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# Customer revisit intention to restaurants: Evidence from online reviews

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**Abstract** One of the generally recognized marketing principles is that retaining customers is more profitable than winning prospective customers. Therefore, how to retain existing customers and improve their repeat purchases is an important consideration for practitioners to gain profit. The purpose of this study is to investigate factors influencing customer revisit intention to restaurants by analyzing online reviews. We used regression analysis to analyze quantitative scores of 10,136 restaurant reviews collected from an online life community in China, and found that food quality, price and value, service quality, and atmosphere are the antecedents of restaurant customers' revisit intention, and that restaurant type moderates the effect of customer satisfaction with service quality, atmosphere, and price and value on revisit intention. We also used text mining technology to identify detailed evaluation indicators in each dimension and explore customers' evaluation behavior characteristics. We found that food quality and, price and value have four indicators while service quality and atmosphere have two indicators. The results are useful for restaurant operators to take effective actions to attract more customers to revisit.

**Keywords** Revisit intention · Customer satisfaction · Online reviews · Regression analysis · Text mining

## 1 Introduction

In today's economy, companies have become competitive in acquiring and retaining customers as they are turning to be customer-centric. One of the generally recognized marketing principles is that retaining customers is more profitable than winning prospective customers (Bitran and Mondschein 1997). Previous research has shown that the cost of attracting a new customer is about five times that of keeping an old customer and the value of winning ten new customers is less than that of keeping an old customer (Verhoef and Donkers 2001). Therefore, how to retain existing customers and improve their repeat purchases is an important consideration for practitioners and has also attracted researchers' attention (Han et al. 2009; Kim et al. 2009a, b; Kim and Moon 2009).

Many new social media (i.e. Web forums, Web blogs) have emerged on the web and become a major information sharing platform for individuals (Chiu et al. 2011; Chau and Xu 2012). At the same time, these applications are integrated into stages of customer decision-making process (Li and Liu 2011). Before people make a purchase decision, they may search for information online and consider other consumers' comments about products or service. For example, if a person wants to dine out, he/she may consider information and other customers' reviews about different restaurants and then decide which one to go. After visits, some customers may share their experiences and express their opinions about the service, food quality, price, etc. on the restaurants. Reviews involve commentators' consumption experiences and feelings about the products or the service they got. Online review analysis is becoming a research instrument and has been applied in many fields. However, there are few studies on revisit intention based on online reviews.

The purpose of this study is to identify influencing factors on restaurant customers' revisit intention by analyzing online reviews. We use regression method to analyze the quantitative part of online reviews to find out influencing factors on revisit intention. We use text mining technology to analyze the open-ended part of online reviews to figure out aspects that consumers consider on every significant influencing factor. This paper makes contributions by enriching revisit theory with emerging online instruments and text mining technology.

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Besides, the conclusion of this paper is valuable for restaurant managers to take effective steps to improve customer satisfaction and revisit intention. The rest of the paper is organized as follows. Section 2 reviews related literature. Section 3 proposes our research model and hypotheses. Section 4 describes the data used in this study. The data analysis method and results are shown in Section 5 and discussion on the results follows in Section 6. Section 7 concludes the paper and suggests some directions for future work.

## 2 Literature review

Behavioral intention is often used as a vicarious indicator for actual behavior (Fishbein and Ajzen 1975). Existing research have proven that customer satisfaction is an antecedent of behavioral intention and actual behavior (Westbrook and Oliver 1991). As for revisit intention, it is always related with customer satisfaction, and the higher satisfaction a restaurant delivers, the higher the possibility that customers will revisit (Oh 2000; Han et al. 2009).

### 2.1 Revisit intention

When a company offers a product or service, it is possible that there are many similar goods or services on the market provided by competitors. Customers usually have many alternatives. Therefore, it is important for companies to improve the value of existing consumers, and take effective steps to attract their repurchase behaviors besides attracting new customers (Hanai et al. 2008). Customer revisit intention has been studied in many domains, such as tourism services (Alegre and Cladera 2009), catering services (Kim and Moon 2009), hospital services (Lee 2005), retail business (Zboja and Voorhees 2006), bank services (Shao et al. 2008), telecom business (Wang et al. 2004), etc. A number of customer retention driving factor models were constructed and estimated by means of structural equation modeling or logistic regression. The factors considered in those models include satisfaction, trust, the number of previous visits, perceived switching cost, customer value, etc. Among the factors influencing repeat visits, considerable studies support that satisfaction is a determinant factor of customer revisit intention (Alegre and Cladera 2006; Um et al. 2006; Hui et al. 2007; Alegre and Cladera 2009; Han et al. 2009; Campo-Martínez et al. 2010).

### 2.2 Customer satisfaction and revisit intention

Customer satisfaction is an overall evaluation comparing post-purchase perceived performance with purchase expectations (Fornell 1992). Take repast as an example, when consumers decide to have a meal in a specific restaurant, they will have an expectation about how they will be served. After the meal, they will compare the serving experience with their anticipation. If the service quality the restaurant offered is equal or higher than expected, they will be satisfied with this restaurant, and likely come to the same restaurant again, and vice versa. Therefore, to enlarge the market segments in the restaurant industry, customer satisfaction is a powerful predictor of customer intent to repurchase (Oh 2000). Qu's study indicates that, by analyzing data from Chinese restaurants in Indiana, the higher customer satisfaction in food and environment, service and courtesy, price and value, location, and advertising and promotion, the bigger likelihood of customer returning (Qu 1997). Different from Qu's conclusion, Weiss et al. found that customer revisit intention is only influenced by satisfaction with the theme restaurant food quality and atmosphere (Weiss et al. 2005). Although dimensions used to estimate customer satisfaction in different studies are not identical, the satisfaction as a determinant factor of customer revisit intention is consistent in different researches.

