The Effect of Online Customer Reviews on Product Sales and Prices – A Longitudinal Study

Emergent Research Forum (ERF) Papers

J.B. (Joo Baek) Kim
Worcester Polytechnic Institute
jkim3@wpi.edu

Abstract

As e-commerce prospers, increasing interests are gained in online customer reviews and its application to the theory and practice. However, there are many controversies around the effect of the online customer reviews. This study will use a longitudinal analysis approach to find the impact of online customer reviews on the price strategy and the product sales, which will add more solid application of effective use of e-WOM to the theory and the practice.

Keywords (Required)

online customer reviews, electronic word-of-mouth, e-WOM, longitudinal analysis, time series

Introduction

Since the emergence of ubiquitous Internet access, people have been able to communicate each other easily beyond physical restrictions. Such a technological advancement led the e-commerce to thrive rapidly over the past years accompanying with the digital economy. That generated another new phenomenon in the digital economy, that is, electronic word-of-mouth (e-WOM) in e-commerce environment. People post their reviews, opinions, complains, and recommendations on products/services to various places, including products review pages, online product forums, and personal webpages/social media, where others, especially potential customers, gain important information about the product/services. The information could significantly affect the potential customers' decision to purchase (Li & Hitt, 2010; Duan, Gu, & Whinston, 2008).

Accordingly, many studies have explored the effect of online customer reviews in e-commerce environment. Factors such as customer product reviews are claimed to influence the product sales at the online retail stores (Dabholkar, 2006; Duan et al., 2008). However, findings are not always consistent (Duan et al., 2008; Cui, Lui, & Guo, 2012). Although various reasons may contribute to the inconsistency among the studies, one of the possible reasons would be the ways of measuring variables in the studies. Many previous studies in this area depend on cross-sectional data collection or do not consider the time effect of the reviews. Since the impact of the online customer reviews is dependent on time (Chern, Wei, Shen, & Fan, 2015), there would be a time lag between the customer reviews and the actual product sales and the seller's price strategy. Moreover, it is possible that the more recent reviews would have more impact on the potential customers' purchase decision.

To address the issues, this research-in-progress tries to answer the following research questions:

(1) How do the online customer reviews affect the potential customers' purchase decision over time?

(2) How do the online customer reviews affect the seller's price strategy over time?

To answer these questions, this article provides a research plan to collect and analyze longitudinal data of online customer reviews, product prices, and product sales at Amazon.com. The rest of the paper contains theoretical background of the topic, planned research method, and anticipated results of the study.

Theoretical Background

Pavlou et al. (2007) suggests the principal-agent perspective which stems from the agency theory (Eisenhardt, 1989) to explain the people's activities such as online customer reviews in e-commerce environment. There typically exists an asymmetry of information between the buyers (i.e., principals) and the sellers (i.e., agents). Especially under the e-commerce environments, this asymmetry of information is amplified due to the physical dispersion between the sellers and the buyers. Hence, due to the fact that the sources of the information are limited to the buyers, they try to increase the sources of the information about the product and the sellers as well as to reduce the uncertainty associated with the transaction as much as possible, which consequently lead the buyers two options: (1) purchasing information about the agent's behavior; (2) rewarding the agent based on performance or outcome (Eisenhardt, 1985). The costs associated with this behavior is called the agency costs, which is consisted of three types, namely, monitoring costs, bonding costs, and residual loss (Gurbaxani & Whang, 1991). In the context of the online retail stores, the online customer reviews would mitigate the agency costs for the potential customers by reducing the information asymmetry. For example, by looking at the other customers' comments and evaluations of the product/sellers, potential customers may gain extra knowledge about the product/sellers beyond the information that the sellers provide, which eventually reduces the additional effort/costs to seek for the information. As mentioned, the uncertainty associated with e-commerce is consisted of the seller quality uncertainty and the product quality uncertainty (Pavlou et al., 2007). Online customer reviews are regarded a proxy of the product quality (Gu & Lin, 2006; Li & Hitt, 2008) as well as supplementing the communication with sellers (Chevalier & Mayzlin, 2006; Zhu & Zhang, 2010).

