CUSTOMERS COMPLAINTS IN ONLINE SHOPPING:
THE ROLE OF SIGNAL CREDIBILITY

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ABSTRACT

Because online customer complaint behavior influences not only customer loyalty, but also other customers' purchase intentions, it is important to examine the antecedents of customer complaint behavior. Previous research on antecedents of customer complaint behavior focuses on personal traits and post-purchase perceptions, while this paper focuses on online customer pre-purchase perceptions. In an online market, trustworthy online retailers send signals to separate themselves from retailers who are untrustworthy in the eyes of customers. However, untrustworthy online retailers can mimic trustworthy online retailers' behavior by sending similar signals without providing services indicated by the signals. Relying on expectation-confirmation theory and signaling theory, we study conceptually and empirically how signal credibility influences online customer complaint intentions. Signal credibility reflects customer pre-purchase perceptions of the quality of an online retailer. Data were collected from a Chinese online B2C market, Tmall.com. The results from this data indicate that signal credibility has a direct negative influence on online customer complaint intentions. Furthermore, signal credibility can moderate the relationship between customer satisfaction with post-purchase services and online customer complaint intentions.

Keywords: online shopping; complaint intentions; signaling theory; expectation-confirmation theory; signal credibility

1. Introduction

In China, the emergence of e-commerce has provided a wide range of retailers with a powerful tool to offer a growing middle class access to a wide variety of goods. According to the 31st Report on China Internet Network Development, which was published by The China Internet Network Information Center (CNNIC), online retail sales have grown rapidly in China, reaching ¥1259.4 billion in 2012 (a 66.5% increase from 2011). Along with this exponential increase in sales, the number of online retailers has continued to grow at an unprecedented rate, and the online retailing industry is becoming increasingly competitive [Szymanski & Hise 2000].

Along with this rapid growth, there has been an increasing number of complaints by customers regarding service failures in their online shopping experiences [Forbes et al. 2005; Hu & Mao 2013]. Through the Internet, customers can easily share their complaints in virtual communities [Hennig-Thurau et al. 2004] and this medium have proven to be very effective at spreading this information across the country. Moreover, because online customer complaint behavior can influence customer's loyalty, as well as other customers' purchase intentions, Chinese online retailers

have had little choice but to pay close attention to customer complaints [Wu 2013] and understand their antecedents in order to prevent the loss of customers and preserve their market share. Many of these retailers have also come to the realization that customer complaints can actually allow them to not only remedy their previous failures but also retain their customers' business [Gilly & Gelb 1982].

In traditional service markets, customer satisfaction has significant negative effects on complaint intentions [Oliver 1980; Voorhees & Brady 2005]. Previous research on drivers of customer complaint behavior mainly focuses on personal traits and post-purchase perceptions [Bodey & Grace 2007; Huang & Chang 2008; Voorhees & Brady 2005]. Lu et al. [2012] examined how dissatisfaction influences customer complaining behavior. Wu [2013] presents an overall conceptual model on the major drivers of customer satisfaction, how customer satisfaction impacts complaint intentions in online shopping, and the interaction effect of pre-purchase perceptions on the relationship between customer satisfaction and complaint intentions. Despite recent advances in e-service research, few studies have examined the main effect of pre-purchase perceptions on customer complaint intentions [Cho et al. 2002; Huang & Chang 2008; Voorhees & Brady 2005].

The goal of this study is to fill this gap by empirically assessing both the main effect and the interaction effect of customers' pre-purchase perceptions of an online retailer's quality on online customer complaint intentions (OCCI). We define these intentions as a function of online customers' willingness to complain when they are not satisfied with products or services provided by online retailers. For pre-purchase perceptions, we focus on signal credibility, which refers to the honesty of the signals that senders (i.e., the retailers) provide to customers regarding their quality [Connelly et al. 2011]. In the online market, signals, such as guarantees, brand names, and licensing can reduce retailer quality uncertainty and increase customer trust [Aiken and Boush 2006]. However, untrustworthy retailers will send the same signals to mimic the trustworthy retailers without providing corresponding quality services. In turn, it will be hard for customers to distinguish between "trustworthy" and "untrustworthy" online retailers. Customers' decisions whether to trust online retailers depend on their signal credibility. High signal credibility occurs when customers trust a retailer can provide the service or product as indicated by the signal, which is sent by the retailer [Wells et al. 2011]. In online retailing, signal credibility reflects a customer's perceived quality of an online retailer [Wells et al. 2011].

Considering customer post-purchase satisfaction has a negative impact on OCCI [Voorhees & Brady 2005] and signal credibility reflects customer pre-purchase perceptions of online retailers quality, this research aims to address the following research questions:

1) In online shopping, what is the influence of signal credibility on OCCI?
2) Does signal credibility moderate the relationship between customer satisfaction and OCCI?

Our research questions have strong implications for service operations management. In order to manage customer complaint behavior, online retailers should be interested in knowing what factors trigger customer complaint intentions initially. Signal credibility, which reflects online customer pre-purchase perception of online retailer quality, is the factor integrated in our model. Understanding how online customer pre-purchase perceptions impact OCCI is helpful for online retailers to decide how to make improvements in their service operations. This study extends existing literature related to customer complaint intentions by integrating the factor of signal credibility in e-service. Furthermore, the present study contributes the much-needed importance of signal credibility to the online retailing service literature. Previous research has indeed examined the impact of signal credibility on customer purchasing intention [Boulding & Kirmani 1993; Wells et al. 2011], but to the best of our knowledge, the present study represents the first empirical investigation of how signal credibility influences online customer post-purchase behavior.

