



Effects of service attributes and competition on electronic word of mouth: an elaboration likelihood perspective

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Abstract

The management of electronic word of mouth (eWOM) is critical in e-commerce. In this study, on the basis of the elaboration likelihood model (ELM), we constructed a model of factors influencing eWOM by dividing merchants' attributes into the central and peripheral routes, which correspond to consumers' systematic and heuristic cognitive modes respectively. We then tested the developed model by using a cross-sectional data set. The results of this study indicate that the degree of competition faced by merchants has a significant negative association with eWOM. Moreover, price level and location moderate the relationship between competition and eWOM. The services of reservation and group buying have positive associations with eWOM. This research has three main contributions. First, we explored the effect of competition on eWOM. Second, we validated the feasibility of applying the ELM to the catering industry by dividing merchant attributes into the central and peripheral routes; this approach is consistent with systematic and heuristic cognitive theories. Finally, this research provides practical suggestions for eWOM management in the catering industry.

Keywords Electronic word of mouth (eWOM) · Competition · Price competition · Location competition · Category competition · Elaboration likelihood model (ELM)

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1 Introduction

The development and growth of social media have enabled consumers to obtain information about products and services from other consumers' comments and reviews posted on social media sites. Social media has also provided consumers with opportunities to offer their consumption-related advice by engaging in electronic word of mouth (eWOM). eWOM is described as "any positive or negative statement made by potential, actual, or former customers about a product or company, which is made available to a multitude of people and institutions via the Internet" [1]. eWOM refers to the electronic exchange of information or opinions about pricing, brands, products, and services between people with no commercial purposes [2]. It has become a valuable information source for consumers and has a considerable effect on the sales, reputation, and survival of enterprises [3]. eWOM plays an essential role in consumers' decision-making processes; however, the academic research on eWOM has mainly focused on the effects of eWOM on sales [3–6] and on the level of consumer trust in eWOM communication [7]. Research on the formation mechanism of eWOM is still lacking [8]. The quality and attributes of products and services influence their eWOM

among consumers. Furthermore, eWOM is closely associated with competition [9]. However, little research has explored the effects of service attributes and competition on eWOM, and even fewer research on the competition effect in various subfields, such as price competition, location competition, and category competition.

Competition among businesses has multiple forms, including price competition [10], brand competition, category competition, and location competition [11], and different forms of competition exert different effects [12]. In service industries, such as the catering industry, brand choice and category choice [12], transportation cost [11], price competition, category competition, and location competition are critical factors that influence customers' dining experience. The present study explored the factors influencing merchant eWOM regarding price competition, category competition, and location competition. These three forms of competition are crucial in the catering industry. To understand the mechanism through which eWOM is influenced by the information processing of individuals, we drew on the elaboration likelihood model (ELM) of information influence to account for the reported differences in influence results across individuals and contexts. Elaboration involves being presented with the content of a message, scrutinizing and assessing the content of the message, and reflecting on themes relevant to the message. The ELM is suitable for explaining the mechanism through which the different information involved in elaboration affects eWOM. An increasing number of researchers have begun to pay attention to the relationships between the attributes of information and the different paths in the ELM. Different information attributes play a different role through the central and peripheral routes [13–15].

This research has three contributions. First, we explained the roles of three forms of competition in forming eWOM, thereby providing insights into the relationship between competitions and eWOM. Second, we divided business firms' attributes into the central and peripheral routes on the basis of the ELM, thereby revealing two mechanisms through which eWOM changes, namely the systematic and heuristic cognitive mechanisms. This result is consistent with the Kano's model on the relationships between service quality attributes and customer satisfaction [16]. Finally, we formulated practical suggestions for eWOM management for service providers.

2 Literature review and theoretical foundation

2.1 eWOM and competition

The critical role of eWOM has been widely acknowledged in the literature, with the majority of studies focusing on

the effects of eWOM [3–5]. However, studies on the factors and mechanisms involved in eWOM generation are scarce [17]. eWOM can be viewed as a consumer approach to reciprocating the satisfaction that they have gained from interacting with a service [18]. Service quality affects user satisfaction and is the main factor influencing eWOM. Furthermore, eWOM is moderated by contextual factors, especially competition [19, 20]. Competition in its many forms is fundamental to the functioning of a market. The literature review further details the relationship between eWOM and competition.

2.1.1 Product category competition and eWOM

Products can be divided into search, experience, and credence products on the basis of the level of information asymmetry [21]. Product type has a marked influence on consumers' propensity to follow product recommendations, with experience product recommendations being more influential than search product recommendations [22]. The research stream of experience product motivated us to extend eWOM research to the effects of different product attributes on consumer reviews.

Products can be divided into different categories. A product category refers to a group of related products or services and is typically created by a firm or industry organization to organize products. Products belonging to the same category have similar functions. Consumers have different expectations for products and services in terms of their functions, and consumer expectations influence eWOM [23, 24]; thus, product category affects eWOM. Studies have focused on eWOM for a specific product category [23] without analyzing the relationship between product category competition and eWOM.