Past studies suggest that the online customer review is one of the most significant factors influencing the customer purchase decision and/or the product sales (Chevalier & Mayzlin, 2006; Duan et al., 2008; Godes & Mayzlin, 2004; Zhu & Zhang, 2010). Due to its easiness to access and richness of contents, the online customer review is much influential to the potential customers (Chong, Ch'ng, Liu, & Li, 2015). By and large, three attributes of the online customer reviews are commonly mentioned eminent: the valence, volume, and variance of reviews (De Maeyer, 2012), while the first two aspects will be mainly focused on in this study.

Online Customer Review Valence

The valence of online customer review refers to the outcome of overall evaluation score that people give toward a product/service in e-commerce environment (Moe and Trusov, 2011; Sun, 2012; Lu, Ba, Huang, & Feng, 2013). For example, at Amazon.com, reviewers are asked to award an overall rating toward the product they review by 1 to 5 stars. Then the retailer posts the average ratings of all the reviewers for the product so the potential customers can recognize the overall evaluation quickly. It is shown that positive reviews generally increase the potential customers' expected quality, which consequently affects the attitudes toward the product (Liu, 2006). On the other hand, negative reviews deteriorate the potential customers' perception towards the product, which eventually hinders the purchase decision. It is turned out in multiple studies that the impact of the negative reviews is much stronger than the positive ones (Chevalier & Mayzlin, 2006; Cui et al., 2010). However, some studies suggest that the valence of the online reviews does not significantly affect the sales (Liu, 2006; Duan et al., 2008).

Online Customer Review Volume

The volume of online customer review refers to the quantity of information available to the potential customers, which leads to greater awareness, confidence, and reduction in uncertainty (Chen, Wu, & Yoon, 2004; Lu et al., 2013). The volume of reviews is considered a significant indicator of product popularity (Zhu & Zhang, 2010). Moreover, people would interpret the large market share as a signal of the product's high quality (Caminal & Vive, 1996). Thus, it is claimed that high volume of online customer reviews positively relates to the product sales (Liu, 2006; Duan et al., 2008; Godes & Mazline, 2004). Some studies suggest that certain types of product/service are more subject to the volume of reviews, such as experience goods, than the search products (Cui et al., 2012).

Online Customer Review and Price Strategy

Recognizing that online customer reviews are an important part of the potential customers' purchase decision and/or the product sales, sellers have paid lots of attentions to deal with the issue. Previous research investigate the pricing strategy in e-commerce environment. Several factors, including service quality, consumer awareness, reputation, price level, status of competitors, and product popularity, are revealed as determinants of the online price (Pan, Ratchford, & Shankar, 2003). Amongst many factors and frameworks suggested, customer awareness and sellers' reputation is most prominent element of price dispersion in online retail marketplace (Chen & Hitt, 2003; Smith, 2001). It is empirically shown through many studies that the seller's reputation is a strong drive for the price determination in online auction environment (Ba & Pavlou, 2002; Dewan & Hsu, 2004). In online retail marketplace, since it is either impossible or considered unethical for the sellers to manipulate the reviews directly, sellers would deal with the online customer reviews by various strategies including price change. For example, if the overall customer reviews toward a product is bad, the seller would lower the price to provide customers with compensation of the uncertainty to purchase the product.

Hypotheses Development

Based on the theoretical background review, we assume that the online customer reviews play a significant role in determining potential customers' purchase decision as well as the sellers' price strategy. Hence, this research-in-progress examines the relationships between the online customer reviews and the product sales as well as the price strategy as depicted in Figure 1.
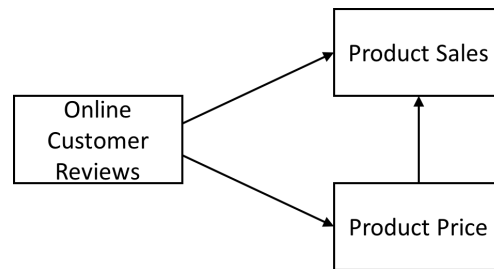

Figure 1. Research Model

Online customer reviews in the model includes both the valence and volume of the reviews posted to the product at the online retail marketplace. Reviewers post reviews toward a product and give a rating. The potential customers may see both the number of the accumulated reviews as well as the average ratings given. Of course, this information may be change over time. That means that the potential customers' perceptions could be different at different points, which would also affect the price and the product sales differently over time.

