

Using deep learning to investigate digital behavior in culinary tourism

Digital
behavior in
culinary
tourism

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Abstract

Purpose – The purpose of this study is to gather insights into digital consumer behaviour related to Chinese restaurants by examining visual contents on Tripadvisor platform.

Design/methodology/approach – Using the deep learning approach, this research assessed consumer-posted online content of dining experiences by implementing image analysis and clustering. Text mining using word cloud analysis revealed the most frequently repeated keywords.

Findings – First, 4,000 photos of nine Chinese restaurants posted on Tripadvisor's website were analyzed using image recognition via Inception V3 and Google's deep learning network; this revealed 12 hierarchical image clusters. Then, an open-questionnaire survey of 125 Chinese respondents investigated consumers' information needs before visiting a restaurant and after purchasing behavior (motives to share).

Practical implications – This study contributes to culinary marketing development by introducing a new analysis methodology and demonstrating its application by exploring a wide range of keywords and visual images published on the internet.

Originality/value – This research extends and contributes to the literature regarding visual user-generated content in culinary tourism.

Keywords Deep learning, Text mining, Image analysis, Culinary tourism, Digital consumer behavior, Online contents

Paper type Research paper

1. Introduction

In this era of Marketing 4.0, digital content has become an integral part of culinary tourism promotion. Previously, restaurant managers invested time and money in intensive surveys in the hope of understanding and influencing consumers (Greenlaw and Brown-Welty, 2009). Now, consumers themselves have taken to posting their own restaurant experiences on various digital content sites (Moe *et al.*, 2017), and this can be a valuable source of consumer information to boost culinary tourism.

Previous research has investigated assorted types of digital content, such as product reviews (Gensler *et al.*, 2015; Moon and Kamakura, 2017; Tirunillai and Tellis, 2012), consumer messages posted on online forums (Netzer *et al.*, 2012), social tags (Nam *et al.*, 2017; Nam and Kannan, 2014),



social connections (Culotta and Cutler, 2016) and tweets (Liu *et al.*, 2017). However, there has been very little research investigating visual digital content, such as images or photos that both consumers and restaurant managers tend to post online.

Recent advancements in the computer vision field have enabled researchers to collect and assess this visual data (Mulhari *et al.*, 2016) and deep learning (specifically, convolutional neural networks) can now recognize and classify images (Ma *et al.*, 2018) based on similarities among them. Using the deep learning approach, this research implemented image analysis and clustering to assess the various types of consumer-posted online content regarding restaurant experiences.

The aim of this study to determine consumers' behavior in culinary tourism, specifically investigate what kind of information consumers seek on social networks before choosing a restaurant, after visiting a restaurant, what visual contents are published on social networks, what motivates consumers to share visual contents and with whom they share. Therefore, the research question in this paper is structured as prepurchasing and postpurchasing consumer behavior on social networks in culinary tourism.

2. Theoretical background

2.1 *Gastronomy's importance to a destination's image*

Tourists' perception of local food consumption value is effective in generating travelers' positive attitudes toward local food and attitudes toward local food positively affect food destinations' images. These attitudes toward both local food and food destination images positively affect tourists' behavioral intentions (Choe and Kim, 2018). Levitt *et al.* (2019) also determined there are specific factors that influence food tourists' desires and intentions to consume local cuisine while traveling. Kivela and Crofts (2006) revealed that gastronomy plays a major role in how tourists experience a destination and that some travelers return to a previous destination to again savor its unique gastronomy (Williams *et al.*, 2019).

The experiences of consuming local cuisines enable tourists to create positive and unforgettable memories, and such positive memories further enhance their identification with or strong attachment to local attractions and behavioral intention (Tsai, 2016). Rittichainuwat *et al.* (2008) investigated first-time and repeat tourists to Thailand and found significant differences in travel motivations among travelers with different demographic profiles and the significance of positive impressions of good food value (Velissariou and Vasilaki, 2014). Vukovic *et al.* (2019) in their study determined the economic, socio-cultural and environmental importance of wine tourism, which create a positive image of the destination.

A strong relationship exists between attitudes and behaviors, and this suggests that culinary experiences at destinations are highly related to attitudinal, psychological, perceptual and other behavioral factors. Further, both deliberate and opportunistic culinary tourists are equally significant in terms of market size, the economic contribution they make to destinations and their cultural/social interaction with communities (Yun *et al.*, 2011). Also, Shams (2015) discussed the relationship among reputation, image and branding and their influence on the internationalization of destinations. Moreover, Vujko *et al.* (2019) investigated the effect of women's entrepreneurship on tourism development in Serbia.

2.2 *Culinary tourist behavior and factors related to motivation on electronic word of mouth*

Getz and Robinson (2014) identified and analyzed those persons who are considered food lovers and are likely to be engaged in culinary tourism. Robinson and Getz (2013) found they exhibit four food involvement dimensions: food-related identity, food quality, social bonding and food consciousness, the last of which is the most powerful predictor of being a food enthusiast. Kim *et al.* (2011) explored the effects of perceived value on intention to revisit and satisfaction; and

satisfaction on intention to revisit in the context of the modified theory of reasoned action. [Son and Xu \(2013\)](#) categorized six themes in travel-dining experiences: as a means for novelty seeking; means for sensory pleasure; peak tourist experience; symbol of authenticity; symbol of prestige; and medium for cultural exploration. It was also found attitude and past behavior were significant predictors of tourists' behavioral intention ([Ryu and Han, 2010](#)).