### 2.3 Dimensions of customer satisfaction

Customer satisfaction is a combination of customers' feelings about service in different dimensions. Many studies have designed and evaluated scales to measure customer satisfaction. Parasuramanet et al. developed a conceptual model of service quality with ten dimensions, which are reliability, responsiveness, competence, access, courtesy, communication, credibility, security, understanding, and tangibles (Parasuraman et al. 1985). Based on this model, they built an instrument named SERVQUAL to estimate consumer perception of service quality with five dimensions which were tangibles, reliability, responsiveness, assurance, and empathy (Parasuraman et al. 1988). Knutson adapted SERVQUAL to the lodging industry and drafted the LODGSERV instrument to measure service quality (Knutson et al. 1990). Stevens et al. tested LODGSERV in different language environments and found that even in different cultures, LODGSERV worked as well (Patton et al. 1994). After that, they developed another instrument DINESERV that had five dimensions with 29 items based on SERVQUAL to test it in the restaurant industry (Stevens et al. 1995). Kim et al. used DINESERV in university dining market, and found that every dimension had a positive effect on customer satisfaction and revisit intention (Kim et al. 2009b).

### 2.4 Customers' online reviews

In the past, reviews were comments written by critics or reporters and presented in newspapers or magazines. The emergence of Web 2.0 makes it possible for everyone to have a word on things they are interested in. As the Internet is woven into people's daily life, people intend to share their opinions with others online by writing reviews. Many of the reviews are about products or services provided by previous

customers. Therefore, online review is becoming an important information source for customers to learn about products (Hu et al. 2008) and assist them in making purchase decisions (Burgess et al. 2011). King indicated that there were two motives to publish the reviews: explanation and critique (Walford 1986). Usually people share their opinions voluntarily on the website, and write contents about products or services, their judgments about consumption experiences, which means information they provided have a high level of authenticity (Decker and Trusov 2010). If websites use identification processes, users will be cautious of their words and avoid voicing sharp critics. Generally, websites allow reviewers to publish their comments anonymously. Customers could express their true opinions without pressure. Meanwhile, sellers may use dishonest postings to inflate their reputation for commercial purpose. Hence, the contents created by customers are commonly more credible comparing with those posted by operators (Dellarocas 2003). Moreover, the larger the number of postings, the more accurate the overall evaluation will be (Chen et al. 2003). Accordingly, we could trust our results if our data owns a quite large number of reviews.

Most previous research evaluated customer satisfaction with indicators proposed by theories, and collected research data through corresponding questions. In the process, some important influencing factors may be missed, since it is difficult to extract information not included in the questionnaire employed. In this study, we intend to test the relationship among customer satisfaction, restaurant type, and restaurant revisit intention with consumers' online rating and review. It is a more effective way to identify elements that affect customer's revisit intention. And, we can also find aspects the consumer is concerned with for each element based on their open comments.

## 3 Research model and hypotheses

Figure 1 depicts our research model. This model consists of two parts: hypothesis testing and review content analysis. Hypothesis testing phase tests the relationship between revisit intention and satisfaction dimensions. Based on the result of hypothesis testing, review content analysis phase analyzes online review contents to identify a number of evaluation indicators in each dimension. It seeks to find indicators that can measure each satisfaction dimension. Review content analysis phase also intends to explore the customers' review behavior. The details of each part are described in the rest of this section.

### 3.1 Hypothesis testing

The purpose of this part is to identify influencing factors on restaurant customers' revisit intention. We posit that the antecedent of revisit intention is satisfaction (Oh 2000). Meanwhile, customer satisfaction can be evaluated by using DINESERV scale in the restaurant industry (Kim et al. 2009b). According to Kim's study, DINESERV contains five dimensions: food quality, service quality, atmosphere, price and value, and convenience (Kim et al. 2009b). Among these dimensions, we focus on analyzing customer satisfaction with four dimensions of food quality, service quality, atmosphere, and price and value, without convenience dimension. We selected those four dimensions for three reasons. First, few websites contain all the dimensions of DINESERV; second, we want to investigate customers' revisit intentions, since the customers have been there, we assume that the location of the restaurant is acceptable for them; third, without considering convenience dimension we still can find the effect of the other four dimensions on revisit intention. Accordingly, we hypothesize as follows.

Hypothesis 1. Customer satisfaction with food quality is positively related to revisit intention.

Hypothesis 2. Customer satisfaction with service quality is positively related to revisit intention.

Hypothesis 3. Customer satisfaction with atmosphere is positively related to revisit intention.

Hypothesis 4. Customer satisfaction with price and value is positively related to revisit intention.

Market targeting plays an important role in creating effective marketing strategies (Woodside and Mazanec 2004) and has traditionally been focused on consumers willing to pay the highest prices (Firth 2010). Hence, per capita spending is a criterion in restaurant segmentation. Considering studies of (Jang et al. 2012) and (Lynn et al. 2012), restaurants are segmented into three types (upscale restaurants, casual-dining restaurants, and downscale restaurants). Since there is no exact definition for each restaurant type, we divided all the restaurants into quartiles (1–25%, 26–50%, 51–75%, 76–100%) based on the increasing average spending per person. Downscale restaurants are defined as the 1st to 25th percentile of restaurants, casual-dining restaurants as the 26th to 75th percentile of restaurants, and upscale restaurants as the 76th to 100th percentile of restaurants. Commonly, different restaurant segments have different customer groups, and diverse groups differ in terms of demographic characteristics, such as income, age, etc. (Bowen 1998). These characteristics were found to be important moderators of the satisfaction-loyalty relationship (Homburg and Giering 2001). Consequently, restaurant type is likely to moderate the relationship between the influencing factors and revisit intention (Kim and Moon 2009; Jang et al. 2012). Therefore, the following hypotheses are proposed.

Hypothesis 5. Restaurant type moderates the relationship between customer satisfaction with food quality and revisit intention.

