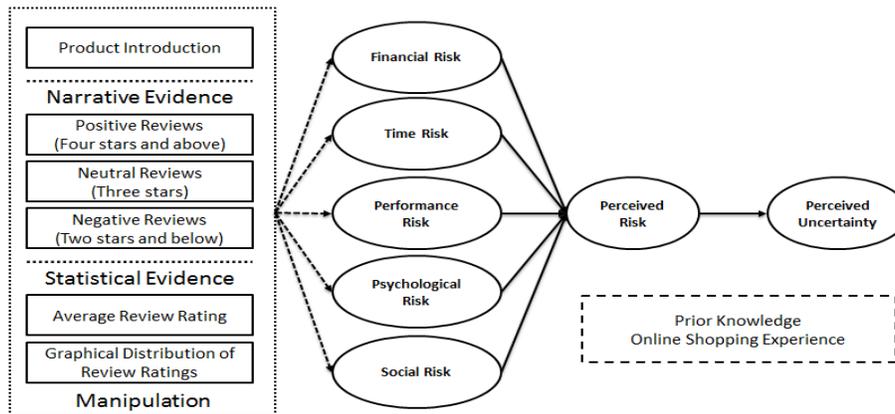


Figure 1. Research Model

RESEARCH METHODOLOGY

Survey Administration

To test the hypotheses, the experiment designed is based on the two criteria: review quantity and graphical distribution of ratings. Specifically, 10 reviews are defined as low volume, and 100 reviews are defined as high volume. Moreover, the product with 100% of positive reviews is defined to be favorable; 50% represents neutral product; and 0% means that the product is unfavorable. Therefore, we have six groups of subjects in the experiment.

An online survey created on Qualtrics.com was emailed to around 300 undergraduate students in the business school of a mid-western university in the US. Qualtrics is a web-based Survey Software that enables users to develop and collect responses to surveys. All measurement items for the study are adopted and adapted from previous research. All the instruments used in the survey were assessed on a seven-point scale anchored at 1=strongly disagree, 4=neutral and 7=strongly agree. Five bonus points were rewarded as an incentive for participation. In the end, there are 137 valid responses for the surveys. A randomization technique was applied in subject selection. Consequently there is uneven number of responses for each survey.

DATA ANALYSIS

Measurement Validation

PLS is used for measurement validation and testing the structural model. The descriptive statistics for the structural model. In particular, composite reliabilities of all principal constructs are considered acceptable since they exceed 0.80. The only outlier is Social Risk. After running several tests, we decide to remove the first two instruments out of the measurement of Social

Risk. That means Social Risk only has one measurement instrument. Convergent and discriminant validity are tested as follows (Pavlou et al., 2007): 1) all AVEs in Table5 are greater than 0.50, suggesting that the variance explained by constructs are much higher than error variance; 2) the square root of AVEs are larger than the cross-correlations of the constructs; 3) all the cross-correlations of the construct are lower than 0.90, which means the constructs are distinct from each other. Also an excellent cross loading matrix suggests adequate convergent and discriminant validity. Similar to the discussion on composite reliability, there is the same problem on both AVE and cross loadings in regards to Social Risk. After removing the first two instruments, the problem disappears.

Testing the Structural Model

The standardized path coefficients for testing the structural model are presented in Figure 2. In line with our assumptions, all the specific risk perceptions such as performance risk, time risk, and social risk and so on, are statistically influential components forming the general risk perceptions toward online transactions. In particular, performance risk and psychological risk are significant at 0.01, social risk is significant at 0.05, and time risk and financial risk are significant at 0.10. All these specific risk concerns can explain about 67.3% of the variability in the general perception of risk. In addition, this general risk perception is found to be an important antecedent of the uncertainty perception in online purchase, significant at 0.05. Moreover, based on the standardized path coefficients in the structural model, performance risk is the most critical concerns in online transitions, psychological risk is the second, and time risk is the least.

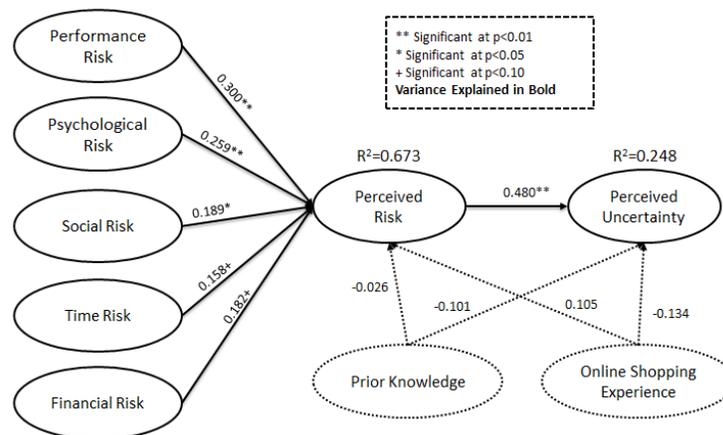


Figure 2. The coefficients and R² for the path model

CONCLUSION AND DISCUSSION

This study aims to investigate the possible source of risk perception in online transactions, as well as the effect of the statistical and narrative evidence embedded in the reviews. Most

functions of the reviews have been confirmed as assumed in the beginning. For example, the majority of the risk perceptions—around 67%—are derived from the concerns such as time risk, psychological risk, performance risk, social risk and financial risk. In this scenario, the performance of the product is the most weighted concern, and the psychological risk is the second. Maybe due to the low price of the product, the finance risk is the least. Nevertheless, this finding still provides us a good way to understand customers' risk perception in online transactions, especially when this perception to some extent – around 20% - can explain the uncertainty in online transactions.