The remainder of the paper is organized as follows. The next section contains a discussion on the conceptual foundation of this study. Following the theoretical foundations, we present the research hypotheses. The research method is then presented, followed by the data analyses and model results. Finally, the paper presents concluding remarks on the study's contributions, limitations, and directions for future research.

2. Theoretical Foundations

2.1. Expectation-Confirmation Theory (ECT)

The expectation-confirmation theory (ECT) provides a background for understanding the relationship between customers' satisfaction and post-purchase behaviors, and ECT is widely used in the marketing literature to study customer satisfaction and post-purchase behavior [Bhattacherjee 2001]. Early conceptualizations of service quality are usually based on the ECT [Santos 2003]. Customer satisfaction is expressed as a function of expectation and expectation disconfirmation [Oliver 1980], which arises from discrepancies between pre-purchase expectations and post-purchase performance of a product or service and has an influence on customers' repurchase intentions [Churchill Jr & Surprenant 1982; Oliver 1980; Wu 2013] (see Figure 1). A customer's expectations are negatively disconfirmed when the perceived performance is worse than his/her expectations and positively disconfirmed when the perceived performance is better than his/her expectations. As positive disconfirmation increases, so does customer satisfaction

[Churchill Jr & Surprenant 1982; Swan & Trawick 1981]. Additionally, expectations and perceived performance can influence satisfaction directly [Churchill Jr & Surprenant 1982]. For example, a higher level of expectation can increase satisfaction level, while a lower level of expectation will reduce satisfaction level [Festinger 1962; Kim et al. 2009]. What's more, satisfaction and dissatisfaction exert an influence on customers' post-purchase behaviors [Bearden &and Teel 1983; Oliver 1980].

With the development of e-commerce, ECT has been used widely in online customer behavior studies [Bhattacherjee 2001; Kim et al. 2009; Shankar et al. 2003; Szymanski & Hise 2000]. Online customers' satisfaction depends on the difference between what they want and what they obtain [Flavián et al. 2006; Szymanski & Hise 2000]. If an online customer is subject to positive disconfirmation by an Internet retailer, the customer will be more likely to trust online retailer again and to repurchase. However, if an online customer is subject to negative disconfirmation, the customer will be unlikely to return to purchase again from the online retailer [Lu et al.2012].

ECT theory tells us how customer satisfaction is generated and how customer satisfaction is related to customer post-purchase behaviors. Customer complaining behavior is one of those customer post-purchase behaviors [Szymanski & Henard 2001]. Building on ECT, we examine how a customer's perceived quality of an online retailer influences the customer's complaining behavior in the online market.
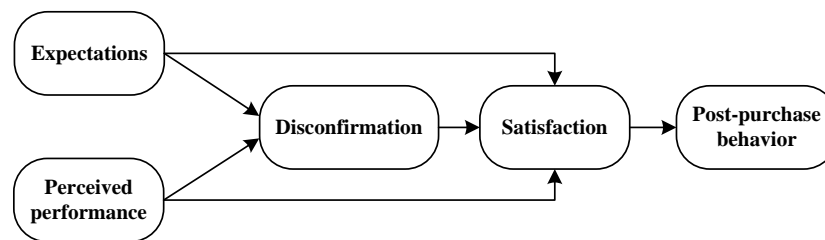

Figure 1: Expectation-Confirmation Theory

2.2. Signaling Theory

Signaling theory is developed from the field of information economics and describes when sellers and buyers have asymmetric information in a market interaction, where retailers know the quality of their goods or services, whereas customers are uncertain about the quality of the retailers' goods or services [Boulding & Kirmani 1993]. Signaling theory provides a framework for understanding how signals convey product or service information to customers, thereby reducing uncertainty and influencing customers' purchase intention [Wells et al. 2011]. Signals, which include brand names, prices, warranties, and advertising expenditures, play an important role in helping customers to distinguish bad retailers from good retailers [Boulding & Kirmani 1993]. According to Kirmani and Rao [2000], signals can be classified into two categories: default-independent signals and default-contingent signals, based on the monetary consequence triggered by the organization which sends the signals.

Marketing signals help customers evaluate online retailers, and also function as a way of reducing risk for customers and influencing customers' purchase intensions. Signals can influence not only pre-purchase behavior, but also post-purchase customer evaluation of online service performance [McCollough & Gremler 2004]. In general, attention has been paid to the pre-purchase stage in transactions between online retailers and customers. For example, McCollough and Gremler [2004] suggest that service guarantees have a positive effect on customer overall satisfaction. However, there is no study discussing how signals influence post-purchase behavior in general and complaint intentions in particular.

3. Theory Development
3.1. Online Customer Compliant Intention (OCCI) and Online Customer Satisfaction

As noted earlier, customer dissatisfaction is an important precursor of complaint intentions. An online customer will be likely to complain if a product or service performs worse than s/he expected before purchasing [Cho et al. 2002]. The more customers feel dissatisfied with the online services, the more likely complaint intentions will arise.

