문화적 요인이 관광객의 음식점 만족도에 미치는 영향: 텍스트 마이닝과 온라인 리뷰를 활용하여

The Effects of Cultural Factors in Tourists' Restaurant Satisfaction: Using Text Mining and Online Reviews

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─────── 요 약 ───────

외식 경험에 대한 온라인 리뷰의 확산은 특히 해외 관광객의 음식점 선택에 중요한 영향을 주고 있다. 선행 연구는 음식의 질, 서비스, 분위기, 가격을 음식점 선택의 중요 요인으로 식별해왔다. 하지만, 이러한 4개의 대표적 요인 이외에 관광객의 음식점 선택에 중요한 영향을 미칠 수 있는 문화적 요인에 대한 연구는 크게 주목받지 못하였다. 본 연구는 중국인 관광객이 dianping.com에 게시한 76개 한식당에 대한 온라인 리뷰 10,000건 이상을 텍스트 마이닝 기법으로 분석하여 해외 여행 맥락에서 관광객의 음식점 선택에 대한 문화적 요인의 영향을 탐색하였다. 연구 결과, 문화적 요인인 한류가 중국인 관광객의 한식당 경험과 만족도에 영향을 미치는 것으로 나타났다. 또한 냉면, 비빔밥, 떡, 족발, 김치찌개 등 한식 관련 단어는 모든 리뷰 주제에 걸쳐 등장했다. 본 연구 결과는 텍스트 마이닝을 활용하여 음식점 선택과 관광객의 만족도에 대한 문화적 요인의 중요한 역할을 식별함으로써 기존 문헌에 기여한다. 해당 연구 결과는 많은 중국인 관광객을 유치하기 위한 실질적인 지침을 제공한다.

키워드 : 한류, 온라인 음식점 리뷰, 만족도, 텍스트 마이닝, 관광

Ⅰ. Introduction

The rapid development and popularization of e-commerce over the last decade have led to the proliferation of online review websites, such as TripAdvisor and Yelp, where consumers can post reviews of products or services that they have bought or consumed and offer specific suggestions (Kim *et al.*, 2021). These reviews provide consumers with extensive information about various products and services that may affect their purchase intentions, especially in the tourism and hospitality sector, as most tourists have limited knowledge of their destinations (Liu and Park, 2015). Tourists refer to restaurant reviews because dining experiences overseas can provide them with unforgettable memories. Therefore, such online reviews of restaurants can provide abundant data that become valuable resources for tourists, enabling them to examine other

tourists' experiences in a timely and detailed manner, to enhance their own choice of restaurants on a real-time basis while restaurants can simultaneously improve their services and increase customer satisfaction (Gan *et al.*, 2017).

In theory, research on Chinese tourists' dining experiences in Korean restaurants could be similar to previous research. In reality, because China is located next to Korea and is heavily influenced by modern Korean culture, so-called "Hallyu" or "Korean Wave," encompassing Korean TV dramas, movies, and music, among others, Chinese tourists may wish to visit a specific restaurant shown in a drama. For instance, a Korean drama titled "Dae Jang Geum," which showcased traditional Korean food at a royal palace became extremely popular, and its fame spread beyond China and throughout Asia. Therefore, a restaurant selling the food shown in this drama became popular with Chinese tourists. Thus, the Hallyu attribute, as a cultural phenomenon, could influence a Chinese tourist's choice of restaurants in Korea. This implies that the influence of cultural attributes could be essential to tourism research in general, and restaurant choice overseas in particular. However, findings from previous studies were limited to attributes directly related to a restaurant, namely, food quality, service, ambiance, and price (Al-Tit, 2017; Blank, 2006; Gupta *et al.*, 2007; MacLaurin and MacLaurin, 2000; Pantelidis, 2010; Ryu and Han, 2010; Zhang *et al.*, 2014). Researchers have not examined this cultural aspect. Hence, the objective of this study is to determine how cultural phenomena, such as Hallyu, affect Chinese tourists' dining experience in Korea. Specifically, this study seeks answers to the following questions:

(1) What attributes do Chinese tourists consider when they choose a restaurant in Korea?
(2) How do these attributes revealed in online reviews

affect Chinese tourists' online ratings of Korean restaurants?

This study intends to determine which attributes, in addition to those mentioned in previous research, Chinese tourists value when choosing a restaurant in Korea. To ascertain this, this study employs the text mining method to analyze Chinese online reviews on dianping.com, which is the largest review website for Chinese tourists. Thus, this study is methodologically distinct from previous studies because previous empirical studies on online restaurant reviews largely used only meta-information, such as consumer-assigned numerical ratings, while this study uses the Latent Dirichlet Allocation (LDA) technique to identify and analyze the most common attributes considered in the reviews. Furthermore, this study uses a regression model to investigate the relationship between new factors identified using LDA and consumer star ratings. This study expects to determine the essential role of cultural attributes in the study of restaurant choice in the tourism industry, thus adding value to the existing theory. Additionally, it may offer practical guidance to restaurant managers by providing them with a new way of managing customer satisfaction.

Ⅱ. Literature Review

This section reviews the existing literature on the commercial importance of online reviews, dining experience, and the Korean Wave or Hallyu effect.

2.1 Online Customer Reviews

Given that online reviews have become omnipresent, internet users have begun rating people, products, or services online (Cheng, 2019). Customers now rarely make a purchase decision without referencing several

online reviews (Cho *et al.*, 2015). A user review report from search engine optimization company BrightLocal shows that 91% of consumers trust online reviews and make decisions based on them (Pitman, 2020). Online reviews are an essential part of the decision-making process (Lee and Kim, 2021). Therefore, people are now increasingly reliant on online reviews for choosing a product or service (Gavilan *et al.*, 2018).