2.1.2 Local competition and eWOM

Research on e-commerce has concluded that the Internet has rendered distance irrelevant [25]; however, this statement does not apply to serving local communities, because the physical presence of customers is essential for the provision of certain goods and services, physical transportation costs remain an essential factor in consumers choosing a vendor. Advertising or selling through the Internet may increase the awareness of a vendor beyond their local area. However, few distant customers purchase from such vendors because of transportation costs. Thus, advertising mainly influences customers within a local service area. A typical example of a local business is a food and beverage provider. Scholars have paid close attention to the food and beverage industry's spatial distribution. Similar to the spatial distribution of location-based services, scholars maintain that the catering industry exhibits aggregated clusters and territorial

distributions within each area [26]. In general, these patterns are closely related to transportation costs.

The restaurant and development levels of business districts are highly associated [27]. The competition between businesses located in a particular area leads to a negative substitution effect [28]. When consumers enjoy improved services, their expectations for services increase, which affects their WOM content. On the basis of this assumption, we hypothesized that location affects the relationship between competition and eWOM.

2.1.3 Price competition and eWOM

The Internet enables customers to compare product prices at multiple outlets by using online price comparison tools. If customers determine that a company has consistently higher prices for identical items than other companies, they may perceive this pricing as unfair. This scenario leads to reduced customer satisfaction [29], which negatively influences customers' eWOM. Service price is a signal of quality [30], and low item price generally indicates low quality and low entry barriers [31].

2.2 ELM

The ELM, introduced by Petty and Cacioppo in 1983 [32], provides an organizational framework for persuasion that may be applied to various source, message, recipient, and context variables [32, 33]. In general, "persuasion" is an activity in which a source attempts to influence a receiver to modify the receiver's opinions, attitudes, and behaviors of the "target". The basic tenet of the ELM is the presence of two routes of persuasion, namely the central and peripheral routes. These routes are anchored at opposite ends on a continuum that represents the likelihood of cognitive effort being expended to process a message [34]. The central persuasion route involves the use of careful reasoning processes and is activated when the proposed arguments are convincing. Any factor that reduces the efficacy of message elaboration limits the possibility of elaboration through the central route. By contrast, the peripheral route is used when the stimulus of a message to cognitive elaboration is minimal, or when the subject cannot dedicate due attention to a message. In summary, individuals tend to reason in a "central" manner when the content of a message is important, and they are able to employ adequate cognitive resources. By contrast, individuals tend to reason in a "peripheral" route when they cannot or are unwilling to employ adequate cognitive resources [33, 35].

We drew on the ELM of information influence to understand how contexts influence eWOM. According to the ELM, high levels of elaboration represent a central route to influence, whereas low levels of elaboration result in a

peripheral route to influence [32]. The central route reflects recipients' careful consideration of the themes presented through a message. By contrast, the peripheral route reflects recipients' use of simple decision rules to evaluate a message rather than their analysis of message content [13]. On the basis of ELM, studies have extensively investigated users' information processing mechanisms regarding issue-related information, such as online reviews [36]. According to these studies, the central and peripheral routes correspond to the systematic and heuristic modes of information processing, respectively [37, 38].

During eWOM communication, information related to competition stimulates recipients' careful consideration to a greater extent than other service information, because competition information is more complex and requires greater effort for cognitive processing. More precisely, price competition, product category competition, and location competition are fundamental to the functioning of the catering market and play distinct roles in information processing. Therefore, the service attributes related to competition are central routes. Conversely, information related to additional services in catering is simple and thus processed through the peripheral route. Studies have indicated that information content persuades a receiver through the central and peripheral routes simultaneously [14, 36].

On the basis of the aforementioned information, we explored the formation mechanism of eWOM (an essential but overlooked research topic), which is influenced by not only service quality but also competition context. Furthermore, the effects of price, product category, and location competition on the catering industry were investigated.

3 Hypothesis development

Marketers have long recognized that consumers often share product-related information on social networking sites; phenomenon is known as eWOM [39]. When consumers engage in eWOM communication, they compare their service provider with other service providers. Because of the negative substitution effect of competition [40], firms are confronted with strong competition, substitutability challenges, and extensive consumer choices, all of which alter consumers' preferences for products and services and increases their expectations [41]. When consumers have more options, they must expend more effort in comparison, which makes them pickier. Customers who are pickier are more likely to have a poor evaluation of firms. The aforementioned analysis indicates that the higher is the competition among merchants, the lower is the rating that a merchant receives. Therefore, the following hypothesis is proposed:

H1 Higher competition has a negative effect on eWOM.