After making a transaction with an online retailer and receiving the purchased product, the customer will need additional service from the online retailer. Service provided by online retailers after product delivery is considered after-sales service, which is an important part of e-service [Parasuraman et al. 2005]. After-sales service quality affects customer satisfaction, which in turn affects behavioral intentions [Rigopoulou et al. 2008]. The influence of online retailers' pre-purchase and purchase services elements (such as consistency of information, system interaction and shipping) on customer satisfaction and post-purchase behavior has been investigated [Rao et al. 2011; Wu 2013].

Accordingly, our study mainly focuses on after-sales service elements. Two of these elements are after-sales responsiveness and refund time.

Service quality is an antecedent of customer satisfaction [Cronin & Taylor 1992] and customer complaint intentions [Zeithaml et al. 1996]. There is also an indirect relationship between service quality and behavioral intentions via satisfaction [Cronin Jr et al. 2000]. Service quality has been frequently evaluated in terms of tangibility, reliability, responsiveness, assurance, and empathy [Parasuraman et al. 1988]. In these five dimensions, responsiveness (a retailer's willingness to help customers and provide prompt response if there is a problem or question) represents a retailer's service attitude, and responsiveness is also an item in E-S-QUAL, which measures the service quality of online retailing [Parasuraman & Zeithaml 2005]. Responsiveness affects customer satisfaction during online shopping. Due to the nature of online shopping, responsiveness plays a more important role in online shopping than in offline shopping. The communication between seller and customer is an important source for satisfaction in online shopping because the communication can result in understanding of product performance and influence customer expectations level [Selnes 1998]. Compared with traditional customers, online customers have more questions throughout the pre-purchase to post-purchase process. For example, after customers get items they purchase, they may ask the online retailer about returns or onsite service. In the pre-purchase stage, online retailers pay more attention to customer inquiries because a customer is a potential buyer; however, after purchasing, some online retailers will not handle customer problems as immediately as in pre-purchase stage. After purchasing, a customer expects to get answers promptly and accurately with a polite service attitude. If the customer is not satisfied with after-sales responsiveness, he or she would like to complain.

Returns management is one key issue faced by online retailers [Griffis et al. 2012], and returns processing can be considered as a service recovery event. The quality of service recovery has a positive impact on customer satisfaction level and future behavior [Harris et al. 2006; Mollenkopf et al. 2007]. Thus, the efficiency of returns processing is positively related to the level of customer satisfaction. However, online retailers (especially in China) have not done enough to satisfy their customers in their return policies as offline retailers have, Moreover, online retailers have been slow to put effective refund systems in place [Bonifield et al. 2010]. Studies of time-based competition have demonstrated that faster response in operations management can bring competitive advantage to firms [Blackburn 1991]. However, service recovery timeliness has asymmetrical impact on emotions. Quick service recovery does not bring significantly higher customer satisfaction levels, while slow service recovery does enhance customers' negative feelings [Chebat & Slusarczyk 2005]. Online customers, in particular, are sensitive to the timeliness of the refund process. According to Griffis et al. [2012], operations performance of online retailing return processes can be reflected by refund time and will influence customers' future behavior. Refund time itself can be an objective indicator to represent customer satisfaction level towards refund time. Complaint intentions will also rise by increasing refund time.

3.2. Signal Credibility and Online Customer Post-purchase Behavior

In order to gain more trust from customers, an online retailer should devote attention to marketing signals, such as product warranty policies, return and refund policies, and security policies. By doing so, the online retailer will separate itself from low-quality online retailers. However, what if online retailers send the same signals?

If online retailers have the same signals, customers will consider the credibility of those signals before making purchase decisions. High signal credibility occurs when customers believe the online retailer can provide the service or product as indicated by the signal [Wells et al. 2011]. Furthermore, signal credibility is positively related to perceived quality [Erdem & Swait 1998; Price 2002; Baek et al. 2010; Baek & King 2011]. Accordingly, higher levels signal credibility implies that a customer is certain of the honesty of the online retailer who sends the signals and perceives the online retailer's quality to be higher. On the other hand, lower levels of signal credibility imply that a customer would perceive the quality of the online retailer to be lower. We can infer that in the pre-purchase process, customer perceptions of the quality of an online retailer will increase with the online retailer's signal credibility. Furthermore, customer satisfaction will be positively related to the perceived service quality [Parasuraman et al. 1994; Reimann et al. 2008; Hung et al. 2014]. As complaint intentions increase with decreasing satisfaction level, we propose the following hypothesis:

H1: In online retailing, signal credibility has a negative effect on OCCI.

Prior studies have demonstrated a moderating effect of signal credibility. For example, Well et al. [2011] find that signal credibility moderates the relationship between website quality and a customer's perception of product quality. Signal credibility influences customer pre-purchase perceptions and is a potential moderator on the relationship between customer satisfaction and OCCI [Wu 2013]. In the post purchase process, a customer has experienced the service provided by an online retailer and formed his or her evaluation of the online retailer. When a customer's perception of an online retailer's signal credibility is higher, the customer has increased expectations about the online retailer's service or product quality and becomes more likely to complain to the online retailer when he or she is not

satisfied with services provided by the online retailer. This is because the customer considers whether the online retailer can provide services as indicated by the signal and whether service will be improved through service recovery [Wu 2013]. The customer prefers to trust a high quality online retailer can provide better service after complaining. In summary, when deciding whether to complain, customers will consider a retailer's signal credibility. Thus, we offer the following hypothesis:

H2a: In the online market, signal credibility moderates the influence of customer satisfaction of responsiveness on OCCI such that customer satisfaction of responsiveness will have a greater negative effect on OCCI when signal credibility is lower as compared to when signal credibility is higher.