Resorting to a series of post hoc analysis, we find that the narrative evidence has a stronger impact than statistical evidence in the reviews. Particularly, the unfavorable products incur the highest risk perception; contrarily, the favorable products incur the least risk perception. A large number of reviews could not dramatically reduce risk perceptions. The products with large number of review are prone to have a moderate level of risk. Similarly, the neutral products incur a moderate level of risk perception. In other words, compared to the total number of reviews, the average rating is more persuasive, and this average rating is manipulated by changing the content of reviews in the study.

Despite that the most of the assumptions have been confirmed, there are still some flaws in the study. In nature, all of them could be rooted in one question – the product employed in the experiment. The outcome of several analyses indicates that in general the subjects hold a negative attitude toward the product. Compared to the well-known tablet computer, IPAD, this product is unknown and much cheaper. From the very beginning, the subjects have a suspicious attitude toward the product. This attitude directly causes the low reliability of the construct of Social Risk, although the instruments of Social Risk have been proven to be reliable in other studies. However, to some extent, this also fits our expectations. In this circumstances full of uncertainty and suspicions, our measurement on risk perception is more accurate and realistic.

REFERENCE

- Allen, M., & Preiss, R. W. (1997). Comparing the Persuasiveness of Narrative and Statistical Evidence Using Meta-analysis. *Communication Research Reports*, 14(2), 125-131.
- Bergen, M., Dutta, S., & Walker, O. C., Jr. (1992). Agency relationships in marketing: A review of the Implications and applications of agency and related theories. *Journal of Marketing*, 56(3), 1-24.
- Chen, L. S.-L. (2010). The Impact of Perceived Risk, Intangibility and Consumer Characteristics on Online Game Playing. *Computers in Human Behavior*, 26(6), 1607-1613.
- Dellarocas, C. (2006). Strategic Manipulation of Internet Opinion Forums: Implications for Consumers and Firms. *Management Science*, 52(10), 1577-1593.
- Featherman, M. S., & Wells, J. D. (2010). The Intangibility of e-Services: Effects on Perceived Risk and Acceptance. *SIGMIS Database*, 41(2), 110-131.
- Gefen, D. (2000). E-commerce: the Role of Familiarity and Trust. *Omega*, 28(6), 725-737.
- Gregg, D. G., & Walczak, S. (2008). Dressing Your Online Auction Business for Success: An Experiment Comparing Two Ebay Business. *MIS Quarterly*, 32(3), 653-670.
- Herr, P. M., Kardes, F. R., & Kim, J. (1991). Effects of Word-of-Mouth and Product-Attribute Information of Persuasion: An Accessibility-Diagnosticity Perspective. *Journal of Consumer Research*, 17(4), 454-462.
- Kim, D. J., Ferrin, D. L., & Rao, H. R. (2008). A Trust-based Consumer Decision-making Model in Electronic Commerce: The Role of Trust, Perceived Risk, and Their Antecedents. *Decision Support Systems*, 44(2), 544-564.
- Kopfman, J. E., Smith, S. W., Ah Yun, J. K., & Hodges, A. (1998). Affective and Cognitive Reactions to Narrative Versus Statistical Evidence Organ Donation Messages. *Journal of Applied Communication Research*, 26(3), 279-300.
- Laroche, M., & Nepomuceno, M. V. (2010). How Do Involvement and Product Knowledge Affect the Relationship Between Intangibility and Perceived Risk for Brands and Product Categories? *Journal of Consumer Marketing*, 27(3), 197-210.
- Laroche, M., Yang, Z., McDougall, G. H. G., & Bergeron, J. (2005). Internet Versus Bricks-and-mortar Retailers: An Investigation into Intangibility and Its Consequences. *Journal of Retailing*, 81(4), 251-267.
- Lee, J., Park, D.-H., & Han, I. (2008). The Effect of Negative Online Consumer Reviews on Product Attitude: An Information Processing View. *Electronic Commerce Research and Applications*, 7(3), 341-352.
- Mishra, D. P., Heide, J. B., & Cort, S. G. (1998). Information Asymmetry and Levels of Agency Relationships. *Journal of Marketing Research*, 35(3), 277-295.
- Pavlou, P. A., & Fygenson, M. (2006). Understanding and Predicting Electronic Commerce Adoption: An Extension Of the Theory Of Planned Behavior. *MIS Quarterly*, 30(1), 115-143.
- Pavlou, P. A., Huigang, L., & Yajiong, X. (2007). Understanding and Mitigating Uncertainty In Online Exchange Relationship: A Principal-agent Perspective. *MIS Quarterly*, 31(1), 105-136.
- Salam, A. F., Rao, H. R., & Pegels, C. C. (2003). Consumer-perceived risk in e-commerce transactions. *Communications of ACM*, 46(12), 325-331.
- Singh, J., & Sirdeshmukh, D. (2000). Agency and Trust Mechanisms in Consumer Satisfaction and Loyalty Judgments. *Journal of the Academy of Marketing Science*, 28(1), 150-167.

- Vermeulen, I. E., & Seegers, D. (2009). Tried and Tested: The Impact of Online Hotel Reviews on Consumer Consideration. *Tourism Management*, 30(1), 123-127.
- Weathers, D., Sharma, S., & Wood, S. L. (2007). Effects of Online Communication Practices on Consumer Perceptions of Performance Uncertainty for Search and Experience Goods. *Journal of Retailing*, 83(4), 393-401.
- Yang, J., Sarathy, R., Lee, D. J. K., & Fang, D. X. (2011). *Investigating the Influence of Product Reviews on Perceived Uncertainty in Online Transactions*. Paper presented at the AMCIS, Detroit, MI.