Management Response to Online WOM: Helpful or Detrimental?

Full Paper

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Abstract

Firms are shifting their social media emphasis from passive listening to active intervening. This paper investigates the performance implications of managerial response to online word of mouth (WOM). Using the longitudinal data of online reviews, managerial responses and financial performance for 730 hotels in a specific U.S. market from 2005 to 2011, we lay out an empirical strategy to examine the performance effects of managerial responses given different conditions of online WOM, while dealing with potential estimation challenges of endogenous managerial response and online WOM, serially correlated financial performance, and unobserved heterogeneity in hotels. Our findings suggest that managerial intervention should be strategic – whether and how to respond depends on the different levels of online WOM metrics.

Keywords: Online word-of-mouth, Managerial responses, Social media, Endogeneity, Instrumental variable approach

Introduction

Online word of mouth (WOM) has become increasingly important due to the fast growth and reach of social media. Its business implications are well documented in many studies concluding that online WOM affects business performance (Chintagunta et al. 2010). For a long time, businesses simply soaked up online WOM and have been figuring the best response to online WOM. However, the challenges of passively listening to online WOM remain two folds. First, consumers can be biased in writing reviews due to online herding (Lee et al. 2015) and self-selection bias (Li and Hitt, 2008), sometimes misleading the perception of other consumers toward the business. Second, negative online reviews can hurt the business image and are particularly damaging to its sales efforts (Min et al. 2015). In any case, businesses need proactive strategies to influence and manage online WOM.

Despite the emerging practice of online managerial response, there has been great divergence in businesses' response strategies. Barsky and Frame (2009) point out that 85% of service businesses have, in fact, no guidelines for monitoring and responding to online WOM. In light of these findings, how to offer managerial response to online WOM towards increased business performance remains a myth in the literature and to the industry. To seek plausible answers to the question, we investigate the financial performance implications of managerial response to online WOM and how its efficacy varies given different conditions of online WOM. Our analysis uses a large-scale but granular data of managerial responses to online reviews, matched with financial performance measures at each individual business level, for 730 hotels in a specific U.S. market from 2005 to 2011. We use an econometrics framework to address estimation challenges in prior literature.

Our findings reveal the varying financial performance effects of managerial response given different conditions levels of online WOM metrics in terms of *valence* and *volume*. On one hand, when a business has only few reviews that are very negative, responding to those reviews may hurt its financial performance. Interestingly, managerial responses may also harm the financial performance of a hotel which has an extremely large amount of extremely positive reviews. On the other hand, when either

valence or volume of online reviews is high, the effort of managerial response on financial performance becomes positive. However, when either valence or volume of online reviews increases from an extremely low situation to its average range, the negative impact of managerial response diminishes and becomes not effective. Overall, we advocate that managerial intervention should be strategic – whether and how to respond depends on the different levels of online WOM metrics.

Our study provides explicit action plans for managers to effectively utilize the efforts and resources required to manage online WOM and truly benefit from the wisdom of online crowds. Our study also contributes to prior literature in which mostly investigate how managerial response influences consumer perceptions, neglecting the economic justifications due to data unavailability. Our study fills in this gap and, to the best of our knowledge, is the first study showing empirical evidences of the varying effects of the managerial response on revenue, given different conditions of the online WOM.

In following section, we review the related literature and theoretical lens for theories of the managerial responses. Next, we describe the data and outline the empirical estimation strategy. Then, we present estimation results. Finally, we discuss the implications of results as well as directions for future research.

Theory and Hypotheses

Management Responses: Damage Control or Open Communication

Research examining the topic of online WOM and financial performance is sparse. Some researchers find evidence that the number of online reviews predicts product sales (Chevalier and Mayzlin, 2006). Others claim that the main predictor is not the volume of online WOM, but rather its valence (Chintagunta et al. 2010) or variance (Sun 2012). In addition, findings on the impact of negative online WOM are inconclusive. Some studies have shown that negative online WOM is more powerful in decreasing sales than positive online WOM is in increasing it (Chevalier and Mayzlin 2006; Sun 2012).

