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A fine-grained sentiment analysis of online guest reviews of economy hotels in China

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Abstract: This study aims to investigate the experiences of Chinese economy hotel guests by applying deep learning fine-grained sentiment analysis on 363,723 Chinese-text online reviews. Findings reveal that location is the domain that most of the positive sentiments are associated, followed by facilities, service, price, image, and reservation experience. Prominent features with negative sentiments include sound insulation, air conditioning, beddings, windows, toilets, TV sets, WiFi signals, towels, elevators, hair dryers, slippers, toilet bowls, return cash, invoices. Positive and negative sentiments are compared. This research offers an alternative approach and a more comprehensive understanding of the experiences and sentiments of Chinese economy hotel guests. Theoretical contributions and practical implications regarding economy hotel management are discussed.

Key words: Economy hotel, online reviews, guest experience, fine-grained sentiment analysis, deep learning, China

1. Introduction

Economy hotels, often called as limited service hotels or budget hotels, have been identified as an important and distinctive segment in the travel and hospitality industry since the mid-1990s(Fiorentino, 1995). In general, an economy hotel provides simple and comfortable accommodation at a modest price, and operates on the principles of economies of scale and standardization (Lei, Nicolau, & Wang, 2019). With a unique market position of offering good service quality and value for money, the economy hotel sector has successfully captured a varied customer segment and is rapidly growing across the world. Since 2000, economy hotels in China have rapidly developed in high demand driven by the rise of affluent Chinese households and the rapid development of infrastructure in the country (Gu, Ryan, & Yu, 2012). With an overall increase in disposable income among Chinese citizens, the economy hotel sector in the country has a high potential for continuous growth in companies, brands, quantities, and social effects (Peng, Zhao, & Mattila, 2015). China is not the same as the American and British markets, since the population is huge. Also, Chinese culture is rather unique and there is an extremely uneven divide between the poor and the rich (Li, Lai, Harrill, Kline, & Wang, 2011). Identifying and understanding the operational characteristics and customer expectations is critical for the success of economy hotels in China.

The nature of the economy hotel determines the challenges that have to be addressed for the sector to survive and further develop while competing with luxury or full-service hotels. Economy hotels need to focus on the utility of hotel stay and refine their service packages to satisfy customers' critical needs within a price limit because the consumption value of a night's stay should be increased to balance the room rate(Zhang, Ren, Shen, & Xiao, 2013). Thus, customer experience is a fundamental concept in service-dominated hotel management and is the new engine of economic growth for hotel chains (Pine & Gilmore, 2011). Changing customer expectations and increasing market competition in the economy hotel category have drawn managers' attention to the importance of customer experience, in which competitive advantages can be fostered for this hotel sector. However, traditional hospitality studies have mostly focused on customer experience in upper-scale or luxury hotels, and relatively little research attention has been paid to economy hotels.

Online platforms provide excellent tools for tourists to express their satisfaction level with the hotel stay experience, or even relive their dissatisfactory critics (García-Pablos, Cuadros, & Linaza, 2016). For economy hotel brands, online travel agents (OTAs), booking platforms or social media are critical marketing tools due to the low monetary cost and high benefits in advancing consumers' emotional or hedonic experience with the brand (Su, Reynolds, & Sun, 2015). Potential customers of economy hotels spend much time reading other people's online reviews to assist in making their own decisions (Schuckert, Liu, & Law, 2015). Online reviews related to services and customer satisfaction play a vital role in online sales of economy hotels. Therefore, studying online guest reviews proves to be an effective approach to understanding customer experience with economy hotels.

Sentiment analysis refers to natural language processing and text analysis to identify and extract evidence of subjective and emotional evaluations from the sources (Pang & Lee, 2005). Most of the current approaches for sentiment analysis in the tourism field have focused on rough analysis. As opinion mining and sentiment analysis research have evolved in both technique sophistication and analysis depth, fine-grained sentiment analysis takes into phrase-level and word-level topics and features associated with sentiment polarity and intensity consideration. It is timing to understand customer experience using this advanced sentimental analysis method (Li, Xu, Tang, Wang, & Li, 2018).

Furthermore, sentiment analysis of hotel guests' online reviews in English has undergone major developments in recent years. However, sentiment analysis research on Chinese tourism has not evolved significantly despite the exponential growth of emerging consumer markets in China. Thus, we used deep and advanced learning technologies to analyze online reviews of economy hotels in China. The purpose of the study is to analyze the experience of Chinese consumers with respect to economy hotels through deep and fine-grained learning sentiment analysis. The four main objectives of this study are: 1) to understand the general sentiments of guests at economy hotels by analyzing online reviews; 2) to identify the satisfactory features and the positive sentiments related to these features; 3) to identify the dissatisfactory features and the negative sentiments related to these features; and, 4) to compare positive sentiments and negative sentiments.

This study distinguishes itself by adopting an advanced sentiment extraction method to probe into the subtle experiences of economy hotel customers. By introducing deep learning to extract opinion from reviews, this research intends to improve the accuracy and effectiveness of analyzing online reviews about economy hotels and ensures that the voice of the customer is understood correctly and effectively (Rouliez, Tojib, & Tsarenko, 2019).

The rest of this paper is structured as follows. Section 2 reviews existing literature on economy hotels, hotel guest experience and customer sentiments and emotions in the service context. Section 3 introduces the research design of fine-grained sentiment analysis. The results of guests' positive and negative sentiments are presented in section 4. Section 5 discusses and compares the findings with past studies.

Contributions are summarized in Section 6. Last but not least, Section 7 concludes this paper with limitations and future research directions.

