

IS THIS OPINION LEADER'S REVIEW USEFUL? PERIPHERAL CUES FOR ONLINE REVIEW HELPFULNESS

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ABSTRACT

With the growing popularity of online user-generated reviews, research has emerged to understand the mechanism of how a review is voted helpful, focusing on the central-route influences of review content and quality, yet little research has studied the roles of peripheral cues such as reviewer credibility and contextual factors. Drawing on the theories of elaboration likelihood model and source credibility model, this study developed an integrative model of online review helpfulness, focusing on the direct influence of reviewer credibility and the moderating effects of service price and rating extremity. An econometrics regression analysis of 16,265 hotel reviews on Yelp showed that reviewer expertise in terms of the number of “Elite” badges, and reviewer online attractiveness in terms of the number of friends both helped a review receive helpfulness votes. The findings further revealed that a review written by an opinion leader (i.e., a reviewer with more Elite badges and more online friends) did not necessarily receive more helpfulness votes. Hotel price weakened the enhancing effect of reviewer expertise. Rating extremity also diluted the influence of reviewer credibility. These findings contribute to the knowledge of online review helpfulness, and offer practical implications on how to position valuable reviews.

Keywords: Online review; Review helpfulness; Source credibility; Peripheral cues; Social media

1. Introduction

The emergence of user-generated content and social media has brought about a revolution of e-word-of-mouth (eWOM) [Fader & Winer 2012]. Online reviews, one important form of eWOM, are information posted by existing consumers about their consumed products or services on e-commerce or third party websites [Duan et al. 2008]. Other consumers rely more heavily on those peer reviews than advertisements on traditional media in making their purchasing decisions. Online retailers such as Amazon offer abundant consumer reviews for books, electronics, and other products carried on the sites. Third-party review services such as Yelp and Tripadvisor provide a considerable amount of peer reviews for restaurants, hotels, and other services [Sparks et al. 2013]. With the prevalence of online reviews, an unwieldy glut of information can overwhelm consumers [Godes & Silva 2012]. To address this issue, many e-commerce and review websites introduced social voting mechanisms that allow users of those sites to vote for helpful or useful reviews they have read [Ghose & Ipeirotis 2011]. Research finds that potential customers are more receptive to those reviews that are perceived more helpful [Zhang et al. 2010], and thus that more helpful

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reviews have stronger influence on users' purchasing decisions. Obviously, reviews are not recognized equally by users [Pan & Zhang 2011]. Therefore, in addition to the research on the outcomes of helpful reviews, that is, the impact of helpfulness on product sales [Chevalier & Mayzlin 2006; Duan et al. 2008; Forman et al. 2008], more recent research focused on the determinants of helpfulness [Yin et al. 2014]. In particular, these studies investigated what characteristics of reviews and reviewers lead to the helpfulness perceived by users [Baek et al. 2013; Ghose & Ipeiroitis 2011; Mudambi & Schuff 2010; Purnawirawan et al. 2014].

As the perception of review helpfulness reflects a user's information evaluation, research shows that the dual process theory of external information process is an appropriate theoretical foundation for online review studies, in particular the elaboration likelihood model (ELM) of persuasion [Baek et al. 2013; Cheung et al. 2012]. The core concept of ELM is two informational influence paths towards perceived usefulness—the central route and peripheral route. The central route represents the central source of influence on potential users' perceptions of the information they received. It is the content of the information itself. The peripheral route represents the peripheral source of influence, which comes from the context of the information. The central route requires a great amount of users' effort, or elaboration, in comprehending systematic cues of the information, prior to forming an attitude or judgment about the information. It means the user has to actually read the message and carefully deliberate over the merits of the argument [Cheung et al. 2012]. In contrast, processing heuristic cues in the peripheral route is simpler and less demanding. Other than the argument embedded in the message, the user may pay attention to more accessible informational indicators such as source identity, expert endorsement, and likeability of or affinity toward the endorser [Baek et al. 2013; Bhattacharjee & Sanford 2006; Cheung et al. 2012]. Moderating factors such as user expertise and relevance may alter users' ability or willingness to elaborate on the information, and thus affect the likelihood of invoking either the central or peripheral route [Bhattacharjee & Sanford 2006; Cheung et al. 2012; Sussman & Siegal 2003]. Nevertheless, the central and peripheral routes are not mutually exclusive with the moderating factors. Users' expertise and relevance, for instance, will augment or attenuate the effect of each route on perceived usefulness, but not determine which route users will solely take [Sussman & Siegal 2003].

Extant research on online review has predominantly focused on the central route. On the other hand, the influence of the peripheral route, such as reviewer attributes and other contextual factors, has rarely been rigorously examined. The motivation of the present research is thus to show that how many helpfulness votes a review received are determined not only by attributes of the review (what), but also by attributes of the reviewer, namely, "who" says "what" matters. To fill the knowledge gap, the present study aims to answer two research questions: (1) in addition to review quality such as length and readability, whether reviewer credibility, such as expertise and attractiveness, has positive impacts on perceived helpfulness of online reviews; and (2) whether contextual attributes such as price and rating extremity have moderating effects on the relationships between reviewers credibility and review helpfulness. To answer these two questions, the present study developed an overarching conceptual framework that integrates and adapts the theories of elaboration likelihood model, source credibility model, and opinion leader model. The study then tested the research model and hypotheses using 16,265 hotel reviews from a popular third-party review website (Yelp) and econometric regression models. The rest of this paper is organized as follows. The next section defines the concept of review helpfulness, and articulates the theoretical foundation of the research model. The third section presents the integrative research model and hypotheses. The fourth section reports research methods, including data collection, measures of variables, and econometrics analytical model. The fifth section reports empirical analyses and results. The final two sections discuss the key findings, limitations, research contributions, and practical implications of the study.