Given the prevalence and significance of online reviews for revenue generation, one of the most recent practices among online service providers is to interact with customers about their experience and openly respond to reviews on social/online review platforms. According to the service failure and recovery literature (Smith et al. 1999), management responses are only needed when negative feedback/comments are made about the customers' experience. In fact, customers' expectation about the likelihood of receiving management responses rises when perception of unfairness in the service failures increases. The response strategy is to mitigate the negativity of comments by admitting that there was a mistake in service delivery, apologizing for the service failure, and meeting the unhappy customers with compensation (Gillin and Gianforte, 2012).

Nevertheless, a cursory look at the review platforms such as Yelp, Angie's List, and Trip Advisor reveals that managers respond to positive (e.g., five-star) reviews as often as negative (e.g., one-star) reviews, irrespective of the age of the comments. This practical observation implies that service recovery may not fully explain the intention behind managerial responses. Rather, managerial responses to both negative and positive reviews on social/online platforms are more motivated by social norms and the notion of reciprocity among parties.

Social Exchange Theory (SET) proposes that social behavior is the result of an exchange process (Blau, 1964). Reciprocity is probably the best known exchange rule and is based on how social exchange is made through interpersonal behavior. Reciprocity has been considered the most crucial factor affecting knowledge sharing within a community and can further influence individuals' perception of how a particular behavior will be performed (Hummel and Lechner, 2002). An exchange requires a bidirectional transaction—something has to be given and something returned. For this reason, interdependence, which involves mutual and complementary arrangements, is considered a defining characteristic of social exchange (Molm, 1994). Managerial reaction to online reviews can be considered as a behavioral/reciprocal response to feedback that is perceived as either kind or unkind.

We believe managers frequently respond to reviews based on reviews' potential impact on the bystanders' perception (e.g., is the review blaming/admiring the service?) and the intentions behind the review (e.g., is the review posted for constructive/helpful purposes or for destructive/harmful purposes?). Responding to most online reviews could potentially benefit service managers because they not only engage

consumers who posted the actual reviews with the business but also influence other prospective customers who witness the transparent communication between the two parties.

When individuals/entities act according to social norms they earn reciprocal benefits in the form of reputation and trust (Shiau and Luo, 2012). Reputation refers to the degree to which a person believes that social interaction potentially enhances image. An online review contributor wants to portray a positive image when he/she shares knowledge so do when service managers respond to comments. In an online context, a perceived increase in reputation is caused by information sharing among other users. In the same vein, managers want to enhance their image when they respond to the online reviews and give personal attention to each individual review. Additionally, when performed properly, a social exchange brings about trust (Dirks and Ferrin, 2002). Trust in an online provider reduces the adverse selection and moral hazards (Pavlou and Dimoka, 2006). Thus, managerial responses to reviews could build trust if they show genuine interest in customers' feedback, demonstrate responsiveness, appreciation, empathy to customers' concerns, and proactively offer customer solutions.

Management Responses, Online WOM Metrics, and Financial Performance

Recent exploratory studies suggest that service managers usually take two different approaches to handle negative online reviews: "playing defense" and "strategic approach to customer engagement" (Xie et al., 2011). However, the response strategy also depends on the nature of the online reviews. This is because when a potential consumer browses through online reviews, he/she will be incidentally exposed to the managerial responses provided for those reviews as well.

As noted earlier, existing literature has established the link between online WOM and performance. However, despite the interdependent nature of managerial response and online review metrics, to date, no study has explored the financial performance implications of managerial responses in light of different online WOM metrics (i.e., 3Vs). Intuitively, managerial response to online reviews should improve the reputation and build trust, which ultimately may result in better financial performance. On the contrary, there might be conditions of online WOM under which providing management responses may damage firm's performance. It is plausible that when the management responds to the online reviews, it disturbs the efficacy of consumer reviews, which may ultimately hurt firm's performance. Below, although not making specific predictions, we present arguments in support (or against) managerial response to online WOM in improving financial performance. We only turn our focus to volume and valence, but not variance. This is because variance is not immediately visible and less salient than the other two metrics in the online WOM evaluation.

The outcome of a persuasion attempt can be assimilative or contrastive (Mason et al., 2007). For example, in the case of social influence through WOM, a bystander's opinion after exposure to an online WOM message accompanied with a managerial response might align with the valence of the message (assimilate) or diverge from the message's position (contrast). Assimilative outcomes occur due to bandwagon pressures (Salganik and Watts, 2008) and social pressures to conform (Cialdini and Trost, 1998), among others. On the other hand, contrastive outcomes can result from consumers' preference for noncompliance (Tajfel, 1978), negative reaction to constraints (Brehm and Brehm, 1981), or a sense of message discrepancy from their own position (Sherif and Hovland,1961).