Price level is defined as the average payment by a customer. In the Internet era, customers and service suppliers can easily compare item prices across various suppliers. In general, a lower item price indicates lower quality and lower entry barriers; thus more suppliers can enter the market [31], which leads to fiercer competition. Market competition varies in different price ranges, and competition variation influences eWOM. On the basis of the aforementioned analysis, the following hypothesis is proposed:

H2 Price level moderates the relationship between competition and eWOM. Specifically, the lower is the price, the stronger is the negative relationship between competition and eWOM.

A product category is a group of products that fulfill equivalent functions. In some competitive settings, consumers buy products from multiple categories, which results in cross-category competition, whereas in other competitive settings, consumers only buy products from a single category, which leads to competition within a category [42]. In the catering industry, consumers usually choose foods in one category at a time, and they usually select dishes in a cuisine, which is a product category. Therefore, competition within a cuisine is a relatively common phenomenon, which indicates that the competition between different cuisines varies considerably. The cuisines provided in the catering industry comprise popular and niche cuisines. Popular cuisines are preferred by the majority of consumers and have more latent consumers than do niche cuisines. Because popular cuisines have higher market demand than do niche cuisines, the competition in popular cuisines is more intense. The aforementioned information indicates that cuisine influences the effect of competition on eWOM. Therefore, we propose the following hypothesis:

H3 The popularity of a cuisine moderates the relationship between competition and eWOM. Specifically, the more popular a cuisine is, the stronger is the negative association between competition and eWOM.

Competition in restaurant markets is highly localized with restaurants competing heavily with other restaurants located in their local geographic area [43]. The locational targeting of customers within certain designated areas is called “geo fencing.” When applied to competitors’ locations, this tactic is called “geo conquering” [44]. Customers can use a location-based service (LBS) [45] through mobile terminals to obtain current location information and avail of location-related services. A characteristic consumer behavior involves the frequent searching for restaurants in the area surrounding a destination. Therefore, the main competitors of restaurant vendors are other

local restaurants, and this competition is called local competition [46]. The aforementioned text indicates that the influence of competition is moderated by location. Consequently, we propose the following hypothesis:

H4 Restaurant location moderates the association between competition and eWOM. Specifically, the negative relationship between competition and eWOM is stronger for restaurants located in an area with nearby competitors.

The urban central business district refers to a particular geographic range formed by radiating to the surrounding area, in which the merchant provide the goods or services within the radius of the maximum sales capacity of the commodity service [47]. Developed and well-known business districts are desirable to consumers. Moreover, the infrastructure and environment of renowned business districts are relatively well developed, and businesses within a renowned business district must adhere to strict quality requirements. Therefore, catering businesses in popular business districts have a more positive online reputation than do those located in other areas. Consequently, we propose the following hypothesis:

H5 Urban central business district locations have a positive association with eWOM.

Service offerings usually consist of core and peripheral attributes, as suggested by the augmented service-offering model [48]. Specifically, core service attributes are related to the basic customer benefits received from or the primary customer reason for a service transaction. By contrast, peripheral services are facilitative or ancillary services to core services. The combination of core and peripheral services forms a service package or bundle of customer benefits. An advanced catering merchant must offer delicious food and convenient, affordable services. The core service is the basic reason for a firm to be in the market and represents the firm’s basic competency [49]. For the catering sector, the core services include cuisine, price, and location. “Peripheral services” facilitate the core offering but are not specifically a part of the core offering. The peripheral services and information provided by catering businesses can have varying degrees of effects on eWOM [50]. Merchants offer peripheral services that increase consumer convenience, which leads to positive eWOM. In the catering industry, peripheral services, include the takeout, reservation, and group buying services. On the basis of the aforementioned information, we propose the following hypotheses:

H6 The provision of takeout services has a positive association with eWOM.

H7 The provision of reservation services has a positive association with eWOM.

H8 The provision of group-buying services has a positive association with eWOM.

Compared with the peripheral attributes of firms, which are easy to process and belong to the peripheral route, degree of competition, price level, product category, and location, which belong to central route, require greater elaboration, and consumers must spend more effort in the decision-making process. Degree of competition, which is a complex concept, influence eWOM directly, while price level, cuisine, and location influence eWOM through competition. Therefore, these four attributes are considered to belong to the central route. The research model is illustrated in Fig. 1.

4 Research method

4.1 Variable measurement

4.1.1 Measurement of competition

We used cross-sectional data in this study, and these data were collected on April 1st, 2015, from one of China’s largest online product review websites. For accurately identifying the factors affecting merchants’ eWOM, we used a data set for a large city, because it contained a large number of ratings and reviews of several catering brands. Among all the variables considered in this study, the degree of competition was the most important, complicated, and difficult to measure. Competition refers to the phenomenon of competing firms becoming similar as they mimic each other under common market forces [51]. We posit that homogeneity among businesses is the leading cause of competition; thus, we used the similarity between businesses to measure their competitive relationship [52]. Similarity is not a perfect proxy for competitiveness but

is, commonly used in practice. The structure formed by the social relationships between individuals represents a social network, which comprises three elements, namely nodes, edges, and edge length. According to social network theory [53], the competitive relationship among catering merchants is also social in nature. We defined the catering competition network as $G = (V, L, S)$, where V represents the set of nodes in the competition network, that is, all catering businesses. The term $L \subseteq V \times V$ represents the set of edges between the nodes in the competition network, that is, the competing relationships among catering merchants. The term S represents the set of edge lengths in the competition network. The similarity between these lengths characterizes the quantitative value of the competitive relationship among catering merchants.