2. Literature review

2.1 Studies on economy hotels

While the operation of economy hotels across countries might vary slightly, the main difference between economy hotels and upscale hotels is the price and the scope of services offered (Brotherton, 2004). Economy hotels have a relatively lower tariff structure and the range of facilities and services available are minimal. The existing findings can be largely divided into two different segments. First, some studies offer a supply-side perspective of the operation of economy hotels. This group of research views economy hotels as a part of the industrial sector. The researchers explore management principles and business models for operational success. Researches have explored the critical success factors that have an impact on the performance of economy hotels (Brotherton, 2004; Zhang et al., 2013). In terms of distribution channels, economy hotel customers in China prefer making reservations through offline channels as they share a close relationship with traditional travel agencies (Lei et al., 2019). Yan, Shen, and Kong (2015) found that lease rentals and human resources are overvalued, while franchise fee and refurbishment cost are undervalued in the control costs of economy hotel sector. In China, it is observed that domestic private economy hotels benefit the most from managerial ties and also use a mixture of business ties to acquire intangible resources at different growth stages (Hsu, Liu, & Huang, 2012, 2015). To understand human resource management, Shen and Huang (2012) investigated job burnout and life satisfaction among domestic migrant workers, who account for a large portion of the staff in these hotels.

With the availability of online data, several earlier studies focused on monitoring and managing consumers' electronic word of mouth (WOM) about economy hotels (Su et al., 2015). Li, Peng, Jiang, and Law (2017) found that consumers have a favorable image of economy hotel chains in China. In terms of e-marketing, Kuo, Zhang, and Cranage (2015) stated that misleading hotel website photos result in negative brand trust for these hotels. Guo, Barnes, and Jia (2017) identified several important non-price dimensions including bathroom and checking in and out that are taken into consideration by customers while rating to two and three star hotels. However, very few studies have investigated the experience of economy hotel guests by analyzing large volume of user-generated content (UGC) data.

The second stream of studies are customer service oriented. These studies look at economy hotel development from the perspective of demand to understand the practical problems faced in service management (Peng et al., 2015). Li, Ye, and Law (2013) found that customers who stay in economy hotels have a lower overall satisfaction level than those who stay in luxury hotels. Regardless of the changes in the expectations of customers and services in economy hotels, the customers are more interested in core products and a comfortable stay than in customized products and services (Rahimi & Kozak, 2017). Li, Yen, and Uysal (2014) stated that competence and sincerity are the two essential dimensions of economy hotels that help to establish reliable and responsible service. However, few studies fully reflect the customer's experience and perception in detail (Chan & Ni, 2011). Thus, advanced data mining techniques can be adopted by researchers to understand the opinion, appraisal, attitude, and emotions of consumers with respect to economy hotels.

2.2 **Hotel guest experience**

Researchers have stated that over time, the economy has transformed into an experience economy (Pine & Gilmore, 1998). The term "experience" is often used to refer to product offerings in service settings that involve hedonic consumption, for example in travel, restaurants, hotels, and arts (Levy, 2010). Studies define customer experience in different ways: the internal and subjective response of customers, all points of contact, overall experience of customers, and guests emotional evaluation of their consumption experience (Brunner-Sperdin, Peters, & Strobl, 2012; Peng et al., 2015). Even though guest experiences at hotels have been extensively studied in literature related to hospitality and tourism management, most researchers pay attention to luxury hotels, food service, casinos, and theme parks(Cetin & Walls, 2016; Walls, Okumus, Wang, & Kwun, 2011). Economy hotel customers are perceived differently from those who select full-service and upscale hotel accommodations as they have different lifestyles and consumption attitudes (Fiorentino, 1995). However, existing knowledge mostly revolves around full-service hotels. For this reason, limited empirical evidence is available to understand the experience of customers who opt for economy hotels, which now represent a huge and expanding market segment. More in-depth studies are required to comprehensively examine consumer experiences in the economy hotel segment.

Researchers have studied economy hotel customer experiences to understand service quality and satisfaction (Huang, Liu, & Hsu, 2014; Ren, Qiu, Wang, & Lin, 2016). Economy hotel customers evaluate service quality based on their expectations against their actual experience (Lo, Wu, & Tsai, 2015). Service quality, as a consumers' judgment of the service contact with employees, was cognitively bundled into the hotel consumption experience (Rauch, Collins, Nale, & Barr, 2015). However, previous research has not reached a consensus on the critical factors of service excellence in economy hotels.

Xu and Li (2016) discussed dissatisfaction or unpleasant experiences in limited-service hotels. Influencing factors like, "tangible experience," "staff experience," and "aesthetic perception" were ranked positively (in order of significance) in influencing economy hotel guests satisfaction (Ren et al., 2016). Scholars have also attempted to understand the dimensions of experience from the perspective of physical environment (Luo & Yang, 2016) or human interaction (Rahimi & Kozak, 2017). Researchers found that room amenities, staff, and accessibility are important attributes that influence guest experience (Rauch et al., 2015). Attributes that influence hotel selection include price, physical features (such as size, facilities, design, space, and room features), services, hotel brand and image, and location (Tanford, Raab, & Kim, 2012). Customers select economy hotels based on price or value for money, hotel image, security and services, location, room, and the availability of food and beverages (Ruetz & Marvel, 2011).

Furthermore, existing studies mainly focus on identifying concepts at the macro level without paying sufficient attention to the nuanced aspects of the economy hotel experience, such as the specific elements that are a part of the factors like “facility” or “location”(Hua, Chan, & Mao, 2009; Ren, Qiu, Ma, & Lin, 2018). These can be ambiguous for researchers and practitioners while developing coherent knowledge to conceptualize ideal accommodation experience and formulate relevant strategies.

Also, conventional methods usually rely on a set of predefined hypotheses that are justified using the existing body of knowledge, and attempts are made to either accept or reject such hypotheses. This method is often not reliable because of poor sample quality and low response rates and leads to vague assessments of the guest experiences. However, through the analytical process of big data, we allow the data to reveal patterns that are reflective of consumers evaluative judgments and affective responses (Xiang, Schwartz, Gerdes Jr, & Uysal, 2015).