Restaurant visitors' digital behavior can guide the implementation of information and communication technology services in tourism ([Torabi Farsani et al., 2016](#)). In the restaurant context, there is little research on word of mouth (WOM); however, food quality and atmosphere has been found to have a significant positive effect on electronic word of mouth (eWOM) ([Bangsawan et al., 2017](#)). Individuals' altruistic needs trigger positive eWOM, and a website's perceived usefulness for this has a significant main effect on eWOM intentions and substantially moderates the relationships between satisfaction/egoistic needs and eWOM intentions ([Yang, 2017](#)).

[Kim et al. \(2015\)](#) explored the drivers of eWOM such as a reflected appraisal of self, self-image congruity, cafe-relevant values and perceived quality, opinion leaders which motivated customers to write electronic reviews and post comments on social media. Presumably, consumers invest their time and energy into generating eWOM on social media to influence product awareness for and decisions made by other consumers ([Hoffman and Daugherty, 2013](#)).

[Lei and Law \(2015\)](#) investigated whether expensive restaurants generally do a better job stimulating customer satisfaction than inexpensive restaurants do. Other content analysis of Tripadvisor restaurants reviews revealed expensive restaurants received a higher percentage of negative comments than the less-expensive restaurants did. Thus, it has been found food quality, personal interaction quality, physical environment quality and perceived value influence eWOM behavior of customers in an indirect way through relationship quality ([Jalilvand et al., 2017](#)).

Both information and emotional feelings motivate purchase intention, eWOM ([Hamdani and Maulani, 2018](#)). [Wang \(2015\)](#) demonstrated gastronomy tourism images and eWOM had significantly positive effects on tourists' intentions, supporting that both are leading factors in attracting tourists, and images of cuisine held a stronger perception than the images of restaurants and food-related activities. Thus, the volume of consumers' restaurant reviews can significantly increase other consumers' interest in visiting a restaurant's webpage, where images of cuisine are often prominently featured. However, [Zhang et al. \(2010\)](#) found reviews written by professional editors (not consumers) played a negative role in attracting users to visit a restaurant's webpage.

2.3 Relevance of exploring visual user content using deep learning

User-generated visual content (images) is becoming increasingly popular and pervasive in recent times. These images, posted by users on online social networks, reflect topics of interest to users and infer user attributes from the posted images ([You et al., 2016](#)). With the development of computer deep learning and big data mining technology, it becomes possible to identify the content of massive numbers of tourist photos by artificial intelligence. For example, 35,356 Flickr tourists' photos in Beijing were identified into 103 scenes by computer deep learning technology and tourists' cognitive maps with different perceptual themes were visualized according to photos' geographical information by ArcGIS ([Stepchenkova and Zhan, 2013](#)). [Koivisto and Mattila \(2018\)](#) introduced a novel methodology of visual frame analysis and revealed how branded events stimulate the creation of visual user-generated content. The combination of brand posts with visuals and text-based messages gives consumers something to talk about and ultimately can lead to stronger relationships ([Brubaker and Wilson, 2018](#)). [Zhang et al. \(2019b\)](#) wrote, "the rapid development of location-based social networks (LBSNs) provides a substantial

amount of image data that not only reveals visual contents of POIs but also users' visual preferences" (p. 53). [Paül i Agustí \(2018\)](#) further found in his study that there is an overlap in the territorial distribution and attractiveness of tourism images distributed via three different media. The results indicated a partial overlap between the locations captured in user-generated images and those promoted by official tourist brochures and travel guides (p. 103).

Furthermore, [Zhang et al. \(2019a\)](#) indicated that visual content analysis of tourist photos is an effective way to excavate tourist behavior and explore tourists' cognition in the tourism destination. It was also observed in one study advertising effectiveness toward tourism photography and landscape using the eye-tracking method among Chinese consumers ([Li et al., 2016](#)). Meanwhile, [Ma et al. \(2018\)](#) used a data set collected from two social media sites, and they compared deep learning models with other machine learning techniques to examine the effect of user-provided photos on review helpfulness. Their findings showed deep learning models were more useful in predicting reviews than other models (p. 120).