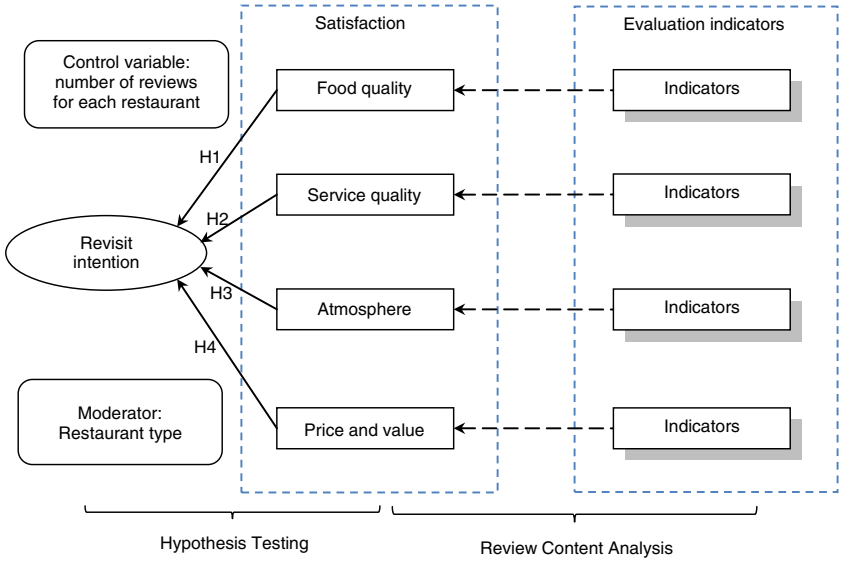


**Fig. 1** Research model

Hypothesis 6. Restaurant type moderates the relationship between customer satisfaction with service quality and revisit intention.

Hypothesis 7. Restaurant type moderates the relationship between customer satisfaction with atmosphere and revisit intention.

Hypothesis 8. Restaurant type moderates the relationship between customer satisfaction with price and value and revisit intention.

### 3.2 Review content analysis

As an important information source, online reviews can reveal customers' judgment on product or service, and the information is relatively credible (Dellarocas 2003). On this basis, the objective of this part is to identify detailed evaluation indicators in each satisfaction dimension and try to find evaluation behavior characteristics by analyzing user generated content.

In order to obtain detailed indicators in each dimension, we first segmented the open-ended comments into words (Zeng et al. 2011). Then, we identified words that were relevant to restaurants' performance in satisfaction dimensions: food quality, service quality, atmosphere, and price and value. Each remaining word was classified into the relevant dimension. Next, the words in each dimension were clustered into several indicators according to the aspects that the words intend to describe.

Based on the word distribution in dimensions and indicators, we seek to explore customer's evaluation behavior characteristics. We assumed that if a review contains words that belong to a dimension or an indicator, it means that that specific review mentioned that dimension or indicator. We calculated review frequency in each dimension and each indicator based on this assumption. By this approach, we can find which dimension people would like to comment on and which indicator people prefer to mention for each dimension. To analyze the relationship between customers' evaluation level and the number of reviews that mentioned a dimension, we calculated the number of reviews that have commented on the dimension in each star level. The number of reviews will be counted as zero, if a review does not refer to the dimension. Then we combined each indicator (dimension) with the others to form indicator-pairs (dimension-pairs), and counted times mentioned by reviews of each indicator-pair (dimension-pair). On this basis, we calculated the occurrence probability of every indicator-pair and every dimension-pair with formula (1) due to the influence of the high marginal frequency of each indicator or dimension. Here $A_1$ and $A_2$ are two aspects and $P(A_1, A_2)$ is the co-occurrence probability of $A_1$ and $A_2$. $N(A_1, A_2)$ is the number of reviews that mentioned both $A_1$ and $A_2$, while $N(A_1)$ and $N(A_2)$ are the numbers of reviews that involved $A_1$ and $A_2$ respectively. In this way, we could find out which indicator-pair and dimension-pair that customers prefer to comment on together.

$$\mathrm{P}(\mathrm{A}_1, \mathrm{A}_2) = \frac{\mathrm{N}(\mathrm{A}_1, \mathrm{A}_2)}{\mathrm{N}(\mathrm{A}_1) + \mathrm{N}(\mathrm{A}_2) - \mathrm{N}(\mathrm{A}_1, \mathrm{A}_2)} \quad (1)$$

## 4 Data collection

We use online reviews to identify influencing factors of customer revisit intention to restaurant and extract indicators that consumers are concerned about. Compared with other research instruments, such as questionnaire, online reviews gathered viewpoints published voluntarily by consumers, which has several advantages. First, since the Internet has anonymous characteristics, customers have less social pressure to express their real feelings as compared with social investigation, and

we can get more accurate opinions. Second, reviews are written by consumers on their own initiative after they are served, while questionnaires are answered by respondents based on their memory, which may deviate from the real perceptions of their experience. Last, collecting data from websites could be easier, less costly and less time-consuming than using questionnaires. Meanwhile, using online reviews as a research data may have some risk. One is that reviews may not meet study requirements since most of websites are not designed for performing research. The other is that there may be some reviews written by people who have not been to the restaurant and may not reflect the real feeling of the writer because of backroom deals. Although the above limitations may exist, according to Chen's study (Chen et al. 2003), the information in reviews is trustworthy if reviews' platforms have a high reputation and the reviews are abundant.

We collected research data from Koubei website (http://www.koubei.com). Koubei is one of the largest online life communities in China, which covers a large amount of user generated content about people's daily life, including dining, entertainment, rent, job, tourism, etc. It is an online open platform where any business organization such as hotel, shopping mall, and restaurant can create a webpage with introduction information, and where users can assess these webpages and publish their reviews accordingly. A huge amount of users visit the website every day to get information about business organization from other people's reviews or publish their own feedback.

Each review about the restaurant on the website consists of two parts: numerical star ratings and open-ended comments. In numerical star rating part, people can grade their satisfaction of a restaurant with marks in four DINESERV items of food quality, service quality, atmosphere, and price and value. Each item is on a five-star scale. A one-star rating reflects a negative judgment whereas a five-star rating stands for a positive one, and a three-star rating indicates a moderate view of satisfaction. In the open-ended comment part, reviewers can write anything, such as what they saw or heard, their feelings about the restaurant, etc. Besides, for each reviewer, there is a question, "Do you want to consume in this restaurant again?" The reviewer can answer with "yes" or "no". Based on the answers for this question, Koubei calculates the rate of revisit intention for a specific restaurant. The rate value is the ratio of the numbers of reviewers who are willing to revisit the restaurant to the total number of reviewers, which is a percentage limited to values from 0 to 1.