We also found that there is lack of tourism research in Chinese language. Chinese sentiment classification has certain characteristics that differ from English sentiment classification as there is a lack of inter-word spacing in Chinese and Chinese words often consist of the combination of more than one character (Peng, Cambria, & Hussain, 2017).

2.3 Customer sentiments and emotions in the service context

In the service context, sentiment analysis has attracted significant attention in recent years. Customer sentiment in most cases of online sentiment analysis refers to the emotions expressed by customers through text reviews (Geetha, Singha, & Sinha, 2017). While emotions refer to specific human feelings such as joy, sadness, anger, fear and surprise, sentiments take into consideration topics and features associated with sentiment polarity (positive, neutral, negative) and intensity (Kirilenko, Stepchenkova, Kim, & Li, 2018).

Tourism researchers have typically used two types of online content for their sentiment analysis: data obtained from professional websites and data from social media posts (Guo et al., 2017). It is noted that most of the datasets used in the literature relate to hotel accommodation and a small number of studies focus on restaurants and airlines (Kwok, Xie, & Richards, 2017).

Deep learning models were employed for sentiment analysis in the tourism field as an automated process of examining semantic relationships and meanings in reviews. As part of machine learning, deep learning is largely motivated by the field of artificial intelligence (AI) and has the general goal of emulating the human brain's ability to analyze, especially for complex problems. After decades of development, deep learning has experienced phenomenal success in a wide range of AI applications in tourism and hospitality that range from forecasting tourist arrivals (Sun, Wei, Tsui, & Wang, 2019) and demands (Law, Li, Fong, & Han, 2019), evaluating hotel locations (Yang, Tang, Luo, & Law, 2015), to analyzing online reviews (Ma, Xiang, Du, & Fan, 2018) and images(Deng & Li, 2018). With these successful applications, it is clear that there has been growing awareness and development of deep learning techniques in tourism marketing and consumer behavior studies.

Both lexicon-based and machine-learning sentiment analysis approaches were used in the tourism literature. Lexical approach uses a dictionary of sentiment-related terms, oftentimes together with estimates of their strength. However, existing lexicon-based sentiment analysis performs poorly on hotel reviews for two reasons. First, many words and expressions in hotel reviews, are not included in traditional sentiment lexicons. Second, some data-driven sentiment lexicon construction methods fail to provide rigorous sentiment scores (Calheiros, Moro, & Rita, 2017). The machine learning approach, which was adopted in our study, outperforms the lexicon-based approach concerning total accuracy (Xiang, Du, Ma, & Fan, 2017). What is more, most studies have focused on analysis through easily available online software and thus lacked applications of inherently generated algorithms. Our study aims to address these issues by applying an advanced sentiment analysis in identifying the sentiment valence in economy hotel service experience.

In tourism studies, some researchers have applied the text analytical approach by using a large quantity of consumer reviews from on-line booking websites to understand guest satisfaction and experiences (Berezina, Bilgihan, Cobanoglu, & Okumus, 2016; Xiang et al., 2015). However, existing research mostly presents the overall sentiment score for each review, overlooking a great deal of details in the review

(Wang, Wang, & Song, 2017). Although some reviewers give identical overall ratings, their feelings about different aspects of experience can differ (Schuckert et al., 2015). Most existing studies propose sentiment summary at sentence level and very few studies have been conducted to identify the fine-grained aspect level contextual preferences and their significance in generating accurate predictions for users. Potential customers are often not only interested in the reviewers' general sentiment about a certain hotel, but also in their opinions about specific experiential features (Sparks, So, & Bradley, 2016). Hence, for a further detailed analysis, it is necessary to get more information regarding the sub-features that may better explain customers' satisfaction and dissatisfaction.

Furthermore, sentiment analysis algorithms tend to be language-specific, we found that there is lack of tourism sentiment analysis research in Chinese. In hotel review analysis, word segmentation is a big challenge since existing Chinese word segmentation tools usually work well on formal texts but informal Internet contexts may have opposite meanings against their original meanings (Cui, Zhang, Liu, Min, & Ma, 2013). Accordingly, sentiment analysis schemes for Chinese hotel reviews are encouraged to advance practical and theoretical developments.

3. Research design

In this study, we adopted deep learning approach to extract fine-grained sentiments expressed in unstructured online reviews of hotels about certain features based on the subjectivity and the linguistic characteristics of Chinese. Deep learning produces state-of-the-art prediction results of sentiment analysis (Ma, Xiang, Du, & Fan, 2018). Sentiment analysis is typically conducted at different levels varying from coarse to fine. The fine level sentiment analysis, which is called aspect level or feature-based sentiment analysis (Medhat, Hassan, & Korashy, 2014), conducted accurate analysis on reviews containing mixed opinions. The fine-grained aggregation method present a summary of the features discussed in the reviews considering their hierarchical relationships with each other (Sparks et al., 2016). Compared with the traditional method, fine-grained sentiment analysis can identify the underlying sentiment of each aspect. Therefore, it can better resolve the research problem we set up in this study in the economy hotel sector.

Our fine-grained sentiment analysis process can be divided into five principal steps: hotel review collection, review preprocessing, manual annotation and auditing, deep learning model training, and predicting review with deep learning models.

3.1 Online review collection and processing

Hotel reviews were collected from eLong.com, one of the largest online hotel booking platform in China. Web crawlers in Python were used to collect data for this study in August and September 2018. The screening criteria for search was set as, “economy hotel.” The search results included all the economy hotels in Beijing and Shanghai and the numbers of reviews for each hotel. After data cleaning, the final dataset contains 363,723 reviews (175394 from Beijing and 187329 from Shanghai).

