

# Identifying the Conditions under Which Online Reviews Translate into Product Sales: A Sentiment Analysis Approach

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## Abstract

Number of available online consumer reviews has increased dramatically. This research-in-progress study draws on Cue-Summation and Communication Persuasion theories to define and validate the online review positiveness as a multidimensional formative index and conduct a sentiment analysis, using secondary data from Amazon.com, to identify the conditions under which online reviews translate into product sales. Particularly, this study focus on the role of product involvement, review time, product price, and review score inconsistency on the impact of online review positiveness on product sales. Potential contributions to theory and practice are also discussed.

## Keywords

Online consumer reviews, sales, sentiment analysis, review positiveness

## Introduction

Recent studies indicate the increase in the number of consumers whom are using online consumer reviews as a valuable source to evaluate their purchasing options (Salehan and Kim 2016). To measure the value of an online consumer review, studies often assess the review helpfulness perception (Yin et al. 2014, Salehan & Kim 2016). Although, perceived helpfulness indicates the extent to which consumers find an online consumer review to be helpful in evaluating the quality of a product or service (Qiu et al. 2012), it does not show how online consumer reviews affect the sales. Some studies argue that unfavorable reviews may affect product sales (Berger et al. 2010; Chevalier and Mazylin 2006; Zhu and Zhang 2010). For example, while Berger et al. (2010) argue that negative publicity can increase sales by enhancing product awareness, Chevalier and Mazylin (2006) found that the product's negative reviews decrease relative sales. To resolve this controversy, the main purpose of this study is to conduct a sentiment analysis to identify the conditions under which online consumer reviews translate into product sales. To this end, we focus on the effect of the positiveness of online consumer reviews on sales. Positiveness of online consumer reviews indicates that the extent to which an online consumer review positively evaluates the quality of a given product or service (Park and Lee 2009).

Given the growth in the use of online consumer review, this study is focused on conceptualizing, operationalizing and validating the concept of online review positiveness. Defining and validating online review positiveness and its impact on product sales will offer new insights into the online review literature. Thus, the second objective of this study is to define and validate the online review positiveness as a multidimensional formative index.

Previous research has found that consumers may differ in the extent of their search and their attention to online consumer reviews depending on the product's level of involvement and their price (Laurent and Kapferer 1985). In addition, the date that a review has been posted, and the level of consistency between different consumer product reviews could influence consumers' online shopping decision makings (Baek et al. 2012). Thus, the third objective of this paper is to investigate the impact of product involvement, review time, product price, and review inconsistency on the relationship between review positiveness and product

sales. To examine these research objectives, using a document based sentiment analysis technique on online consumer reviews and sales rank obtained from Amazon.com, we draw on Cue-Summation and Communication Persuasion theories to investigate the effect of online consumer reviews on sales.

## Theoretical Background

### Communication Persuasion Theory

Communication Persuasion is a theory for mass communication effectiveness (Haase 2012). This theory explains the effect of messages on changing the attitudes of information receivers. Particularly, this theory uses Stimulus-Organism-Response (SOR) Framework to explain the attitude change in information receivers. SOR framework was first introduced by Mehrabian and Russell (1974). This framework outlines how an organism’s response will be affected by environmental cues. Mehrabian and Russell (1974) argue that environmental cues act as stimulus which affect the understanding of an organism about its surrounding environment and ultimately shape that organism’s response. Based on Communication Persuasion theory, persuasive messages (i.e., stimulus) can change individuals’ attitude (i.e., organisms), which impact their behavior (i.e., response) (Haase 2012). In the context of this study, online review score, review sentiment, and review title sentiment act as stimulus that shape perceived online review positiveness (i.e., organism) which eventually leads to product sales (i.e., response).

### Cue-Summation Theory

Cue-Summation (Servin 1967) is a theory that explains humans’ learning and information processing procedure. This theory defines a cue as an information, received by a human from the environment. This theory claims that learning is the product of the processing of the cues. Moreover, if the number of cues increases, learning becomes more comprehensive and effective (Dwyer 1978). In the context of this study, online review sentiment, review title sentiment, and review score could be considered as different types of cues that help consumers learn about how positive the consumers’ reviews are in evaluating a particular product or service.

## Research Model and Hypotheses Development

To satisfy our research objectives, and by drawing on Cue-Summation and Communication Persuasion theories, we propose the following research model.