H2b: In online market, signal credibility moderates the influence of refund time on OCCI such that refund time will have a greater positive effect on OCCI when signal credibility is higher as compared to when signal credibility is lower.

The research model is summarized in Fig 2. In this model, signal credibility is assumed to affect OCCI directly. Specifically, signal credibility is assumed to moderate the relationship between customer satisfaction level and OCCI.
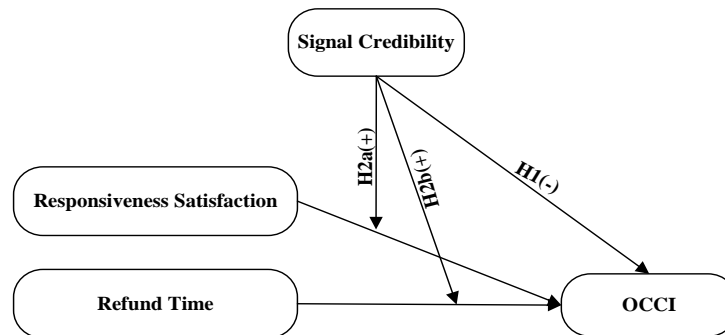

Figure 2: Research Model

4. Research Design
4.1. Data Collection

To test the proposed hypotheses, data for the study were collected from Tmall.com, a B2C online market in China. A feedback mechanism in Tmall.com records service information and customers' dynamic ratings of sellers and is publicly available at http://www.tmall.com/. The service information provides customers with metrics about service failures, such as average refund time and complaint ratios. The metrics provide dynamic information to customers about online retailers across different aspects of the purchase process, such as product description, responsiveness satisfaction, and shipping time. Customers can view information in the evaluation system before making a purchasing decision. The ratings are not self-reported by the online retailers, but are based on feedback provided by actual customers from their purchase experiences with the individual retailers. After a purchase is completed, Tmall.com sends a message to invite buyers to participate in a survey regarding their purchasing experience. The survey uses a five-point scale to measure levels of satisfaction with product description, responsiveness satisfaction, shipping time, and logistics service. A rating of five points represents excellent service, while a rating of one point represents very poor service. Figure 3 shows a rating page from Tmall.com. Table 1 presents a list of metrics reported by Tmall.com.

Tmall.com has a number of characteristics that make it particularly suitable for examining the research model in this paper. First, Tmall.com has become extremely popular with many buyers and sellers in China. At the time of our study, Tmall.com had registered a little over 400 million buyers, 50,000 sellers, and 70,000 brands. Second, retailers in Tmall.com broadcast three signals of quality: all the products are certified, come with an invoice, and are returnable in seven days. Furthermore, Tmall.com asks retailers to provide different levels of guarantee to deal with service failures related to these three signals, and retailer guarantees are available to buyers before purchasing. These data reported by Tmall.com is unique in the Chinese online market.

Vendor(Lenovo) ratings		
Evaluation items	Score	Comparison with industry level
Product description	4.7	1.84% Lower than industry level
Responsiveness	4.6	2.73%Lower than industry level
Shipping time	4.6	3.01%Lower than industry level

	Vendor (Lenovo)		Industry average
Refund process time	2.61 days	>	2.49 days
Refund ratio	6.03%	>	3.62%
Complaint ratio	1.89%	>	0.23%
Number of punishment	0 times	>	1.04 times

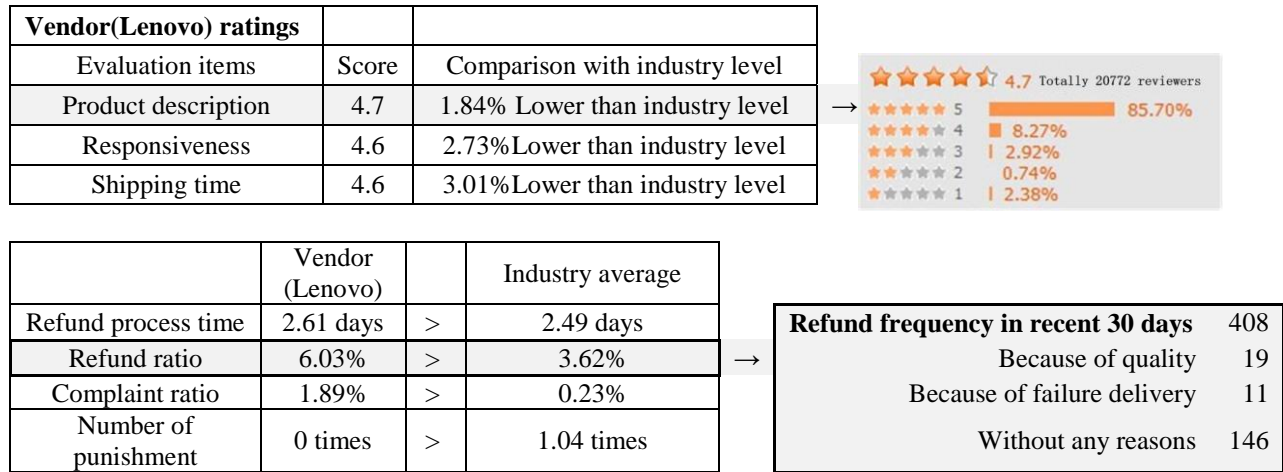| Refund frequency in recent 30 days	408
Because of quality	19
Because of failure delivery	11
Without any reasons	146