We downloaded all reviews and the rate of revisit intention of restaurants that are located in Harbin China from the Koubei website. The result of this study may have bias, since the restaurants were only selected in Harbin. However, because both per capita disposable income of urban households and the proportion of the income for catering services in Harbin are similar with those in China (Bureau of Statistics of Harbin 2011; National Bureau of Statistics of China 2011), we think this study's results are representative in China. The period of the data covers from October, 2006 to April, 2010. After removing restaurants without the rate of revisit intention and reviews, we finally obtained 10136 reviews of 194 restaurants. Each review contains the restaurant's name, reviewer's username, the score of food quality, the score of service quality, the score of atmosphere, the score of price and value, and the content of the open comment. The profiles of restaurants were also collected, including address, average spending per person, etc. We extracted all the information about restaurants and stored it into a relational database for further analysis.

## 5 Data analysis and results

### 5.1 Regression analysis

#### *5.1.1 Variables and regression model*

We could operationalize the variables of our model using the Koubei data set. The unit of analysis is a restaurant. The dependent variable is revisit intention measured as the rate of revisit intention (Revisit Intention). The explanatory variables are satisfaction of food quality, satisfaction of service quality, satisfaction of atmosphere, and satisfaction of price and value. Each of these variables for a unit represents the average evaluation on the dimension of the restaurant among the reviewers. For food quality (Food Quality), it was derived by dividing the aggregate number of the star ratings of food quality by the number of reviews for the restaurant (Total Reviews). Service quality (Service Quality), atmosphere (Atmosphere), and price and value (Price and Value) were measured with the same method. As the numerical star ratings part of online reviews is on a one to five scale, the value of each independent variable ranges from one to five.

Since the dependent variable is a percentage, this could hide some potentially important information. For instance, "9 out of 10 people intended to repurchase" may have a different interpretation than "90 out of 100 people intended to repurchase". We include the total number of reviews for each restaurant (Total Reviews) as a control variable (Mudambi and Schuff 2010).

The moderating variable is restaurant type. According to the definition of restaurant type (see section 3.1), all the restaurants were segmented into three types (downscale/casual-dining/upscale) based on the increasing average spending per person. Specifically, restaurants with diners spent less than 23 RMB Yuan per person are partitioned into downscale restaurants and more than 43 RMB Yuan per person are partitioned into upscale restaurants. There are 49 downscale restaurants, 95 casual-dining restaurants, and 50 upscale restaurants. Restaurant type (Restaurant Type) is coded as a

ternary variable, with a value of −1 for downscale restaurants, 0 for casual-dining restaurants, and 1 for upscale restaurants.

The descriptive statistics for the variables in the data set are shown in Table 1. The average star rating of each satisfaction dimension is around 3.5, and that of service quality is the largest, followed by food quality, atmosphere, and price and value. On average, a restaurant has about 44 reviews and 65.4% of reviewers intended to purchase again.

We used linear regression analysis to test the effects of satisfaction in four dimensions (food quality, service quality, atmosphere, and price and value) on customer revisit intention via SPSS 18. The resulting model is shown in formula (2).

$$\begin{aligned} RevisitIntention = {} & \beta_0 + \beta_1 FoodQuality + \beta_2 ServiceQuality + \beta_3 Atmosphere + \beta_4 PriceAndValue + \beta_5 TotalReviews \\ & + \beta_6 RestaurantType + \beta_7 FoodQuality \times RestaurantType + \beta_8 ServiceQuality \times RestaurantType \\ & + \beta_9 Atmosphere \times RestaurantType + \beta_{10} PriceAndValue \times RestaurantType + \mu_i \end{aligned} \quad (2)$$

### 5.1.2 Reliability and validity

Before regression analysis, we checked reliability and validity of four items of DINESERV. The Cronbach's alpha (Cronbach 1951) value is shown in Table 2. Its value is estimated to be 0.742 and it is larger than the alpha of 0.6, which indicates that the scale of four items is highly reliable for data analysis. As for validity evaluation, we calculated the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy (Kaiser 1970) and Bartlett's test of sphericity (see Table 3) (Bartlett 1950). The value of KMO is 0.586 (>0.5) and test value of chi-square 294.473 is significant ($p$ <0.05), thereby indicating that the scale we used has a good validity.

### 5.1.3 Satisfaction dimensions influencing revisit intention

After eliminating the insignificant terms, the final regression coefficients for the significant terms are shown in Table 4. As indicated, the model fits the data well with an adjusted R-Square of 0.521. The model is significant with an F-ratio of 27.257. For variables, the t-statistic shows that food quality, service quality, atmosphere, and price and value are all significant predictors of revisit intention. Additionally, the expected relationships between customer satisfaction in the four dimensions of DINESERV and revisit intention (Hypothesis 1-Hypothesis 4) are supported by the positive coefficients (0.092, 0.232, 0.150, and 0.073, respectively). This means that customer satisfaction in each dimension has a positive effect on revisit intention. In terms of the standardized coefficients of independent variables, satisfaction with service quality has the largest impact on revisit intention with a standardized coefficient of 0.411. Other standardized coefficients are atmosphere (0.298), food quality (0.160), and price and value (0.121).

In order to test Hypothesis 5–8, we examined the interaction of the four influencing factors and restaurant type. Service Quality×Restaurant Type ($p$ <0.1), Atmosphere×Restaurant Type ($p$ <0.05), and Price and Value×Restaurant Type ($p$ < 0.05) were statistically significant. Restaurant type moderates the effect of customer satisfaction with service quality, atmosphere, and price and value on revisit intention. Therefore, H6, H7 and H8 are supported. The negative coefficient for the interaction Service Quality×Restaurant Type term indicates that customer satisfaction with service quality has a greater positive effect on revisit intention for downscale restaurants than for upscale restaurants. For satisfaction with both atmosphere and price and value, it has a smaller positive effect on revisit intention for downscale restaurants than for upscale restaurants (0.119>0 and 0.099>0). Food Quality×Restaurant Type ($p$ >0.1) was not statistically significant. Therefore restaurant type does not moderate the effect of customer satisfaction with food quality on revisit intention. Accordingly, the results did not support H5.