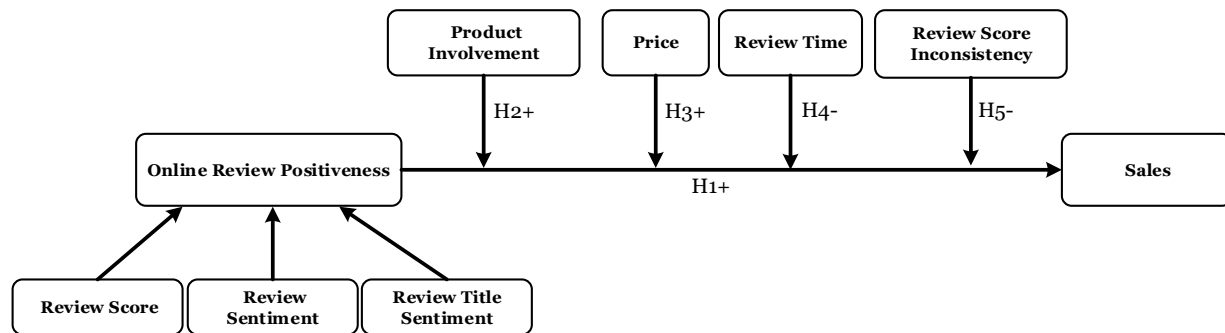


Figure 1. Research Model

**Online review positiveness** refers to the extent to which online consumer reviewers have positively evaluated the quality of a product (Park and Lee 2009). According to Cue-Summation theory, a piece of information will be considered as effective, if it contains enough cues, offering a realistic perspective. In our research, we have outlined the online review postiveness as a construct composed of review score, review sentiment, and review title sentiment, which are explained below:

**Review score** is a numerical evaluation of reviewers about the quality of a product or a service (Krosnick et al. 1993). These numerical values which mainly are presented in a Likert score format, typically range from one to five, reflect the evaluation of a reviewer about the quality of a product or service. Lower scores mainly reflect negative evaluation, whereas high scores represent higher evaluation (Krosnick et al. 1993).

**Review sentiment** reflects the overall perception of a review writer, obtained from the open-ended text of an online consumer review, about the quality of a certain product or service. These sentiments contain various degrees of emotions and can be classified into three main categories of positive, negative, or neutral (Ghasemaghaei et al. 2016).

**Review title sentiment** reflects the overall perception of a review writer, written in the title section of an online review.

Accordingly, a review will be perceived as positive if it is associated with higher levels of review score, positive review sentiment, and positive review title sentiment. According to Cue-Summation theory, if an online consumer review provides a realistic perspective in a positive manner, reviewers will perceive it as having a higher level of positiveness. Based on Communication Persuasion theory, online review score, review sentiment, and review title sentiment act as stimulus that shape perceived online review positiveness (i.e., organism) which eventually leads to product sales (i.e., response). Moreover, according to Hu et al. (2008) positive online consumer reviews significantly increase products' sales. Thus, we hypothesize that: **H1: Online review positiveness is positively associated with product sales.**

**Product involvement** refers to the extent of consumers' effort in buying a certain product or service (Park and Mittal 1985). A product is said to be of high involvement for customers when they perceive it to be of high importance for them, while a product is said to be of low involvement when consumers perceive it to be of low importance for them (Antil 1984). For high involvement products (e.g., laptop, TV), consumers will engage in more extensive information searches compared to when they look for low involvement products (e.g., CDs, light bulbs, and pens) (Von Reischach et al. 2010). Therefore, for high involvement products, consumers may pay more attention to the online consumer reviews as an important source to understand and evaluate the quality a product or service. Baek et al. (2012) argue that when it comes to high involvement products, consumers mainly use online consumer reviews to compare their alternatives at the final stage of purchasing decisions. Therefore, the effect of positiveness of online consumer review on product sales is expected to be higher for high involvement products or services. Thus, we hypothesize that: **H2: Product involvement positively moderates the impact of review positiveness on product sales.**