Figure 3: Sample Review Pages from Tmall.com (It's in Chinese originally)

A random sampling of 361 online retailers selling books and computers was drawn from Tmall.com. We chose the book and computer sellers for several reasons. First, it is reported by IResearch that books and computers are among the most successful products sold online in China. Customers also have different purchase behaviors regarding online book and computer buying. For instance, customers tend to be cautious when purchasing computers, which are higher-value; however, customers are less worried about books, as customers consider books as lower-value products. Finally, there is a high level of diversity among online retailers in book and computer business, which provide a sufficient source for analyses.

4.2.   Variables

Measurements for the variables were obtained via an online field study involving direct observation of every online retailer website at Tmall.com. For each online retailer, data collection involved visiting the page of the rating site containing data about e-services. Table 1 presents a list of the variables and their measures.

The dependent variable in the study, *online customer complaint intentions*, is measured by a complaint ratio, reflected in the number of complaints per unit sold by the retailer. *Signal credibility, responsiveness satisfactio*n, and *refund time* are the independent variables of interest in this study.

 In an online setting, it is difficult for a customer to distinguish high quality retailers from low ones based solely on retailers' website appearances [Biswas & Biswas 2004]. Customers tend to reduce uncertainty and lower their risk perceptions regarding purchasing transactions by relying on certain types of signals; therefore, *signal credibility* is an important factor in our model. Wells et al. [2011] measured signal credibility by the cost or investment necessary to develop and maintain a high quality website. However, Tmall.com develops and maintains the websites for online retailers. The key difference at Tmall.com is that all online retailers have to deposit a certain amount of money (guarantee) in Tmall.com to pay for service failures, which may occur when the service provided is not as indicated by the signals offered by the retailers' Tmall.com sites. This guarantee informs consumers of the possibility of their experiencing a service failure. There are five categories of money guarantees that online retailers have to deposit: ¥300000, ¥150000, ¥100000, ¥50000, ¥10000. How much an online retailer has to deposit in Tmall.com depends on its credibility, which is evaluated by the Chinese State Trademark Bureau. Every online retailer must submit its deposit before establishing on Tmall.com. The higher the guarantee that the online retailer deposits, the less credibility the online retailer has. Furthermore, in an online market, it is difficult for untrustworthy retailers to build sales volumes [Chen & Dhillon 2003], while a higher sales volume can help an online retailer gain trust from customers. Accordingly, considering that guarantees are inversely related to online retailers' credibility and sales volume, we measured *signal credibility* by $(-\frac{\text{Guarantee}}{\text{Sales volume}})$. Because there is no information provided for sales volume, sales volume is measured by $\frac{\text{Refund frequency}}{\text{Refund ratio}}$[1].

Responsiveness satisfaction captures customer satisfaction with the online retailer's after-sales response, which is related to availability of contact options, technical support, on-site service, and return and exchange [Cho et al.

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[1] Sales volume is a proxy measure. Tmall.com provides information for Refund ratio and Refund frequency, and Tmall.com calculates Refund ratio by $\frac{\text{Refund frequency}}{\text{Sales volume}}$. Therefore, sales volume=$\frac{\text{Refund frequency}}{\text{Refund ratio}}$.

2002]. *Refund time* refers to the average speed with which a retailer handles and processes returns and credits, and it s a measure of customer satisfaction regarding the return experience [Griffis et al. 2012]. Customers' satisfaction regarding return experiences involving a retailer decreases as refund time go up.

Table 1: Items Reported by Tmall.com

	Description	Unit
Product type	This gives the information of the type of the products that vendors provide. The sample of this study was classified into two types: books and computers.	0=Books, 1=Computers
Product variety	This measures how many different products an online retailer is selling.	Unit
Responsiveness satisfaction	This allows customers to rate their satisfaction with how online retailers response.	Highly =5, Quite a bit=4, Somewhat=3, A little=2, Not at all=1
Refund process time	Speed of online retailer to deal with return application and credit processes	Number of Days
Refund ratio	Refund frequency per unit, i.e. $\dfrac{\text{Refund frequency}}{\text{Sales volume}}$	Percentage (%)
Refund frequency	Number of refunds per month	Number of occurrences
Sales volume	The monthly amount of sales by a retailer. It is measured by : $\dfrac{\text{Refund times}}{\text{Refund ratio}}$.	Units
OCCI	Complaint ratio: complaint times per unit, i.e. $\dfrac{\text{Complaint times}}{\text{Sales volume}}$	Percentage (%)
Guarantee	This informs customers how much an online retailer has to deposit in Tmall.com to respond to service failures. The amount an online retailer has to deposit in Tmall.com depends on its credibility, which is evaluated by the Chinese state trademark bureau. There are five categories of guarantees: ¥300000, ¥150000, ¥100000, ¥50000, ¥10000. The credibility of an online retailer is negatively related to the amount of the guarantee.	Yuan
Signal credibility	The negative ratio of each retailer's guarantee by its sales volume, i.e. $-\dfrac{\text{Guarantee}}{\text{Sales volume}}$, where sales volume is $\dfrac{\text{Refund frequency}}{\text{Refund ratio}}$	Yuan per unit