As Mudambi and Schuff (2010, p. 186) noted, "Online customer reviews (electronic word of mouth) can be defined as peer-generated product evaluations posted on the company or third-party websites." Review websites (e.g., TripAdvisor, Yelp) enable users to post or search for reviews that are open-ended personal judgments about consumption experiences, usually accompanied by a numerical rating. Service providers can also obtain timely feedback and perform analysis based on the collected data to improve their products and services. As numerical star ratings are quantitative, they can be easily obtained and analyzed using statistical computing methods. In contrast, text comments are relatively more difficult to analyze because of their qualitative nature. However, text reviews provide valuable insight into the reasons behind a numerical rating, which is meaningful to consumers and providers. Hence, this study focuses on the analysis of numerical ratings and text comments.

2.2 Dining Experience

Prior research has generally identified food, service, atmosphere, and price as the four basic aspects that constitute the dining experience; however, the order of importance varies.

Jia (2020) has found that when it comes to restaurant satisfaction, Chinese tourists value the taste of food, while American tourists value service. In addition, previous studies have identified restaurant environment as important factors for customer satisfaction in addition to food quality and service (Al-Tit, 2017; Mattila, 2001; Namkung and Jang 2008; Wall and Berry, 2007). Pantelidis (2010) added price to these three factors. Blank (2006) observed that food, service, and decor are the typical parameters of restaurant reviews used in Zagat ratings and AAA diamond ratings. Andaleeb and Conway (2006) concluded that customers wanted front-of-house staff to "respond" with courtesy, helpfulness, and knowledge, making employee service quality the most important factor, preceding price and food quality. In a study of four themed restaurants in Singapore, MacLaurin and MacLaurin (2000) highlighted food quality and menu as two important elements,

〈Table 1〉 Summary of Dining Experience Attributes

Attributes	Studies
Price, Location	Kim *et al.* (2022)
Food quality, Service	Jia (2020)
Food quality, Service, Price	Andaleeb and Conway (2006), Gupta *et al.* (2007), Tian *et al.* (2021)
Food quality, Service, Environment	Al-Tit (2017), Blank (2006), Mattila (2001), Namkung and Jang (2008), Ryu and Han (2010), Sulek and Hensley (2004), Wall and Berry (2007), Zhang *et al.* (2014)
Food quality, Service, Price, Environment	Pantelidis (2010)
Food quality, Service, Price, Environment, Location	Hyun (2010), MacLaurin and MacLaurin (2000)

along with the concept, service quality, atmosphere, convenience, value, product merchandise, location, and pricing. According to Sulek and Hensley (2004), fairness of seating procedures, restaurant atmosphere, and food quality affected customer satisfaction. Yan *et al.* (2015) determined that customers consider four major aspects－service quality, ambiance, price, and value－when deciding whether to revisit a restaurant.

Restaurant location and convenience of transportation also greatly influence consumer consumption decisions, especially in a foreign location. Tourists choose to dine in restaurants located near popular attractions with convenient transport links. Kim *et al.* (2022) showed that location along with price affects the satisfaction of restaurants. Hyun (2010) indicated that food quality, service quality, price, location, and environment are five dimensions that influence restaurant patron behavior.

Most researchers used the survey method as the primary tool to collect data and analyze customer satisfaction. For instance, Carman (1990) used a SERVQUAL survey to measure the service quality perceived by customers during their dining experience. SERVQUAL typically requires respondents to answer questions predetermined by researchers rather than enabling an unstructured review of the experience, which may deviate from expectations. Only a few restaurant researchers chose to use the data-mining method to measure customer satisfaction (Pantelidis, 2010). Moreover, few researchers have used big-data analysis to study the dining experience of Chinese tourists in Korea based on Chinese websites.

2.3 Hallyu

A broadcasting planning company operated by Koreans in Beijing, China first used the term "Hallyu" or "Korean Wave." Hallyu can be defined as a new wave of Korean-generated popular culture products, such as music, computer games, food, and traditional and contemporary fashion (Kim *et al.*, 2009). The Chinese media has also used the term since mid-1999. The global media began to follow the emergence of the Korean Wave, and the term was officially coined at the end of the 20th century. Korean celebrities at the center of the Korean Wave have become extremely popular worldwide, boasting large international fan bases. Hallyu has recently expanded to the Middle East, the United States, Europe, and South America (Elaskary, 2018; Kim, 2019).

Shim (2006) stated that the popularity of Korean pop culture has led to a large number of international fans eager to learn Korean and travel to Korea. The growth of Hallyu affects fans' consumption decisions, while celebrity associations and television dramas substantially affect the preference for Korean restaurants (Lee *et al.*, 2015). According to Kim *et al.* (2008), the success of the "Dae Jang Geum" drama series led to a proliferation of Korean restaurants in Hong Kong. It increased interest in Korean food, as well as the number of Hong Kong tourists traveling to Korea. In 2014, the Korean drama "My Love From the Star" gained popularity in China, attracting more than three billion viewers. Such pervasive viewership inevitably translates into sales of cosmetics, clothes, and food consumed by the drama's protagonists. According to the Korea Cultural Tourism Research Institute, the number of Chinese tourists visiting South Korea rose sharply when the show was aired, increasing from 4.32 million in 2013 to 6.12 million in 2014. Therefore, Hallyu could be a crucial attribute affecting the dining experience of Chinese tourists in Korea as a cultural attribute in addition to existing factors.