3. Methodology

In this study, the following steps were taken to collect data:

- Collect images: we collected 4,000 photos of nine Chinese restaurants from the Tripadvisor website. These images included those of the Jin Xuan Chinese Restaurant, Canton Disco (The Shanghai EDITION), Yuexuan Chinese Restaurant, Lost Heaven, Paradise Dynasty, all located in Shanghai, China, and images of Celestial Court, Wan Li (Renaissance Beijing Wangfujing Hotel), Choy's Seafood Restaurant and King's Joy Beijing located in Beijing, China.
- Extract information from images: we used Inception V3 for image recognition, including Google's deep neural network. Inception V3 is trained on the ImageNet data set ([Krizhevsky et al., 2012](#)). This procedure is called image imbedding, and by using a neural network, it produces an enhanced data table for each image based on the image's contents. Then, similarities between photos were measured by the cosine distance of the corresponding vectors. Finally, the data generated from the cosine distance metric was used for hierarchical clustering, a procedure which helped identify similar types of photos and differences among the group of photos and also various types of photos related to restaurants posted online.
- Collect open-ended text responses: 125 respondents from China answered the following three open-ended questions:

Q1. What do you want to know before going to a restaurant?

Q2. What motivates you to post reviews online?

Q3. With whom do you want to share your reviews?

The survey was conducted online through the help of the Qualtrics platform and used non-probability convenience sampling. The respondents were Chinese nationals who visited Chinese restaurants. The demographic profile of respondents is provided in [Table 1](#).

- Extract information from text responses: the open-ended questions' responses then underwent a word cloud analysis using the Orange program ([Demšar et al., 2013](#)). The word's relative size represents how frequently it appeared in the responses compared to other words. This thus provides a visual illustration of the frequency of words used in the open-text responses. The word cloud produced meaningful and informative data from short responses of open-ended survey questions.

| Variable definition | Frequency | (%) |
|------------------------|-----------|-------|
| <i>Gender</i> | | |
| Male | 37 | 29.60 |
| Female | 88 | 70.40 |
| <i>Age range</i> | | |
| 18 – 24 | 22 | 17.60 |
| 25 – 34 | 50 | 40.00 |
| 35 – 44 | 20 | 16.00 |
| 45 – 54 | 15 | 12.00 |
| 55 – 64 | 9 | 7.20 |
| 65 – 74 | 7 | 5.60 |
| 75 – 84 or older | 2 | 1.60 |
| <i>Education level</i> | | |
| High school and below | 18 | 14.40 |
| Bachelor degree | 92 | 73.60 |
| Master's degree | 12 | 9.60 |
| Above | 3 | 2.40 |
| <i>Marital status</i> | | |
| Single | 98 | 78.40 |
| Married | 27 | 21.60 |

Table 1.
Descriptive statistics

4. Analysis and results

4.1 Image clustering

Our image analysis and hierarchical clustering generated 12 clusters related to restaurants. These included the following: atmospheric; table decorations; decorative lighting; decorative plants; interior designs; award photos; views from the restaurant; consumers having fun in the restaurants; consumers promoting food; consumer testimonials; menus; and food and drink presentations. These clusters provided us the types of photos posted online by both restaurant managers and consumers and individually discussed in the following paragraphs.

- Atmospheric is related to consumers' perceptions of the restaurant's external surroundings and internal environment, consisting of lighting, music and decoration style. It often creates a distinctive mood, especially romantic or nostalgic, which can enhance consumers' positive feelings while dining. Most Chinese restaurants create an ethnic-style atmosphere using characteristic Chinese elements (e.g. lanterns, Chinese calligraphy, window paper cuts, wooden furniture and bamboo handicrafts) that contributes to a festive and harmonious dining environment; this is believed to have a blessing effect on the Chinese food experience. [Figure 1](#) shows images depicting atmospheric attributes.
- Table decorations are the designed components on the dining table, including tableware, tablecloth, the arrangement of food or other trinkets on the tables. Customized patterns or various colors match the tone of the restaurant or the connotation of the dishes. Attractive table decorations foster a pleasant dining experience and improve consumers' perception of the food dishes. Often, diners share photos of the decorative table settings on social platforms, which supports a positive perspective on the food's taste. [Figure 2](#) depicts the table decoration images.
- Decorative lighting plays an important role in restaurant ambience and decorations using lamps can be diverse. [Figure 3](#) presents photos of the various ways to display