We also account for potential variations in the dependent variable caused by two control variables: *product variety* and *product type*. *Product variety* refers to the number of different stock keeping units (SKUs) an online retailer sells. Product variety contributes to attract customers and increase market competitiveness [Ramdas 2003]. Moreover, the range of SKUs available may affect customer evaluations of online shopping experience and affects customer satisfaction [Thirumalai & Sinha 2011].The second control variable, p*roduct type* refers to the product category where the online retailer competes. As we mentioned before, we selected retailers from two categories: books and computers. Therefore, product type will take one of two different values for each retailer. Product type may influence customer satisfaction level, which affects OCCI. Several studies have found that differences in product characteristics across product types affect the customer purchase behavior and post-purchase behavior [Assael 1974; Cho et al. 2002; Mentzer et al. 2001; Miracle 1965; Thirumalai & Sinha 2005]. Thirumalai and Sinha [2005] argue that, other things being equal, customers tend to have different satisfaction levels with the order fulfillment process of different product types. Burke [2002] suggests that ratings of shopping experience vary significantly across product categories. By controlling for product type, we also account for potential effects by product prices. Because computer prices are

usually higher than book prices[2], customer satisfaction is likely to follow a different trend when computers (high-priced products) are involved than when books (low priced products) are involved.

5. Results

Table 2 and table 3 present the means, standard deviations and correlations for the variables used in this study.

The empirical testing of the proposed hypotheses, discussed earlier, involved hierarchical multiple regression analyses [Cohen & Cohen 1975]. Table 4 summarizes the standardized parameter estimates resulting from the regression models we used to test the hypotheses. In the first step, customer complaint ratio was regressed on control variables i.e., product type and product variety (in Model 1). Next, we estimated the main effects by signal credibility, responsiveness satisfaction, and refund time (in Model 2). The standardized regression coefficient for signal credibility was -0.269 and highly significant (P<0.001), providing strong support for H1, which indicates that signal credibility has a negative effect on OCCI. That is, customers will have a lower intensity in their complaint intentions with online retailers who have higher signal credibility and will have a greater intensity in their complaint intentions with online retailers who have lower signal credibility.

H2a and H2b involve moderating effects. Therefore, to test these hypotheses we added interaction effects separately in the regression (Model 3). After entering the interaction terms, significant interaction terms and significant increases of variance explained (R^2) indicated the presence of an interaction effect [Cohen & Cohen 1975]. Model 3 explains 10.9 percent of additional variance in complaint intentions (significant at P<0.05). Therefore, the moderating effect was significant for signal credibility.

Table 2: Descriptive Statistics

| Variables | Panel A (All retailers) (N=337) | | Panel B (Product type) | | | |
| | | | Books (N=191) | | Computers (N=146) | |
	Mean	SD	Mean	SD	Mean	SD
Product variety	23816.893	80567.280	41933.613	103524.774	116.253	138.528
Signal credibility	-453.259	1101.243	-192.385	469.626	-794.540	1521.277
Responsiveness satisfaction	4.838	.070	4.862	0.047	4.806	0.082
Refund time	2.296	2.206	1.652	1.637	3.139	2.550
OCCI	.072	.719	0.002	0.105	1.163	1.087

To evaluate interaction effects, Cohen et al. [1975] recommend plotting the regression effects of the dependent variable (in our case, OCCI) on the predictors (responsiveness satisfaction and refund time) at three values of the moderator (signal credibility): the mean of the moderator, plus one standard deviation below the mean of the moderator and one standard deviation above the mean of the moderator. The visual plots for signal credibility in Figures 4 and 5 show how signal credibility influences the relationship between responsiveness satisfaction and OCCI and the relationship between refund time and OCCI.

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[2] In our sample of firms, we found that SKU mixes among computer retailers and among book retailers were very homogenous in terms of price but, on average, prices among computer retailers were significantly higher than prices among book retailers.

Table 3: Correlations

	Product type	Product variety	Signal credibility	Responsiveness satisfaction	Refund time	OCCI
Product type	1					
Product variety	-.258**	1				
Signal credibility	.271**	-.109*	1			
Responsiveness satisfaction	-.397**	-.016	.034	1		
Refund time	.335**	-.143**	.083	-.303**	1	
OCCI	.112*	-.028	.271**	-.013	-.014	1

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).
c. Listwise N=337

Table 4: Regression Analysis

Regression Analysis						
Independent Variables	**Model 1**		**Model 2**		**Model 3**	
	β	**t-Value**	**β**	**t-Value**	**β**	**t-Value**
Controls						
Product Type	0.111661*	1.984203	0.054023	0.843577	0.057997	0.901677
Product Variety	0	0.006863	0.005380	0.097210	0.018271	0.333588
Main Effects						
Responsiveness Satisfaction			-0.018625	-0.310139	0.024422	0.395612
Refund Time			-0.058898	-1.026515	-0.024190	-0.412206
Signal Credibility			-0.262522***	4.723444	-0.296200***	-5.171995
Interaction Effects						
Responsiveness Satisfaction× Signal Credibility					0.153295**	2.619796
Refund Time × Signal Credibility					0.137144*	2.485655
R^2	0.012446		0.078112		0.108578	
Adjusted R Square	0.006533		0.064186		0.089611	
R Square Change	0.012446		0.065666		0.030466	
F Change	2.104683		7.859029***		5.622032**	

β=standardized regression estimates; *significant at the 0.05 level; **significant at the 0.01 level; ***significant at the 0.001 level.