Ⅲ. Data and Methods

This study employed data posted on dianping.com, which provided billions of cumulative reviews. We conducted data pre-processing, such as word segmentation, removing stop words, and feature selection after data collection. Subsequently, we used the topic model method to perform an in-depth analysis of the pre-processed data. After identifying attributes from review texts, we examined how these attributes influence customer satisfaction (overall consumer star ratings) using linear regression analysis.

3.1 Data Collection

We collected the data used in this study from dianping.com, one of the most extensive review websites in China. It is a third-party consumer guide website where merchants can promote their stores and users can freely browse and post comments. Dianping.com is considered a leading review website in China due to its ubiquity. It hosts over 4.4 million merchants and 310 million active monthly users. Consumers rely on online reviews at dianping.com before making decisions, and Chinese tourists in particular refer to online reviews while traveling, preferring to utilize review and advice tools. As dianping.com also provides information about vendors abroad, Chinese tourists use it extensively.

This is the primary reason why we chose dianping.com. The platform lists over 2,800 cities across China and nearly 200 other countries. It enables users to publish reviews anonymously only after logging in with a valid e-mail address or phone number, ensuring the user's authenticity. Customers leave textual comments and numerical star ratings for taste, environment, and service, enabling us to conduct various studies.

Considering that this study focuses on the online reviews of restaurants in Korea posted by Chinese tourists, we collected review data for restaurants located in Seoul, where most tourist attractions are located. We obtained 10,252 reviews of 76 restaurants across Seoul, written between March and October 2018. Each review contains the restaurant's name, the reviewer's username, the overall star rating, the rating for taste, physical environment, and service quality, and text comments. <Table 2> shows an example of a customer review. Representative Korean food restaurants, such as the fried chicken store Korean BBQ, were included

〈Table 2〉 An Example of User Review Data

Username	番茄和魚 (Tomato and Fish)	Stars	4
		Taste	4
Restaurant name	三岔口肉鋪 (3-way Intersection Butcher's Shop)	Environment	5
		Service	5

Text: 去韓國肯定要嘗一嘗韓式烤肉，做了些攻略，在弘大的三岔口肉鋪感覺不錯，而且又是YG老板開的，說不定運气好還能偶遇到明星哦，追星小伙伴很适合，点了兩塊肉，還有喝的等等，食材都是比較新鮮的，口感也不錯，小菜送的也挺多，味道也好！推荐嘗試

[If you go to Korea, you must try Korean BBQ. I strategized and found that the 3-way Intersection Butcher's Shop in Hongdae is good. It is owned by YG's (one of the most famous entertainment agencies in Korea) boss. You might be lucky enough to meet stars. It is suitable for star fans. We ordered two pieces of meat, some drinks and so on. The ingredients are relatively fresh, the taste is good. They gave us many side dishes, and also taste good! Recommended to try]

in the data analysis but cafes were not.

After preparing data derived from dianping.com for analysis, we used the text mining method to investigate attributes considered by Chinese tourists when dining in Korea. Finally, we used a regression model to explore the relationship between the attributes and customer satisfaction (overall star ratings).

3.2 Text pre-processing

In text mining, data pre-processing is the process of converting unstructured data into structured data using the natural language processing method. Pre-processing includes segmenting words (tokenization), deleting stop words, deleting symbols, and more. We first substituted some English words for Chinese characters with the same meaning. For instance, we substituted words like "Running Man," "rm," "RM," and "running men" with "跑男," because they all refer to the title of a specific Korean variety show. Subsequently, we deleted non-Chinese characters and numbers, such as phone numbers, symbols, and punctuation, which are irrelevant to the current study. Next, we segmented the text comments into words with the code "segment CN" under the R program environment, originating from a Rwordseg function. We eliminated all stop words, including "the," "and," "we," and "I," among others, as they are irrelevant to this study. Finally, we deleted low-frequency words that appeared less than five times across all reviews. The result was a list of 30 words, with their frequencies provided in <Table 3>. The 50 most frequently used terms are presented in a word cloud in <Figure 1>. Next, to utilize the R tool and LDA method without analysis errors, the Chinese review had to be translated into English. This study translated Chinese reviews from

〈Table 3〉 An Example of User Review Data

Word	Freq.	Word	Freq.	Word	Freq.
味道 taste	2,531	价格 price	767	牛肉 beef	552
明洞 Myeongdong	1,350	环境 environment	738	海鮮 seafood	449
服務員 server	1,264	拌飯 bibimbap	663	大衆点評 dianping	406
推荐 recommend	1,232	口味 taste	658	年糕 rice cake	397
服務 service	1,144	烤肉 BBQ	652	章魚 octopus	372
中文 Chinese	1,016	猪蹄 pig trotter	653	便宜 cheap	370
朋友 friend	834	鷄湯 chicken soup	646	螃蟹 crab	360
跑男 running man	828	炸鷄 fried chicken	639	弘大 Hongdae	348
小菜 side dish	803	位置 address	584	口感 taste	338
泡菜 paocai	788	套餐 set meal	567	態度 attitude	332

online sites into English and used them for analysis. Under the guidance of a professor, a Chinese graduate student translated Chinese into English.