Consumers tend to favor their peers' evaluation due to non-commercial and unbiased knowledge sharing more than the justification provided by service managers (Hsu and Lin, 2008). When the volume and valence are both low, the contrastive outcomes of online WOM persuasiveness in the presence of managerial response is likely. Since the number of reviews is limited, consumers observe negative reviews consistently, despite manager's effort to respond to those comments. This may signal managers' reluctance or incapability to address the real areas of concerns and may imply they are unable to fix substantial problems to avert the submission of negative reviews. However, when potential consumers see consistent and positive ratings from their peers, they tend to assimilate with the supportive managerial responses. This is due to social pressures to conform (Cialdini and Trost, 1998), bandwagon effect (Salganik and Watts, 2008), and/or the trust they may have in peer consumer ratings as an information source (Vermeulen and Seegers, 2009). In this situation, management responses to positive online reviews may improve the firm's financial performance because they reduce the psychological cost of leaving a positive review (i.e., assimilation tendency) and increase the psychological cost of posting a negative review (i.e., contrast avoidance).

When the volume of WOM is high but the valence is low, it indicates that there are many unhappy customers expressing their dissatisfaction with the business online. The cue-utilization framework implies that an information cue's usefulness varies with its perceived diagnosticity; the more predictive it is of product quality, the more diagnostic it becomes (Richardson et al. 1994). Also, a cue's ability to persuade consumers depends on the availability/saliency of other cues (Skowronksi and Carlton 1987). When consumers are exposed to two or more diagnostic cues simultaneously (e.g., volume and valence), the negative piece of information tends to stand out based on the cue-utilization framework (Purohit and Srivastava, 2001). In this case, increased level of managerial responses is expected and would help the bidirectional communication and reciprocity between complaining consumers and responsive managers. By facilitating the reciprocal exchange of information and demonstrating responsiveness, managers can enhance the firm's image and build trust (Dirks and Ferrin, 2002). Since cues compete for diagnosticity (Herr et al. 1991), consistent managerial responses will create a positive signal (i.e., not only for consumers who posted the actual reviews, but also for those who witness the transparent communication between the two parties). This will eventually help reduce the saliency of other negative diagnostic cues in the decision task and encourage bystanders to assimilate with the managerial responses.

Conversely, high volume and positive valence of online WOM indicate that there are many happy customers of the product and/or service. A large volume of positive reviews has high diagnostic value and could serve as a strong predictor of product quality (Khare et al., 2011). Thus, these cues may convince subsequent consumers to concur with the product quality and prevent them from using other sources of information in a decision (Miyazaki et al. 2005). In this situation, offering additional managerial responses in the presence of a large amount of highly positive ratings may create contrastive outcomes. Given the availability of two reliable cues (high volume and high valence), managers do not need to take part in the conversation because their action may distract consumers from processing the helpful information. That is, these two cues may underperform as the diagnosticity and persuasiveness of them may interfere with a competing alternative cue (Miyazaki et al. 2005). If subsequent consumers have already seen very strong and clear signal about the quality of products and services from a large group of individuals, external disturbance from a completely different source (e.g., managers of the firm) would make consumers react to it negatively. In this case, they may even consider managerial responses intrusive and interfering with the principles of information sharing and transparency in an online community.

Data

We collect managerial response to consumer reviews from TripAdvisor, which offers more than 150 million reviews and opinions covering more than 810,000 hotels, bed-and breakfasts, and specialty lodging in the world. The managerial response to consumer reviews for a given hotel is time-stamped and permanently presented on TripAdvisor. Therefore, TripAdvisor provides a good interactive setting where we can observe the exchange of information between management and consumers in a time-series fashion. In addition, TripAdvisor provides information on hotel characteristics and user background. This enables us not only to collect individual hotel level information such as age, size, class, and amenities but also reviewer demographics (gender) and experiences.