Meanwhile, retailers at e-commerce would set their price strategy based on the customer reviews posted to the products over time. As it is claimed by previous studies, the reputation plays a significant role in price strategy in online commerce environment (Ba & Pavlou, 2002; Chen & Hitt, 2003; De Maeyer, 2012). For example, in case that a product has few reviews and low review ratings, a seller would decrease the price to attract customer attentions and/or compensate customers' uncertainty regarding the product. To the contrary, as more and better reviews are posted to the product, the seller would increase the price. Therefore, this study hypothesizes as follows:

> *H1a: The average rating of online customer reviews will positively affect the product price over time.*

> *H1b: The number of online customer reviews will positively affect the product price over time.*

Similarly, since online customer reviews are associated with the potential customers' attitude to the product, which consequently relates to the purchase decision, the product sales would be also affected by the volume and the valence of online reviews over time. For example, a surge of review rating at a point could increase the sales over time as well as accumulation of review volume would affect the product sales. Adding to the findings from previous studies that show both the valence and the volume of the reviews

would affect the sales of the product over time (Yu et al., 2012; Cui et al., 2012), this study hypothesizes as follows:

> *H2a: The average rating of online customer reviews will positively affect the product sales over time.*

> *H2b: The number of online customer reviews will positively affect the product sales over time.*

Price is another major factor that can influence the customers' purchase decision in the online retail environment. Especially given that the online customers are more price sensitive than the brick-and-mortar customers, price change would be another strong determinant of the product sales (Degeratu, Rangaswamy, & Wu, 2000). Hence, this study hypothesizes as follows:

> *H3a: The product price change will inversely affect the product sales over time.*

Data Collection and Methodology

To test the hypotheses above, data of online customer reviews (review ratings and counts) is collected at Amazon.com. Customers who write a review on a product are required to enter their rating on the product in 1 to 5 stars scale as well as text reviews. Potential customers also can easily find the average review rating and how many reviews are posted to the product so far. The detailed information regarding the reviews such as the reviewer ID, the date when the review was posted, the review text, and so on, are available so we can gather the historical review data.

Amazon.com actually does not provide the historical data of price change and sales volume. However, there are several third-party web data providers who keep track of the price changes and the sales rank information over the period of time. We access to one of the service providers (i.e., Keepa.com), and extract historical data of the prices and the sales ranks for the products selected. Since Amazon.com as well as Keepa.com have a large selection of the products, we need to confine our scope of the analysis to a specific product domain. One possible product group would be video game titles. Video game titles are one of the most popular products in e-commerce. They are the third most purchased products at online stores. In addition, video games are experiential goods, of which purchase decision is based on the perceived quality that is quite subjective (Mudambi & Schuff, 2010), so the online customer reviews could affect the purchase decision quite significantly. From a preliminary data collection, we could find about 5,500 game titles from one of the console game platform (i.e., XBOX) over the period of 2008 to 2014.

Time series multiple regression model will be used to test the hypotheses. In the analysis model, data of historical price change, sales rank, and the customer reviews (ratings and counts) for the products will be included.

Expected Conclusion

As e-commerce prospers, increasing interests are gained in online customer reviews and its application to the theory and practice. However, there are many controversies around the effect of the online customer reviews, hence little applicable knowledge is available to the field. This study will use a longitudinal approach to find the impact of online customer reviews on the price strategy and the product sales, which will add more solid application of effective use of e-WOM.

REFERENCES

Ba, S., & Pavlou, P. A. 2002. "Evidence of the Effect of Trust Building Technology in Electronic Markets: Price Premiums and Buyer Behavior, *MIS Quarterly* (*26:3*), pp. 243–268.

Caminal, R., & Vives, X. 1996. "Why market shares matter: an information-based theory," *The RAND Journal of Economics*, (27:2), pp. 221–239.

Chen, P. Y., & Hitt, L. 2003. "Understanding price dispersion in internet-enabled markets," Working Paper, Carnegie Mellon University, Pittsburgh, PA.

Chen, P.Y.; Wu, S. & Yoon, J. 2004. "The impact of online recommendations and consumer feedback on sales," In *Proceedings of the International Conference on Information Systems.* Washington, DC: Association for Information Systems, pp. 711–724

Chern, C.-C., Wei, C.-P., Shen, F.-Y., & Fan, Y.-N. 2015. "A sales forecasting model for consumer products based on the influence of online word-of-mouth," *Information Systems and E-Business Management*, pp. 1–29.