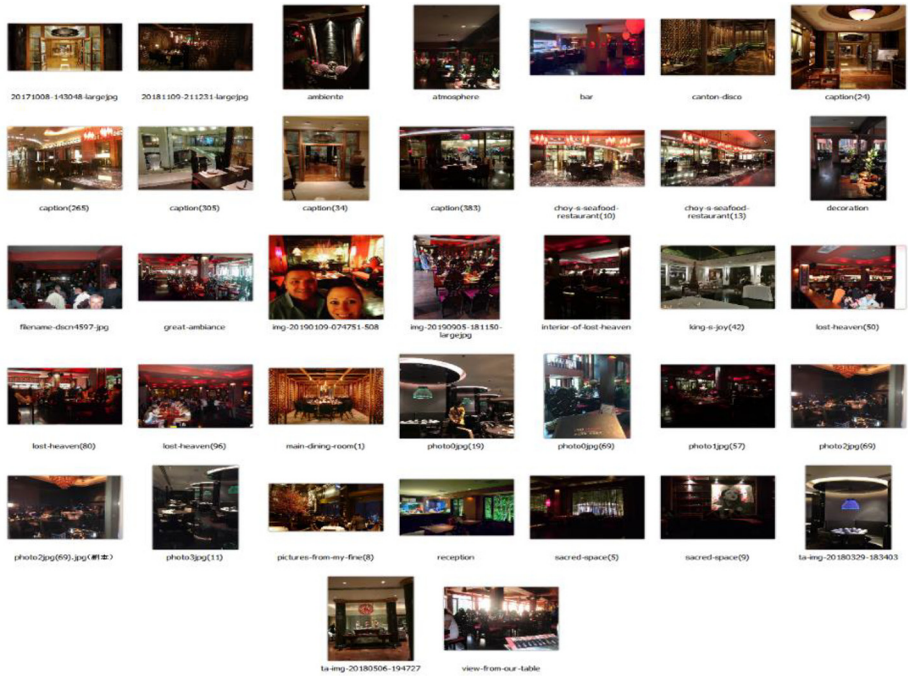


Figure 1.
Images of
atmospheric in
restaurants

Source: Images cluster generated from deep learning

lighting, whether it be hanging from the ceiling or placed on the table, and they suggest its versatility, which influences its effect.

- Using plants as decorations requires skill. Many Chinese consumers believe in feng shui, an ancient Chinese practice of arranging items in a room to balance and harmonize them within their environment. [Figure 4](#) presents images of plants in restaurants.
- Photos of restaurants' interior designs indicate their sophistication. The photos in [Figure 5](#) indicate good viewing positions usually have huge floor-to-ceiling windows, which provide a good visual experience and light.
- Restaurants' awards are often framed and prominently displayed. Thus, to appeal to consumers, restaurants display their awards where consumers can see them. [Figure 6](#) provides pictures of some of these restaurant awards.
- The restaurant's physical location can influence the consumer's visual experience while dining. [Figure 7](#) presents images of the restaurant views.
- Consumers who have happy experiences while dining in restaurants often use their cameras to record these moments and share photos to convey a sense of enjoyment. [Figure 8](#) displays images of restaurant consumers enjoying their dining experiences.
- Consumers may be asked by restaurant owners to participate in promoting the restaurant's food by being photographed with the restaurant's signature dishes or

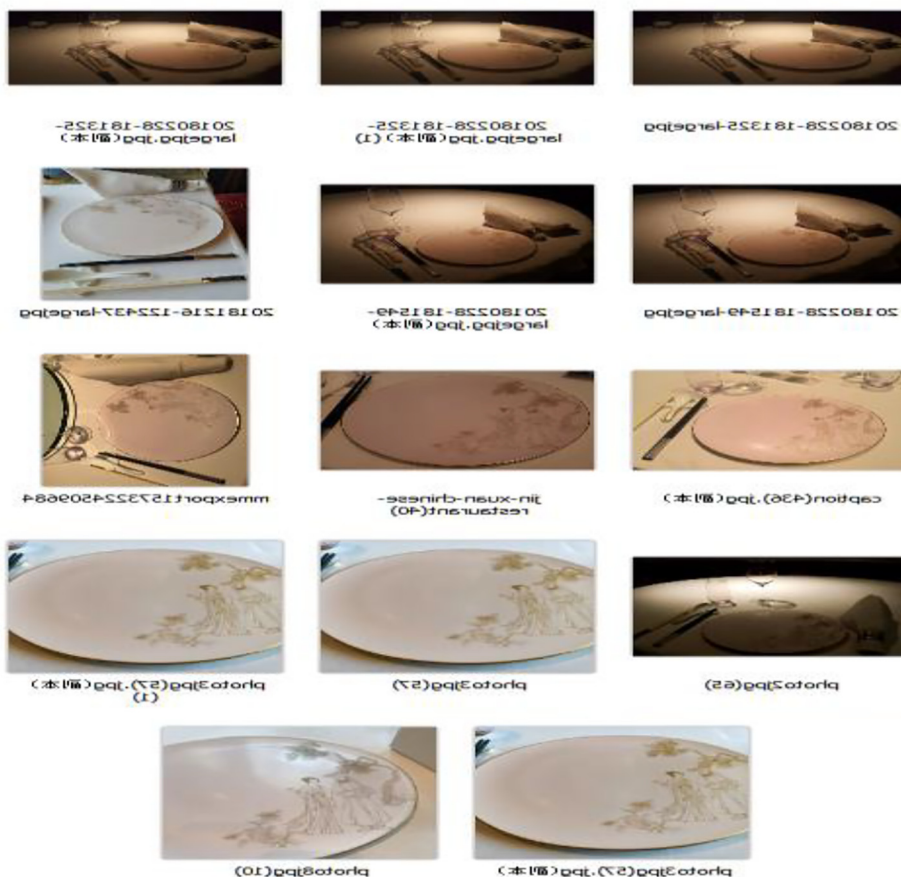


Figure 2.
Images of table
decorations

Source: Images cluster generated from deep learning

logo. The photos in [Figure 9](#) show consumers holding the same sign, as if they are promoting a certain activity or spirit.