Our dataset includes 3,763 managerial responses to 28,443 consumer reviews for 730 hotels of a regional market in southern U.S. from January 2005 to June 2011. We matched the dataset with quarterly financial performance records, including revenue, revenue per available room, room rate, and occupancy, provided by local revenue comptroller offices. In particular, revenue and revenue per available room are two key financial performance measures widely used in the hospitality industry. We also collect web search volume of TripAdvisor from Google Trends for the study period, which will be used as part of our instrumental variables in our analysis.

The numerical ratings for the review can range from terrible to excellence on a scale of 1 to 5. From the data collected from the TripAdvisor, we calculated three online WOM metrics for each hotel– *valence*, *volume*, and *variance*. One can also argue that the interaction between the online WOM metrics might be important in quantifying the effects of online WOM. Specifically, one can also argue that the interaction between the average user rating and the volume of ratings (*Valence × Volume*) might be important in quantifying the online WOM effects (Chintagunta et al. 2010). Specifically, the more raters there are that view the hotel as being good, the bigger is the impact on subsequent financial performance.

In conjunction with online WOM metrics, we track whether there is a managerial response attached to a consumer review. We developed one measure that represents the level of efforts of manager (or business)'s social media interactions, the cumulative number of managerial responses. Table 1 gives the variable definitions along with their descriptions, summary statistics and data sources.

Dimension	Variable	Description	Mean	Std. Dev	Min	Max
Hotel Level · 7,750 observations · 730 hotels in a regional market · From January 2005 to June 2011 · From Local revenue comptroller offices	*Revenue*	Quarterly hotel revenue, including room revenue and non-room revenue (restaurants, meeting space, swimming pools, etc.)	1,351,623	1,756,098	15,205	17,300,000
	RevPAR	Quarterly revenue per available room in the dollar term	67.19	36.97	0.00	323.45
	Class	Hotel class on a scale scheme of 1 to 5 designated by TripAdvisor, with 1 = budget traveler hotels, 2= mid-market economy hotels, 3= full service hotels, 4= above average hotels with some outstanding features and a broad range of services, and 5=luxury hotels	2.72	1.05	0.00	5.00
	Age	Number of years since opening	17.43	12.65	1.00	63.00
	Size	Number of rooms	189.41	184.91	5.00	1840.00
	Amen	Number of amenities such as indoor swimming pool, free high-speed Internet, fitness center, wheelchair access, and pets allowed	7.90	2.54	0.00	13.00
Review Level · 28,443 reviews · 3,763 managerial responses · From TripAdvisor	*Valence*	Cumulative average ratings	3.46	0.87	1	5
	Volume	Cumulative number of ratings	28.23	47.48	1	841
	Variance	Variance of cumulative ratings	1.20	0.67	0	8
	Badge	Average reviewer badge points on a scale scheme of 1 to 5 designated by TripAdvisor, with 1=Reviewer, 2=Senior reviewer, 3=Contributor, 4=Senior contributor, and 5=Top contributor	2.21	0.70	1	5
	Mem	Average years of membership of a reviewer with TripAdvisor	0.80	0.65	1.5	6
	Gender	Dummy variable of reviewer gender, with 1=male and 0 =female	0.47	0.41	0	1
	Vol-Manager	Cumulative number of management responses	1.90	7.90	0	195
Review Site Level · From Google Trends	*GTR*	Search volume of TripAdvisor site in Google Trends	56.93	17.35	18.38	80.69

Table 1 Descriptive Statistics

Empirical Analysis

Model Specification

The unit of analysis is a hotel (*i*)-quarter (*t*) combination (*i*,*t*). For hotel *i* that is reviewed on TripAdvisor in quarter *t*, its revenue performances of *Revenue* and *RevPAR* are given, respectively, by

$$Log\left(\text{Revenue\_Performance}_{i,t}\right) = \beta_0 + \gamma_{1:n_1} MR_{t-1} + \delta_1 SMS_{i,t-1} + \phi_{1:n_2}\left(MR_{t-1} \times SMS_{i,t-1}\right)$$
$$+ \beta_{1:n_3} HC_i + \kappa_{1:n_4} HC_{i,t} + u_{i,t} \tag{1}$$