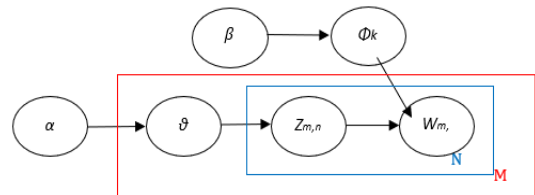

〈Figure 1〉 Word Cloud of the 50 Highest-frequency Words

3.3 Latent Dirichlet Allocation

Text mining technology can efficiently unearth topic information from massive text data and their main content. The most common analysis method in text mining research is extracting words and counting their frequencies. However, this method does not convey semantic information between texts. The topic model methodology replicates the latent literal topics embedded in the text and subsequently discovers potential semantic variables. A topic is a series of related words that correlate to a specific subject in a text or a collection of documents. For instance, when a user reviews a restaurant, they will first determine which aspects of the restaurant to evaluate and subsequently choose a series of words related to that aspect. Thus, a topic model provides keener insight into the intention or values of the reviewer.

Blei *et al.* (2003) initially proposed LDA as the representative algorithm of the topic model, which is a generalization of probabilistic latent semantic in-

dexing (Hofman, 1999). LDA is essentially a typical bag-of-words model, which assumes each document is a collection of topics formed by a set of words with no sequential relationship between them. A document may contain multiple topics, where each word is generated by a single topic following a topic-word distribution. Consumers write reviews from a limited vocabulary to express their ideas, and one or more topics comprise a review. Thus, the LDA method is an efficient way to find topics embedded in massive documents and their potential relationships.

We assume that a corpus D consisting of M reviews exists and that each review contains a set of N words. There should be K topics expressed in the corpus, which includes all M. In this study, customers chose words from latent K topics to describe their dining experience in Korea, and a distribution of words characterized each topic. <Figure 2> shows the detailed LDA process.

〈Figure 2〉 Process of the LDA Model

$W = (w_1, w_2, ..., w_M)$ represents the total words, and $Z = (z_1, z_2, ..., z_M)$ represents the total topics in the corpus. W is the only observable variable in this model, and Z and θ are latent variables. $W_{m,n}$ refers to the specific N-th word occurring in review M, and $Z_{m,n}$ refers to the topic for the N-th word in review M. Φ_k and θ_m are the word distribution for topic K and the topic distribution for review M, respectively. The boxes are "plates" representing replicates or repeated entities. The outer plate represents

documents (in this case, restaurant reviews). In contrast, the inner plate represents the repeated word positions in the given document, each of which is associated with a choice of topic and word. The parameters α and β are hyper-parameters to be Dirichlet-distributed. Based on these definitions, a review's generative process in the corpus can be divided into the following steps:

(1) Draw each per-corpus topic distribution $\Phi_k \sim$ Dir(β) for k∈{1, 2,···K}

(2) For each document, draw the per-document topic proportion $\theta_m \sim$ Dir(α)

(3) For each document and each word, draw the per-word topic assignment $Z_{m,n} \sim Multi(\theta_m)$

(4) For each document and each word, draw the observed word $W_{m,n} \sim Multi(Z_{m,n}, \text{n})$

We can calculate the probabilities with this formula:

$$p(\Phi_{1:k}, \theta_{1:m}, Z_{1:m}, W_{1:m}) = \Pi_{i=1}^{K} p(\phi i|\beta) \quad (1)$$
$$\Pi_{m=1}^{Mp} \theta_m | \alpha \Pi_{n=1}^{N} p(Z_{m,n} \mid \theta_m)$$
$$p(W_{m,n} \mid \Phi_{1:k}, Z_{m,n})$$

3.4 Regression Model

Consumers evaluate satisfaction levels with restaurants using ratings on a five-star scale, in which 1 is "the lowest level of satisfaction," and 5 is "the highest level of satisfaction." We used a linear regression model to examine how significant the identified attributes were to customers' overall star ratings. The model is shown in Equation 2. The dependent variable is the consumer's overall star rating for the restaurant, and the independent variables are the key attributes identified from the LDA results, which will be explained in the next section.
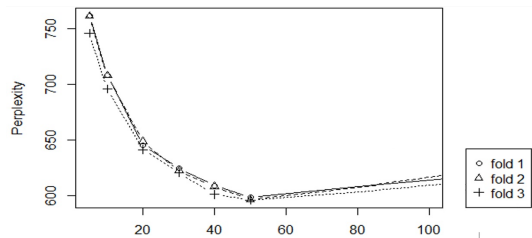
$$\text{stars} = \beta_0 + \beta_1 attribute1 + \beta_2 attribute2 \quad (2)$$
$$+ \beta_3 attribute3 + \beta_4 attribute4 + \cdots + \epsilon$$

IV. Results

4.1 Key Attributes from the Customer Review

We applied the LDA method to extract latent topics from the collected data, the online reviews of the dining experiences of Chinese tourists across 76 restaurants in Korea in dianping.com. LDA identified 50 topics, an optimal number based on the perplexity approach. As shown in <Figure 3>, the perplexity value was the lowest when 50 topics were extracted from the corpus. While most objects examined in the current study are short texts, each review has limited content and a finite number of topics. In this case, if the number of topics is too large, the information will be excessively dispersed. Therefore, we collected 6 topics utilizing a clustering method, with the 20 most frequently occurring words comprising each topic. Among them, Hallyu of Topic 2 is a new topic that has never been stated in previous studies (Gupta *et al.*, 2007; MacLaurin and MacLaurin, 2000; Pantelidis, 2010; Ryu and Han, 2010).