To measure the degree of competition faced by each merchant in a competition network, we calculated the proximity centrality of each node in the network by using Eq. (1). The greater is the proximity of a merchant to the network center, the higher is the average similarity and the stronger is the competitive relationship between the merchant and other merchants.

$$C_i = \frac{1}{d_i} = \frac{1}{\frac{\sum_{j \neq i} d_{ij}}{n-1}} = \frac{n-1}{\sum_{j \neq i} d_{ij}} \tag{1}$$

where C_i represents the degree of competition faced by the i -th merchant, d_i is the average Euclidean distance between the i -th merchant and other merchants, d_{ij} is the Euclidean distance between merchants i and j , and n is the number of merchants in the competition network. The calculation results for competition were normalized to avoid errors caused by data differences.

The similarity between merchants was calculated using a merchant’s price level, longitude, latitude, as well as the topic distribution of the merchant’s comments and messages. The Latent Dirichlet Allocation (LDA) method was used to obtain the topic distribution [54]. All the comments of each merchant were placed in a review document. First, we applied JIEBA, which is an open source Chinese word segmentation tool, to remove stop words from the text and conduct word segmentations. We then used the Gensim library in Python to perform LDA topic modeling. We selected an appropriate number of topics on the basis of the coherence [55]. The higher is the coherence, the higher is the consistency of a topic and the stronger is the effect of the model prediction. The coherence results obtained for different numbers of topics in this study are displayed in Fig. 2.

To avoid the overfitting problem, the selection of an appropriate index with a small number of topics is essential. Therefore, we selected 21 topics for cluster LDA analysis (Fig. 2) and obtained the topic probability distribution of each merchant’s review document. The topic probability

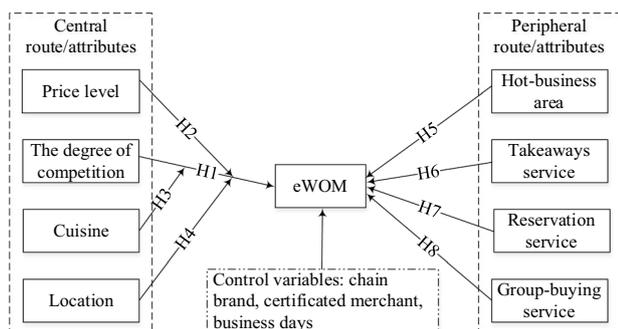


Fig. 1 Model of the factors influencing eWOM

distribution reflects the probability of consumers’ impressions of all aspects of a merchant’s service.

The calculation of similarity required a high computational load; thus, we employed a six-core server for the calculation. We divided the sample data into six parts, used the multiprocessing library in Python to create a process pool containing six processes, calculated the Euclidean distance for each aliquot of the sample, and finally obtained the competition measurement value.

4.1.2 Measurement of other variables

The location variable differs from the HotBusArea variable, which indicates whether a restaurant is located in an urban central business district. Location is used to measure whether a competitor’s cluster exists around a restaurant. We

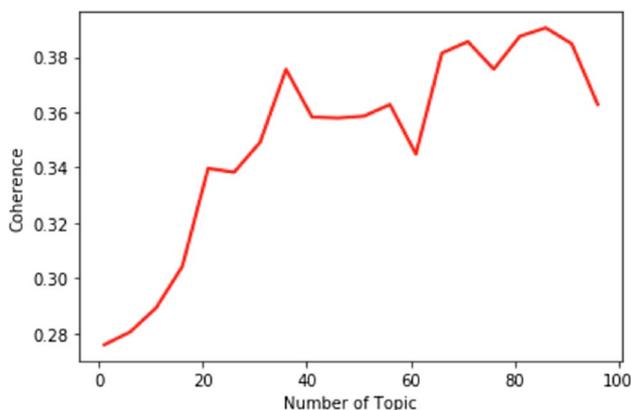


Fig. 2 Coherence results for different topics

used a clustering algorithm to classify restaurants according to their locations. We considered that location reflects the geographical area within which a restaurant provides services to consumers and location has a strong influence on competition.

The other factor affecting eWOM is the quality of firms’ products and services [56]. Therefore, we used merchant certification and chain brand status to control the effect of product and service quality on eWOM. Furthermore, a merchant’s experience affects the quality of their products and services [57]. We determined a merchant’s experience in terms of the number of days that their business had been opened. Finally, the number of consumer reviews is closely related to eWOM [3]; thus, we adopted the number of reviews as a control variable. Cuisine is a taxonomic variable with nine categories; hot pot is the most popular cuisine, and Hubei cuisine is the least popular. The symbols and definitions of all the variables used in this study are presented in Table 1.