The process of data preprocessing includes word segmentation and manual tagging. The tool for word segmentation used in this study is Jieba, a source code that assists Python to segment words in Chinese (https://github.com/fxsjy/jieba). We used Word2Vec to calculate the similarity and the term frequency between words.

3.2 Manual annotation

Two types of expressions, hotel features and sentiment of hotel features, are to be identified from online reviews. As noted, these expressions can be words or a sequence of words. A basic fine-grained task is to extract a feature in a text and identify its sentimental polarity (Zhao, Qin, & Liu, 2014). Thus the reviews had to be manually annotated.

As no relevant Chinese lexicon in the field of tourism and hospitality could be found, we developed a specific annotation scheme (Table 1) based on Ren et al. (2016) and Huang et al. (2014).

Table 1. Annotation scheme

Code	Meaning	Label	Examples
E	Entity	B-E，I-E	Hotel, Service, Room
A	Attribute		
AF	Attribute Facilities	B-AF I-AF	Bed, Windows ,TV
AR	Attribute Reservations	B-AR I-AR	e-long, booking
AL	Attribute Location	B-AL I-AL	metro station, fast food
AI	Attribute Image	B-AI I-AI	Chain, brand
AV	Attribute Value	B-AV I-AV	Price, deposit

AS	Attribute Service	B-AS I-AS	Front desk, waiter
O	Others	O	Other reviews except above

The conventional BIO encoding for tag representation is utilized to label each sentence. B, I, and O denote the beginning, intermediate, and outside entities of aspect terms. Entity means objects discussed in the text, while attribute means characteristics of one aspect of these entities. Sentiment polarity was also considered in the annotation, where P implies positive sentiment and N implies negative. In the sentence, “The room quality is good,” we can extract “room quality” as the attribute and label “positive” as the polarity tag.

During the process of manual annotation, 14,000 reviews that were randomly selected from all the reviews have been annotated by eleven undergraduate students using the open source code software Notepad++. After manual annotation, the data was divided into a training set of 75% reviews and a testing set of 25% reviews.

3.3 Experiments and model training

The annotated reviews were changed into one-hot word vector by Word2vec which was developed by Google (Mikolov, Chen, Corrado, & Dean, 2013). Under the deep learning framework, Bidirectional Long Short-Term Memory (BiLSTM) – conditional random field (CRF) model was used to train and predict the data. BiLSTM is an advanced deep neural network sequence model to extract expressions in opinionated sentences (Luo et al., 2018). The model contains text layer, part of speech layer, connection layer, and output layer, where the output layer uses CRF for data output and model training using the training set. The training set is used to evaluate the trained model, and best experimental results on an average, reach 84 percent accuracy.

We applied the above effective model to predict the remaining unlabeled reviews and got the corpus for the follow-up sentiment analysis.

3.4 Data analysis

Our findings integrated sentiment polarity (that is, negative and positive sentiments) with the traditional word frequency-based guest experience evaluation. All the reviews are divided into six domains based on the annotation scheme. Feature words of each domain were identified and computed. Categorizing feature words helped us to determine the writer's attitude toward a particular issue. Identifying and categorizing the positive or negative sentiment of each feature reveals the evaluative judgments and attitude of customers toward a particular feature.

Adverbs play an important role in determining the strength of sentiments. We adopted the Chinese sentiment classification of adverbs (Table 2) by Chen et al. (2018), and constructed a word list to adjust the sentimental polarity, and assign each adverb in the reviews a sentimental value. The positive evaluation is recorded as a positive number, while negative evaluation is recorded as a negative number. According to the difference of the sentimental strength, the total score is divided into four sentimental levels, and the value is 0.25, 0.75, 1.25, and 1.75. If the sentence does not have the adverb of any sentiment, it is recorded as 1 (negative sentiment is -1).

Table 2. Score system of sentiment

Sentiment score	Adverbs(in Chinese)
0.25	稍微（a bit)、些许（fairly)、有点（a little)、有些（a

	trifle）、略（lightly）、略微（slightly）、多少（somewhat）
0.75	较（rather）、较为（comparatively）、比较（relatively）、不大（hardly）、不太（not much）、不很（adequately）
1.25	很（progressively）、更（increasingly）、更加（very）、更为（more）、越（further）、越发（more and more）、备加（doubly）、愈（even more）、愈加（all the more）、愈发（better）、越（all the better）、格外（extraordinarily）、太（too）、挺（well）、忒（overly）、非常（greatly）、特别（particularly）、相当（greatly）、十分（very much）、甚（deeply）、颇（quite）、颇为（incredibly）、甚为（seriously）、满（considerably）、蛮（decidedly）、够（enough）、多么（highly）、真（truly）、特别（exceptionally）、尤其（especially）
1.75	最（most）、最为（exceedingly）、极（immensely）、极为（intensely）、极其（extremely）、极度（acutely）、分外（excessively）、要命（severely）

The following sentimental value calculation model was used. In this case, C is the total sentimental value, T stands for the total T aspects, λ_t is the sentimental value of t, and p_t stands for the weight of t aspect. The weight is the ratio of the total number of sentimental words in t to the total number of sentimental words in T. The calculation of λ_t is that the number of sentimental words in this level multiplied by the number of sentimental words. Subsequently, the sentiment values of each attribute were calculated.

$$C = \sum_{t=1}^{T} \lambda_t \, p_t$$

The actual sentiment of each attribute is multiplied by the percentage of each attribute of total reviews. The general sentiment is the sum of all the features.

To further explore the content and structure of sentiments, all the high-frequency words were recorded and fed into Gephi, which is a data visualization and manipulation software to provide visual representations of the associated networks between words. This study applied Gephi in two steps: (1) collecting all the high frequency words and undertaking back-to-back translation from Chinese to English; (2) running a co-occurrence analysis on the most frequently mentioned words and building a cluster network. The results of semantic network analysis were presented in Section 4.