On the right-hand side of equations, we have the following variables. $SMS_{i,t-1}$ is a vector of online WOM metrics of hotel *i* until quarter *t*, including *Valence, Volume,* and *Variance and* their interaction terms, *Valence × Volume* and *Valence × Variance*. MR_{t-1} is the cumulative number of managerial responses to consumer reviews by hotel *i* until quarter *t*. Then we created the interaction term between the online WOM measures and managerial responses, $MR_{t-1} \times SMS_{i,t-1}$. The remaining variables are largely "control" variables. HC_i denotes a vector of hotel *i*'s time-invariant characteristics such as *Class* and *Amen*. $HC_{i,t}$ denotes a vector of hotel *i*'s time-varying characteristics such as *Age* and *Size*. $u_{i,t}$ denotes the error term. In line with previous studies (e.g., Boulding and Christen 2003), we assume three different sources of error for $\mu_{i,t}$ in each equation: unobserved fixed factors, v_i, and unobserved random factors, $\eta_{i,t}$, which

further consists of a first-order autoregressive component with parameter ρ (to capture dissipating returns) and an idiosyncratic component, $\omega_{i,t}$. That is, $u_{i,t} = v_i + \eta_{i,t}$ and $\eta_{i,t} = \rho\eta_{i,t-1} + \omega_{i,t}$. Hence, estimations of Equation (1) allow us to examine the revenue implications from two perspectives, the total revenue and the revenue per available room, where $\phi_{1:n_2}$'s are the parameters of interest with respect to the revenue implications of managerial responses to different conditions of online WOM.

Estimation Challenges and Approach

To estimate the effect of managerial responses to online WOM on firm performance, we have to address three estimation challenges including endogenous managerial response and online WOM metrics in their relation to financial performance variables, serially correlated financial performance, and unobserved heterogeneity in hotels.

The first challenge is that, in our context, online WOM metrics and managerial response can be endogenously determined by product performance or unobserved factors influencing the performance (Chintagunta et al. 2010). The presence of managerial responses in conjunction with consumer reviews creates several additional complications. For example, hotels often use managerial responses to communicate (or advertise) service quality improvements, which may highly relate to the progression of their performance and online WOM metrics. As such, managerial responses are an endogenous choice variable as well.

The second estimation challenge derives from serially correlated financial performance. Suppose a manager sees an increase in her revenue in a particular quarter *t* and the continued increase in the next quarter *t*+1. It is possible that the revenue performance increase in the quarter *t*+1 stems from the increased consumer purchase in response to improved service quality (hiring competent employees, renovating hotels, etc.) made available in the quarter *t*. Without adjusting the serial correlation in our dataset, our estimation for the parameters of online WOM and managerial response can be biased

The third estimation challenge is that we cannot observe all different aspects of hotels related to online WOM, managerial response and performance, namely unobserved heterogeneity. For example, managerial responses may depend on individual managers' skills and abilities. Likewise, hotel-specific characteristics such as business culture, employee training, and incentive schemes are important determinants of managerial response strategies; yet, all are difficult to quantify and observe.

To address the aforementioned three estimation challenges, we use mainly the estimation procedure in Boulding and Christen (2003), that consists of the following parts: (i) instrumental variable (IV) estimations. We identify a set of unique instrumental variables to sufficiently remove contemporaneous correlation in the endogenous variables of managerial responses and online WOM measures with performance measures. (ii) Fixed effects estimation. To obtain the consistent estimate of ρ (the first order autoregressive effect in $\eta_{i,t} = \rho\eta_{i,t-1} + \omega_{i,t}$), we run fixed effects estimations using fitted values of time-varying variables from (i). (iii) ρ-differencing of data using the estimated value of ρ from (ii) to remove the first-order autoregressive effect in our dataset. Thus far, our dataset is corrected for contemporaneous effects and serial correlation. (iv) Fixed effects estimations to obtain estimates of model parameters. To obtain the consistent estimates of the effects of time-varying variables, we run the fixed effects estimation using the ρ-differenced of the fitted values of time-varying variables from the IV-estimation (i). (v) Robustness check with the multilevel mixed-effects estimation in which we account for unobserved heterogeneity of hotels.

Instrumental Variables

For the endogenous online WOM measures, the characteristics of reviewers who post these online reviews are suitable instrumental variables for two reasons. First, a reviewer's profile at TripAdvisor and review experience (historical overall and sub ratings, reviewer badges, and membership years with TripAdvisor) are, in theory, isolated from hotel performance (i.e., validity of instruments). Second, the review ratings given by those reviewers reflect considerably personal perceived hotel service quality, which is mostly influenced by their preferences and experiences for the past stays (i.e., relevance of instruments).