4.2 Empirical model for eWOM

To test the hypotheses of this study, we formulated three equations. The equation of Model 1, which is the basic model used to test H1-H4, is as follows:

$$\begin{aligned}
 SCORE = & \alpha_0 + \beta_1 * HotBusArea_i + \beta_2 * TakeoutFlg_i \\
 & + \beta_3 * ReserveFlg_i + \beta_4 * GroupBuyFlg_i \\
 & + \beta_5 * Control_i + \epsilon_i
 \end{aligned}
 \tag{Model 1}$$

Table 1 Description of all variables in the study

Variable type	Variable	Variable symbol	Description
Dependent variable	eWOM	SCORE	A customer’s overall rating of a restaurant; it measures consumers satisfaction; a continuous numeric variable from 1.0 to 10.0;
Independent variables	Price level	PerPrice	A price level is the average payment by a customer; a numeric variable (integer);
	Cuisine	Cuisine	A taxonomic variable comprising nine cuisines;
	Hot-Business district	HotBusArea	Location in urban central districts. If it is true, HotBusArea = 1;
	Group-buying service	GroupBuyFlg	Provision of group-buying service. If it is true, GroupBuyFlg = 1;
	Takeout service	TakeOutFlg	Provision of takeout service. If it is true, TakeOutFlg = 1;
	Reservation service	ReserveFlg	Provision of reservation service. If it is true, ReserveFlg = 1;
	Degree of competition	Competition	The competition each restaurant faces in the catering competition network; Normalized, and its value range [0,1];
Control variables	Area	Location	Location in an area with many merchants. If it is true, Location = 1;
	Certified merchant	VIPFlg	Merchant certification. If it is true, VIPFlg = 1;
	Chain brand	Mainshop	Chain brand. If it is true, Mainship = 1;
	Number of eWOM	ComNum	Total number of business reviews reflecting their business presence among consumers;
	Number of business days	Opendays	The number of days of business operation

For verifying H1, we applied Model 2, which is expressed as follows:

$$SCORE = \alpha_0 + \beta_1 * HotBusArea_i + \beta_2 * TakeoutFlg_i + \beta_3 * ReserveFlg_i + \beta_4 * GroupBuyFlg_i + \beta_5 * Control_i + \beta_6 * Competition_i + \epsilon_i$$

(Model 2)

To test H2, we formulated Model 3, which is expressed as follows:

$$SCORE = \alpha_0 + \beta_1 * HotBusArea_i + \beta_2 * TakeoutFlg_i + \beta_3 * ReserveFlg_i + \beta_4 * GroupBuyFlg_i + \beta_5 * Control_i + \beta_6 * Competition_i + \beta_7 * PriceLevel_i * Competition_i + \epsilon_i$$

(Model 3)

To test H3, we formulated Model 4, which is expressed as follows:

$$SCORE = \alpha_0 + \beta_1 * HotBusArea_i + \beta_2 * TakeoutFlg_i + \beta_3 * ReserveFlg_i + \beta_4 * GroupBuyFlg_i + \beta_5 * Control_i + \beta_6 * Competition_i + \beta_7 * Cuisine_i * Competition_i + \epsilon_i$$

(Model 4)

To test H4, we established Model 5, whose equation is as follows:

$$SCORE = \alpha_0 + \beta_1 * HotBusArea_i + \beta_2 * TakeoutFlg_i + \beta_3 * ReserveFlg_i + \beta_4 * GroupBuyFlg_i + \beta_5 * Control_i + \beta_6 * Competition_i + \beta_7 * Location_i * Competition_i + \epsilon_i$$

(Model 5)

The meanings of all the variables in the aforementioned five equations are listed in Table 1.

4.3 Data and pre-analysis

4.3.1 Descriptive statistics of the variables

After obtaining the values of all variables, we conducted a preliminary statistical analysis of the variables. The detailed statistical information is presented in Table 2.

4.3.2 Correlation analysis

We performed a correlation test on the research variables, and results are summarized in Table 3. If the absolute value of the correlation coefficient is higher than 0.5, then the two variables have a strong correlation with each other [58]. We observed no significant correlation between any two study variables; therefore, all the study variables were introduced into a regression model. To verify that no covariance existed between the variables, we performed multiple linearity testing (Sect. 5.2.1).

5 Results and additional analysis

5.1 Analysis of results

The research results indicated that reservation and group buying services had positive correlations with eWOM, whereas competition had a negative association with eWOM. Thus H1, H7, and H8 were supported, whereas H5 and H6 were not supported.

