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MEASURING THE VALUE OF MANAGERIAL RESPONSES TO ONLINE REVIEWS – A NATURAL EXPERIMENT OF TWO ONLINE TRAVEL AGENCIES

*Mesurer la valeur des réponses managériales aux commentaires des clients : étude
expérimentale de deux agences de voyage en ligne*

Research-in-Progress

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Abstract

This study assesses the influence of managerial responses to online customer reviews on product sales. We leverage a natural experiment provided by two online travel agencies. Both agents allow customers to post reviews on hotels, but only one of the travel agents allows hotel management to post managerial responses. Using a difference-in-difference approach, we find that managerial responses have a significant impact on hotel bookings. A hotel that provides managerial responses receives 60% more online bookings than an equivalent hotel without managerial responses. Our result highlights the importance of managing and responding to online customer reviews.

Keywords: Travel industry, online reviews, natural experiment, managerial responses

Résumé

Cette étude porte sur les effets des réponses managériales aux commentaires des clients-internautes sur les ventes d'un produit. En collectant des données auprès de deux agences de voyage, nous constatons que les réponses managériales ont un impact significatif sur les ventes (les réservations d'hôtel).



本研究提出并分析了针对在线客户评论的管理反馈对企业绩效的影响问题。论文采用 *difference-in-difference* 方法，对来自两个在线旅游网站的数据进行了分析，发现酒店的管理反馈对其网上预订具有显著的影响。分析结果表明，进行管理反馈的企业获得了超过 60% 的在线预订，这一发现揭示了企业对在线客户评论进行有效管理和反馈的重要性。

Introduction

Online user reviews are an important source of information for potential customers. Recent studies demonstrate that user reviews significantly influence sales of products and services (Chevalier and Mayzlin 2006; Duan et al. 2008). Given their influence, businesses increasingly take a proactive approach to respond to concerns expressed by online reviewers. The most common recourse available to businesses is adding responses to individual reviews, where business can offer apologies or provide explanations in the hope of mitigating the negative influence. The aim of this study is to assess the impact of such managerial responses and address the question: “how do managerial responses influence product sales?”

A key challenge in measuring the influence of managerial responses and product sales is to identify causality. A positive correlation between managerial responses and product sales does not necessarily indicate that managerial responses to online reviews increase product sales. Managerial responses could be a reflection of underlying managerial expertise. A business with good managerial expertise usually has higher sales. It is also more likely to respond to online customer reviews, leading to a spurious correlation between the two. To assess the true influence of managerial response, it is necessary to control for a business' managerial expertise that is not observable to researchers. A unique contribution of this study is that we explore a natural experiment that exists in two major online travel agencies in China to address the problem. Both online travel agencies provide extensive online user review features. There, however, exists one key difference between the two agencies – one travel agency allows a business to post responses to user reviews while the other does not. This design difference allows us to distinguish the influence of managerial responses from the influence of managerial practice. By comparing sales of the same hotel across the two travel agencies, we are able to cancel out the influence of underlying managerial expertise and identify the true influence of managerial responses.

Using a difference-in-difference approach, we find that managerial responses have a significant impact on hotel bookings. A hotel that provides managerial responses receives 60% more online bookings than an equivalent hotel without managerial responses. We also find that consumer review ratings have a significant influence on product sales while the ratings provided by the travel agents have little influence. Our result highlights the value of managerial responses to online customer reviews.

Literature Reviews

The importance of word-of-mouth has been widely documented in the existing literature (Anderson 1998; Goldenberg et al. 2001; Zhu et al. 2006; Stokes and Lomax 2002). Although its definition varies, the term word-of-mouth generally refers to the personal communications between individuals concerning the quality of goods and services. Studies show that consumers' decision making process is strongly influenced by word-of-mouth (Goldenberg et al. 2001). As a result, marketing strategies based on word-of-mouth are widely used in a variety of consumer-oriented industries (Stokes and Lomax 2002).