2. Literature Review

2.1. Defining Review Helpfulness

Online reviews for the purpose of this study are information about products or services posted by users on a retail website (e.g., Amazon and Newegg) or third-party review website (e.g., Yelp and TripAdvisor). Those e-commerce websites provide platforms for users to post their own and see others' textual comments and numeric ratings of products and services offered by or available for search on the sites. The user-generated information not only complements the description provided by the product or service provider, but also plays an increasingly important role in the decision-making process of a potential customer due to its effect of peer influence or "e-word-of-mouth" [Baek et al. 2013; Cheung & Thadani 2012; Chevalier & Mayzlin 2006; Mudambi & Schuff 2010]. Whether there are abundant or scarce online reviews may influence the sales of the product or service [Chevalier & Mayzlin 2006; Forman et al. 2008; Ghose & Ipeiroitis 2011; Lu et al. 2014]. It will also affect the user experience with, and thus the value of the e-commerce site [Komiak & Benbasat 2006; Yin et al. 2014].

The growing popularity and quantity of online reviews poses further questions as to how users evaluate the indirect experience information, how they can easily and quickly spot the helpful information, and how those

websites recommend or position reviews according to helpfulness. With a large amount and variety of reviews, a potential customer might need just a few of the most informative ones to facilitate his or her rational purchase decision [Cao et al. 2011; Forman et al. 2008]. Accordingly, websites offer users the option to vote whether a review was helpful or useful to them. One can tell the helpfulness of a review by the number of peer votes it received. This peer voting mechanism is commonly used in practice to make useful reviews stand out, and to help users efficiently parse through numerous reviews [Cao et al. 2011; Racherla & Friske 2012].

This study adapts the concept of review helpfulness consistently defined in past research [Baek et al. 2013; Mudambi & Schuff 2010; Pan & Zhang 2011; Yin et al. 2014]. It is a user's attitude toward the information conveyed in a review by another user. It is based on users' perceived value of the information that helps reduce users' uncertainties when considering a potential purchase, assists their decision-making processes, and to some extent even influences their purchase decisions. The primary measurement of review helpfulness is the number of helpfulness (or usefulness) votes given by users (i.e., peer recognition) [Cao et al. 2011; Forman et al. 2008; Mudambi & Schuff 2010; Zhang & Tran 2010]. As a common practice in prior research [Pan & Zhang 2011; Racherla & Friske 2012], the concepts of "helpfulness" and "usefulness" are interchangeable in this study. Table 1 shows the past research that examined a variety of review and reviewer characteristics in determining review helpfulness.

Table 1: Summary of Prior Studies on the Helpfulness of Online Review

Prior Studies	Data/Method	Context	Review Attributes			Reviewer's Characteristics	
			Rating /Extremity	Two-Sidedness	Length	Identity disclosure	Experience /Expertise
Forman et al. [2008]	Amazon /Econometrics	Book	x			x	
Mudambi & Schuff [2010]	Amazon /Econometrics	Search and Experience Goods	x		x		
Zhang et al. [2010]	Survey/SEM	Software Program	x		x		
Ghose & Ipeirotis [2011]	Amazon /Econometrics	Electronic Goods	x			x	x
Schlosser [2011]	Lab Experiment	Movie, Book;	x	x			
Korfiatis et al. [2012]	Amazon /Econometrics	Book;	x		x		
Cheung et al. [2012]	Survey/SEM	Unspecified	x	x			x
Baek et al. [2013]	Amazon /Econometrics	Search and Experience Goods	x		x	x	x

2.2. Elaboration Likelihood Model (ELM)

ELM in dual process theories suggests that information content and context both influence a recipient's perception of the information. One early adoption of ELM in the IS discipline studied the processes that influenced recipients' perceptions of the information they received via email from external consultants, and in turn influenced their usage of the information in an organizational setting [Sussman & Siegal 2003]. Users who were experts in the topic or highly involved in it had the ability or motivation to deliberate central cues. In that case the central route, or argument quality, would have a great impact on the perceived usefulness of the information. User expertise and involvement, however, were relatively irrelevant to the process of peripheral cues [Sussman & Siegal 2003]. A later study examined the similar processes through which external informational messages influenced potential users' perceived usefulness of the technology advocated in the messages [Bhattacharjee & Sanford 2006]. Similarly, computer-savvy IT users would much likely scrutinize those advocating messages, and thus the content in those messages really mattered to them for their perceived usefulness of the technology; they relied less on peripheral cues to frame their perceptions. In contrast, peripheral cues exerted more significant influence on novice or less expert users [Bhattacharjee & Sanford 2006].

To evaluate the helpfulness of online reviews, this study rests on an assumption with regard to user attributes—those users who seek others' opinions have low level of prior knowledge about the product or service. Consequently, those users actively search for the information for their purchase decision. In other words, those users have common

attributes of low expertise and high motivation. Due to the lack of variances, user attributes will not significantly moderate the effects of central and peripheral cues in online reviews. Moreover, low expertise implies that users may attend more strongly to peripheral cues. For example, a user without much knowledge about a product may believe those reviews written by online “opinion leaders” are generally more trustful and useful, and thus searches for those reviews first [Luca 2011]. In this context, this study is more interested in the peripheral route.

ELM research indicated that potential users following the central route will be largely influenced by *argument quality*, which refers to the substantiality and nature of the content contained in the information. Those taking the peripheral route will be primarily influenced by *source credibility*, which refers to the quality and attributes of the information source, reflecting nothing about the information itself. The next sub-section will focus on source credibility, which is more salient in the context of online communications [Sussman & Siegal 2003]. In particular, source credibility is more relevant with user-generated online reviews. Because any user may become a reviewer so long as he or she wants, reviewers’ profiles will widely vary.

2.3. Source Credibility Model

Although ELM is able to provide a conceptual framework to study review helpfulness, prior ELM-based IS studies lacked solid theoretical support to operationalize source credibility in the peripheral route, and thus had varied and sometimes arbitrary measurement and inconsistent results with regard to source credibility. While ELM has identified that source credibility serves as an important cue in informational influence process, the mechanisms underlying the role is far more complex than a single relationship between credibility and usefulness [Cheung et al. 2012; Sussman & Siegal 2003].