4. Findings

4.1 The general sentiment of customers about economy hotels in China

In accordance with the overall sentimental evaluation, “location” obtained the most positive evaluations (Score= 64860), followed by “facilities” (Score=24263), “service” (Score=17888), “price” (Score=4350), “image” (Score=193), and “reservation” (Score=20). The larger coefficient of the sentiments indicates that economy hotel guests were overwhelmingly positive about many aspects of their experiences. One reason for this could be that travelers are more inclined to post positive reviews rather than negative reviews (Zhang, Zhang, & Yang, 2016).

Satisfactory features that attracted a more positive sentiment and dissatisfactory features that lead to negative sentiments were identified (Table 3). In the next section, the sentiments of features are discussed in detail. In Table 4 in the Supplementary Materials document, we have summarized the frequency of all the words that are related to the features and sentiments.

Table 3. **Features generated positive sentiments and negative sentiments**

Domain	Rank	Positive sentiment Satisfactory features	Count	Positive sentiment tendency	Domain	Rank	Negative sentiment Dissatisfactory features	Count	Negative sentiment tendency
Service	1	服务（Services）	69952	90.1%	**Facilities**	1	隔音(Sound insulation)	24143	60.6%
Facilities	2	环境(Circumstances)	43703	92.6%	**Facilities**	2	空调（Air conditioners）	8322	59.3%
Location	3	位置（Location）	37482	82.3%	**Facilities**	3	床上用品（Beddings）(4410)	7822	56.4%
Location	4	交通（Traffics）	33146	92.7%	**Facilities**	4	窗户（Windows）	5814	55.1%

Location	5	地铁（Subways）	30735	81.5%	**Facilities**	5	卫生间（Toilets）（2923）	5346	54.7%
Price	6	性价比（Cost performance）	29671	89.3%	**Facilities**	6	电视（TV sets）（2874）	5061	56.8%
Reservation	7	押金（Deposit）	26634	99.5%	**Facilities**	7	信号（WiFi signals）	2630	51.0%
Facilities	8	卫生（Sanitation）	24059	81.7%	**Facilities**	8	毛巾（Towels）	2053	59.7%
Facilities	9	设施（Room facilities）	21719	83.1%	**Facilities**	9	电梯（Elevators）	2345	51.7%
Service	10	服务态度（Service attitudes）	19985	90.6%	**Facilities**	10	吹风机（Hair dryers）（683）	1257	54.3%
Facilities	11	床（bed）	13667	80.0%	**Facilities**	11	拖鞋（Slippers）（711）	1141	62.3%

Service	12	前台（Receptions）	7154	78.2%	**Facilities**	12	马桶（Toilet bowls）（825）	1077	76.6%
Facilities	13	装修（Decorations）	6359	76.0%	**Reservation**	13	返现（Return cash）	266	55.6%
Location	14	机场（Airports）	6248	86.5%	**Reservation**	14	发票（Invoices）	231	59.7%
Facilities	15	热水（Hot water）	4171	76.4%					
Service	16	服务员 (waitress)	3928	80.7%					
Location	17	公交（Buses）	3302	83.9%					
Location	18	火车站（Railway stations）	2426	86.2%					
Location	19	超市（Supermarkets）	2287	86.4%					

Location	20	小吃（Snacks）	2108	91.8%
Service	21	打扫（Cleanings）	1774	70.4%
Service	22	退房（Check-out）	1223	64.7%

Note: Count is total frequency of feature occurrence. Positive (Negative) sentiment tendency=Count of positive(negative) sentiment/Total count*100%.

4.2 Guests' positive sentiments

Based on the frequency, the ranking of features represents the degree of customer concern. Sentiment words describe the detailed reasons. The first satisfactory feature is “service″ and it includes positive comments about the services offered at the hotel. The guests indicated that they liked the economy hotel because the “service” was “pretty good” and “full of enthusiasm.” The “enthusiastic” and “thoughtful service” is represented through a “thumbs-up” and implies that they are “satisfied,” which leads them to “recommend” the hotel to others. The second satisfactory feature is “circumstances.” The customers enjoy the “clean,” “quiet,” and “comfortable” environment. The “circumstances” are considered “elegant” and “neat” and create an atmosphere with “love,” which in turn leads to “relaxation” and “pleasant enjoyment.”

The next satisfactory feature is “convenient” “location” that is “easy to find,” with “fast” and “well-equipped” “traffic” and transportation facilities. By analyzing the feature words, we found that the guests pay attention to transportation and geographical locations. They give importance to the distance from “metro station,” “airport,” “bus stations,” “railway stations” and look at it in terms of being “near,” “not far,” and “easy to find.” More importantly, they lay emphasis on the fact that they can access transportation “conveniently” and “free of charge.” Online reviewers also pay attention to “big” “supermarkets” that are “close” to the hotel so that guests can buy “affordable” items. While food and drinks are generally not expected in the economy hotel experience, provision of “a good many” of “snacks” at “affordable” prices that are “good” and “sanitary” is interpreted by guests as a delightful experience.

With respect to room, positive comments focus on “bed,” “decoration,” and “hot water.” Guests not only require “clean” and “neat” facilities, but also hope that facilities are “new” and “complete,” and rooms are “spacious.” A number of new words that indicate positive sentiments such as, “characteristic,” “briefness,” “fashionable,” “beautiful,” and “exquisite,” are found in the reviews. This implies that guests have high aesthetic requirements even from economy accommodations.

As for service, economy hotel customers believe that “service attitude” of staff adds to the level of satisfaction. In this respect, many positive comments such as, “pretty good” service at the “receptions” and appreciation of “cleanings” staff are observed. In general, they hope that staff at the hotel are “clean” and “polite,” and offer “thoughtful” and “free of charge” services. They speak highly of the “enthusiasm,” of front desk staff and how “patient” they are; moreover, “timely” and “caring” cleaning is indicated with a “thumbs-up” and these hotels are “recommended” to others.