〈Figure 3〉 Number of Topics

For each topic in <Tables 4> and <Tables 5>, the most frequently mentioned words were arranged in order. <Table 4> presents the first 3 topics identified

by the LDA method from 10,252 online reviews of 76 restaurants located in Seoul. In Topic 1, the most frequent word is "taste," followed by a set of menu-related words. Ten of the 20 words (e.g., chicken soup, seafood pancake) in Topic 1 refer to traditional Korean foods, and five words (e.g., light, strong, delicious) refer to taste. The representative word for Topic 2 is "Running Man," a famous Korean variety show and a part of Hallyu. Other words in Topic 2, such as "star," "Kanghodong," and "Korean star" are also elements of Hallyu referring to Korean celebrities. The top 10 words in Topic 2 indicate that some tourists chose BBQ restaurants because of Hallyu influences (e.g., shown in a drama) and that they perceived service as an essential factor. In contrast, Topic 3 customers considered the price to be critical in their reviews. Though the words in Topic 3 are mainly about specific food, "price" is ranked higher than that.

As shown in <Table 5>, Topic 4 places "Myeongdong" and "address" at the top, defining this topic as the location attribute. "Myeongdong" is one of the most famous local tourist attractions in Korea, where customers can shop and dine. Recommendation (e-WOM) is the primary attribute of Topic 5, where "recommend" is the most frequently mentioned term. The word "comment" in Topic 5 indicates that customers visited the restaurant after considering other positive comments online (similar to recommendations). The key attribute of Topic 6 is "language and service," the most frequent words used in the topic, as shown in <Table 5>.

〈Table 4〉 First Three Topics Extracted from all Reviews

Topic 1	Topic 2	Topic 3
味道 Taste	**跑男 Running Man**	价格 Price
小菜 Side dish	朋友 Friend	拌飯 Bibimbap
泡菜 Paocai	烤肉 BBQ	海鲜 Seafood
鷄湯 Chicken soup	明洞 Myeongdong	味道 Taste
招牌 Signature	服務員 Server	章魚 Octopus
餃子 Dumplings	牛肉 Beef	螃蟹 Crab
海鮮餅 Seafood pancake	韓牛 Korean beef	推荐 Recommend
糯米 Glutinous	**明星 Star**	米飯 Rice
清淡 Light	冷面 Cold noodle	大衆点評 Dianping
鷄肉 Chicken	帮忙 Help	新鮮 Fresh
人參 Ginseng	性价比 Value	便宜 Cheap
濃郁 Strong	肉質 Meat quality	蟹黃 Crab roe
免費 Free-of-charge	醬湯 Doenjang jjigae	試試 Try
雪濃湯 Ox bone soup	五花肉 Streaky pork	嘗嘗 Taste (verb)
干淨 Clean	担心 Worry	第一次 First time
自助 Self-service	牛排 Steak	醬油 Soy sauce
調味 Flavored	打卡 Sign in	美味 Delicious
景福宮 Gyeongbok Palace	**姜虎東 Kanghodong**	紫菜 Kim
鮮美 Delicious	猪肉 Pork	巷子 Alley
肉湯 Broth	**韓星 Korean star**	蟹肉 Crabmeat

Note: Bold marks in the Table represent words related to Hallyu

〈Table 5〉 Last Three Topics Extracted from All Reviews

Topic 4	Topic 5	Topic 6
明洞 Myeongdong	推荐 Recommend	服務 Service
位置 Address	猪蹄 Pig trotters	中文 Chinese
年糕 Rice cake	套餐 Set meal	环境 Environment
口感 Taste	弘大 Hongdae	服務員 Server
美食 Gourmet food	沙拉 Salad	炸鷄 Fried chicken
排骨 Ribs	点評 Comment	口味 Taste
特色 Korean	网紅 Famous restaurant	態度 Attitude
嘗試 Attempt	分量 Quantity	啤酒 Beer
選擇 Choice	老板 Restaurateur	菜單 Menu
土豆 Spine soup	建議 Suggest	**韓劇 Korean drama**
正宗 Authentic	滿滿 Full of	店面 Storefront
地鐵 Subway station	蔬菜 Vegetable	位置 Address
体驗 Taste of	油膩 Greasy	辣味 Spicy
炒飯 Fried rice	火鍋 Hot pot	熱情 Helpful
豆腐 Tofu soup	女生 Girls	地圖 Map
裝修 Decoration	份量 Quantity	交流 Communicate
市場 Market	第一 First	舒服 Comfortable
傳統 Traditional	打卡 Sign in	入味 Tasty
好找 Easy to find	打包 Take out	座位 Seat
小吃 Snack	泡菜湯 Kimchi stew	一般般 So-so

Note: Bold mark in the Table denotes a word related to Hallyu.

The most common analysis method in text mining research is extracting words and counting their frequencies. However, this method does not convey semantic information between texts. The topic model methodology replicates the latent literal topics embedded in the text and subsequently discovers potential semantic variables. The LDA model classifies documents into themes through the words and structure of textual data, and the title of each topic is evaluated by inferring the most frequently used words by researchers (Cho *et al.*, 2015; Park and Song, 2013). Hence, we adopted the LDA method and extracted variables from each topic. Tasting local food at a tourist destination gives tourists an unforgettable experience of a lifetime. Although the menu of local food, therefore,

is unconditionally important for tourists, we considered the significance of menu items taken for granted.

To sum up, Topic 1 is the taste, Topic 2 is the cultural aspect－Hallyu, Topic 3 is the price, Topic 4 is the location－tourist spots, Topic 5 is the recommendations in online reviews, Topic 6 is the service, communication (foreign language availability), and environment.