In order to consolidate different sets of conceptual dimensions of source credibility identified in prior ELM-based research, this study adopts source credibility model (SCM) developed in a full research stream in marketing. According to SCM, source credibility reflects a communicator’s characteristics that positively influence recipients’ acceptance of a message. The model provides a well-tested, three-dimension conceptual framework to operationalize source credibility [Ohanian 1990]. The first dimension of *expertise* measures the extent to which a communicator is expert, knowledgeable, experienced, qualified, or skilled. A source with expertise is considered to be capable of making valid and persuasive assertions [Willemssen et al. 2011]. The second dimension of *trustworthiness* measures the extent to which the communicator is dependable, honest, reliable, sincere, or trustworthy to make a valid and persuasive assertion. The last dimension of *attractiveness* measures the extent to which the communicator is physically attractive, classy, beautiful, elegant, or sexy [Ohanian 1990]. A considerable body of research in advertising and communications suggests that these three dimensions are important cues in recipients’ judgment of messages [Ohanian 1990; Till & Busler 1998; Willemssen et al. 2011]. Recipients generally believe that sources with expertise and attractiveness are much likely to present information that is trustworthy and valid [Evans & Clark 2012]. Moreover, a validation study of SCM showed that the three dimensions do not measure the same concept, rather each captures a unique perspective of source credibility [Ohanian 1990].

This study posits that a similar information influence mechanism works between source credibility and perceived helpfulness of online reviews. First, similar to endorsers, most online reviewers are previous customers of the product or service they reviewed. When they receive peer recognition for the reviews they wrote, those reviewers may be considered as experts and even become “opinion leaders” on the website. Other users will value the reviews they write. Second, due to the nature of virtual communities, it is not the physical attractiveness, but the “online attractiveness” of reviewers, such as the online social status of a reviewer, plays a role in source credibility. Reviewers who are able to attract many online friends could even achieve a celebrity status in their social networks. Third, in a virtual community most users and reviewers do not know each other. The lack of face-to-face interactions makes it either impractical or unreliable to assess peer trustworthiness. Moreover, since everyone can write online reviews, it is impossible for users to know every reviewer’s real intent of writing reviews. Recent research in persuasive communication has narrowed down the dimensions of source credibility to expertise and attractiveness [Evans & Clark 2012]. Therefore, trustworthiness is not included as a direct determinant of online review helpfulness in this study. On the other hand, as users have to quickly sort out reviews which make sense, they have to rely on the limited clues available online to evaluate those reviews written by “strangers,” when no other direct information is accessible to check the veracity of reviewers and their assertions. In other words, if the user is fully acquainted with the reviewer, there is no need for the user to take a risk of trust; if the user has no any knowledge about the reviewer, then there is no basis to develop a trust. Between total knowledge and no knowledge is where the information of source credibility kicks in.

A consumer with the similar source credibility is often regarded as an “influencer” or “opinion leader” in the market, who can effectively pass on information to other consumers [Lee et al. 2010]. The opinion leader has (1) the ability and competence to disseminate information, and (2) a socially connected network of peers to disseminate information. In the context of online review, reviewers with expertise and online attractiveness can become opinion

leaders in the social network—they are more competent and more likely to be recognized than the average users in the virtual community, and they occupy a structurally advantageous position within the network. Others in the community are thus much likely to be influenced by them.

3. An Integrative Research Model of Review Helpfulness

The credibility of a reviewer, the price of the product or service reviewed, and the extremity of the review rating can all be classified as peripheral cues, as shown in the research model of this study (Figure 1). Peripheral cues are more salient in the context of this study based upon the assumptions that online review users have low levels of knowledge about the subject, and that they have high levels of motivation in searching for reviews.

The research model examines the ELM-based relationships in online hotel reviews. Hotels are typical experience services, which require actual usage for a full assessment [Mudambi & Schuff 2010; Racheria & Friske 2012]. In seeking for experience reviews, therefore, consumers have to put faith in information source for lack of their own experience. This information process again indicates a peripheral route [Baek et al. 2013; Mudambi & Schuff 2010]. Because experience services are subject to variation in personal tastes and preferences, consumers may be initially skeptical about reviews written by unfamiliar people [Mudambi & Schuff 2010; Racheria & Friske 2012]. In this case, social information of source credibility will facilitate a positive perception. Therefore, when evaluating experience reviews, users tend to attribute helpfulness to reviewer-related (i.e., peripherals cues) rather than review-related factors (i.e., central cues) [Pan & Zhang 2011]. The effect of reviewer credibility is greater than that of review quality on perceived helpfulness [Racheria & Friske 2012]. In the reviews of experience goods on Amazon, peripheral cues such as reviewer rankings are more influential than central cues [Baek et al. 2013]. Accordingly, peripheral cues are of key interest in this study.