The growth of the Internet has significantly broadened the reach of word-of-mouth and presented new opportunities and challenges to consumers and practitioners (Pan et al. 2007). Existing literature has focused on the influence of online word-of-mouth. Zhu et al. (2006) and Cheung et al. (2004) find that online word-of-mouth is beneficial to both consumers and managers. Likewise, Dellarocas (2003) find that online word-of-mouth can have important implications for managers in brand building, product development, and quality assurance. Chevalier and Mayzlin (2006) examine the effect of consumer reviews on relative sales of books at Amazon.com and Barnesandnoble.com and find that word-of-mouth can significantly influence book sales. In brief, the Internet provides a platform for inter-personal communications and information sharing on goods and services.

With the influence of online word-of-mouth is well understand, there have been few studies identifying managerial strategies for online word-of-mouth, particularly with regard to negative online word-of-mouth. The need is especially acute as studies show that unsatisfied customers often engage in greater word-of-mouth than satisfied ones (Anderson 1998). The objective of this paper is to take a first step to identify and measure the influence of a particular type of managerial strategies – online managerial responses. Managerial responses are responses posted by the management replying to online customer reviews. The response is not only visible to the posters of the reviews but also to all customers who visit the customer review site. The objective of managerial responses is two-folded. First, it establishes a positive image of customer service and, second, it addresses particular concerns or criticisms raised in the online customer reviews.

Empirical Model

To identify the influence of online managerial responses, we note that managerial responses are correlated with a business' offline managerial expertise. A key task of the empirical model is to separate the two and identify only the influence of online managerial responses. The task is particularly challenging because we do not observe a business' offline managerial expertise. Consider the following log-linear model for online sales of hotel i at travel agent j :

$$\log(\text{sales}_i^j) = \mu^j + v_i + \beta_1 \text{MgrRsp}_i^j + \beta_2 \text{OffMgr}_i + \beta_3 \log(p_i^j) + \mathbf{X}_i \Gamma^j + \varepsilon_i^j \quad (1)$$

In the above model, μ^j represent fixed effects for the travel agent. v_i captures fixed effects for hotel i . MgrRsp_i^j represents hotel i 's online managerial response at travel agent j and OffMgr_i represents the hotel's offline managerial expertise. p_i^j identifies the price of the hotel and the influence of price factors. \mathbf{X}_i includes all other factors that influence hotel sales and we allow the influence to differ across travel agents. The objective of the analysis is to identify β_1 , i.e. the influence of managerial responses on sales. However, since managerial response (MgrRsp_i^j) is correlated with offline managerial expertise (OffMgr_i) and since we do not observe a hotel's offline managerial expertise, estimation of equation (1) encounters the well-known missing variable problem. The coefficient β_1 will be biased and influenced by the correlation between offline managerial expertise and hotel sales.

To address the missing variable problem, we leverage a unique natural experiment provided by two large travel agents that provide online hotel booking services in China. Both travel agents allow and encourage consumers to post online reviews. A main difference between the two is their policy with regard online managerial responses. One travel agent does not allow hotel management to respond to online reviews, while the other allows. The difference in policies creates a natural experiment that enables us to address the missing variable problem. This is because a hotel's sales on both travel agents are influenced by offline managerial expertise but sales at only one travel agent are influenced by online managerial response. Using a difference-in-difference approach, we can cancel out the influence of offline managerial expertise and identify the influence of online managerial responses.

Formally, we have the following model to measure sales of hotel i at two travel agents.

$$\begin{aligned} \log(\text{sales}_i^j) &= \mu^j + v_i + \beta_1 \text{MgrRsp}_i^j + \beta_2 \text{OffMgr}_i + \beta_3^j \log(p_i^j) + \beta_4^j \log(p_i^{j'}) + \mathbf{X}_i \Gamma^j + \varepsilon_i^j \\ \log(\text{sales}_i^{j'}) &= \mu^{j'} + v_i + \beta_2 \text{OffMgr}_i + \beta_3^{j'} \log(p_i^{j'}) + \beta_4^{j'} \log(p_i^j) + \mathbf{X}_i \Gamma^{j'} + \varepsilon_i^{j'} \end{aligned} \quad (2)$$