For the endogenous managerial responses, a good instrument candidate would be a variable that reflects managers' response strategy but not relates to hotel performance. When responding to consumer reviews, managers usually tend to focus primarily on the most popular review website that has a large number of users and audience because reviews in such sites are most impactful. The search volume of TripAdvisor on Google Trends measures the public search interest of TripAdvisor in the search engine of Google and can thus be a good indicator of managers' strategy to respond on a certain review website (i.e., relevance of instruments). In addition, the search volume of TripAdvisor indicated by Google Trends does not directly influence hotel performance (i.e., validity of instruments), because the Google Trend search volume of TripAdvisor only measures the public search interest of TripAdvisor, rather than that of a particular hotel in a particular destination.

Empirical Results

Revenue Effects of Managerial Response to Online WOM

	Instrumental Variable-Fixed Effects		Multilevel Mixed Effects	
	(1)	(2)	(3)	(4)
Dependent Variable	*Revenue*	*RevPAR*	*Revenue*	*RevPAR*
Online WOM measures				
Valence	**0.740*****	**0.727*****	**0.713*****	**0.667*****
	(0.110)	(0.110)	(0.0916)	(0.0863)
Volume	**-0.0126*****	**-0.0125*****	**-0.00654*****	**-0.00403****
	(0.00191)	(0.00189)	(0.00152)	(0.00143)
Variance	0.0844	0.0837	**0.117***	**0.122****
	(0.0572)	(0.0555)	(0.0455)	(0.0425)
Valence × Volume	**0.0445*****	**0.0436*****	**0.0376*****	**0.0336*****
	(0.00881)	(0.00863)	(0.00571)	(0.00533)
Valence × Variance	-0.222	-0.220	-0.137	-0.137
	(0.161)	(0.158)	(0.101)	(0.0937)
Managerial intervention in online WOM				
Vol-Manager	-0.0457	-0.0632	0.0592	-0.00158
	(0.0704)	(0.0723)	(0.0408)	(0.0344)
Vol-Manager ×Valence	0.0665	0.0670	0.0895	**0.111***
	(0.0760)	(0.0729)	(0.0516)	(0.0476)
Vol-Manager× Volume	0.00214	0.00236	0.000155	0.000660
	(0.00118)	(0.00122)	(0.000657)	(0.000566)
Vol-Manager× Valence × Volume	**-0.00721****	**-0.00728****	**-0.00546*****	**-0.00557*****
	(0.00224)	(0.00224)	(0.00128)	(0.00116)
Adj. R-square (Log-likelihood)	0.132	0.136	(-260.5648)	(-117.57762)
HT-specification test	172.09(10) p<0.0001	198.31(10) p<0.0001	-	-

Standard errors in parentheses, ***Significant at 0.001 level; **Significant at 0.01 level; *Significant at 0.05 level (Based on two-tail test). Note: the estimates of the time-varying controls (e.g., size and age), ρ, $\sigma^2_{\xi_0}$, $\sigma^2_{\xi_1}$, constant are omitted for saving space and available from authors upon request. VIF (variance inflation factor) =3.47 and the total number of observations =1834.

Table 2. Revenue Effects of Managerial Response to Online WOM

We present the estimation of the revenue effects of managerial response to online WOM in Table 2. The *Revenue* and *RevPAR* models using IV-Fixed effects regression and Multilevel Mixed Effects regression are presented sequentially from Column 1 to 4. For all models, the estimated effects of valence across different models are positive and statistically significant (*p<0.001*). With respect to *Volume*, for all models, we find a significant volume disadvantage. In contrast with previous studies supporting the main driver of firm performance is the volume of reviews (Chintagunta et al. 2010), our findings find that it is the valence that seems to matter and not the volume in the service industry setting.

The statistical significance of the effects of *Valence × Volume* (*p<0.05*) for all models in Table 2 indicates that the revenue effect of *Valence* is not independent of *Volume*. This finding suggests that the revenue effect of the average rating does rely on how many reviewers have contributed to it. Specifically, the effect of *Valence* on hotel performance is higher when there is considerable mass to confirm this valence; in contrast, even if the average rating for a hotel is extremely high, it may hurt hotel performance if there are not enough online crowd that has contributed to the average rating. This finding lends support to prior

literature that demonstrates consumers do not separate *Valence* and *Volume* of online reviews when shopping (Chintagunta et al. 2010). Because *Variance* does not have the statistically significant dependency with *Valence* and *Volume* in preliminary results (also confirming the results in Chintagunta et al. 2010), we have ignored its dependency with managerial response in further analysis.