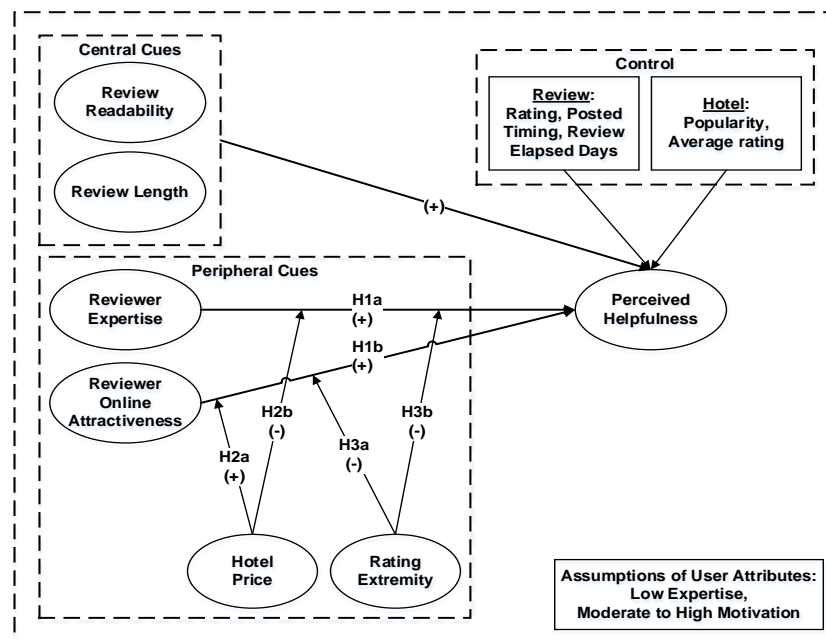


Figure 1: ELM-based Research Model of the Helpfulness of Online Hotel Reviews

3.1. Reviewer Expertise

Expertise refers to the reviewer's capabilities and credentials of writing quality reviews and providing useful information, recognized by the community. In the offline world, for instance, publishers often invite authoritative sources, such as literature experts, to write book reviews [Korfiatis et al. 2012]. In online reviews, review sites rate reviewer expertise based on track records [Willemsen et al. 2011]. The expert status of those reviewers is warranted by the website through badges. This information about a peer's reliable role performance constitutes "good reasons" to trust a stranger's reviews [Willemsen et al. 2012]. The "Elite" badge on Yelp, for example, shows a clear signal of the reviewer's preparedness, competency, and expert standing in writing reviews, as Yelp endorses those elites, "You've heard legends about their reviews, [and] their shiny profile badges..." [Yelp 2014]. Amazon also bestowed "Top 10,000 Reviewer" badges on reviewers who have acquired reputation in writing quality reviews. Consumers

are much receptive to the reviews with the badges displayed alongside [Baek et al. 2013]. Amazon reviewer ranks, with other self-disclosed personal social data, played a significant role in determining review helpfulness [Ghose & Ipeirotis 2011].

The persuasive impact of communicator expertise has been consistently shown robust [Pallak et al. 1983]. The present study posited that, when encountering reviews written by reviewers with high expertise, users will likely make cognitive inference that those reviewers are competent to provide helpful information consistently. It led to the first hypothesis:

H1a: *Reviewer expertise has a positive effect on users' perceptions of review helpfulness.*

3.2. Reviewer Online Attractiveness

Previous literature has shown the positive influence of a communicator's physical attractiveness on message persuasiveness [Pallak et al. 1983; Till & Busler 1998]. This effect is independent of argument quality and source expertise, no matter whether the message receiver has actually read the message or whether the endorser is an expert [Pallak et al. 1983]. Nevertheless, no studies to date have looked into online attractiveness, as most of them used Amazon as the research platform, where social data of reviewers were not readily observed. This study investigated the third-party review website of Yelp, which incorporates extensive social networking features with its review service. The number of a reviewer's friends on Yelp is visible to users during a quick search of reviews, without a further click on his or her complete profile link. This study posited that, in the absence of traditional social ties and face-to-face interactions, social structural information such as the number of online friends can emulate physical attractiveness to enhance source credibility and influence users' attitudes toward the reviews.

Online attractiveness is the amount of peers' attentions, acceptances, and emotional approvals that a reviewer attracts and maintains, that is, his or her popularity in an online community. It reflects the reviewer's social presence, value, and influence in that community in the form of his or her online friendships [Rindova et al. 2006]. Accordingly, this study posited that the number of the reviewer's online friends, or his or her "network centrality," serves as a proxy for the construct of online attractiveness (Yin et al. 2013). Reviewers with high degrees of network centrality can achieve a virtual status of "celebrity" or "opinion leader." These reviewers act as a word-of-mouth channel and as role models to inspire peers to imitate their behaviors. More specifically, they can "provide advice and guidance for the search, purchase, and use of" products or services, and "support with decision making" [Lee et al. 2010]. They can generate affective stimulation for users to judge their reviews in a positively biased manner. The fact that other users are willing to associate with the reviewer provides a peer guarantee of the reviewer's trustworthiness, and an emotional security in what he or she commented on a product or service. The inherent social nature of online review communities implies that online attractiveness, although not directly relevant to a review or a reviewer's expertise, can serve as an emotional heuristics of review helpfulness.

A study of YouTube found that users with more social ties in the social network had stronger power over those with fewer ties, in terms of influencing others' perceptions and persuading others to follow their choices [Susarla et al. 2012]. A more recent study of movie reviews on Twitter found that the positive effect of Twitter messages on movie sales from users with more followers was significantly larger than that from those with fewer followers [Rui et al. 2013]. This study hypothesized that the greater the reviewer's lure in terms of social ties, the greater his or her influence on users' perceptions of the helpfulness of his reviews:

H1b: *Reviewer online attractiveness has a positive effect on users' perceptions of review helpfulness.*

3.3. Contextual Moderator of Price

According to SCM research, a message could be more persuasive if there is a "match-up" between a particular attribute of the communicator and the product [Till & Busler 1998]. More specifically, the original dual process theories posited that communicated prices could affect the recipients' attitude toward a message [Petty & Cacioppo 1986]. The effect of source credibility could be strong or weak, depending on the product price. Communicators with relatively high credibility may be influential with expensive products, while their influence may be discounted by low-price products, or vice versa [Gotlieb & Dubinsky 1991]. Nevertheless, empirical knowledge of the moderating role of price for the different dimensions of source credibility is scarce.

High-priced luxury hotels emphasize more on the hedonic purpose of consumption, reflecting an affective experience of aesthetic or sensual pleasure, fantasy, and fun [Pan & Zhang 2011]. Consumers of those expensive hotels are generally less cost-sensitive than others. The reviewers will thus receive more emotional responses from the users. In those hotels reviews, heuristics suggested by the reviewer's online attractiveness may be more useful than heuristics suggested by his or her expertise. In contrast, consumers of low-priced hotels attend comparatively more to the utilitarian purposes and functionalities. When cost and value is salient for them, consumers may find a better functional match between source expertise and the hotel. In this case, the reviewer's expertise may be sounder than his or her attractiveness in the evaluation of the review. This study posits that price is a context in which a user's affective state is highly activated when he or she searches for reviews for a high-priced hotel; alternatively,

the user will rely more on cognitive processes for a low-priced hotel review. Therefore, perceptions of users reading high-priced hotel reviews would be more positively influenced by the reviewer's online attractiveness, and the positive effect of expertise is likely to be stronger in low-priced hotel reviews, as shown in the following hypotheses:

H2a: *The positive impact of reviewer online attractiveness on review helpfulness is greater in reviews for higher-priced hotels than in those for lower-priced hotels.*

H2b: *The positive impact of reviewer expertise on review helpfulness is weaker in reviewers for higher-priced hotels than in those for lower-priced hotels.*

3.4. Contextual Moderator of Rating Extremity

A well-accepted assumption in marketing practice is that exaggeration may be discounted. A previous research, however, found that a message from a high-credibility source may be even more persuasive due to its high extremity [Goldberg & Hartwick 1990]. In other words, contrary to an intuitive understanding, source credibility has its greatest effect on message perceptions when the message is extreme. The research did not provide theoretical explanation to this finding, and despite a large amount of citations to this finding, no further empirical evidence even exists to support the role of claim extremity in enhancing the influence of source credibility. The present study argues in the opposite direction that review extremity will dilute the salience of the communicator, and consequently discourage heuristic information processing.

Textual, descriptive comments in reviews are always accompanied with numerical star ratings typically ranging from one to five stars. Star ratings represent an overall assessment of products or services [Pan & Zhang 2011]. They can quickly indicate attitude extremity in that a one- or five-star rating reflects either absolutely negative or positive attitude toward the product or service, compared with a midpoint rating of three stars that reflect a truly middle-ground attitude. The concept of rating extremity has also been coined as "review equivocality" or "review valence" [Forman et al. 2008; Ghose & Ipeirotis 2011; Mudambi & Schuff 2010; Racherla & Friske 2012]. Other research takes a relativism approach in that extremity is a large degree of deviation from the average rating of all reviews, while ratings close to the average reflect indifferent views [Baek et al. 2013; Cao et al. 2011; Pan & Zhang 2011]. This study takes the latter approach as extremity represents the extent to which a rating is inconsistent with other reviewers' congruent views. Rating extremity is a heuristic cue [Cheung et al. 2012].

Previous marketing research found that moderate messages in advertising can enhance source credibility [Mudambi & Schuff 2010]. In other words, low-extremity claims can still be accepted, even when presented by a low-credibility source [Goldberg & Hartwick 1990]. On the other hand, claim extremity weakens the influence of source on thought confidence of message recipients [Goldberg & Hartwick 1990]. Extreme view also contradicts the social attractiveness of an opinion leader, who people believe presents the majority views in his or her social network. Endorsements with extreme views, even made by expert or attractive communicators, could be still perceived weak.

Most IS research examined the direct effect of rating or review extremity on review helpfulness. Yet, even the findings of those studies are contradictory [see Baek et al. 2013; Forman et al. 2008; Ghose & Ipeirotis 2011; Mudambi & Schuff 2010; Pan & Zhang 2011; Yin et al. 2014]. This study focused instead on rating extremity's dilution effect on source credibility. Hotel reviews reflect personal experience and preference. Users generally trust their own senses and subjective judgments, and are skeptical about the extreme views of others [Mudambi & Schuff 2010]. People listen to a reviewer's view only because they believe the reviewer is in a trustable social position and competent to provide unbiased information. Rating extremity may hurt source credibility, if the extremity simply reflects personal favor, reaction, or emotional attitude without substantiation. In fact, extremity may introduce "idiosyncratic noises" to reviews particularly for experience goods [Pan & Zhang 2011]. On the other hand, users may believe that low-extremity ratings represent more objective evaluations performed by calm reviewers. A moderate rating also indicates its consistency with the average rating and less dissonance between the review and the majority view [Cheung et al. 2012].

An empirical study of book reviews on Amazon lends the closest support to the theoretical argument of rating extremity: the positive relationship between reviewer characteristics and perceived helpfulness is significantly attenuated by extreme ratings [Forman et al. 2008]. Users' skepticism or resistance to extreme ratings will lead them to profile reviewers with those extreme viewpoints into a small group idiosyncratically distant from the majority, and hence negatively affect those reviewers' credibility. This leads to the last couple of hypotheses:

H4a: *The positive effect of reviewer online attractiveness on review helpfulness is weaker in reviews with extreme ratings than in those with moderate ratings.*

H4b: *The positive effect of reviewer expertise on review helpfulness is weaker in reviews with extreme ratings than in those with moderate ratings.*

3.5. Control Variables

Previous research on review helpfulness mostly focused on the effects of central cues—different aspects of content quality of reviews. The most straightforward quantitative measurement of content quality is review length. Longer reviews likely include more details of the product or service, and of peers' experience of using it in specific contexts. A large amount of information within the review helps reduce a user's uncertainty and increase his or her confidence. Empirical studies of product reviews, mostly on Amazon, found that review length was a highly significant predictor of review helpfulness—the helpfulness increased as the word count increased [Baek et al. 2013; Korfiatis et al. 2012; Mudambi & Schuff 2010; Pan & Zhang 2011; Yin et al. 2014; Zhang et al. 2010].

Another more sophisticated measurement of content quality is review readability—cognitive efforts and educational levels required to read and comprehend reviews. When the required cognitive effort fits a user's educational level, the review is easy for the user to read. An easy review will be more helpful than a more difficult one [Ghose & Ipeiritis 2011; Korfiatis et al. 2012; Yin et al. 2014]. This study included review length and readability as the primary central cues in the research model. In addition, this study controlled for review-related and hotel-related variables in order to demonstrate the unique and incremental effects of reviewers' social approval cues.

4. Research Methods

4.1. Data Collection

A customized web crawler program based on Locoy Spider automatically ran for three days on Yelp to collect review data of all hotels in San Francisco, USA. The following information was captured in each review: the numerical star rating, the review text, the number of useful votes, the date the review was posted, the number of Yelp friends of the reviewer, and the number of Yelp elite badges of the reviewer. In addition, the following information about the hotel of each review was collected: the average rating, the price sign, and the total number of reviews. At the end of the data collection, 16,939 reviews for 339 hotels were collected. After removing reviews with missing values, this study obtained 16,265 reviews for 307 hotels.