We take the difference between the two equations to cancel out the influence of offline managerial expertise as well the fixed effect for hotel i .

$$\log(\text{sales}_i^j) - \log(\text{sales}_i^{j'}) = (\mu^j - \mu^{j'}) + \beta_1 \text{MgrRsp}_i^j + (\beta_3^j - \beta_4^{j'}) \log(p_i^j) + (\beta_4^j - \beta_3^{j'}) \log(p_i^{j'}) + \mathbf{X}_i(\Gamma^j - \Gamma^{j'}) + (\varepsilon_i^j - \varepsilon_i^{j'}) \quad (3)$$

Our difference-in-difference is similar to the approach used by Chevalier and Mayzlin (2006) that assesses the influence of book reviews with the exception that we focus on the influence of managerial response and that the design difference across the two travel agents provides a natural experiment that is not available in online book stores.

A further challenge in the study is that we do not observe actual hotel bookings at either travel agent. We assume that a customer's probability of posting a review is a function of travel agency characteristics (f) and hotel characteristics (g). We also assume that the influences of the two are independent from each other. Given the assumption, we have $\text{numRvws} = \text{sales} \times f^j \times g_i$. Equation (2) can therefore be transformed to

$$\log(\#Rvws_i^j) - \log(\#Rvws_i^{j'}) = (\mu^j - \mu^{j'} - f^j + f^{j'}) + \beta_1 \text{MgrRsp}_i^j + (\beta_3^j - \beta_4^{j'}) \log(p_i^j) + (\beta_4^j - \beta_3^{j'}) \log(p_i^{j'}) + \mathbf{X}_i(\Gamma^j - \Gamma^{j'}) + (\varepsilon_i^j - \varepsilon_i^{j'}) \quad (4)$$

To assess the validity of using number of customer reviews as a proxy for hotel bookings, we conducted a survey of all major hotels in a large city served by both travel agents. We obtained detailed hotel booking numbers from more than 50% of the hotels being surveyed and identified bookings to each travel agent. Our analysis shows that number of customer reviews is highly correlated with the actual booking numbers. We report the survey result in the Robustness section.

Data

The data in this study was retrieved from Ctrip.com (NASDAQ: CTRP) and Elong.com (NASDAQ: LONG). They are the two largest online travel agencies in Mainland China. Both online agencies have a mechanism that allows their customers to provide online reviews for the hotel stays. In addition, Ctrip.com allows the hotel management to give response to online customer reviews, while Elong.com does not provide this feature.

We developed two crawlers using Ruby to automatically download web pages of reviews and information of hotels from both websites and developed another Ruby based system to parse HTML and XML web pages into our database. We used the crawlers to retrieve all available information of hotel bookings from Ctrip.com and Elong.com from ten randomly selected large cities in China (Shanghai, Beijing, Guangzhou, Shenzhen, Chongqing, Chengdu, Harbin, Xi'an, Lanzhou, and Lhasa). For each hotel in our data set, we collected two types of information. The first type is detailed information on hotel description from both travel agents' websites. The second type of information contains all review information including contents of reviews, authors, publishing dates, hotel ratings by the two travel agents (from 1 to 5), and binary data with regard to the presence of managerial feedback to customer reviews. We collected all reviews of a hotel from the date it joined Ctrip.com or Elong.com until February 2008. Table 1 provides the summary information of the data.