We then examine the revenue effect of managerial response to online WOM. The main effect of *Vol-Manager* is statistically insignificant ($p>0.05$) across all models in Table 2. This finding is not surprising because, by nature, the main effect of *Vol-Manager* should not provide any insights given the fact that managerial responses always co-exist with consumer ratings. Rather, the impact of *Vol-Manager* should be explained with *Valence* and *Volume* together. Therefore, we focus on how online WOM metrics moderates the effect of managerial response in this study (or how to provide managerial response given different conditions of online WOM). As expected, the estimates of the three-way interaction term among *Vol-Manager*, *Valence*, and *Volume* in Table 2 show that the relationship among these three variables is indeed statistically significant, demonstrating the impact of *Vol-Manager* depends on *Valence* and *Volume* together empirically.

To illustrate separately how *Valence* and *Volume* can jointly moderate the effect of *Vol-Manager* on *Revenue*, Figure 1 describes how the revenue effect of *Vol-Manager* can vary given different conditions of *Valence* (Figure 1(a)) and *Volume* (Figure 1 (b)) respectively. We use three illustrative lines (5th, 50th and 95th percentiles) to represent different levels (low, medium, and high) of the moderating variables, *Valence* and *Volume*. Asterisks are placed on lines where the marginal effect of *Vol-Manager* becomes statistically significant at the 0.05 level.

(a) Marginal effect of *Vol-Manager* for all values of *Valence* with three different percentiles of *Volmue*

(b) Marginal effect of *Vol-Manager* for all values of *Volume* with three different percentiles of *Valence*
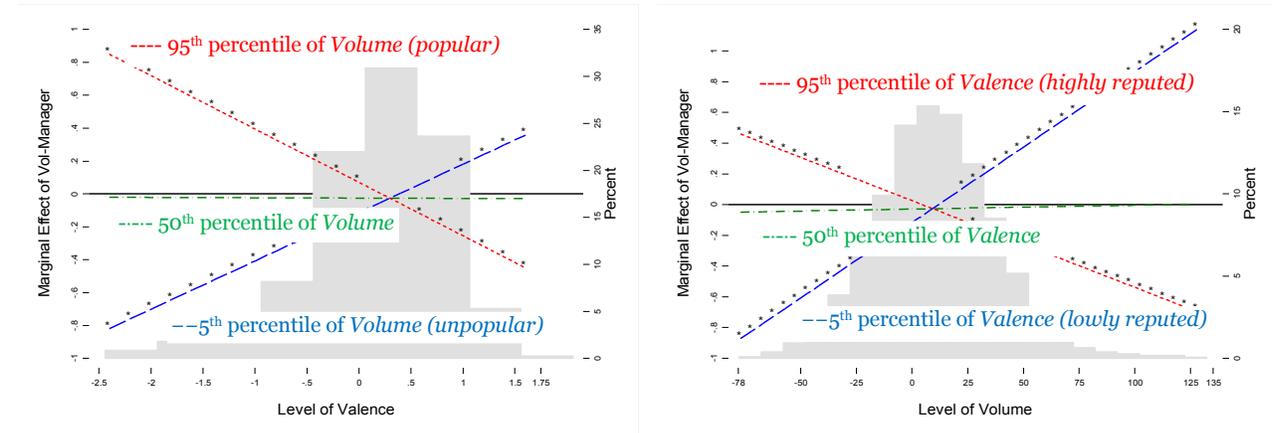
Estimated coefficient on the three-way interaction term = -0.00721 (Standard error=0.00224, *p*-value<0.01)

Figure 1. Marginal Effects of *Vol-Manager* Vary given different conditions of *Valence* and *Volume*

Note: The vertical axes on the left indicate the magnitude of the marginal effect of *Vol-Manager* on revenue performance. The vertical axes on the right are for the histogram, which plots the distribution of observations in the sample on *Valence* in (a) *Volume* in (b)) depicted on the horizontal axis. The solid line is the computed marginal effects at different values of *Valence* in (a) or *Volume* in (b) and dashed lines are upper and lower limits of 95% confidence intervals of the marginal effects of *Vol-Manager* on revenue performance. Asterisks indicate statistical significant at the 5% level.