4.2. Measurement of Variables and Descriptive Statistics

The dependent variable (DV) of *review helpfulness* was the number of helpful votes a review received. The independent variable (IV) of *expertise* was the number of “Elite” badges given by Yelp and posted alongside the review. When granting the Elite status, Yelp considered the following factors: frequency and quality of reviews posted by the reviewer, and his or her behavior as a role model of good “yelpy” citizen in the community [Yelp 2014]. The IV of *online attractiveness* was the number of the reviewer's online friends, which was also viewable alongside the review. This study also checked the self-disclosure effect of reviewer identity (e.g., photos and locations of reviewers) on review helpfulness [see Forman et al. 2008; Racherlat & Friske 2012], but no significant results were found.

The price signs (from \$ to \$\$\$\$) of hotels on Yelp represented the moderator variable (MV) of *hotel price*. Another MV of *rating extremity* was measured by the absolute difference between the numerical rating given by the reviewer and the average rating of all previous reviews.

Among the seven control variables (CV), *review readability* represented the easiness of understanding the review. This study adopted one of the most commonly used readability tests—Coleman-Liau Index (CLI)—to calculate the complexity of a text and thus the educational level required to understand the text [Ghose & Ipeiritis 2011; Korfiatis et al. 2012]. The higher the CLI score, the *lower* the degree of readability. *Review length* was simply the word count of the review.

The review-related CV included review rating, review posted timing, and review elapsed days. Review rating simply referred to the star rating given by a reviewer, ranging from one to five stars. Including it along with rating extremity can partial out the non-linear relationship between rating and helpfulness [Mudambi & Schuff 2010]. Review posted timing referred to the number of days between when the first review was posted and when the current review was posted. The timing has been proven to be significantly related to helpfulness [Liu et al. 2008]. Review elapsed days was the number of days between when the current review was posted and when the data collection of this study occurred. The hotel-related CV included a hotel's average rating [Yin et al. 2014] and its popularity—the total number of reviews for the hotel [Ghose & Ipeiritis 2011]. Table 2 presents the descriptive statistics of all variables, and Table 3 shows the correlation matrix of all variables.

4.3. Econometric Model

Poisson regression is more appropriate than traditional linear regression to model count data. This study used negative binomial (NB) regression, a variation of Poisson processes to model review helpfulness, a count DV. Because 47% of the reviews in the sample did not receive any helpful vote, a large number of zeros existed for the value of DV. To solve the issue of excess zeros, a zero-inflated NB (ZINB) model was employed. ZINB model makes the theoretical assumption that the sample could be characterized by two regimes, one where cases always have zero counts (i.e., “excess zeros” or “certain zeros”), and the other where cases have either zero (i.e., “true

zeros” or “real zeros”) or positive counts [Greene 1994]. In the sample of the present study, excess zeros might come from those reviews that were never seen by any users, for examples, the reviews listed on the very last page for a popular hotel receiving a long list of reviews. True zeros came from those reviews seen by users but did not receive helpfulness votes. Accordingly, the zero-inflated model in this study estimated DV in two equations, one for the excess zeros (see Equation (1a)), and another for the real research model (see Equation (1b)):

$$y_{kj} \sim 0, \quad \text{with probability } q_{kj} \quad (1a)$$

$$y_{kj} \sim g(\lambda), \quad \text{with probability } 1 - q_{kj} \\ (\lambda = 0, 1, 2, 3, \dots) \quad (1b)$$

Where y_{kj} was the number of helpful votes received by review k for hotel j . $g(\lambda)$ was either Poisson or NB distribution. The unobservable probability q_{kj} was generated as a logit or probit model of the observable covariates to ensure non-negativity. An observed zero for y_{kj} was generated from either Poisson or NB process.

Table 2: Descriptive Statistics of Variables

Variable	Unit of the Scale	Min.	Max.	Mean	Std. Err.
DV:					
Review helpfulness	Number of helpful votes	0.00	43.00	1.37	2.48
IV:					
Reviewer expertise	Number of “Elite” badges	0.00	8.00	1.04	1.76
Reviewer online attractiveness	Number of Yelp friends	0.00	5000.00	119.54	403.49
MV:					
Hotel Price	Number of “\$” signs	1.00	4.00	2.43	0.69
Rating Extremity	Difference between the rating and the average rating	0.00	4	0.91	0.77
CV:					
Review length	Number of words	1.00	609.00	175.86	137.16
Review readability	Coleman-Liau Index	-47.57	28.20	5.43	2.65
Review rating	Number of stars	1.00	5.00	3.60	1.22
Review posted timing	Number of days	0.00	2854.00	1456.58	699.03
Review elapsed days	Number of days	4.00	2865.00	838.78	613.80
Hotel popularity	Number of reviews	1.00	360.00	164.91	116.60
Hotel average rating	Number of stars	1.00	5.00	3.60	0.55

Table 3: Correlation Matrix of Variables

Variables	1	2	3	4	5	6	7	8	9	10	11	12
1 Review helpfulness	1.00											
2 Reviewer expertise	0.28	1.00										
3 Online attractiveness	0.42	0.47	1.00									
4 Review length	0.25	0.07	0.06	1.00								
5 Review readability	-0.02	-0.02	-0.02	0.02	1.00							
6 Hotel Price	-0.03	0.14	0.09	-0.05	-0.01	1.00						
7 Rating Extremity	0.07	-0.11	-0.06	0.07	0.00	-0.09	1.00					
8 Review rating	-0.04	0.09	0.06	-0.14	0.09	0.17	-0.37	1.00				
9 Review posted timing	-0.08	-0.14	-0.04	-0.01	0.01	0.11	-0.11	0.01	1.00			
10 Review elapsed days	0.08	0.25	0.10	-0.03	0.00	0.09	0.05	0.09	-0.75	1.00		
11 Hotel popularity	0.01	0.16	0.15	0.00	-0.05	0.60	-0.09	0.09	0.16	0.05	1.00	
12 Hotel average rating	0.01	0.07	0.05	-0.05	0.05	0.36	-0.14	0.43	0.12	0.08	0.18	1.00