- Consumers often provide testimonials endorsing a restaurant because of its quality and service. [Figure 10](#) displays a restaurant-provided guest book.
- Restaurant menus inform consumers of dining choices, meal prices and restaurant style. They usually highlight special dishes to attract consumers and recommend these dishes through special symbols. The menu's design is usually consistent with the restaurant's decorative style. [Figure 11](#) presents several representative menus.
- Among consumer-uploaded restaurant photos, those of food and drink are the most prevalent; this demonstrates that consumers most value this part of digital content. [Figure 12](#) represents photos of various food presentations that are used to attract consumers, including traditional noodles, afternoon tea dessert sets and decorated drinks (usually with flowers, fresh fruits or matching colors) to enhance consumers' regard for the drinks and the restaurants.



caption(695)



caption(705)



img-20181003-172544-largejpg



lost-heaven(77)



lost-heaven(88)



lost-heaven(99)



photo3jpg(32)



photo3jpg(50)

Figure 3.
Images of decorative
lighting

Source: Images cluster generated from deep learning

4.2 Extracting information from texts

Three open-ended questions were asked of the sample of Chinese consumers. Their responses were processed using word cloud analysis. The most frequently appearing responses are discussed in this section. We have also extracted other details related to the frequently used words to understand their responses.

The first question posed was “What do you want to know before going to a restaurant?”. The responses recorded related to five areas: food dishes, price, taste, environment and service quality. Consumers choose among restaurants that offer a variety of food categories. Usually, a restaurant’s main food dish determines the restaurant’s tone and provides a basis for consumers



Figure 4.
Images of decorative
plants

Source: Images cluster generated from deep learning

to choose. When choosing a restaurant, diners base their decisions after considering price and perceived value. Like other consumption areas, consumers generally seek a cost-effective dining experience when choosing a restaurant. Taste is considered a major part of a food dish's quality. Consumer ratings and digital message content indicate both the consumption worthiness and the quality of the food. In addition, knowledge of the overall food taste style (e.g. salty or sweet, spicy or bland) is sought by consumers. The quality of service delivered to the consumer during their dining experience, based on their expectations, can influence their satisfaction toward the whole purchasing process. [Figure 13](#) displays a word cloud analysis of the importance of the text related to the question of "What do you want to know before going to a restaurant?"

The second question posed was: *What motivates you to post reviews online?* In answer, the following four areas were revealed: offered discounts, received gifts or coupons, satisfaction from owner or employee service and sharing good photos. Understanding the power of positive reviews, restaurants often offer discounts to dining consumers to motivate them to make post-meal endorsements. Similarly, consumers frequently post online reviews to profit from discounts,

