



# User reviews and uncertainty assessment: A two stage model of consumers' willingness-to-pay in online markets



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## ABSTRACT

We develop a two-stage conceptual consumer decision model from the risk perspective to understand the role of online user reviews in consumers' Willingness-To-Pay (WTP). In stage one, consumers assess product uncertainty with product reviews. In stage two, they assess seller uncertainty with seller reviews, conditional on their assessment of product uncertainty in stage one. We further develop an operationalization of our conceptual model using the expected utility theory and derive hypotheses on the effects of online user reviews on consumers' WTP. We test our hypotheses using data from an experimental study and an empirical study.

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## 1. Introduction

Online user reviews play an important role in e-commerce industry. Sellers pay close attention to how consumers talk about the products they purchase and the journey they experience presumably because consumers' post purchase opinions ultimately determine consumers' satisfaction and loyalty. According to Business Week (October 2009), some 70% of Americans say they consult product reviews or consumer ratings before making a purchase. Social commerce firm Bazaarvoice (bazaarvoice.com) also observed that 60% of retailers use customer reviews in choosing their product assortments. It estimates that as much as 70% of the products with product review ratings lower than and equal to 2 stars (in a 5 star system) have been pulled from some sites, compared to an average of 47%. These products are also pulled 24 days faster than the site average.

It has been well documented in the literature that third-party online user reviews play an essential role in consumers' uncertainty assessment and purchase decisions such as whether to buy or how much to pay (WTP) [12,35]. Broadly speaking, there are two main sources of uncertainty for consumers in online shopping: product uncertainty and seller uncertainty. Most of the studies focus on understanding the role of online use reviews in mitigating purchase uncertainty associated with either products [13,14,32] or sellers [3,36], but not both until recently. In recent studies [12,16], the integrated effects of both product uncertainty and seller uncertainty are investigated for online used product markets where third-party product reviews are either non-existent

or purged into seller reviews and an adverse selection problem often happens in understanding the impacts of user reviews.

However, in majority of online markets (e.g., new goods market), independent third-party product reviews widely exist (e.g., Amazon.com) and significantly affect consumers' product information search and consumer decision process. On product information search, product uncertainty primarily concerns product quality [15] which sellers have little control of product information dissimulation. Although there may be other means of uncertainty assessment in digitizable industries (e.g., a sample in music industry, an excerpt in book industry, a free download of limited version in software industry, etc.), product reviews at various shopping websites are the more frequently sought information source for consumers to assess product quality uncertainty. Beyond product reviews, consumers also search the price information offered by the online retailers (e.g., the "add to basket to find price" feature at Amazon) because fixed price retailers also factor the product reviews into their pricing decision. On consumer decision process, consumers may search information for products and sellers across different electronic marketplaces. For example, a consumer may choose to evaluate product uncertainty at one site (e.g., Amazon) and evaluate seller uncertainty at another site (e.g., eBay). The product reviews and seller reviews affect what to purchase (product), whom to purchase from (seller), and how much to pay (willingness-to-pay).

In this paper, we take a risk perspective to study how consumers use the distributional characteristics (i.e., volume, valence, and variance) of both product reviews (PR) and seller reviews (SR) to assess online purchase uncertainties and determine their willingness-to-pay (WTP) where independent third-party product reviews exist. Our research contributes to the literature [e.g., 7,12,13,16,6,25,32,36,38,39] in three aspects. First, we examine the joint effects of product reviews and seller

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reviews on consumers' WTP by developing a two-stage conceptual model grounded on theories of consumer decision processes under uncertainty. Second, we examine the moderations of consumer risk attitudes on consumers' WTP by allowing consumer risk attitude heterogeneity not only across consumers (i.e., different consumers may have different risk attitude towards product uncertainty or seller uncertainty), but also within consumers (i.e., the same consumer may have different risk attitude between product uncertainty and seller uncertainty). Finally, beyond the previous studies (e.g., [36]) which focused on volume and valence of dichotomous user reviews (e.g., the binary reputation system at eBay), we find volume, valence, and variance are important for continuous user reviews (e.g., the five star rating system at Amazon).

The rest of the paper is organized as follows. In Section 2, we review the relevant literature. In Section 3, we develop our conceptual model and operational model in which we further develop our hypotheses. In Section 4, we design an experimental study to test the internal validity of our hypotheses. In Section 5, we collect data from real online markets to test the external validity of our hypotheses. Finally in Section 6, we summarize the contributions of our research, discuss the implications of our research on theory and practice, and highlight the limitations and future research of our study.