With the continual growth of urban infrastructure, the infrastructure outside hot usiness districts has improved considerably over time. Therefore, whether a restaurant is located in a hot business district is no longer an important factor affecting customer dining experience. Consequently,

Table 2 Summary statistics and descriptions of variables

ID	Variable name	Observation	Mean	SD	Min	Max
1	SCORE	6159	7.699692	0.695764	4.2	9.4
2	Competition	6159	0.762662	0.120562	0	1
3	PriceLevel	6159	74.261405	64.445413	6	1251
4	Cuisine	6159	3.118201	0.814965	1	9
5	HotBusArea	6159	0.304920	0.460411	0	1
6	GroupBuyFlg	6159	0.73941	0.499361	0	1
7	TakeoutFlg	6159	0.053418	0.224883	0	1
8	ReserveFlg	6159	0.243384	0.429160	0	1
9	Location	6159	0.082806	0.275611	0	1
10	VIPFlg	6159	0.720409	0.448835	0	1
11	Mainshop	6159	0.379932	0.485409	0	1
12	ComNum	6159	353.520377	918.996270	1	23,515
13	Opendays	6159	1482.776262	5.786469	1421	1486

Table 3 Correlation matrices

Variables	1	2	3	4	5	6	7	8	9
1. SCORE	1								
2. Competition	-0.153***	1							
3. PriceLevel	-0.155***	-0.319***	1						
4. Cuisine	0.084***	0.065***	-0.006	1					
5. HotBusArea	0.041***	-0.095***	0.103***	0.046***	1				
6. GroupBuyFlg	0.368***	-0.044***	0.018	-0.012	-0.044***	1			
7. TakeoutFlg	0.017	-0.388***	-0.059***	-0.129***	-0.009	0.104***	1		
8. ReserveFlg	0.244***	-0.145***	0.142***	-0.014	0.015	0.330***	0.060***	1	
9. Location	-0.021**	-0.216***	-0.060***	0.062***	-0.199***	0.019***	-0.064***	-0.059***	1
10. VIPFlg	0.386***	0.031**	0.057***	0.040***	0.044***	0.589***	0.087***	0.353***	-0.011
11. Mainshop	0.207***	-0.146***	0.021*	0.076***	0.040***	-0.028**	0.021*	-0.022*	0.003
12. Opendays	-0.034***	0.419***	0.021*	-0.024	0.023	-0.025	-0.008	0.003	0.010
13. ComNum	0.318***	-0.330***	0.036***	-0.012	0.090***	0.075***	0.025**	0.056***	-0.073***
Variables	10	11	12	13					
10. VIPFlg	1								
11. Mainshop	0.116***	1							
12. Opendays	-0.008	-0.004	1						
13. ComNum	0.109***	0.243***	0.022*	1					

*** Significant at $p < 0.01$; ** Significant at $p < 0.05$; * Significant at $p < 0.10$

in this study, urban central business district location had no significant association with eWOM; thus, H5 was not supported.

The majority of online food reviewers eat at restaurants and then provide an online food review to generate eWOM. Thus, most online reviewers do not require takeout services. The aforementioned information might explain why H6 was not supported in this study. Inconsistent results have been obtained in previous studies in terms of the relationship between the provision of takeout services and eWOM [59, 60].

Price level and location had significant influences on the association between competition and eWOM; thus, H2 and H4 were supported. However, cuisine popularity did not have a significant effect on the relationship between competition and eWOM; thus, H3 was not supported. The root cause of this result is that the catering industry is an extremely competitive and low-threshold one; therefore, cuisine differences have little effect on competition. The data analysis results are presented in Table 4.

To determine the influences of location and price on the relationship between price level and eWOM, we adopted the seemingly unrelated regression (SUR) model [61] and divided location and price level into two categories each. Location was divided into concentrated areas and normal areas, and price level was divided into low and high. A concentrated area is a location with a high density of competitors, whereas a normal area is a location with a low density of competitors. The high-price category comprised

the restaurants with the top 25% highest prices, whereas the low-price category comprised restaurants with the top 25% lowest prices. The results of the group regression are reported in Table 5. First, competition had a positive association with eWOM for the low-price category, whereas, it had a negative association with eWOM for the high-price category. Moreover, competition had a stronger negative association with eWOM for concentrated areas than for normal areas.

5.2 Robustness analysis

5.2.1 Multiple linearity testing

Because competition was measured using similarity and calculated using multiple variables, multiple linearities might have existed between competition and the other variables. The presence of multiple linearities influences the results of ordinary least squares (OLS) regression. We used least absolute shrinkage and selection operator (LASSO) regression to validate the robustness of the results.