To validate the feasibility of this model, we examine the normal P-P plot and the scatter plot separately. Figures 2 and 3 show the results of normal P-P plot and scatter plot respectively. In P-P plot, dots are around internal bisector randomly. This indicates that normal distribution was approximately

**Table 1** Descriptive statistics for full data

| Variable | Mean | SD | N |
|---|---|---|---|
| Food Quality | 3.521 | 0.278 | 194 |
| Service Quality | 3.696 | 0.281 | 194 |
| Atmosphere | 3.486 | 0.316 | 194 |
| Price and Value | 3.402 | 0.265 | 194 |
| Total Reviews | 43.531 | 62.409 | 194 |
| Revisit Intention | 0.654 | 0.159 | 194 |

**Table 2** Reliability statistics

| Cronbach's alpha | Cronbach's alpha based on standardized items | N of items |
|---|---|---|
| 0.742 | 0.742 | 4 |

**Table 3** KMO and Bartlett's test

| | | |
|---|---|---|
| Kaiser-Meyer-Olkin measure of sampling adequacy | | 0.586 |
| Bartlett's test of sphericity | Approx. chi-square | 294.473 |
| | df | 6 |
| | Sig. | 0.000 |

found by the distribution of random error. From the scatter plot, standardized residual appears above or below the zero line with randomness and uniformity. It meets the regression condition where random error should have equal variance and independent distribution. In summary, this regression model is feasible.

## 5.2 Reviews analysis

### *5.2.1 Detailed evaluation indicators*

In order to obtain detailed indicators that people pay attention to in each dimension, we extracted features from the content of the reviews. First, comments were segmented into words with Chinese lexical analyzer called ICTCLA, which stands for the Institute of Computing Technology, Chinese Lexical Analysis System (Qun et al. 2004), and 7,827 words were obtained. Then, we removed irrelevant words, including all pronouns (I, he, etc.), conjunctions (and, also, etc.), interjections (oh, wow, etc.), verbs (go, forget, etc.), some nouns (friend, childhood, etc.), adjectives (silly, hungry, etc.), and incorrectly segmented words. Next, according to Chinese usage, we manually classified the remaining 145 words into food quality, service quality, atmosphere, and price and value. Finally, there were 45 words in food quality, 30 words in service quality, 51 words in atmosphere, and 19 words in price and value. Subsequently, words in each dimension were clustered into several indicators. We named every indicator by the words it contained as shown in Table 5. From Table 5, we realized that people judge food quality on its taste, variety, health and visual appeal. As for service quality, customers concern about the appearance and the attitudes of employees in restaurants. When consumers evaluate the dining atmosphere, they usually comment on how they feel about the environment or what facilities the restaurant has. After dinner, customers usually compare the price and the treatment, like how much they paid, the price-quality ratio, whether they received a discount or not, and the amount of food they got.

### *5.2.2 Evaluation behavior characteristics*

Analyzing descriptive words in Table 5, we found that some of them are commendatory, some are derogatory, and some are neutral. In order to explore description behavior characteristics, we classify the words into three groups of commendatory, derogatory, and neutral. As shown in Table 5, the number of commendatory descriptive words is frequently larger than that of derogatory words if the indicator has both commendatory words and derogatory words. When people comment on an indicator, they often use different words to describe the performance if they feel good, while people show their opinions without vivid description if they feel bad. For example, they describe good taste of food with delicious, tasty, fragrant, etc. whereas they use abnormal taste or yuck to show their feeling without explaining how strange the taste is. This also exists in the indicator of employee attitude and that of environment. For the neutral words, they have the similar meaning with the name of the indicator or imply what the indicator is. For instance, the words "view" and "atmosphere" indicate that people commented on the indicator "environment". We also can know that the commentator discussed about the employee's appearance from the word "dressing", "uniform" or "looks".

Based on the words in Table 5, we obtained the "review frequency" in each indicator and each dimension, which is the number of reviews that comment on the indicator or the dimension, by counting the number of reviews that contain

**Table 4** Regression results

| Model | Unstandardized coefficients | | Standardized coefficients | t | Sig. |
|---|---|---|---|---|---|
| | B | Std. Error | Beta | | |
| (Constant) | −1.293 | 0.139 | | −9.286 | 0.000*** |
| Service Quality | 0.232 | 0.038 | 0.411 | 6.156 | 0.000*** |
| Atmosphere | 0.150 | 0.041 | 0.298 | 3.691 | 0.000*** |
| Food Quality | 0.092 | 0.048 | 0.160 | 1.896 | 0.059* |
| Price and Value | 0.073 | 0.041 | 0.121 | 1.763 | 0.080* |
| Restaurant Type | −0.336 | 0.187 | −1.513 | −1.799 | 0.074* |
| Service Quality × Restaurant Type | −0.125 | 0.067 | −1.997 | −1.871 | 0.063* |
| Atmosphere × Restaurant Type | 0.119 | 0.054 | 1.884 | 2.212 | 0.028** |
| Price and Value × Restaurant Type | 0.099 | 0.044 | 1.515 | 2.265 | 0.025** |

Dependent variable: Revisit Intention

R Square: 0.541; Adjusted R Square: 0.521

F-ration: 27.257; Sig.:0.000[a]