In Figure 4, the visual plot shows the direct effect of responsiveness satisfaction on OCCI and a significant interaction effect between responsiveness satisfaction and signal credibility on OCCI. With an increasing level of signal credibility, the slope increases from negative to positive. That is, the high levels of signal credibility dilute the negative effect of responsiveness satisfaction on OCCI. This implies that the negative effect of responsiveness satisfaction on OCCI is weaker at higher levels of signal credibility. However, regardless of the level of responsiveness satisfaction, OCCI on lower levels of signal credibility will not deteriorate to that of high levels of signal credibility. From the above analysis, we determined that our results support H2a. However, it is obvious that responsiveness satisfaction can influence OCCI. On lower levels of signal credibility, responsiveness satisfaction has a negative effect on OCCI.

Likewise, in Figure 5, the visual plot shows that refund time influences OCCI and indicates a crossover interaction between refund time and the level of signal credibility on OCCI, in line with H2b. With an increasing level of signal credibility, the slope becomes larger from negative to positive. That is, the positive effect of refund time on OCCI is

weaker at lower levels of signal credibility. Refund time on higher levels of signal credibility has a positive effect on OCCI, but on lower levels of signal credibility it has a negative impact on OCCI. In addition, an increase of refund time under lower levels of signal credibility will cause OCCI to deteriorate to levels lower than those obtained for the same magnitude of refund time under high levels of signal credibility. From Figure 5, we can infer that different refund time can yield the same levels OCCI under different levels of signal credibility.
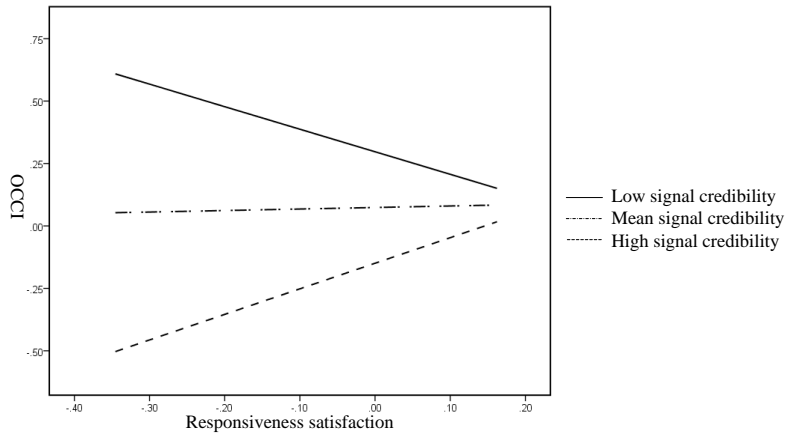
Figure 4: Main and Interaction Effects of Responsiveness Satisfaction and Signal Credibility on OCCI
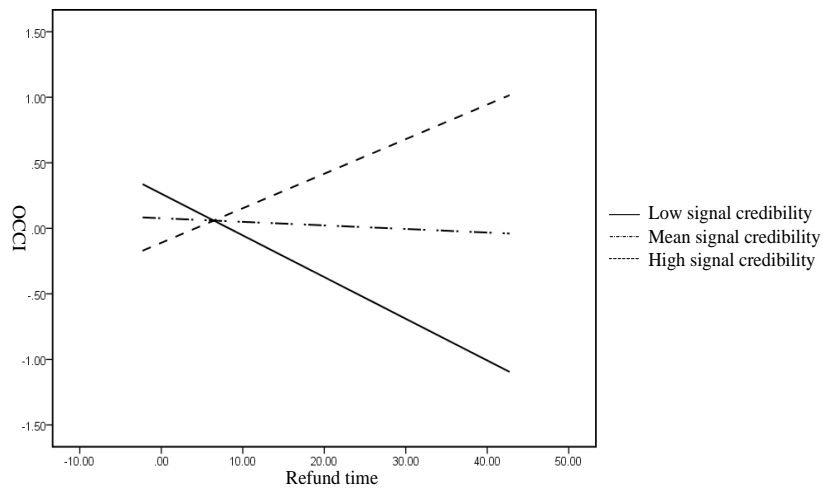
Figure 5: Main and Interaction Effects of Refund Time and Signal Credibility on OCCI

6.   Discussion

Our study draws from expectation confirmation and signaling theories to offer a more thorough understanding of online customer complaint behavior. The objective of this study is twofold: to investigate how online retailer signal credibility affects OCCI; and to investigate how the relationship between customer satisfaction and OCCI is moderated by signal credibility. The results provide strong support for the negative influence of signal credibility on OCCI and the moderation effect of signal credibility on the relationship between customer satisfaction of responsiveness and OCCI and the relationship between refund time and OCCI.