5. Data Analysis and Results

This study used STATA to run the ZINB model that included a logit regression and an NB regression. The logit regression estimated the probability of a review not receiving any helpful vote. The result of this model is not reported here for brevity. Results of NB regression are shown in Table 4. First of all, the Vuong test was significant, suggesting that standard NB was rejected in favor of ZINB model, and thus the split statistical processes were appropriate. The likelihood-ratio test was also significant, suggesting that the dataset was over dispersed and thus ZINB regression was more appropriate in this study than a zero-inflated Poisson regression [Greene 1994]. Second, in order to examine the moderating effects, three models were tested: the baseline model (Model 1) with only IVs

and CVs; Model 2 included the MV of rating extremity; and Model 3 further included the MV of hotel price. The step chi-square changes were both significant in Models 2 and 3, showing significant differences in $-2\log(\text{likelihood})$ and AIC between Models 1 and 2, and between Models 2 and 3, respectively. The statistics demonstrated the existence of the moderating effects [Atkins & Gallop 2007; Zhang et al. 2010].

Table 4: Results of Zero-inflated Negative Binomial Regression

Variables	Model 1	Model 2	Model 3
IV:			
Reviewer expertise	.038*	.053*	.116**
Ln(Reviewer online attractiveness)	.244**	.287**	.091*
MV:			
Rating extremity \times online attractiveness		-.036**	-.029*
Rating extremity \times expertise		-.020*	-.022*
(Rating extremity)		.319**	.301*
Hotel price \times online attractiveness			.080**
Hotel price \times expertise			-.025*
(Hotel price)			-.303**
CV:			
Review readability	-.013*	-.014*	-.014*
Ln(Review length)	.528**	.520**	.517**
Review rating	-.123**	-.057**	-.062**
Ln(Review posted timing)	-.034**	-.011 ^{ns}	-.014 ^{ns}
Ln(Review elapsed days)	.054*	.062*	.062**
Ln(Hotel popularity)	-.223**	-.227**	-.201*
Hotel average rating	.201*	.165*	.176*
Log likelihood	-23570.22	-23465.58	-23417.36
AIC	47176.44	46973.17	46883.72
χ^2 change		209.28**	95.91**
Vuong test of ZINB vs. standard negative binomial: $z = 4.24, p < .01$			
**: $p < .01$; *: $p < .05$; ^{ns} : $p > .1$			

The final ZINB regression model (Model 3) showed that, after controlling for the effects of argument quality and other review- and hotel-related variables, a hotel review posted on Yelp by a reviewer with higher degrees of *expertise* and *online attractiveness* was perceived more helpful by users. The results supported Hypotheses 1a and 1b. As for the proposed moderating effect of *hotel price*, the coefficient of the interaction of price and online attractiveness was significantly positive, and that of price and expertise was significantly negative. Hypotheses 2a and 2b were supported. Similar procedure was conducted for the moderating effect of *rating extremity*. The dilution effects of rating extremity on both relationships between source credibility and perceived helpfulness were statistically strong, in support of Hypotheses 3a and 3b.

6. Discussion

6.1. Key Findings

Utilizing real-world data of 16,265 hotel reviews captured directly from Yelp, the present study demonstrated that *reviewer expertise* in terms of Yelp's "Elite" badge recognition had a positive impact on users' perceptions of the helpfulness of a hotel review. The more Elite badges a reviewer has, the more likely users will believe his or her reviews are helpful. This influence can be explained by cognition-based peer trustworthiness established by reviewer expertise. In addition, the study operationalized *reviewer online attractiveness* as existing social ties (i.e., online friendships) of reviewers, and proved that it also had a positive effect on perceived helpfulness. The more popular the reviewer is on Yelp, the more likely users will believe his or her reviews are helpful. This influence can be explained by affect-based trustworthiness established by the social status of the reviewer.

The definitions and measurements in the current model further suggested that expertise reflects the competence requirement, and online attractiveness reflects the network centrality requirement in opinion leadership model, respectively. Reviewers' social approval status as opinion leaders on Yelp, however, does not translate into their influences on users' perceptions of review helpfulness evenly and unconditionally. As expected in the research model, for a high-priced hotel a review was evaluated more favorably with regard to helpfulness if the review was posted by a "virtually" attractive reviewer with higher social status on Yelp. In this case, the influential mechanism is strengthened through the affective-trust rather than cognitive-trust path. The positive effect of reviewer expertise was actually weakened in those high-priced hotel reviews. In contrast, for a low-priced hotel review helpfulness was

more significantly correlated with expertise than with attractiveness. In that case, users' cognitive trust with the reviewer is reinforced. In sum, *hotel price* affects differently the ways how the two dimensions of reviewer credibility influence perceived helpfulness—online attractiveness of the reviewer is more salient in reviews for expensive hotels, while cheaper hotels elicit from users more expertise-oriented thoughts about reviews.

The influence of opinion leaders was also negatively moderated by *rating extremity* in the current model. The finding shows that an extreme rating in terms of a large departure from the historical average rating significantly affected users' perceptions of helpfulness by attenuating reviewer credibility in both dimensions. When an opinion leader posted a hotel review, users might more likely believe that review was helpful if the opinion leader gave a moderate star rating rather than an extreme one. On the other hand, even if a reviewer was not an opinion leader, that is, with low expertise and attractiveness, it was still possible for his or her review to be perceived helpful, so long as the reviewer did not give a rating considerably different from the average rating. Overall, the finding suggests that rating extremity hurts the underlying trustworthiness for cognition-oriented expertise and affect-oriented online attractiveness of reviewers.

6.2. Limitations

Several limitations exist in the present study. First, this study was unable to directly measure users' trust due to the limitation of objective and secondary data captured from Yelp's website. Second, the model and data in this study were unable to tell whether a sequence exists between peripheral cues and central cues. According to the current results, there is a possibility that users use the information of source credibility, hotel prices and review ratings to screen for potentially useful reviews, and then scrutinize the content of those reviews to make the final judgment on helpfulness. However, this study cannot provide empirical evidence due to the limitation of the research method. Future studies can address the issues by taking mixed-method approaches. In addition to collecting data from review websites, for example, researchers can conduct experiments or surveys to study trust as the consequence of source credibility, and as the precedent of perceived helpfulness. Experimental and survey methods also help investigate the sequential relationship between peripheral and central cues.