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

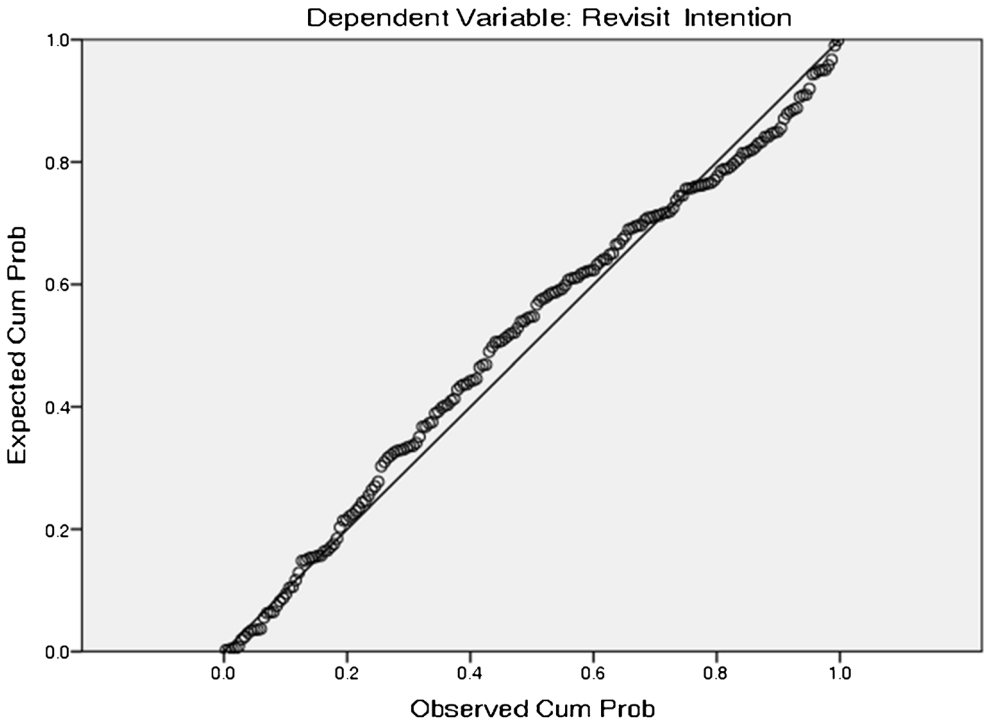


**Fig. 2** P-P plot

at least one word of the indicator or the dimension (see Table 6). For example, if the contents of two postings are "the price is very cheap" and "it is very cheap" respectively, both the numbers of these reviews commenting on "price and value" dimension are 1 because they both mentioned "cheap" no matter there is a "price" or not. Table 6 indicates that the contents of 6,557 reviews refer to food quality, and its number of reviews is the highest. Atmosphere, price and value, and service quality are ranked second, third, and last, respectively, in terms of review frequency. This rank is not consistent with the rank of their partial coefficient in the regression model. According to the results of regression, service quality has the

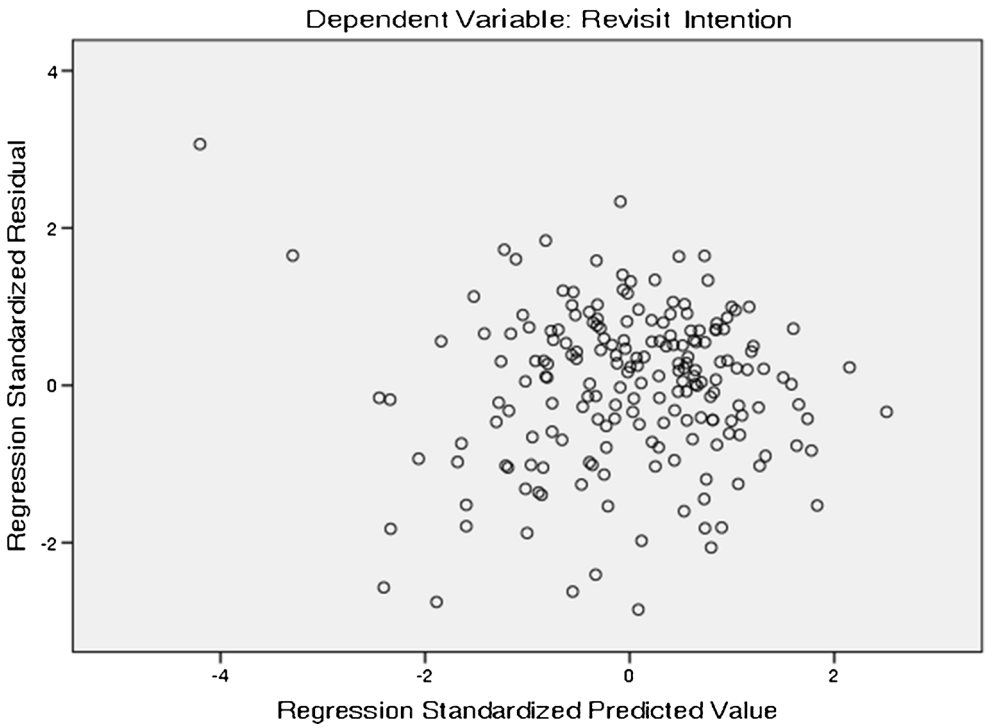


**Fig. 3** Scatter plot

**Table 5** Word distribution in four dimensions

| Dimensions | Indicators | Descriptive words (145) |
|---|---|---|
| Food quality (45) | Taste (29) | Neutral: 味道(taste), 滋味(flavor), 口感(mouth feel),口味(taste), 品味(taste), 味觉(taste sense)<br>Commendatory:好吃(delicious),正宗(veritable),爽口(refreshing),地道(authentic), 香甜(luscious), 淡(delicate),美味(tasty),回味无穷(memorable), 入味(thoroughly flavored),香味(good smell), 津有味(eat with appetite),够味儿(just the right flavor),口福(gourmet's luck),原汁原味(authentic), 嫩(fragrant),有滋有味(savory), 美味可口(delicious),合口味(hit the spot),馋涎欲滴(mouth-watering)<br>Derogatory: 难吃(yuck), 油腻(greasy), 怪味(strange taste), 异味(abnormal taste) |
| | Variety (7) | Neutral: 种类(kind),品种(variety),样式(style)<br>Commendatory:各种各样(all kinds of),各式各样(assorted),丰富(plentiful),繁多(various) |
| | Health (6) | Neutral:消毒(sterilize)<br>Commendatory:健康(healthy),滋补(nourishing),滋养(nourishing),卫生(hygienical),新鲜(fresh) |
| | Appearance (3) | Neutral: 色泽(color)<br>Commendatory:美观(artistic),精致(exquisite) |
| Service quality (30) | Employee appearance (11) | Neutral: 着装(dressing),装扮(attire),工作服(uniform),服装(dress),旗袍(cheongsam),制服(uniform), 相(looks),个子(height),身材(stature)<br>Commendatory: 漂亮(beautiful),帅(handsome) |
| | Employee attitude (19) | Neutral: 态度(attitude)<br>Commendatory: 周到(considerate),热情(enthusiasm),无微不至(meticulously),人性化(personalization), 求必应(all requests will be granted),人情味(human interest),快速(quick),随叫随到(on call), 面带微笑(smile),笑脸相迎(be greeted with a smile),真诚(faith), 温柔(gentle) ,规范(uniform),友好(friendly)<br>Derogatory:傲慢(arrogant),恶劣(bad),打闹(fracas),无精打采(lackadaisical) |
| Atmosphere (51) | Environment (29) | Neutral: 环境(environment), 视野(view), 气氛(atmosphere), 情调(sentiment), 氛围(atmosphere),轻音乐(light music)<br>Commendatory: 干净(clean),舒服(comfortable),宽敞(roomy),静(quiet), 幽静(peaceful),安静(quiet), 亮(light and spacious), 暖和(warm),整洁(neat),隔音(sound insulation),清静(quiet), 僻静(quiet),洁净(clean), 高档(upmarket), 温馨(warm), 惬意(pleased),温和(mild),柔和(soft) , 浪漫(romantic),别有风味(special),舒适(comfortable)<br>Derogatory: 吵闹(noisy),闹哄哄(noisy) |
| | Facilities (22) | Neutral: 设施(facility),装修(decorated),建筑(structure),风格(style),装潢(decorate),灯光(lamplight), 置(fix up), 陈设(furnishings),设计(design), 欧式(Europeanism), 硬件(facility), 食谱(cookbook), 位(grade) ,古典(classical)<br>Commendatory: 优雅(elegant),时尚(fashion),古色古香(antique),简约(brief),淡雅(elegant),别具风味(special),典雅(elegance) ,奢华(luxurious) |
| Price and value (19) | Price (11) | Neutral: 价格(price),价钱(price), 菜价(price),价位(price),服务费(service fee)<br>Commendatory: 低廉(cheap), 廉价(cheap), 工薪层(wage levels)<br>Derogatory: 囊中羞涩(impecunious),小贵(expensive),超贵(very expensive) |
| | Price-quality ratio (4) | Commendatory: 实惠(affordable),物美价廉(cheap and fine),公道(fair),划得来(worthwhile) |
| | Discount (3) | Neutral: 打折(discount),折扣(discount),打折扣(discount) |
| | Amount (1) | Neutral:份量(amount) |