Figure 1(a) shows the revenue effect of *Vol-Manager* given different level of *Valence* for relatively popular hotels (illustrated by the red line with the 95th percentile of *Volume*), somewhat popular hotels (by the green line with the 50th percentile of *Volume*) and less popular hotels (by the blue line with the 5th percentile of *Volume*) with respect to the volume of reviews. In line with previous literature (Lee et al., 2015), we use the size of reviews to denote product popularity. We find that, for popular hotels, the increased *Valence* acts to negatively decrease the marginal effect of *Vol-Manager* on revenue; for less popular hotels, increased *Valence* can actually help to positively increase the effect of *Vol-Manager* on revenue. Figure 1(b) provides another angle to view the revenue effect of *Vol-Manager* given different levels of *Volume* with respect to the valence of reviews. The line with the 95th percentile of *Valence* suggests that the marginal effect of *Vol-Manager* on revenue decreases for highly rated hotels while the line with 5th percentile of *Valence* indicates the marginal effect of *Vol-Manager* increases for lowly rated hotels, as more reviews are created or the hotel becomes more popular.

Our results suggest that managerial response should be strategic – whether and how to respond depends on the conditions of online WOM. Specifically, as we hypothesized earlier, when a hotel has only few reviews that are very negative, responding to those reviews may hurt its revenue. Potential consumers may regard such hotel as a big failure, and the service recovery effort of the hotel by responding to those negative reviews may signal extremely low quality of their service or intrusively effort to disguise the problem to potential consumers. Then, responses from such hotels may be recognized as only "lip service" which is weak, serving to compound the original problem (truly low or uncontrollable quality) rather than correct it.

When either of *Valence* or *Volume* increases from an extremely low situation to its average range, the negative effect of managerial response on revenue diminishes. In contrast, when either *Valence* or *Volume* is high, providing managerial response becomes positively effective in revenue generation. On one hand, when only few very high ratings exist, managers' effort is usually a strategy to affirm highly satisfied consumer experiences as we hypothesized earlier. Such actions can augment signaling of very positive ratings to potential consumers to accelerate the formation of brand relationship and then deepen customers' trust in the hotel service. On the other hand, when there are relatively a large number of very negative reviews, the effort of service recovery by means of responding to online reviews can drive the revenue. In this scenario, the large size of reviews represents high popularity but the valence of these reviews is quite low, creating a potential risk of assimilative bandwagon effect and social pressures to confirm with the negative opinions from the online crowd. In the presence of *high volume* and *low valen*ce, increased level of managerial responses is immediately expected to recover the service failure and would help the bidirectional communication between complaining consumers and responsive managers reach an effective social exchange with mutual understanding.

Interestingly, we find that managerial responses to online WOM may hurt the revenue when there are a lot of positive reviews. This is the *high valence-high volume condition* where so many reviewers have been extremely happy with the service quality of a hotel. If the hotel already overwhelmingly supported by a large number of customers for its service excellence, managers may not want to engage with the crowd to create unnecessary information overload and interference through managerial responses. It makes sense that those that do would care more deeply about the service excellence a hotel stands for rather than how much it engages with them. If subsequent consumers have already seen very strong and clear signal about the quality of products and services from a large group of crowd, external disturbance from the completely different source (managers from the firm) would make consumers react to it negatively. For example, consumers may raise questions in their minds about the soundness of the business and leading them to become suspicious about the underlying motives.

6. Conclusions and Implications

We advocate that the managerial intervention in online WOM should be strategic – whether and how to respond depends on the specific conditions of online WOM. In the backdrop of firms shifting their social media emphasis from passive listening to active intervening, our findings provide important implications for practicing managers. Using our findings, managers can effectively utilize the efforts and resources required to manage online WOM and truly benefit from the wisdom of online crowds.

The literature on managerial response to online WOM is still relatively new and more work is needed to guide practicing managers' social media strategies. It is necessary to point out the need of replication by future research to justify and improve our current understanding about the performance implications of managerial intervention in responding to online WOM in various settings of businesses.

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