Thus, we concluded that the attributes Chinese tourists consider when dining in Korea are Hallyu, language, recommendations, price, taste, environment, location, and service. Now, we used these eight attributes as independent variables to understand which attributes are most significant to the overall star rating using linear regression.

4.2 The Impacts of Key Attributes on the Star Rating

Through text mining on Chinese tourists' online restaurant reviews, we obtained eight key attributes and subsequently created eight clusters of related terms to calculate the frequency of the given terms in each attribute. <Table 6> provides the distribution of each cluster.

This frequency is measured as the sum of each occurrence of the key terms in the data. For example, as shown in <Table 7>, when Review 1 mentions the helpful service cluster, the value of the cell is 1. Other service cluster terms are not mentioned, therefore, the value of those cells is 0. Thus, the frequency sum for the service cluster in Review 1 is 1.

The data we collected included ratings for environment, service, and taste. To ensure the diversity of the data, we used these variables as explanatory factors instead of the attributes extracted using LDA. Thus, the independent variables of this model are Hallyu, location, language, recommendation, price, rating of taste, rating of environment, and rating of service. Hallyu, location, language, recommendation, and price variables were calculated using the frequency of the words based on the review format of dianping.com (see <Table 2>). The rating of taste, rating of environment, and rating of service were composed based on the restaurant evaluation score (out of 5) provided by dianping.com. We conducted correlation and multicollinearity analyses before regression, and they demonstrated acceptable levels, as shown in <Table 8>. We measured the variance inflation factor (VIF) scores to assess the collinearity of the independent variables; the low VIF scores indicated that the multicollinearity issue was not problematic (Groebner *et al.*, 2005).

〈Table 6〉 Distribution of Eight Clusters

Coding
hallyu <-dtm2_cluster [,c ("Running man", "Korean stars", "stars", "Kang Ho Dong", "Korean Drama")]
language <-dtm2_cluster[,c("Chinese")]
recommendation <-dtm2_cluster[.c("recommendation", "social media celebrity", "comment")]
price <-dtm2_cluster [,c("price-performance", "price")]
taste0 <-dtm2_cluster [,c("light", "flavourful", "flavour", "delicious", "fresh", "yummy", "authentic", "mouthfeel", "tasty", "peppery taste")]
environment0 <-dtm2_cluster [,c("clean")]
location <-dtm2_cluster[,c("Myeongdong", "Hongdae", "Gyeongbokgung", "alley", "easy to find", "Market", "subway", "location", "map")]
service0 <-dtm2_cluster[,c("enthusiasm", "comfort", "help")]

〈Table 7〉 An Example of the Cluster "Service"

Terms				Sum of frequency
Reviews	熱情 Kind	舒服 Comfortable	帮忙 Help	
1	1	0	0	1
2	0	0	0	0
3	0	0	0	0
	1	0	0	1

〈Table 8〉 Correlation Analysis and Collinearity Analysis

Variable	1	2	3	4	5	6	7	8	9	VIF
Stars	1									
Hallyu	.039**	1								1.029
Language	.026**	.005	1							1.012
Recommend ation	.010	.021*	.040**	1						1.013
Price	-.041**	.047**	.046**	.054**	1					1.013
Location	.058**	.102**	.067**	.042**	.065**	1				1.028
Taste	.888**	.024*	.031**	.010	-.036**	.060**	1			2.581
Environment	.770**	.023*	.010	.015	-.036**	.045**	.760**	1		3.557
Service	.770**	.029**	.031**	.017	-.022*	.046**	.723**	.809**	1	3.142

〈Table 9〉 Results for Regression Model

	Variables	B	Std. Error	Beta	t	Sig.
Dependent Variable: Star	Constant	.135	.020		6.879	.000
	Hallyu	.024	.007	.015	3.651	.000
R-square: 0.826	Language	-.005	.012	-.002	-.434	.664
	Recommendation	-.003	.009	-.001	-.334	.739
	Price	-.031	.012	-.010	-2.530	.011
Adjusted R-square: 0.826	Location	.005	.006	.003	.794	.427
	Taste	.666	.007	.662	99.961	.000
	Environment	.090	.008	.089	11.389	.000
F-statistic: 6,080.351	Service	.216	.007	.220	30.054	.000

<Table 9> provides the coefficients of the regression model; as indicated, the model fits the data with an adjusted R-squared value of 0.826. The model is significant, with an F-statistic of 6,080.351. The explanatory variables of Hallyu, taste, environment, and service are statistically significant because all the p-values are 0.000. We can see that taste is the dominant factor affecting the predicted variable, as a one-unit increase in taste will increase the overall star rating score by 0.666. The price (p<0.01) of the food is also a significant factor that inversely affects the overall rating; a one-unit increase in price will decrease the rating by 0.031 units. However, the p-values for language (0.639), recommendation (0.700), and location

(0.455) are greater than the common alpha level of 0.05, indicating that these variables are not statistically significant. Subsequently, the fitted regression model is as follows:

4.3 Additional Analysis

Additionally, we conducted a separate logistic regression to verify the effects of the explanatory variables on the overall star ratings comprehensively. We created a dummy variable with the overall star rating as a dependent variable. The dummy variable was coded 1 if the quality score of the attribute was greater than or equal to 4.3 and 0 if the quality score was less

than 4.3. The threshold of 4.3 is the mean value of the overall star ratings, ensuring that customers with review star ratings over 4.3 are generally satisfied.