With regard to price, a new finding is that the feature that brings the highest positive sentiment is “deposit,” with 99.5 percent reviews revealing this positive sentiment tendency. In the case of many economy hotels, when checking in at the hotel, guests mention that the way to pay the deposit is “pretty good” and it is “cheap,” or even that they did not need to pay a deposit because it is “free of charge.” Therefore, guests can “check-out” “fast” and in a “convenient” manner. This convenience can be a comparative advantage of economy hotels. The efficiency of check-out leads to a satisfactory culmination of the entire experience of staying at the hotel.

4.3 Guests negative sentiments

The features that lead to dissatisfaction are the ones that are associated with negative sentiments more than positive sentiments. We analyzed the 363,723 reviews and identified fourteen features, that include the major dissatisfactory experiences of the guests. We consolidated all the negative reviews to consecutively understand customer experience clearly.

The biggest negative experience is because of “bad” “sound insulation.” Customers describe this as “not good” experience because it is “noisy” or they are “awakened by noise.” The “poor” and “inferior” sound-proofing of rooms leads to a “terrible” experience.

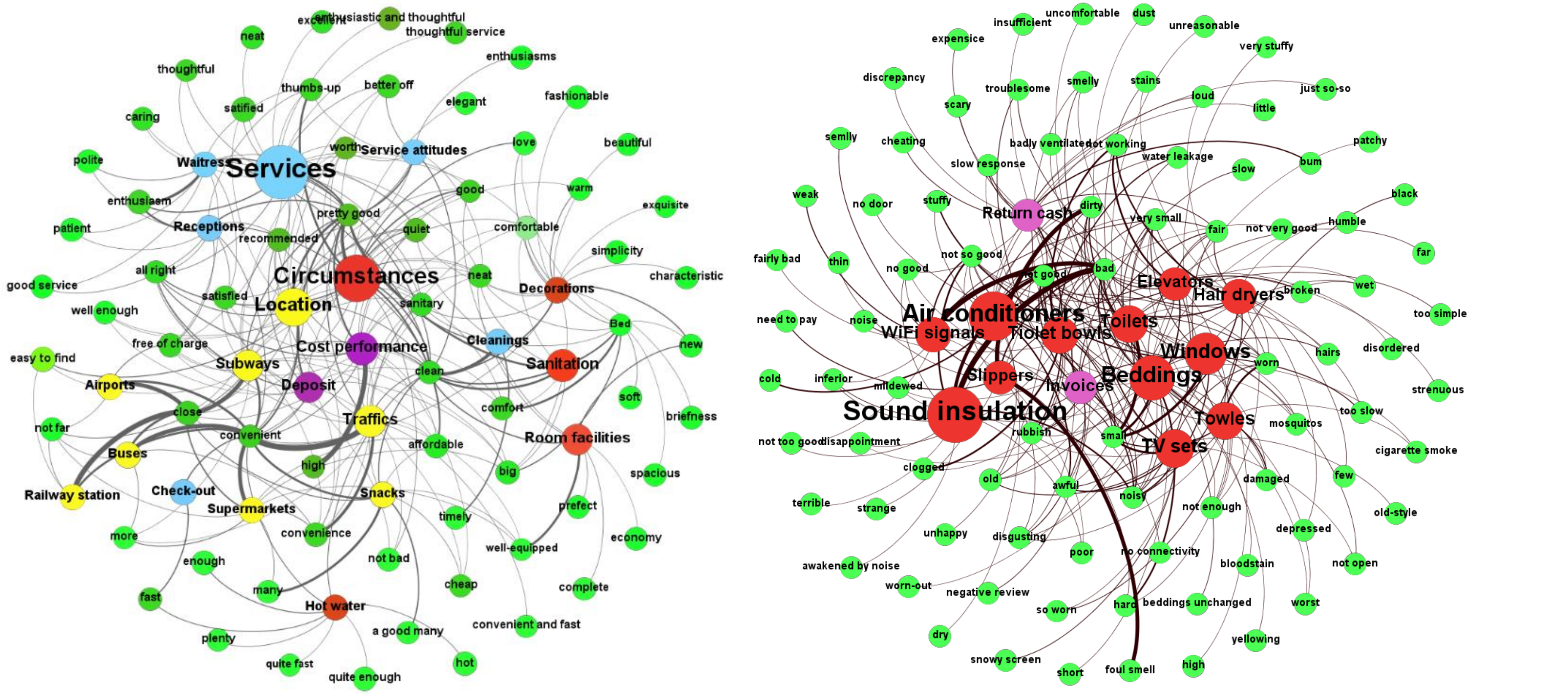
Electrical facilities in the hotel room also lead to a lot of negative sentiments, and “air conditioners” and “TV” are the cause of most complaints. A number of detailed reviews that mention these two aspects are presented in Table 5. The “air conditioners” are “noisy” and “cold,” or even “worn” out and have “water leakage.” Certain customers were disappointed with the “old-style” of “TV” and used negative descriptive words, such as “small,” “awful,” and as having a “snowy screen.” Customers have to deal with the ageing electronic devices in the economy hotels, and this leads to a bad experience.

Uncomfortable “bedding” also generates unpleasant experiences for hotel guests. Our research found many detailed reasons for the complaints about bedding. The most important aspects mentioned were that the bedding was “small,” “hard,” and “dirty.” The experience of customers was “disappointing” and they were unsatisfied because of “wet,” “yellow,” and “damaged” bedclothes. Some reviews also mentioned that the “worn-out” bedding in the hotel room was full of “cigarette smoke” or even “mildewed.” This lead to a “bad,” “disgusting” experience which was amplified when they saw “hair” and “bloodstain” on the “unchanged” “bedding”. An interesting finding is that many guests complained about the “windows” in economy hotels. They do not like the depressing interiors as the windows are usually “small” and “stuffy.” They complained that windows do “not open” and hence rooms are “badly ventilated.”