6.1.   Theoretical Implications

From an academic perspective, we tested a research model of OCCI in online retailing. The findings of this study relate to and extend the extant literature in several ways. First, OCCI has received very limited attention in past research [Cho et al. 2002]. Several recent studies have addressed factors that trigger customer complaint behavior and customer complaint behavior management [Kim et al. 2003; Mittal et al. 2008; Ngai et al. 2007]; however, while these studies have focused on online customer complaint behavior, most of these studies analyzed data related to customer

personality traits [Huang & Chang 2008; Jasper & Waldhart 2013]. Significant work remains to understand OCCI from the perspective of service operations. We posit that ECT provides a fresh and robust theoretical foundation for explaining how and why signal credibility affects OCCI. This research contributes to the conceptual understanding of the nature and important antecedents of OCCI by considering customer's pre-purchase perceptions of an online retailer's quality.

Second, both trustworthy retailers and untrustworthy retailers send signals. When all retailers send the same signals, it is difficult for customers to tell which retailers are trustworthy and which are not. Signal credibility plays an important role in separating trustworthy retailers from untrustworthy ones. The present study highlights the importance of signal credibility to the online retailing service literature. Previous research has examined the impact of signal credibility on customer purchasing intention [Boulding & Kirmani 1993; Wells et al. 2011], but the present study represents the first empirical investigation of how signal credibility influences online customer post-purchase behavior. Our findings underscore the main effect of signal credibility on OOCI and the critical moderation effect of signal credibility on the relationship between customer satisfaction and OCCI. Furthermore, the results of our signal credibility analysis fully support ECT's arguments that customer satisfaction negatively affects customer complaint intentions.

The results from this study have interesting implications for cognitive dissonance theory. In a state of dissonance after purchasing a product, customers may feel "disequilibrium," such as anger or anxiety [Festinger 1962]. The analysis shows that the positive effect of refund time on OCCI is stronger at higher levels of signal credibility, and OCCI with lower levels of signal credibility will decrease to be less than that with higher level of signal credibility with increasing refund time. This finding can be explained by cognitive dissonance theory: when customer confidence in an online retailer and the online retailer's behavior are dissonant from each other, a customer may change his/her opinion regarding the online retailer to relieve his/her discomfort, especially with increasing dissonance [Festinger 1962]. From here, we can infer that at lower levels of signal credibility, the dissonance between customer expectation and online retailer refund service increases with the increasing level of refund time. As a result, customer complaint intentions decrease. This results from losing trust in the online retailer since customers do not believe they will be better served by service recovery after complaining. However, at higher levels of signal credibility, customers trust that the online retailer can provide refund service as indicated by the signal and they do not change their opinion of the online retailer. In order to receive the service they desire, they complain.

6.2.   Practical Implications

The results from our study have strategic implications for most businesses using the online marketing channel. It is critical that online retailers understand the factors that lead not only to purchase intention, but also the factors that affect customer post-purchase behavior: complaint intentions. Complaint intentions are doubly important because they influence not only customer loyalty, but also other customer purchase intentions. Once they set a signal, online retailers should put emphasis on managing and maintaining high signal credibility. If they do not, a customer will have a higher intention to complain as s/he finds the signal is not credible. In order to enhance customer trust of online retailer signals, online retailers should provide products and services as indicated by the signals to separate themselves from low-quality online retailers who send the same signals. How online retailers build and maintain high signal credibility is another important issue; however, it is beyond the scope of our present study.

Also, online retailers should pay attention to the moderation effect of signal credibility. From Figure 4 and Figure 5, we find that effects of responsiveness satisfaction and refund time satisfaction of online services on OCCI are contingent on the level of signal credibility. Therefore, online retailers should provide services according to customer expectations and how they respond after being served. For example, in this study, with higher levels of signal credibility, OCCI will increase with refund time and responsiveness satisfaction; thus, online retailers have to decide when to refund and how to respond cost-effectively to achieve a certain level of complaint intentions with a certain level of signal credibility.

6.3.   Limitations and Future Directions

This study opens the way for other studies related to the impact of signal credibility on customer behavior. As with any study, this research also has limitations and its results should thus be interpreted accordingly. We list some of the limitations of our study below, each of which also provides direction for further investigation.

The sampling procedure employed for the data collection may be limiting. We did not consider experience goods in this study. Computers and books are both search goods, whose attributes are known before purchasing. Experience goods, like shoes, need to be tried before customers understand them completely [Lee et al. 2005]. Differences between search goods and experience goods may merit future examination. The current study provides a basis on which subsequent studies can present additional outcomes to experience goods.

Another limitation of the current study relates to cultural differences. Chinese customers have their own customer behavior, which is decided by their society, culture and economy. For instance, in China, many products have poor

quality, and Chinese customers undertake higher purchasing risks [Liu et al. 2008]. On the other hand, customer protection laws in developed countries are stronger, and customers will take fewer risks than Chinese customers. Therefore, customers in China are likely to be more sensitive and cautious about online retailer credibility than customers in developed countries. With the increasing global nature of online retailing, the application of the model to cultures outside China should be considered in future research.

In addition to further examining the limitations, the study can be extended in other directions as well. Few studies have dealt directly with the relationship between complaint intentions and signal credibility in online retailing. The integration of signal credibility provides an important foundation for future studies in online customer behavior. Future research could consider signal credibility to enable a deeper understanding of customer post-purchase behavior and pay attention to how managers of online retailing manage their signal credibility.

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