**Price** is a value requested to finalize the purchase of a certain product or service (Lichtenstein et al., 1988). To assure more satisfactory purchases for products with high prices, consumers spend more time to search for product information (Clarke and Belk 1979). According to Baek et al. (2012) depending on how much consumers intend to pay for a product, they show different behaviors in their decision-making process. Compared to low-priced products, people often read online reviews in more detail for high-priced products (Baek et al. 2012). Therefore, it is expected that compared to low-priced products, the effect of positiveness of online consumer reviews on sales would be higher for high price products. Thus, we hypothesize that: **H3: Product price positively moderates the impact of review positiveness on product sales.**

**Review time** refers to the time gone since the review was originally posted. According to communication persuasion theory, the effect of an advertising message will be reduced as the time elapses (Deshpandé and Stayman 1994). In our context, we expect that those reviews that have been posted lately have a higher impact on the product sales comparing to those posted earlier. Thus, we hypothesize that: **H4: Review time negatively moderates the impact of review positiveness on product sales.**

**Review score inconsistency** refers to the extent to which the score of a review is not consistent with the average ratings of other reviewers (Baek et al. 2012). Higher levels of inconsistency between review scores lower the credibility of those reviews and have negative impact on consumers' perceptions regarding the product evaluation quality. Cheung et al. (2009) found that if an online consumer recommendation is consistent with a consumer previous experiences and expectations, it has a positive effect on perceived the credibility of the product evaluation. Thus, not only consumers rely more on those consistent online consumer reviews, but they also find those online consumer reviews to be more helpful in making their purchasing decisions (Baek et al. 2012). Hence, lower levels of product evaluation inconsistency decrease the effectiveness of the positiveness of the online consumer review on product sales. Therefore, we hypothesize that: **H5: Review score inconsistency negatively moderates the impact of review positiveness on product sales.**

## Methodology

### Research Methodology

To assess the proposed hypotheses of this study, we will use secondary data, scrapped from Amazon.com, using Html scrapping techniques. The raw data will include consumer review content, review title content, review score, review date, and sales rank. We will then categorize the collected consumer reviews based on product involvement, price, and review date. To analyze the textual content, we employ some text mining techniques. Text mining techniques have paved the way to analyze online consumer reviews' content. This special text mining usage is called sentiment analysis (Duan et al. 2008). For this study, document based sentiment analysis method will be used. This method is an unsupervised method that can classify online consumer reviews based on the overall semantic orientation of their content. Therefore, in this study, the sentiment analysis will be conducted at consumer review level. Accordingly, we will classify online consumer reviews' content and review titles' content into three different categories of positive, neutral, and negative. Furthermore, perceived online consumer review positiveness will be measured as a multidimensional formative index including review score, review sentiment, and review title sentiment. To calculate review score inconsistency, the sparsity of review scores will be calculated. All the above mentioned procedures will be programmed in R. According to the current literature, there are no suggestions for minimum sample size to be collected from the web. However, we will be collecting at least twenty thousand online consumer reviews for the last five years. This collected database will include online consumer reviews for both high (e.g., Laptop) and low (e.g., book) product involvements.

### Data Analysis

After extracting the raw data, and to validate our proposed research model and hypotheses, as our research is an exploratory research, we will use a structural equation modeling technique, namely Partial least square (PLS) (Gefen et al. 2000). Furthermore, to understand the predictability of our proposed research model, we will calculate the goodness of fit indices based on Vinzi et al. (2010) recommendations.

## Conclusion

The proposed research has potential to contribute to both theory and practice. Recently, online consumer reviews have been increased dramatically. The main purpose of this study is to conduct a sentiment analysis to identify the conditions under which online reviews impact product sales. Particularly, we focus on the influence of the positiveness of online consumer reviews on sales and the impact of different factors that affect this association. Moreover, this study focuses on conceptualizing, operationalizing and validating the concept of online review positiveness which could potentially offer new insights into the online review literature.

This study also has some major practical contributions. The potential findings of this study could shed the light on the importance of online consumer reviews and whether or not online consumer reviews affect sales. This practical finding could be used by those websites that offer online consumer review platforms. Another practical contribution of this study is in highlighting the applicability of sentiment analysis in practice. This shows that text mining in general, and sentiment analysis methods in specific, could facilitate usability of online consumer reviews. In addition, our research may eventually help online vendors recognize what factors constitute perceive online consumer review positiveness. Moreover, the results of this study help both online and brick-and-mortar vendors to develop better business strategies by understanding the role of product involvement, review time, product price, and review score inconsistency on the impact of online reviews on product sales.

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