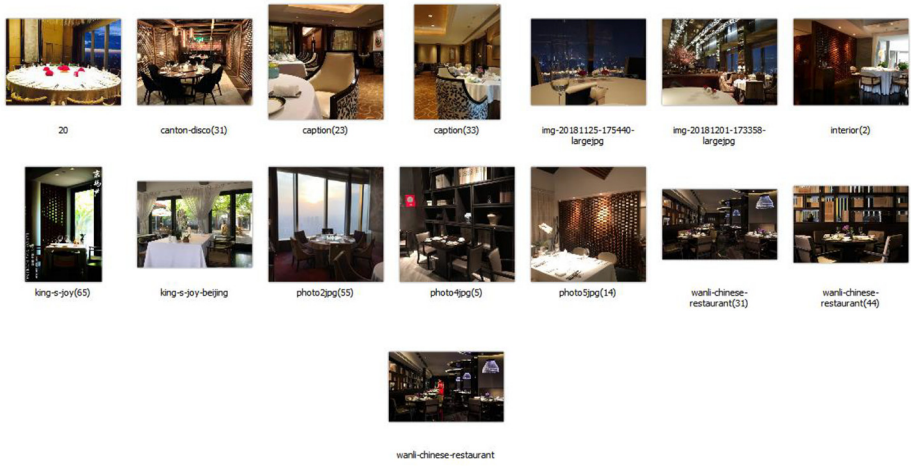


Figure 5.
Images of interior
designs

Source: Images cluster generated from deep learning

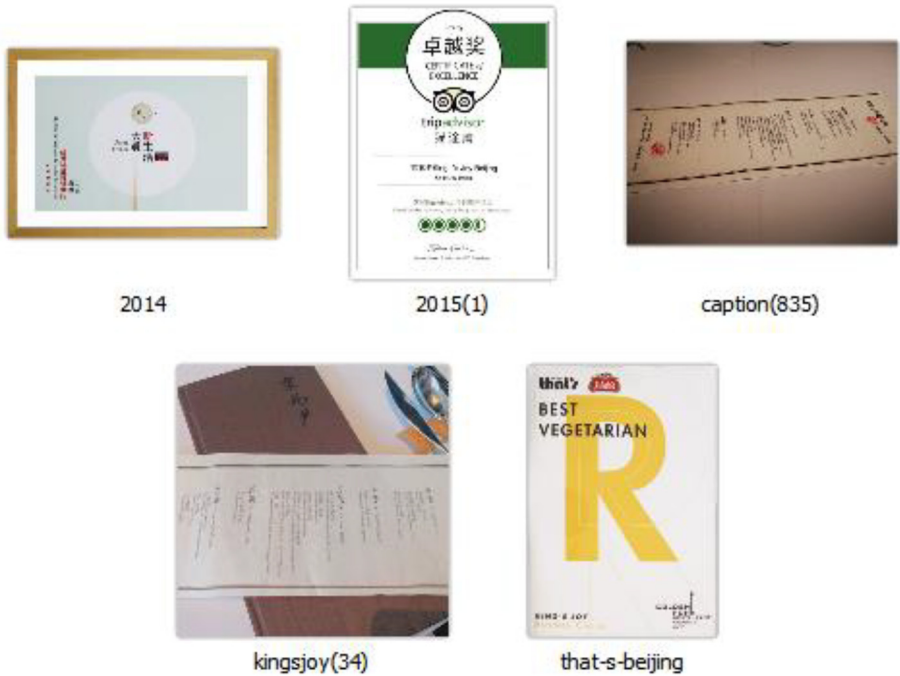


Figure 6.
Images of award
photos

Source: Images cluster generated from deep learning

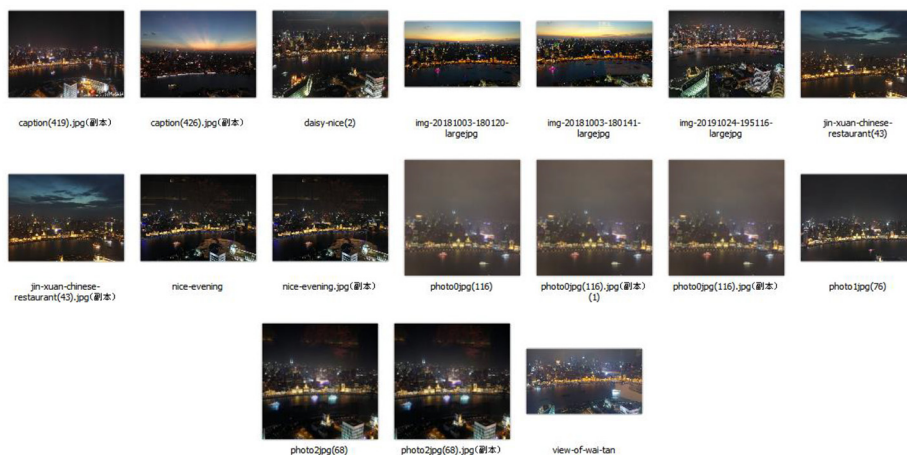


Figure 7.
Images of views from
the restaurants

Source: Images cluster generated from deep learning

which may make consumers feel their consumption was worthwhile or they received more than what they paid for. Like discounts, gifts and coupons offer consumers more motivation to post online because they have enjoyed these often-unexpected benefits, which may also increase their dining satisfaction. Gifts can also strengthen the restaurant's relationship with consumers. Consumers may post online reviews out of respect for and satisfaction of the service they received from owners or employees and find it is a good way to express their feelings. Figure 14 displays a word cloud analysis of the importance of the text related to the question of "What motivates you to post reviews online?"

Question 3 asked "With whom do you want to share your reviews?". The responses revealed five entities: owners, employees, other consumers, other restaurants and everyone. Consumers may feel a positive attitude toward the restaurant, and if they consider the restaurant owner an affable, charming person, consumers tend to post positive reviews. This more likely happens in small-scale restaurants because consumers could have more direct contact with the owner, and the consumer may want to share their review with the owner. Employees are often the "face" of the restaurant because they directly offer services to consumers. Thus, they convey the restaurant's image to the consumer and, to some extent, represent the restaurant. In their reviews, consumers often praise employees' performance, but others may use the platform to air complaints, hoping for improved service in the future. Consumers share reviews about the dishes and service they experienced in restaurants for consumers who may be unfamiliar with a restaurant. It is thought consumers' reviews may be more convincing than restaurant-generated text. Figure 15 displays a word cloud analysis of the importance of the text related to the question "With whom do you want to share your reviews?"

The relationship between the two studies: image analysis and an open-ended text-based survey were provided into a conceptual framework, which is shown on Figure 16.