In the logistic model, the odds ratios are the key indicators. Odds, widely used in gambling, are the ratios of the expected number of times that an event will occur to the expected number of times it will not occur. Thus, we calculate the odds of an event as:

$$ODDS = \frac{p}{1-p} = \frac{probability\,of\,event}{probability\,of\,no\,event} \qquad (4)$$

$$p = \frac{ODDS}{1 + ODDS} \qquad (5)$$

Given that logistic regression is a logit model, it is the natural log of the odds of a rating score above 4.3. The model is:

$$Log(ODDS) = Log\left(\frac{\hat{p}}{1-\hat{p}}\right) = \alpha + \beta X \qquad (6)$$

If $\hat{p}$ is the probability of the event, which is coded 1, the overall star rating score is above 4.3. <Table 10> displays the results of the logistic regression model, with a focus on the numbers in the "Exp(B)" column. This is better known as the odds ratio obtained from the parameter estimates by computing e^{β}.

For the statistically significant factors to the predicted variable, the Exp(B) of Hallyu (p<0.04) is 1.196, which indicates that the odds of an overall star rating score above 4.3 are 1.196 times higher for reviews with Hallyu attributes than for reviews without them. In other words, the odds of a review with a score above 4.3 are 19.6% higher when the review is related to Hallyu. Taste has the most significant odds ratio, as highly satisfied tourists' reviews are 20.107 times higher in comparison to reviews with scores lower than 4.3. Meanwhile, the ratings of environment and service are statistically significant to dependent variables, with p-values of 0.000

V. Discussion

This study identified several attributes of the dining experience of Chinese tourists in Korea using online reviews based on a data analysis technique, LDA. The analysis examined the impact and extent of the identified attributes' effect on overall star ratings. The results of the LDA method delineated six main topics used by Chinese tourists in online reviews. For instance, words regarding taste frequently occur with menus. Tourists consider service and Chinese language service

〈Table 10〉 Results of the Logistic Regression Analysis

	B	S.E.	Wald	df	Sig.	Exp(B)
Hallyu	.179	.062	8.195	1	.004	1.196
Language	-.171	.104	2.896	1	.089	.837
Recommendation	.093	.081	1.331	1	.249	1.098
Price	-.138	.111	1.546	1	.214	.871
Location	-.097	.053	3.434	1	.064	.907
Taste	3.001	.070	1826.833	1	.000	20.107
Environment	.951	.066	209.248	1	.000	2.588
Service	.858	.061	195.114	1	.000	2.358
Constant	-21.057	.385	2998.184	1	.000	.000

essential factors, according to the LDA results. Finally, we divided the results into eight attributes: Hallyu, language, recommendation, price, taste, environment, location, and service. To verify whether these attributes influenced customer ratings, we conducted a regression analysis. We identified attributes and the ratings of taste, environment, and service as independent variables and overall star rating numbers as dependent variables in the regression analysis model. The results showed Hallyu, the price of food, and the ratings of environment, service, and taste to be statistically significant. Based on the results of the regression analysis, service, taste, and environment are the main factors that positively affect customers' dining satisfaction, consistent with prior research (Blank, 2006; Namkung and Jang, 2008; Sulek and Hensley, 2004). Restaurants that provide high-quality service, tasty food, an accommodating environment, and lower prices will garner high ratings from customers. We used additional linear regression analysis to confirm this. We extracted six topics from the online reviews and found that when Chinese tourists dine in Korea, they consider restaurants with staff that can provide service in Chinese. Although the language attribute was statistically insignificant, it is vital not only for Chinese tourists but also for tourists worldwide. Reisinger and Turner (2002) found that Asian tourists were particularly appreciative of hosts with some degree of competence in their respective native languages. Service in different languages or multiple-language menus can improve customer satisfaction to some extent and attract more foreign customers. The attribute of Hallyu in Chinese tourists' online dining reviews is the most significant finding that differentiates this study from prior research (Andaleeb and Conway, 2006; Namkung and Jang, 2008; Sulek and Hensley, 2004; Zhang *et al.*, 2014). One of the six topics extracted using LDA was Hallyu. The name of the famous Korean variety show, Running

Man, appeared at the top, indicating its frequent usage across tourists' reviews. This variety show invites masters of ceremonies (MCs) and guests (e.g., idols, actors, comedians) to complete tasks at Korean landmarks to win a race that often promotes traditional Korean food. This variety show is well-received in Asia, and the MCs are popular. Similarly, Running Man and a popular Korean celebrity named Kang Ho Dong appear in Topic 2. Running Man and Kang Ho Dong belong to Hallyu. This indicates that Hallyu is one of the attributes that Chinese tourists consider when reviewing restaurants. Furthermore, the investigation of how attributes influence star ratings showed Hallyu to be significant (p<0.05). This result confirms researchers' claims that culture influences people's decision-making (Hofstede, 1984; Kluckhohn, 1951; Rokeach, 1973) and that Korean culture has a strong impact on preferences for Korean restaurants (Lee *et al.*, 2015). Finally, our study is novel in its discovery of a new attribute (i.e., Hallyu), which plays a critical role in tourists' satisfaction from visiting restaurants.

Despite these significant findings, any interpretation of the results should consider the study's limitations. First, this study explored the attributes that Chinese tourists consider when dining in Korea. Hence, the results are limited to China and Korea. Second, although we treated overall star ratings as the indicator of customer satisfaction in this study, simple numbers do not adequately express customers' actual reactions. Therefore, sentiment analysis may be necessary to understand customers' emotions comprehensively. Third, we performed the analysis using only 10,252 reviews of 76 restaurants in Seoul, Korea. However, future research needs to obtain more duration and number of data, including Seoul and other regions. Finally, this study focused only on online restaurant reviews. We used the topic of the review as an independent variable affecting the restaurant's star rating. However, in-

dependent variables, such as the information on a poster, the restaurant fixed effect, and restaurant size, may affect the restaurant's star ratings.