LASSO is an algorithm created to identify multicollinearity [62]. This algorithm performs penalty parametrization in multiple linear regression, which enhances model stability and enables the filtering of model features. By using Model 2 as a benchmark, we conducted k-fold cross-validation to select the optimal parametric adjustment parameter that minimized the mean square prediction error (MSPE). The coefficients of the Lasso regression were non-zero. This

Table 4 Empirical research results

	Model 1	Model 2	Model 3	Model 4	Model 5
HotBusArea	.0202	.0119	– .0008	.0169	.0052
TakeoutFlg	– .1116**	– .1871***	– .0961**	– .1517***	– .1985***
ReserveFlg	.1599***	.1429***	.1155***	.1444***	.1382***
GroupBuyFlg	.3020***	.2986***	.3106***	.2978***	.2996***
VipFlg	.2844***	.3038***	.2765***	.2990***	.3077***
Mainshop	.1931***	.1853***	.1869***	.1781***	.1839***
ComNum	.0002***	.0002***	.0002***	.0002***	.0002***
Opendays	– .0040***	– .0007	– .0036**	– .0003	.0001
Competition		– .3708***	– .2929***	– .0488	– .4001***
PriceLevel			– .0004		
PriceLevel*competition			.0035***		
Cuisine				.1367**	
Cuisine*competition				– .1056	
Location					.4367**
Location*competition					– .7216**
Observations	6159	6159	6159	6159	6159
Likelihood Ratio Test		$p=0.000$	$p=0.000$	$p=0.000$	$p=0.000$
Overall R ²	0.2815	0.2836	0.2996	0.2880	0.2846

Significance level: * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$

Table 5 Group regressions of location and price level analysis

	Concentrated area	Normal area	Low price level	High price level
Competition	– .6418*	– .4443***	1.6621***	– 1.1526***
HotBusArea	0.0002	.0044	– .0619**	.0125
GroupBuyFlg	.1706**	.3039***	.3030***	.2517***
TakeOutFlg	.2346	– .2126***	.5185***	– .2930***
ReserveFlg	.08716	.1264***	.0994*	.0660*
VIPFlg	.3584***	.3046***	.1435***	.3347***
MainShop	.0562	.1834***	.1436***	.2061***
ComNum	.0083***	.0002***	.0005***	.0001***
Opendays	– .0083	.0008	– .0201***	.0086***
Observations	1510	4649	1452	1522
Overall R ²	0.3348	0.2878	0.2721	0.2911
F Value	F (8,501) = 31.5 $p=0.000$	F (9,5639) = 253.2 $p=0.000$	F (9,1442) = 59.9 $p=0.000$	F (9,1512) = 68.9 $p=0.000$
p-value	0.0875*		0.000***	

Significance level: * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

result indicated that the coefficients estimated using the OLS and LASSO regression were relatively close; thus, the OLS regression method was suitable for our research.

5.2.2 Robustness check for the peripheral route

For further verifying the stability of the developed model, we tested the relationships between peripheral route attributes and competition. We established new equations by adding cross-product terms to the peripheral route attributes and

competition. The results presented in Table 6 (for Models 6–9) indicate that the peripheral route attributes had no significant moderating effect on the relationship between competition and eWOM.

5.2.3 Robustness check for the cuisine effect

For further exploring the relationship between cuisine and competition, we compared two classical cuisines: hotpot cuisine, which is the most popular among the cuisines considered in this study, and Yunnan cuisine, which is less

Table 6 Results of adding cross-product terms

	Model 2	Model 6	Model 7	Model 8	Model 9
HotBusArea	.0119	.0395	.0114	.0106	.0094
TakeoutFlg	-.1871***	-.1870***	.3829	-.2130***	-.2661***
ReserveFlg	.1429***	.1429***	.1422***	.1530***	.1276***
GroupBuyFlg	.2986***	.2986***	.2991***	.3028***	1.741***
VipFlg	.3038***	.3039***	.3047***	.2953***	.2891***
Mainshop	.1853***	.1853***	.1848***	.1818***	.1783***
ComNum	.0002***	.0002***	.0002***	.0002***	.0002***
Opendays	-.0007	-.0007	-.0003	-.0006	.0006
Competition	-.3708***	-.3605***	-.3707***	-.0763	.4977***
HotBusArea *competition		-.0365			
TakeoutFlg *competition			-1.008		
ReserveFlg *competition				-1.361	
GroupBuyFlg *competition					-1.872
Observations	6159	6159	6159	6159	6159
Likelihood Ratio Test		$p=0.000$	$p=0.000$	$p=0.000$	$p=0.000$
Overall R ²	0.2836	0.2836	0.2839	0.2932	0.3091

Significance level: * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$

popular cuisine. We used the linear seemingly unrelated regression equations (SURE) to determine the two competition coefficients for the two compared cuisines [63]. The results indicated that the competition coefficients of the two cuisines did not differ significantly; thus, cuisine did not moderate the relationship between competition and eWOM. The regression results of SUR are presented in Table 7.

5.3 Endogeneity issues

Studies have found that many merchants are aware of the potential benefits of eWOM and hire individuals or public relations firms to spread biased opinions in their favor [64, 65]. To verify whether this effect existed in the present study, we selected a data set with a large number of posts (merchants with the top 25% comments number) for regression. We considered that a relatively small number of merchants increased their ratings by hiring individuals and that a large number of comments reduced the effect of merchant manipulation. The results presented in Table 8 indicate that the problem of biased opinions was not a concern in this study.