## 2. Relevant literature

### 2.1. Consumers' decision process on their WTP

A consumer's WTP denotes the maximum price the consumer is willing to pay for a product from a seller [35] and is determined by the consumer's expected utility when the purchase is under uncertainty [36]. Consistent with the literature (e.g., [31]), we assume consumers follow the two-stage purchase decision process to decide their WTP. This process involves two important stages: the *product evaluation stage* in which consumers evaluate product(s), followed by the *seller evaluation stage* in which consumers evaluate seller(s) who sell the products. In other words, we assume that consumers determine their WTP for a seller on a product in stage two is based on their evaluation of the product in stage one.

Compared with offline purchases, the uncertainty assessment of online purchases has two important implications on consumers' decision process: 1) information search and 2) alternative evaluations. On information search, the information sources consumers search between offline and online markets are different. Consumers are often *passive* information searchers in offline markets. They are targeted by the marketers' communication mix (e.g., advertising, sampling etc.) on product information. Sellers (e.g., brick-and-mortar retailers) offer opportunities for consumers to assess and verify product quality and seller reputation in physical settings. Consumers engage limited search of interpersonal information such as word-of-mouth (WOM) because interpersonal information is either constrained by consumers' social networks or difficult for them to justify. However, consumers are often *active* information searchers in online markets because of the lowered search costs (e.g. [9]) and enriched third-party reviews (e.g., [10]). Smaller sellers constrained by limited marketing budgets often eliminate their traditional promotion mix entirely (e.g., eBay sellers or Amazon eStores) and entirely rely on third-party online user reviews on products and sellers for marketing communications. Indeed, online user reviews are perceived impartial and are the most searched and important source of information for making online purchase decisions [10]. On alternative evaluation (for both products and sellers), consumers face different uncertainties between offline and online markets. While purchase uncertainty in offline markets is primarily in product alone, purchase uncertainty in online markets is related to both products and sellers. As such, consumers not only evaluate various products in a category to assess product uncertainty as they do in offline markets, but also evaluate different sellers to mitigate seller uncertainty which they do not in offline markets.

### 2.2. The role of online user reviews

The separation of consumers from sellers in online markets makes consumers' purchase uncertainty one of the most salient considerations in their purchase decisions [21]. According to consumers' purchase process elaborated above, consumers' purchase uncertainty comes from two sources accordingly: *product uncertainty* at product evaluation stage and *seller uncertainty* at purchase decision stage [16].

Product uncertainty is the main concern for consumers at product evaluation stage, regardless the product is used or new. For used products, product conditions present a major source of product uncertainty [12]. For new goods, the product uncertainty primarily stems from product quality or performance because of consumers' unfamiliarity with the product [15]. Consumers' limited knowledge and/or expectations with a product lead to their varying assessment of the product quality. Product uncertainty is more salient if the product complexity is high [5] or the product is experiential [23,26].

It is well documented in various offline markets that interpersonal communications such as WOM play an important role in consumers' assessment of product uncertainty, particularly when the stake of uncertainty is high and interpersonal communications are the primary source for consumers' information search. For example, in markets of new durables, Mahajan et al. [27] found that WOM from early adopters (e.g., innovators) significantly affect the behavior of later adopters (e.g., imitators) because the WOM from innovators mitigates the product uncertainty for the imitators. Similar observations were also made in markets of industrial products [29]. In online markets, eWOM such as online product reviews (PR) is the most sought product information [10] and have played similar role in product uncertainty assessment and critical marketing outcomes such as consumers' preference [17] and sales [6]. The literature also documented mixed findings regarding the impact of online product reviews (PR). For example, on the box-office sales in the movie industry, the main driver is shown to be PR volume in some studies [13,14,25], but PR valence in others [7].

Seller uncertainty, although not a big issue in offline markets in general, is the main concern in online markets for consumers at purchase decision stage. Seller uncertainty is unique for online markets because many online sellers have limited offline presence or limited awareness to the consumers or both (e.g., individual sellers at eBay), which makes seller uncertainty assessment difficult in online markets. As such, seller uncertainty assessment using online seller reviews (SR) has attracted much attention in e-commerce literature [3,12]. Similar to online product reviews, these researches also show mixed findings on the effects of SR volume and SR valence on product sales as well as consumers' WTP [36].

Recent studies [12,16] investigate product uncertainty and seller uncertainty jointly in used good markets. These researches show that seller uncertainty is not independent of product uncertainty, but rather have important implications for signaling product uncertainty, presumably because sellers have motivation to bias the listing of product information for used products, an adverse selection problem dated back to Akerlof [1] in the economics literature.

### 2.3. The moderation of consumers' risk attitude

According to decision theory under uncertainty, consumers' WTP is not only determined by the degree of uncertainty involved, but also moderated by consumer risk attitudes<sup>1</sup> [4,22,35]. Wu and Ayala

<sup>1</sup> Although uncertainty is a term developed for objective probability distributions and risk is reserved for subjective probability distributions, consumer risk attitude is applicable to both cases [30]. We use uncertainty and risk interchangeably in this study.

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