According to the results, factors such as “small” “toilet” in economy hotels was also mentioned in many negative reviews. “Towel,” “slippers,” “hair dryer,” and “toilet bowls” were found to be negative sentiment generators. Unfortunately, the toilets of economy hotels are “too simple,” “smelly,” and “dirty.” The “towels” are usually “worn” out and are dirty and “black.” “Slippers” are “thin” and “hard” but still “need to pay”. “Hair dryers” are “not working” and “not enough.” “Toilet bowls” are “clogged” and there is “water leakage.”

The “elevators” in economy hotels make customers feel uncomfortable as sometimes they are “not working” and are “small.” The “noisy” and “slow” elevators seem “troublesome.” Another issue in economy hotels is that they have insufficient “weak” “signal” coverage. The customers are unhappy when they have to face WiFi connection issues or “no connectivity” of the WiFi network. In terms of reservations, some customers complain about “return cash” and “cheating” and that staff take too much time in issuing the “invoices” or the process is “too slow.”

4.4 Comparison between positive and negative sentiments



(a)Image of positive sentiments (b)Image of negative sentiments

Figure 1. Sentiments image of economy hotel guests' reviews

Note: The nodes represent high-frequency words, and the size of the node shows its importance; the line connecting the nodes represents the association between word, and the distance between nodes represents the degree of closeness. Red nodes identified features of facilities, yellow nodes identified features of location, blue nodes identified features of service, purple node identified features of reservation and price, green nodes identified sentiments affiliated to the sentiments.

Figure 1 demonstrated the semantic clusters and networks of positive and negative sentiments of the reviews. Clusters represent the satisfactory or dissatisfactory features around positive sentiments or negative sentiments.

Features related to facilities (marked with red color in Figure 1) such as bed, hot water, decoration, receive many positive as well as negative comments. However, the foci of customer satisfaction and dissatisfaction were different when comparing the positive and negative sentiments As shown in Figure 1, many words related to location (yellow) are important in generating customers' positive sentiments, while they are not significant in the negative reviews. The positive sentiments concentrate on convenient location and high-quality service. Features related to service (blue) also obtained many compliments, indicating Chinese customers are overall satisfied about service of economy hotels. For the features of reservation (purple), the guests speak high of good deposit and quick check-out, but leave complaints about slow cash returning and invoicing.

In contrast, the structure of negative sentiments is more centric than positive sentiments, focusing on some specific facilities in guest room. Service environmental setting issues, including poor sound insulation, weak Wi-Fi, also lead to dissatisfaction. Some facility problems, such as noisy air conditioners, small TV, stuffy windows and dirty bedding generate the major negative sentiments.

5. Discussion and conclusions

In this study, we collected extensive data and ran a fine-grained sentiment analysis to enable a comprehensive understanding of the consumer experience in economy hotels in China. We identified features and sentiments words that reflect consumers' opinions on the important experiential features contributing to their (dis)satisfaction with economy hotel stays. Since this list of words is a discrete representation of guest experience, we consolidate them as integral description. Moreover, the structure of guest experience is identified through sentiment imaging by comparing positive and negative opinions. The results showed several similarities and differences.

First, the current study is in line with the research by Hua et al. (2009) in revealing that a pleasant experience includes many physical features of the hotel. These include, cleanliness, noise free environment, sanitary surroundings, new facilities, and elegant decorations. However, the findings of this study are different from the survey conducted by Xu and Li (2016), who identified that the main factors in limited-service hotels that have an impact on customer satisfaction are, good value and room quality. Upon examining online reviews, it is evident that low-price is not the biggest positive sentiment for economy hotel guests. our findings contradict with Duan, Yu, Cao, and Levy (2016)'s viewpoints that consumers of economy hotels focus on hotel performance from the perspective of more basic aspects. Economy hotel guests do not seem to be only driven by low prices; they also expect to demand other service aspects to fulfil a good experience (Xu, 2019). As this sector develops, service quality will be eventually the differentiator and will offer a competitive advantage among economy hotels.

Second, similar to the finding of Nash, Thyne, and Davies (2006), negative sentiments mainly arise from complaints about the facilities. As has been established, economy hotels in general cost less and offer basic guestrooms (Chan & Ni, 2011). Although Guo et al. (2017) found quietness and maintenance are less important to economy hotel customers compared with luxury hotels, we identified sound insulation as the biggest dissatisfactory factor by customers staying in economy hotels. Economy hotels often adopt space saving methods to control fixed and operational costs. Although cost saving is one of the major features of economy hotels (Yan et al., 2015), this study recommends that economy hotels should not reduce room size and over-simplify the facilities as this leads to serious negative sentiments. This phenomenon is quite different from the low expectations of facilities in budget hotel guests in the western countries (Brotherton, 2004).

Zhang et al. (2013) concluded that a typical economy hotel room is around twenty square meters with simple and inexpensive designs. Based on our findings we claim that design and amenities were very important for economy hotel guests in China based on their consumption habits. Chinese guests, even the ones who choose economy hotels, still hold traditional collectivism lifestyle such as family duty and caring for the children; therefore, their requirements of hot water and spacious room should be given high consideration. Our findings supplement the results from previous studies, such as that conducted by Xu and Li (2016), whose findings suggest that maintenance management are important even for economy sector hotels where cost and staffing have to be minimized.

Third, our research indicates that location of the hotel is a factor that has the most positive impact, and convenient access to public transit (such as subways, local bus station) is more important than private transportation (such as taxi). In the Chinese context the importance of geographic location of economy hotels is a vital factor for competitive priorities (Subramanian, Gunasekaran, & Gao, 2016). For economy hotel guests, transportation convenience is not only an auxiliary attribute, but is a core attribute that has an impact on customer experience. This finding is different from that of Peng et al. (2015).