5. Managerial implication

In managerial terms, the suggested conceptual framework in this study is vital because social networks have a significant impact on the choice of a restaurant and the further promotion of a restaurant by satisfied consumers on social media. It is also important for raising

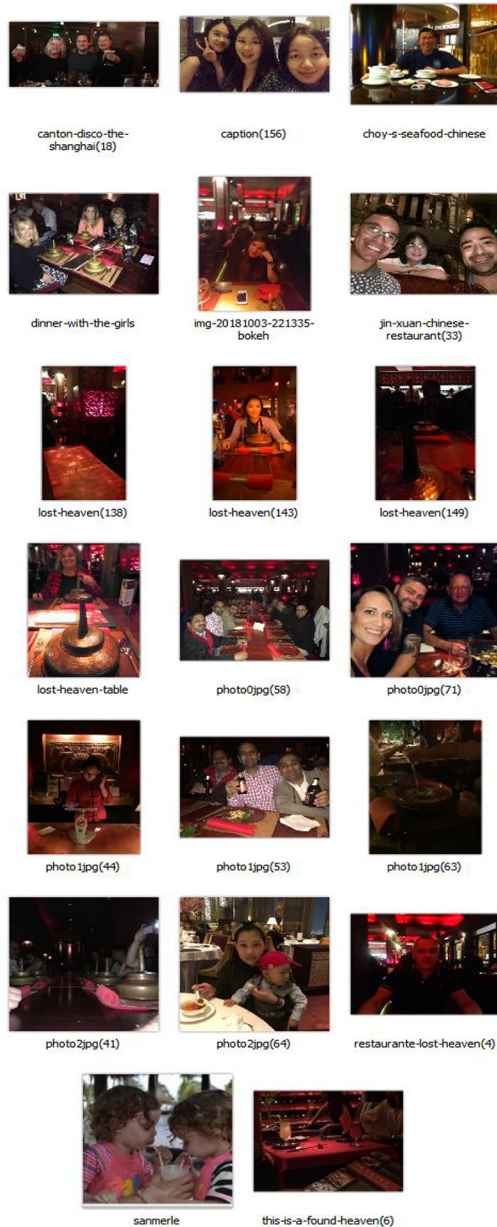


Figure 8.
Images of consumers
having fun in
restaurants

Source: Images cluster generated from deep learning



Figure 9.
Images of consumers
promoting food

Source: Images cluster generated from deep learning

awareness about the restaurant, as the communication between consumers covers new consumers. Restaurant managers, to induce a positive attitude toward the restaurant, should know the consumer behavior. Therefore, content created by consumers on social networks can help in developing a communication strategy. Managers can get an idea of what connects their consumers with the restaurant and how they perceive it.

This research has implications for digital marketing on social media. First, this paper investigates consumers' information needs before going to a restaurant and after purchasing behavior (motives to share) based on an open-questionnaire survey of 125 Chinese respondents. Word cloud analysis revealed the most frequently repeated keywords on the subject of what information consumers want to know before going to a restaurant and what motivates them to share photos after visiting to restaurants and with whom they share. The research contributes specifically to the development of culinary marketing by introducing a contemporary analysis methodology and demonstrating its application by exploring a wide range of keywords and visual materials published on the internet. Second, this study showed which specific restaurant services aspects, as reflected in the photos provided by users, actually resulted in positive feedback. The analysis showed that the 4,000 most-popular thematic photos about nine Chinese restaurants that were published by Tripadvisor users and restaurant managers revealed 12 image clusters. When posting photos, consumers can creatively capture a photo and present themselves at the restaurant and use it in publications. Moreover, managers can discover what

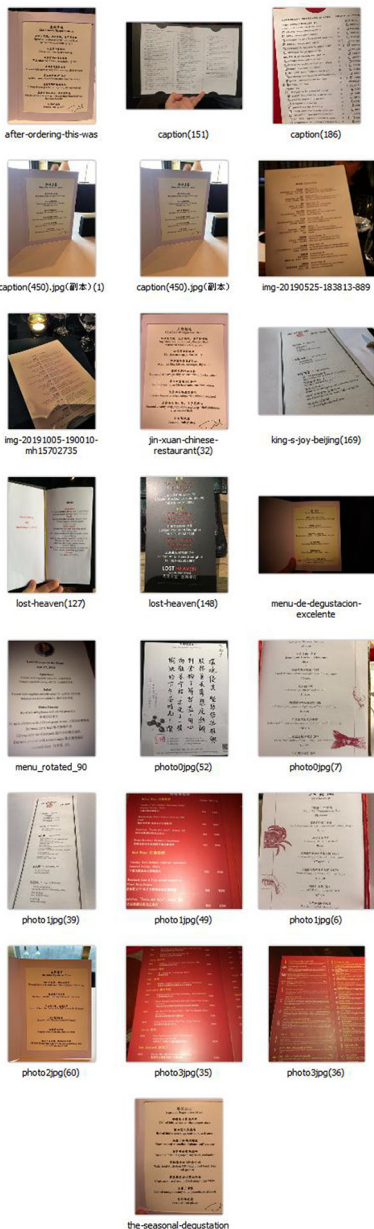


Figure 10.
Images of consumers'
testimonials

Source: Images cluster generated from deep learning

their customers associate with their restaurant and how they perceive it. This visual information can then be used to increase the efficiency of targeted advertising and to support value cocreation (Koivisto and Mattila, 2018).

This research indicates that the visual contents published by restaurants should be relevant and interesting enough to generate likes. They should also motivate users to repost them or offer comments, and this can build strong online consumer community of restaurants. Consumers engage more on promoting restaurants over online platforms, when they see other consumers are getting involved (Brubaker and Wilson, 2018).