Table 1 Summary of the data set		
Name of Travel Agency	Ctrip.com	Elong.com
Number of Selected Cities	10	10
Number of hotels	2205	1759
Number of hotels with reviews	1896	1169
Number of customer reviews	40424	12217
Number of hotels with managerial feedbacks	161	N/A
Number of reviews with managerial feedbacks	700	N/A

Number of hotels appears on both agencies (Matched hotels)	791	791
Number of matched hotels with managerial feedbacks	57	N/A

Many hotels appear on both Ctrip.com and Elong.com, but the names for the same hotel could be slightly different on the two travel agents' websites. To match hotels from two travel agents in our database, we wrote a java program using an approximate string-matching technique called SecondString. The program takes a pair of hotel names as input and returns the matching score of the names. The more alike the two names are, the closer the score approaches 1. We keep all name pairs whose matching scores are greater than 0.85. We then manually go through matched hotel names to ensure correct matching. The matching approach identifies 791 hotels available on both Ctrip.com and Elong.com for our study. Among them, 57 hotels have at least one managerial feedback on Ctrip.com.

Hotel sales are not only influenced by prices, managerial responses but also by other factors. In particular, prior studies suggest that online consumer review ratings have a significant influence on product sales. To identify customer review ratings on the two travel agent websites, we estimate sentiment orientation of each customer review. We use a text mining classifier, Dynamic Language Model classifier with n-grams (n=8), from LingPipe suite to perform the estimation. The training and testing dataset for the classifier is provided by manually marking sentimental orientations on 1000 reviews. These reviews were then used to train and evaluate the classifier. The accuracy of the classifier is 80% on the testing data set.

Given the estimated sentiment orientation of each customer reviews, we aggregate the information to form average review rating for the analysis. Prior studies suggest that few customers ever view comments beyond the first two web pages (Pavlou and Dimoka, 2006). We, therefore, establish a moving window of the 20 most recent reviews over the study period. For each day, we identify the 20 most recent reviews and calculate the mean and standard deviations of the review ratings. We then average the mean rating over the study period to reflect the average consumer opinion of the hotel during the study period.

Table 3 presents all the variables of hotels used in the following analysis.

Table 2 Variables of a Hotel	
Variable	Description
Review_num_2007_Ctrip	The number of reviews published for a certain hotel between February 1, 2007 and January 31, 2008 on Ctrip.com (Proxy of Sales on Ctrip.com)
Review_num_2007_Elong	The number of reviews published for a certain hotel between February 1, 2007 and January 31, 2008 on Elong.com (Proxy of Sales on Elong.com)
Ctrip Rating	The mean of the average values of 20 most recent reviews of a hotel between February 1, 2007 and January 31, 2008 on Ctrip.com
Elong Rating	The mean of the average values of 20 most recent reviews of a hotel between February 1, 2007 and January 31, 2008 on Elong.com
Ctrip_Price	The lowest price of the room per night listed for a hotel on Ctrip.com
Elong_Price	The lowest price of the room per night listed for a hotel on Elong.com
City_Ranking	The rank of a city among the ten cities according to its GDP in 2007.
Has_feedback	Dummy variable, taking the value of 1 if there is at lease one feedback from the hotel to the reviews on Ctrip.com
Star_rating	The star rating of a hotel given by an official organization to indicate the quality of the hotel. The rating is from 1 to 5. Five-star indicates the highest quality.

As we mentioned, one challenge in measuring the influence on product sales is that product sales data are often not available to researchers. A number of approaches have been used to infer product sales from data observed. For example, some researchers used Amazon.com sales ranks to derive product sales. We address the concern in this study by noting that both travel agencies allow only customers who successfully make online transactions to publish

online reviews. We therefore take the number of published reviews on a travel agent website as a proxy for hotel sales via the travel agent during the study period. We later test this assumption in the Robustness section.

Results

Table 4 presents the result of the analysis. It reveals that managerial responses to online reviews significantly increase hotel sales. The impact is both statistically and practically significant. The coefficient on managerial response suggests that the sales increase could be as much as 60%. The result complements prior findings that suggest uncertainty and trust could play an important role in electronic commerce (Pavlou et al. 2007; Benbasat 2008). Managerial responses provide a way to for hotel management to build up trust and mitigate uncertainty for online consumers, resulting in higher sales. Our analysis also shows that user ratings significantly influence hotel sales as well. A 10% rating increase at Ctrip.com and Elong.com leads to a 7% to 10% sales increase. The analysis also reveals that price has little influence on hotel sales at the two travel agents. This is potentially due to the fact that most hotels provide the same prices to both travel agents. As a result, there is little variation in price difference between the two agents to identify the influence of prices.