*The number in parenthesis is the number of the words the indicator or the dimension contains

greatest effect, followed by atmosphere, food quality, and price and value. This difference could be explained by that the number of reviews is influenced by the ease of description. Food quality is the easiest to describe. Service is the hardest one since it is not visible. When people commented on the food quality of restaurants, over ninety percent of the reviews were related to the food's taste whereas only a small proportion of reviews involved the food's healthiness, variety and appearance. Atmosphere and service quality have a similar situation – reviewers paid much more attention to one indicator than the other indicators, and the most frequently mentioned indicator of atmosphere and service quality are

**Table 6** Review frequency

| Food quality | 6,557 | Atmosphere | 3,996 | Price and value | 2,559 | Service quality | 1,388 |
|---|---|---|---|---|---|---|---|
| Taste | 6,119 (93.32%) | Environment | 3,723 (93.17%) | Price | 2,026 (79.17%) | Employee attitude | 1,255 (90.42%) |
| Health | 763 (11.63%) | | | Price-quality ratio | 815 (31.85%) | | |
| Variety | 442 (6.74%) | Facility | 711 (17.79%) | Discount | 49 (1.91%) | Employee appearance | 156 (11.24%) |
| Appearance | 126 (1.92%) | | | Amount | 28 (1.1%) | | |

environment and employee attitude, respectively. For price and value, most of customers commented on price and price-quality ratio, and a small part of them mentioned discount and food amount.

The relationship between the number of reviews and star levels is shown in Fig. 4. An Analysis of Variance Test (ANOVA) was conducted and the results indicate that the difference between the five star levels by the number of postings having commented on the dimension is significant ($F=4.094$, df=4, $p=0.019$). As an overall trend of the curves, it is clear that there is an inverted U-shaped relationship between the number of posting and customer satisfaction. For each influencing factor, more postings will be observed with moderate customer satisfaction than with extremely low or extremely high customer satisfaction. When customers are extremely satisfied or dissatisfied with an aspect, they may tend to just give the aspect a star rating without comments. But when they are moderately satisfied, they may think it is necessary to explain why they give this rating with comments.

Figure 5 shows the occurrence probability of every possible indicator-pair in each dimension. The result indicates that if people comment on two aspects of food quality simultaneously, food taste and health are their first choice. However, the occurrence probability of 0.073 indicates that a few people express opinions on both taste and health. However, when people comment on atmosphere or price and value, people probably mention one indicator together with another indicator (0.108 and 0.134). For price and value, people prefer to comment on both price and price-quality ratio (0.134). When people express their opinions on service quality, they rarely mention employee attitude together with employee appearance (0.016).

For every indicator-pair, selected from two different dimensions, and every dimension-pair, the results of the occurrence probability are shown in Fig. 6. Figure 6 indicates that people commented on both food quality and atmosphere with the highest probability. And the health-facility pair is customers' favorite indicator-pair. On the other hand, the least popular dimension-pair is service quality and price and value. As for the least popular indicator-pair, it is price and employee attitude.

## 6 Discussion and implications

In this paper, we illustrated the satisfaction in four dimensions instead of overall satisfaction that is used in previous work. Consistent with most previous research, we found that satisfaction is related with revisit intention, and customer's satisfaction about food quality, service quality, atmosphere, and price and value each has a positive effect on revisit intention. Our results are different from Weiss et al.'s research, who found that customer satisfaction with food quality and atmosphere were the only significant attributes influencing return intention, without satisfaction of service quality (Weiss et al. 2005). Nonetheless, our finding is consistent with Qu's (1997) results, whereby we note that the likelihood of customers returning increases when there was a higher satisfaction level in food and environment, service, and price and value. Different from Qu's finding that "Food and Environment" has the greatest effect, we found that satisfaction with service quality is the strongest influencing factor. The difference indicates that as many years passed, nowadays customers eat in a restaurant is not only to act on their desire for a meal, but also to meet their increasing desires for entertainment (Ryu et al. 2010). Accordingly, restaurant managers should improve the quality of the restaurant in those four dimensions and pay more attention to service quality. In our model, satisfaction with the four dimensions explains more than half of the variance of revisit intention with a $R^2$ value of 0.541, and it has a little more explanatory ability than that of Han et al.'s model (2009) of structural equation modeling, in which