6 Discussion and conclusion

This study explored the associations between service attributes, competition, and eWOM in the catering industry according to the ELM, with a particular focus on the effects of price competition, location competition, and category

Table 7 Research analysis of different cuisines

	SURE	
	Hotpot cuisine	Yunnan cuisine
Competition	-.728***	-.312*
HotBusArea	.0350	.002
TakeoutFlg	.261**	-.106
ReserveFlg	.132***	.202***
GroupBuyFlg	.264***	.310***
VipFlg	.353***	.241***
Mainshop	.152***	.129***
CommentNum	.0001***	.0002***
Opendays	.005	-.0005
Observations	2452	1983

Significance level: * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$

competition. The results indicate that merchants' additional service attributes, including reservation, and group buying services, have significant associations with eWOM. Customers can evaluate simple merchant characteristics by exerting low cognitive effort through the peripheral route [32, 33]. The results also indicate that price competition and location competition are more complicated to evaluate than additional service information, with consumers exerting additional cognitive effort in engaging eWOM when receiving messages related to competition [32, 33]; thus, competition information is processed through the central route.

Table 8 Results of contrastive regressions

	Model 2	High comment numbers	Public transportation consideration
HotBusArea	.0119	.1338*	.0657
TakeoutFlg	−.1871***	−.0756***	−.2023***
ReserveFlg	.1429***	.0416*	.1350***
GroupBuyFlg	.2986***	.2287***	.3051***
VipFlg	.3038***	.4171***	.3019***
Mainshop	.1853***	.0267*	.1802***
ComNum	.0002***	.0000***	.0002***
Opendays	−.0007	.0181***	−.0003
Competition	−.3708***	−2.7739***	−.4307***
Public_transport			.0848***
Public_transport*HotBusArea			−.0932***
Observations	6159	1541	6159
Likelihood Ratio Test		$p=0.000$	$p=0.000$
Overall R ²	0.2836	0.3073	

Significance level: * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$, and regression results of all merchants are based on Model 2

6.1 Theoretical and managerial implications

This research focused on the influences of merchant characteristics on eWOM and analyzed the moderating effects of price competition, category competition, and location competition on eWOM. This study has three main theoretical contributions.

First, this study expanded the application of the ELM. According to the main concept of the ELM and the effort involved in processing service attribute information, we classified merchant attributes into those processed through the central and peripheral routes. Within the context of cognitive psychology, the central route is involved when attributes must be compared to make judgments, and the peripheral route is involved when primary judgments are being made. The information is consistent with the ELM, which indicated that individuals process information through the central or peripheral route depending on their cognitive information processing ability and degree of “elaboration” [32, 33]. The results of the present study indicate that the provision of reservation and group buying services triggers consumers’ cognition through the peripheral route, whereas price competition and location competition trigger consumers’ cognition through the central route.

Second, the present study connected the Kano’s model and ELM. In the Kano’s model, the categories of quality attributes depend on the customer satisfaction and dissatisfaction with how individual requirements are satisfied [16]. However, the Kano’s model does not account for the differences between service attributes from an individual cognitive perspective. Our study identified the differences

between these attributes from the perspective of individual psychology.

Third, the present study deepens the understanding on the effects of various forms of competition on eWOM. We tested the moderating effects of price competition, location competition, and category competition on eWOM. In the catering industry, price level and location moderate the effect of competition on eWOM. This result enriches the research on eWOM and provides insight into the relationship between competition and eWOM [17].

In the catering industry, merchant quality attributes are divided into two categories, namely attributes processed through the central and peripheral routes, which influence eWOM through different mechanisms. Consequently, business managers can provide simple information to trigger the peripheral route of heuristic cognition as well as detailed information on location and price to stimulate the central route of systematic cognition. For example, restaurants should not emphasize their low prices, which might give customers an impression of low service quality and thus result in poor restaurant reputation. In addition, restaurants need not emphasize that good infrastructure exists around their location or that they are located in a central business district. They should pay more attention to their comparison with surrounding businesses so that they can gain customers’ favor. These measures can help restaurants achieve positive eWOM among consumers.

6.2 Limitations and future research

This study has three limitations. First, we used objective data and determined that the different influence mechanisms of eWOM are derived from different cognitive patterns. However, this finding must be confirmed by additional evidence from individual cognitive studies. Second, according to the ELM, an individual's overall evaluation of a target may be influenced through two distinct routes, which are affected by individual characteristics, such as motivation and ability [66]. It is a critical research direction for the future studies. Finally, the provision of takeout services did not have a significant effect on eWOM in this study, and inconsistent conclusions have been obtained for the relationship between the provision of takeout services and eWOM in previous studies [59, 60]. We believe that the importance of takeout services has changed over time, especially since the warning of the COVID-19 pandemic [67]. This aspect can be investigated in the future studies.

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Declarations

Conflict of interest The authors declare that they have no conflict of interest.

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