Source: Images cluster generated from deep learning

Figure 11.
Images of menus

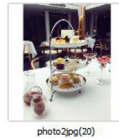


Figure 12.
Images of food and
drink presentation

(continued)



20170402-203727-largejpg



20170402-204050-largejpg



canton-disco-the-shanghai(24)



dessert



img-20180130-192426-largejpg



lost-heaven(5)



photo2jpg(35)



table-with-a-view



this-is-a-found-heaven(2)

Source: Images cluster generated from deep learning

Figure 12.

6. Discussion and conclusion

Culinary tourism is an ever-expanding way to attract tourists to a destination. The current literature shows an increasing interest in studying visual content in tourism and other areas, and deep learning of big data is providing a new way to understand tourists' overall preferences. Nevertheless, research in the subset of culinary tourism is very limited. Recently, however, social networks have become instrumental to our understanding of digital consumer behavior, particularly in culinary tourism.

In the restaurant business, there has been a traditional focus on textual reviews. But with the advent of consumers posting digital content online, restaurant managers must shift their focus to this medium to understand what leads to diners' satisfaction, or dissatisfaction, and how to respond effectively to customer needs and market dynamics.

Figure 13.
Images of “What consumers want to know before going to a restaurant?”



Source: Word cloud analysis using text mining

Figure 14.
Images of “What motivates consumers to post reviews online?”



Source: Word cloud analysis using text mining

Figure 15.
Images of “With whom consumers want to share their review?”



Source: Word cloud analysis using text mining

Visual elements attract a user’s attention because these are processed faster and easier than text (Powell *et al.*, 2015). A visual image can also amplify users’ responses to textual messages (Geise and Baden, 2015), which can lead to involvement through likes, comments and sharing with others. In addition, effective analysis of the number of photos submitted by users can help to extract the value of social knowledge on the Internet to provide better support for decision-making when tourists search for information.

This research thus extends and contributes to the literature regarding visual user-generated content in culinary tourism and provides useful insights for image marketing management for this business. Thus, the various components of online surveys, including photos, videos and text comments although not investigated in relation to each other in this paper, still stimulate participation, feed this effect and provide guidance for future research.

7. Limitations and further research

Some limitations are associated with this present study. Combining text and photos may enhance the perceived usefulness of reviews, which suggests online reviews’ various components should not be studied in isolation (Lo *et al.*, 2011; Vu *et al.*, 2015), as we have done in this study. However, Li *et al.* (2016) discovered photos with a single textual message, rather than multiple comments, tend to attract greater attention and texts in a known language are more attractive than those in unknown languages. Inception V3, which we used for image recognition using Google’s deep neural network analysis, does not consider the likely interactions between viewing photos and texts; it assumes they independently affect the user’s response to online reviews. This may be considered a limitation.

The current study is limited to only a few restaurants in China and its consumers, as well as to one platform, Tripadvisor. However, this study’s results can be useful for marketing tourist destinations to attract Chinese tourists, who are numerous, and international tourists with disposable incomes.

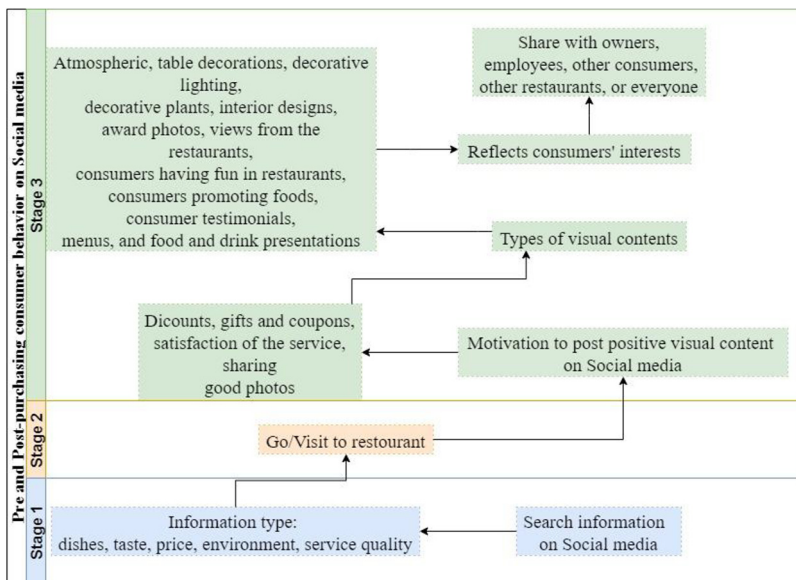


Figure 16.
Prepurchasing and
postpurchasing
consumer behavior
on social media

To test the effectiveness of this present analysis, future studies could be conducted in other tourism locations and on assorted review platforms to investigate the possibility of identifying different types of tourist behavior. In the tourism business, video content, animations and stories are increasingly being used; therefore, research in this direction would be useful for a wider understanding of tourists who use the internet. Finally, it is possible to study tourist behavior with additional online post variables such as those published on the first-time and then repeat restaurant visits, according to times of visits or level of tourist satisfaction and those linked with the users' demographic profiles.

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Further reading

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