5.1 Academic Implications

We believe this study has the following academic implications. First, the findings of this study reveal that Hallyu influences Chinese tourists' dining experiences in Korea and their satisfaction to some extent. As shown in <Table 1>, previous studies have argued that food quality, service, price, environment, and location affected the satisfaction of customers dining in restaurants (Al-Tit, 2017; Blank, 2006; Hyun, 2010; MacLaurin and MacLaurin 2000; Ryu and Han, 2010; Sulek and Hensley, 2004; Wall and Berry, 2007; Zhang *et al.*, 2014). However, previous studies largely disregarded the role played by cultural factors (e.g., Hallyu) in the dining experience of tourists. Cultural factors can be more important for the restaurant satisfaction of foreign tourists than for general restaurant satisfaction. This is because tourists can derive unforgettable experiences from the culture of the country to which they have traveled. Drawing on this research gap, this study is one of the first to consider cultural effects while investigating tourists' online reviews of Korean restaurants. From this perspective, this study extends the literature by investigating the influence of cultural factors in the tourism and hospitality sector.

Second, this study found that besides Hallyu, restaurant staff service, quality of food, restaurant environment, and price affected the dining experience of Chinese tourists in Korea. Previous studies showed that food quality, service, price, environment, and location are important factors for dining satisfaction (Hyun, 2010; MacLaurin and MacLaurin, 2000). In the context of Chinese tourists visiting Korea, we revealed that Chinese tourists consider restaurant staff service, qual-

ity of food, restaurant environment, and price when evaluating restaurants. Our finding is consistent with previous research (Pantelidis, 2010), although it did not target Chinese tourists in Korea. This study provides the key attributes (i.e., restaurant staff service, quality of food, restaurant environment, price, and Hallyu) of restaurant star ratings in the context of Chinese tourists visiting Korea.

Third, we proposed a six-topic model that provides important attributes like Hallyu through the LDA method. Future research on tourist satisfaction can use this study's six-topic model as a theoretical basis. In addition, our study was able to discover a new cultural factor, Hallyu, by analyzing online reviews using the LDA method. Future research can also discover new attributes related to tourist satisfaction through the method used in this study.

5.2 Practical Implications

The findings of this study offer several practical implications for restaurant owners and platform operators. First, restaurateurs should diversify the menu for tourists by increasing customers' choice of food types. This study extracted six topics from online reviews of tourists visiting restaurants using LDA analysis. Food-related words appeared in all the topics, including food taste, type, and quantity. Chinese tourists tend to eat various food types, such as Korean BBQ and chicken (see <Table 4>, <Table 5>). Based on the six topic models of this study, we summarized only food types by topic. As indicated in <Table 11>, each topic has various types of food.

In addition, the findings of our study show that Myeongdong and Hongdae are the places that appear most frequently in Chinese tourists' reviews and, consequently, emerge as the best locations for restaurants to attract Chinese customers. Therefore, the success

〈Table 11〉 Summary of Food Types by Topic

Topic 1	Topic 2	Topic 3	Topic 4	Topic 5	Topic 6
side dish	BBQ	bibimbap	rice cake	pig trotters	fried chicken
ox bone soup	Korean beef	crab roe	ribs	set meal	beer
ginseng	cold noodle	crabmeat	spine soup	kimchi stew	

of restaurants will require the development and provision of various foods for tourists.

Second, restaurants should take advantage of cultural factors like Hallyu to attract new tourists. The findings of this study prove that cultural factors influence customer satisfaction and the evaluation of restaurants. Given that Hallyu fascinates many Chinese tourists, restaurants can attract new customers by promoting the country's inherent culture. For instance, preparing menus based on the favorite foods of celebrities related to Hallyu could help attract new tourists. Knowledge of food and culture trends could enable online review platform operators to adjust their marketing strategies according to the increase in the number of users.

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The Effects of Cultural Factors in Tourists' Restaurant Satisfaction: Using Text Mining and Online Reviews

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Abstract

The proliferation of online reviews on dining experiences has significantly affected consumers' choices of restaurants, especially overseas. Food quality, service, ambiance, and price have been identified as specific attributes for the choice of a restaurant in prior studies. In addition to these four representative attributes, cultural factors, which may also significantly impact the choice of a restaurant for tourists, in particular, have not received much attention in previous studies. This study employs the text mining technique to analyze over 10,000 online reviews of 76 Korean restaurants posted by Chinese tourists on dianping.com to explore the influence of cultural factors on the consumer's choice of restaurants in the overseas travel context. The findings reveal that "Hallyu (Korean Wave)" influences Chinese tourists' dining experiences in Korea and their satisfaction. Moreover, Korean food-related words, such as cold noodle, bibimbap, rice cake, pig trotters, and kimchi stew, appeared across all the review topics. Our findings contribute to the existing tourism and hospitality literature by identifying the critical role of cultural factors on consumers', especially tourists', satisfaction with the choice of a restaurant using text mining. The findings also provide practical guidance to restaurant owners in Korea to attract more Chinese tourists.

Keywords: *Korean Wave, Online restaurant reviews, Satisfaction, Text mining, Tourism*

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