Table 4 Result of the Analysis				
Variable	Unstandardized Coefficients		T	P-value (sig)
	Beta	Std. Error		
(Constant)	.612	.757	.809	.419
MgrRsp (dummy)	.600	.247	2.423	.016
Ctrip Price (log)	.013	.494	.026	.979
Elong Price (log)	.303	.478	.633	.527
Ctrip Rating (log)	.734	.096	7.661	.000
Elong Rating (log)	-1.049	.063	-16.578	.000
CityRanking	-.418	.027	-15.226	.000
StarsRating	-.035	.037	-.944	.345
Number of observations	791			
R-square	44%			
Sig of Model (p)	.000			
Dependent Variable: $\log(\text{numRvws}_i^C) - \log(\text{numRvws}_i^E)$				

Robustness

To validate our approach of using number of online reviews as a proxy for hotel sales, we conducted a survey of hotel management in a major city in March 2008. With the help of the Bureau of Tourism, the government agency in charge of regulating hotels, we sent out a survey to obtain actual hotel bookings via travel agent websites from all major hotels in the city. By the end of March 2008, we received responses from 19 hotels that have contracts with either of the two travel agents, representing more than 50% of all hotels with contracts with the two travel agents within the city. Among the 19 hotels, 10 hotels have contracts with both Ctrip.com and Elong.com. The survey provides monthly hotel bookings through the two travel agents for each of the 19 hotels. We accumulated the number of bookings for each hotel to match the time period of the dataset. We then use a log-linear regression to identify the relationship between number of reviews and number of hotel bookings

$$\log(\#Rvws_{ij}) = \alpha_0 + \alpha_1 j + \alpha_2 \log(\#Bookings_{ij}) + \varepsilon_{ij} \quad (5)$$

where j is a dummy variable for travel agents. We use 1 and 0 to present Ctrip.com and Elong.com respectively.

The result in table 5 shows a significant positive relationship between the number of reviews and the number of hotel bookings with an R-square of 68%. The R-square suggests a correlation of more than 80% between the number of reviews and the number of hotel bookings. It indicates that number of reviews can be used as a proxy for actual hotel booking volume.

Model	Unstandardized Coefficients		Standardized Coefficients	T	P-value (sig)
	B	Std. Error	Beta		
(Constant)	-1.76	0.75		-2.36	0.03
Ln(#Bookings)	0.37	0.13	0.35	2.90	0.01
Website	1.43	0.28	0.62	5.17	0.00
R-Square	68%				
Number of observations	29				
Sig of Model (p)	.00				
Dependent Variable	Ln(#Rvws)				

Conclusion

Our results suggest that managerial responses have a significant impact on hotel bookings. A hotel that provides managerial responses receives 60% more bookings than a comparable hotel without managerial responses. The finding suggests that consumers pay close attention to service quality in conducting online transaction. Responding to online customer reviews provides an opportunity for the management to interact with online consumers and to signal its customer service quality. The analysis highlights the importance of managing and responding to online customer reviews.

Our finding is not limited to online travel agents. Online transactions increasingly expand from product purchase to service procurement. Service quality is, therefore, an important consideration in consumers' decision making process. We show that managerial responses to online reviews play an important role in influencing consumer decisions.

Our analysis also has a number of limitations. First, we do not observe actual hotel bookings. We use number of reviews as a proxy for actual hotel bookings and demonstrate significant correlation between the proxy and the variable of interest. The use of proxy, however, increases noises in the model because relatively few travel agent customers post review online. In addition, unlike survey-based studies, we cannot identify underlying factors that influence travel agent customers' decision making process and how managerial responses influence these factors. We leave these questions to future research.

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