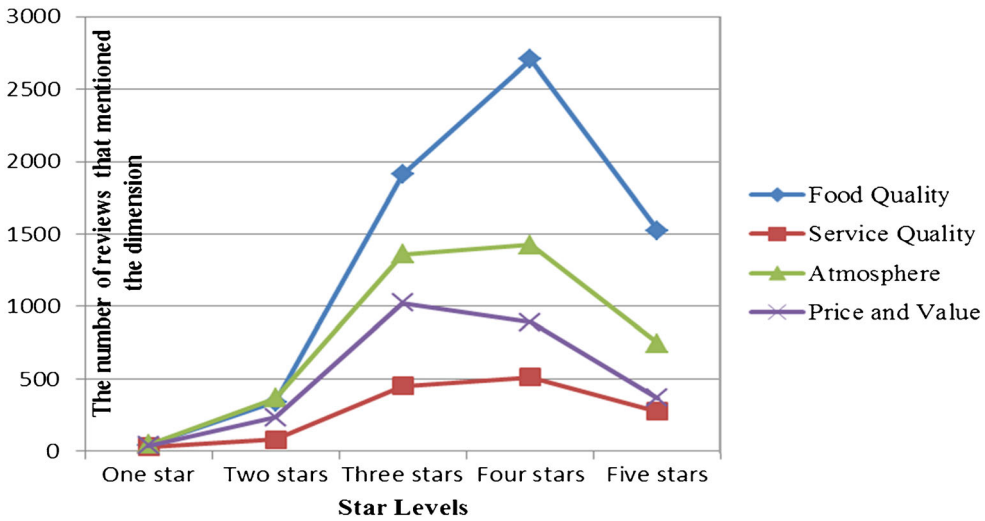


**Fig. 4** Relationship between the number of reviews and star levels

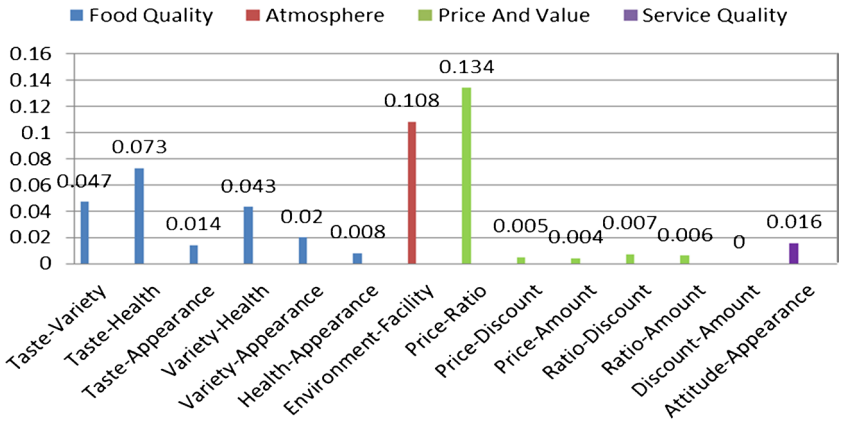


**Fig. 5** Occurrence probability of indicator-pair in each dimension

overall satisfaction is predicted by other four dimensions of excitement, comfort, annoyance and romance. However, our model has a bit less explanatory ability than Oh's model (2000), which uses perceived quality, perceived value and satisfaction as the predictors of returning to restaurants with $R^2$ value of 0.61.

The findings of review analysis suggest some detailed implications for food service operators. Words distribution in each dimension gives managers specific directions to retain old consumers. For improving satisfaction of service quality, training of employees should be effective, because it can hold employees' enthusiasm to treat consumers warmly. Meanwhile, attendants' appearance is also important. To improve satisfaction of the atmosphere, the facility should be consistent with the atmosphere. When customers are addicted to it, they will likely revisit. As for food quality, managers can work hard on food taste, food variety, visual appeal and food nutrition. Besides, pricing is a complex but important matter, and a reasonable price can keep good relationship with consumers.

From the result of review frequency analysis, we can know the indicator that customer is most concerned with in each dimension. It has implications for restaurant operators who can improve customer's satisfaction with limited funds and resources. For instance, improving the taste of food is the preferred path for managers to increase customer satisfaction with food quality. As for atmosphere, price and value, and service quality, the first choice is to improve environment, lower price and enhance employee attitude respectively. The occurrence probability analysis of indicator-pair showed that people sometimes associate one aspect with another. From the results, we can know the second choice for improving food quality, atmosphere, price and value, and service quality are healthiness of food, facility, price-quality ratio, and employee appearance, respectively.

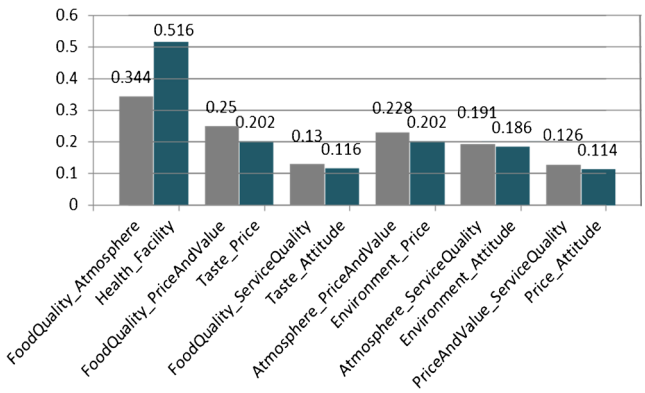


**Fig. 6** Occurrence probability of both dimension-pair and indicator-pair among dimensions

## 7 Conclusion

This paper proposes a research framework to identify influencing factors on restaurant customers' revisit intention. More specifically, we used regression analysis for identifying influencing factors, and data mining for factor specialization and evaluation behavior characteristics exploration. We validated this model using over ten thousand Chinese online reviews. The result of regression analysis reveals that satisfaction of food quality, price and value, service quality, and atmosphere are the antecedents of revisit intention of restaurants, where service quality is the determinant factor. Our text mining results indicate that the satisfaction of each dimension is judged from a number of specific aspects, and people pay different attention to these aspects. They also have different favorite evaluation aspect pairs in each dimension or from different dimensions. The paper makes contributions by applying online reviews and text mining technology in revisit research, and by extending the theory of revisit influencing factor identification in Chinese domain. The results of this study have consulting value for restaurants on retaining existing customers. Future work includes improving the proposed model by involving time factor.

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