In addition, this study only examined the experience service of hotels. It is more ideal and informative to collect data of reviews for both search and experience goods and services. In this way future studies can investigate the moderator role of product or service type in addition to price and rating.

7. Conclusions

7.1. Implications for Research

This study makes the following contributions to the research on online review helpfulness, a topic that has increasingly attracted attention from researchers and practitioners in e-commerce, social media marketing, and consumer psychology. First, this study helps develop a comprehensive body of knowledge about informational influence processes for online review perception. While previous research either focused on central cues or lacked coherent theoretical perspectives for peripheral cues, the current study develops an overarching conceptual framework that integrates and adapts the theories of elaboration likelihood model, source credibility model, and opinion leader model. Based upon these theories and extensive literature review, this study articulates the concepts and logics of each variable and relationship in the model. The empirical evidence from the model not only shows the co-presence of central and peripheral routes in online reviews, but more importantly, complements prior findings by illustrating the influential mechanism of various peripheral cues, namely, the direct effects of reviewer credibility and moderating effects of contextual factors. Within the peripheral cues of the model, two conceptual dimensions of source credibility—*expertise* and *attractiveness*—are the primary determinants of perceived helpfulness. *Trustworthiness*, the third dimension, although not theoretically and practically appropriate to be observed in virtual communities, serves as the underlying mechanism explaining the relationships between source credibility and helpfulness. Moreover, the direct influences of reviewer credibility are adjusted by other contextual peripheral cues—*hotel price* and *rating extremity*. In high-priced hotel reviews, the affective-trust-based influence of reviewer attractiveness is augmented, and the cognitive-trust-based influence of reviewer expertise is abated. In low-priced hotel reviews, the influential mechanism works in the opposite direction. This study also addresses contradictory findings in previous research by showing that rating extremity affects helpfulness perception by negating the positive influence of opinion leadership. The finding provides empirical support for the conceptual and practical argument of the dilution effect of claim extremity on source credibility.

Second, this study contributes to the online review research in terms of methodology. While prior research studied almost exclusively product reviews on the e-retailer website of Amazon, this study is one of the first to look into service reviews on a third-party review website based on a social network platform. The focus on peripheral cues is shown in the present study particularly appropriate for reviews of the experience service of hotels, where users have to put faith in reviewer credibility for lack of their own experience. Using the social media site of Yelp

helps advance the understanding of source credibility beyond those communicators originally studied in marketing literature—product manufacturers, service providers, third-party advertisers, celebrity endorsers, and community opinion leaders. The communicators on Yelp are themselves the users of the social network website. They share their consumer experience with other users, and they make friends with other users in the virtual community. Most of them do not have formal affiliations with the product or service they review, but many of their reviews serve as viral marketing channels for the product or service. This study shows that community recognition of competence, popularity among peers, and peer trustworthiness are especially critical for the influence of user-generated reviews.

This study also demonstrates how to apply and measure in the social media context the theoretical dimension of attractiveness in the original source credibility model. Moving from Amazon to Yelp enables this study to use social structural information such as the number of a reviewer's online friends to reveal reviewers' popularity in the virtual community, and in turn emulate offline physical attractiveness. It is thus a methodologically advantage of using Yelp as the research platform.

Capturing data from an actual review website also has the advantages of obtaining a large volume of real-world observations and being more objective than conducting perceptual survey with users, which was used in a number of previous ELM-based studies [e.g., Cheung et al. 2012; Schlosser 2011; Sussman & Siegal 2003; Zhang et al. 2010]. On the other hand, similar to non-response biases found in surveys, the real website data in this study contains excessive number of zero for the value of helpfulness vote. This is because a large number of reviews were not seen by users and thus received no helpfulness votes at all. The present study is one of the first IS studies that use econometrics model of zero-inflated negative binomial regression to methodologically address the issue of excess zeros in the count data of review helpfulness. As the result, the empirical evidence from Yelp provides robust support for the conceptual framework proposed in the study.

7.2. Implications for Practice

In addition to the theoretical and methodological contributions, the present study has several practical implications. Providing easy access to helpful reviews has become a competitive strategy of many e-commerce websites to achieve differentiation [Mudambi & Schuff 2010]. A sorting or recommendation algorithm accurately reflecting or predicting helpfulness not only helps users locate the most useful reviews effectively, but also helps e-commerce websites better position valuable reviews to improve users' overall experience and increase their stickiness with the sites [Cao et al. 2011]. The findings in this study suggest that, for experience services, users may first use contextual information such as reviewer expertise, reviewer social status, service price, and review ratings to quickly sort out those reviews they believe to be useful. They then read those reviews. With both reviewer and review attributes in their minds, users make the final judgment whether a review is actually helpful. Therefore, review websites can develop a default sort order for experience service reviews based firstly on reviewer establishment and secondly on review quality. The algorithm or model should also factor in the price of the service and the star rating given to the service. For example, reviewer social status should be given more weight in high-priced service reviews, while reviewer expertise should be further underscored in low-priced service reviews. Likewise, moderate ratings given by reviewers should further boost the positions of reviews in the sorting result, while extreme ratings suggest bias and will cause reviews to be placed in lower positions.

Lastly, the findings in this study suggest that those reviewers with high expertise and social status may become opinion leaders in online communities, and that their reviews are more likely than others' reviews to influence users' purchase decisions. E-commerce and third-party review websites should use reviewer attributes to identify these opinion leaders and encourage them to further participate in and actively contribute to the online community, so that the overall quality of reviews can be improved and the value of the review service can be increased. Yelp, for example, has created "Yelp Elite Squad" to mobilize those most active, connected, and valuable members in its community to serve as "evangelists and role models, both on and off the site" [Yelp 2014].

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