Chevalier, J. & Mayzlin, D. 2006. "The Effect of Word of Mouth on Sales: Online Book Reviews," *Journal of Marketing Research* (43:3), pp. 345-354.

Chong, A. Y. L., Ch'ng, E., Liu, M. J., & Li, B. 2015. "Predicting consumer product demands via Big Data: the roles of online promotional marketing and online reviews," International Journal of Production Research, pp. 1-15.

Cui, G., Lui, H.-K., & Guo, X. 2012. "The Effect of Online Consumer Reviews on New Product Sales," *International Journal of Electronic Commerce*, *17*(1), pp. 39–58.

Dabholkar, P. 2006. "Factors Influencing Consumer Choice of a 'Rating Web Site': An Experimental Investigation of an Online Interactive Decision Aid," *Journal of Marketing Theory and Practice* (14:4), pp. 259-273.

De Maeyer, P. 2012. "Impact of online consumer reviews on sales and price strategies: a review and directions for future research," *Journal of Product & Brand Management*, 21(2), pp. 132–139.

Degeratu, A. M., Rangaswamy, A., & Wu, J. 2000. "Consumer choice behavior in online and traditional supermarkets: The effects of brand name, price, and other search attributes," *International Journal of Research in Marketing* (17:1), pp. 55-78.

Dewan, S., & Hsu, V. 2004. "Adverse Selection in Electronic Markets: Evidence from Online Stamp Auctions," *The Journal of Industrial Economics*, (*52:4*), pp. 497–516.

Duan, W., Gu, B., & Whinston, A. B. 2008. "Do online reviews matter? - An empirical investigation of panel data," *Decision Support Systems* (45:4), pp. 1007 -1016.

Eisenhardt, K. M. 1989. "Agency theory: An assessment and review," *Academy of Management Review*, pp. 57-74.

Godes, D. & Mayzlin, D. 2004. "Using Online Conversations to Study Word-of-Mouth Communication," *Marketing Science* (23:4), pp. 545-560.

Gu, B. & Lin, M. 2006. "The dynamics of online consumer reviews," *In Workshop on Information Systems and Economics (WISE)*.

Gurbaxani, V., & Whang, S. 1991. "The impact of information systems on organizations and markets," *Communications of the ACM* (34:1), pp. 59-73.

Li, X. & Hitt, L. M. 2008. "Self-Selection and Information Role of Online Product Reviews," *Information Systems Research* (19:4), pp. 456-474.

Liu, Yong. 2006. "Word of Mouth for Movies: Its Dynamics and Impact on Box Office Revenue," *Journal of Marketing*, (70:3), pp. 74–89.

Lu, X., Ba, L., Huang, & Feng, Y. 2013. "Promotional Marketing or Word-of-Mouth? Evidence from Online Restaurant Reviews," *Information Systems Research*, (24:3), pp. 596–612.

Moe, W. W. & Trusov, M. 2011, "The Value of Social Dynamics in Online Product Ratings Forums," *Journal of Marketing Research*, (48: June), pp. 444–56.

Mudambi, S. M. & Schuff, D. 2010. "What Makes A Helpful Online Review? A Study of Customer Reviews on Amazon.Com," *MIS Quarterly,* (34:1), pp. 185-200.

Pan, X., Ratchford, B. T., & Shankar, V. 2003. "The evolution of price dispersion in internet retail markets," In *Organizing the New Industrial Economy* (pp. 85-105). Emerald Group Publishing Limited.

Pavlou, P. A., Liang, H., & Xue, Y. 2007. "Understanding and mitigating uncertainty in online exchange relationships: A principal - agent perspective," *MIS Quarterly* (31:1), pp. 105-136.

Smith, M. D. 2001. "The law of one price? The impact of IT-enabled markets on consumer search and retailer pricing," Working paper.

Sun, M. 2012, "How Does the Variance of Product Ratings Matter?" *Management Science*, (58:4), pp. 696–707.

Yu, X., Liu, Y., Huang, X., & An, A. 2012. "Mining online reviews for predicting sales performance: A case study in the movie domain," *IEEE Transactions on Knowledge and Data engineering*, (*24*:4), pp. 720-734.

Zhu, F. and Zhang, X. 2010. "Impact of online consumer reviews on sales: The moderating role of product and consumer characteristics," *Journal of Marketing* (74:2), pp. 133-148.