We believe that the preferences for convenience in hotel location and transportation access may be related to cultural preferences for utility and function (Li et al., 2011), particularly in new environments. Guests are still sensitive to the "price-value relationship," but they change the low-price preference from room rate to public transportation and inexpensive food and beverages. If the location meets three basic requirements of consumers, namely, free-of-charge transportation, low-cost dining, and budget shopping, it can generate positive comments. Economy hotel chains often have many units in the same area and there is little variation among the hotels (Mellinas, Nicolau, & Park, 2019). In the economy hotel context, guests prefer hotels located close to transportation portals (airports and railway station) more than tourist attractions and entertainment venues. This contradicts the findings of Luo and Yang (2016) for hotels of all sectors. The finding is also different from that of studies on luxury and full-service hotels where guests look for exclusive dining experiences (Cetin & Walls, 2016). Economy hotel guests highly appreciate the availability of local services, products, and businesses (such as the number of restaurants and supermarkets nearby and snack availability).

Fourth, our study provides evidence of consistence with Ali, Amin, and Cobanoglu (2016)'s finding that soft elements such as harmonious customer interactions, positive attitude, and quick responses, are an important dimension that has an impact on customer experience. Contradicting with Mohsin and Lengler (2015) conclusion that economy hotel guests have low expectations with service, this study found guests in China's economy hotels cherish enthusiastic face-to-face interactions with human contact. Frontline employees who directly serve customers still determine much of the customers' service experience (Kandampully, Zhang, & Jaakkola, 2018). Therefore, a balance between technology and human touch has to be maintained in economy hotels. However, unlike the study conducted by Rahimi and Kozak (2017), this study indicates that professional and efficient service always ensures satisfaction amongst economy hotel guests. For economy hotels in China, Confucian values related to workplace dedication may result in relatively high expectations of Chinese visitors in performance related to service including check-in and cleaning.

6. Theoretical and practical contributions

While big data analytics has been touted as a new research paradigm in many disciplines, very few applications in the hospitality and tourism domain fully explore its capabilities. By using fine-grained classification, this study adds further depth to analytical methods in online review analysis. A major drawback in the current approach concerning sentiment analysis in hospitality is that it is technique-oriented, which heavily focuses on algorithms, without providing practical guidelines (Alaei, Becken, & Stantic, 2019). Our study attempts to address this limitation by taking into consideration the results to derive insights to improve the operation strategy of economy hotels.

As compared to a number of previous studies, this study has several important implications.

Firstly, from a theoretical perspective, our results extend the current knowledge on sentiment of hotel guests in economy hotels, an area where research is sparse generally in Asia and almost non-existent within the context of China (Yang, Xia, & Cheng, 2017). This study provides an opportunity for enhancing economy hotel management in general and China's economy hotel management specifically to understand the positive and negative sentiments of customers. In other words, it identifies the factors that are satisfactory and dissatisfactory in this hotel sector.

The findings of this study shed light on the nature of economy hotel guest experiences. The positive and negative sentiments expressed through reviews and the overall sentiment are important factors based on which economy hotels can appropriately ensure operational and strategic improvements. By depending on real experience data of guests rather than the perceived data from a survey, a more general and truthful interpretation of this issue is possible.

Secondly, we applied sentiment analysis method by considering the language habits of Chinese hotel customers. Hotels in Chinese region account for near 60 percent of the supply in the Asia–Pacific market (Yang & Cai, 2016). With the explosion of Chinese online hotel reviews, sentiment analysis plays an important role in opinion mining. Accurate understanding of sentiment expressed in Chinese reviews can establish a solid foundation for future research.

Thirdly, economy hotel managers need to respond to both positive and negative online comments to enhance and preserve the image of their establishments. Accordingly, we recommend that hotels and online review websites develop a review analysis platform by using automated text-mining methods, such as deep learning.

Fourthly, the new generation of economy hotels in China should consider redecoration or renovation in terms of design, hardware facilities and services, while considering aesthetics and comfort. In general, the operators must improve the rate of utilization, enlarge the space for activities, broaden the vision, and also reduce the cost of installation and maintenance. The designers could reduce the unnecessary decorations in rooms to make the space more open and create a warm and quiet environment. Fashionable, practical, and green furniture and electrical equipment could be introduced into guest rooms. Hotel service providers should attempt to provide better quality of service during customers' entire duration of stay.

Fifthly, economy hotel investors in China should pay more attention to their physical and virtual locations in response to the needs of their guests. Hotels can be built next to universities or the airport to target some special market segments, such as students and transit tourists.

7. Limitations and future research

The research some limitations which also point to future research. First, the performance of text analytics should be examined using multiple data sets in big data analytics. Future research should test the efficacy of deep learning models across different tourist places and across different review platforms in order to demonstrate its robustness.

Second, the most important component of sentiment analysis systems is sentiment lexicon. However, a Chinese lexicon in the tourism and hotel domain is still lacking. In future, the annotation scheme used in our study can be further improved to develop a supervised machine learning system for the automatic detection of positive and negative sentiment in tourism domain. A high-quality tourism-specific Chinese sentiment lexicon should be built upon extensive tourism data.

Third, the relationship between the extracted entities need to be optimized. Future research could apply the core technology of next generation artificial intelligence and integrate the new development with fine-grained sentiment analysis so that not only users' emotional viewpoints can be mined, but also the reasons behind them can be clarified.

Fourth, we only analyzed online textual reviews of economy hotels. Future research could enrich the analysis by developing techniques for analyzing textual contents incorporating other peripheral cues such as tags that come along with user-provided photos. Apart from textual information, photos of economy hotels can provide insights about the experiences of tourists and their specific interests. More research should be conducted to collect other information such as user ID in order to understand the relationship between personal characteristics or trip-related factors and consumer experience.

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