~~Analyzing~~ Cross-culture differences in tourists faced with Japanese hospitality: A text mining and rank-biased overlap measure study of satisfaction and dissatisfaction ~~between~~ factors in Chinese and ~~English-speaking customers of Japanese hotels with machine learning~~ Western cultures

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Abstract ~~Up until recently,~~ The Japanese spirit of hospitality and service, *Omotenashi*, is known worldwide for its excellence. Recent years show a steady increase in international tourists coming to Japan. Chinese tourists, especially, have been steadily increasing. However, before the shift that has brought in a global perspective in recent years, most studies in tourist behavior ~~have been~~ were biased for the Western world. ~~With the increase of Chinese outbound tourists to other countries, academic interest for this group has risen. Increasing variation amongst clients means that managing hotels in a way that caters to their different tastes becomes more important. Despite this,~~ Previous research shows that different cultural backgrounds result in different expectations and, arguably, different satisfaction factors. Knowing this, a cross-cultural ~~studies~~ study of differences between Asian and Western cultures ~~are scarce and predate~~ after the current boom in the Chinese economy ~~. This economical boom could change their expectations and experiences of Chinese customers, which would, in turn, influence their~~ in the environment of the high standard Japanese

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hospitality is fascinating. Will the top-grade hospitality of Japan influence both populations equally, or will their cultural differences set them apart? Will they be satisfied with the hotel's purely managerial attributes or be more concerned with environmental factors that hotel management cannot change? We bring light to these questions and the differences in each population's satisfaction and dissatisfaction ~~with hotels~~factors. Taking advantage of Web 2.0, we ~~can apply~~ applied Shannon's entropy to ~~automatically extract the satisfaction and dissatisfaction factors from very large data samples of online reviews without interfering with the decision process of customers. This means that we can measure how important are certain attributes of the hotel to customers, and whether those are managerial or environmental for the hotel. In our study, we performed a sentiment analysis using an SVM classifier and~~ extract these factors automatically and then use them in an SVM to classify a more extensive data set. We then measured the similarity value for ~~satisfaction and dissatisfaction keyword frequency ranking~~ the frequency in ranked keyword lists using the Rank-biased Overlap measure~~, which~~. It is used for top-weighted ranked lists with different elements and lengths. We found that Chinese ~~customers prefer big and clean spaces, and that Western customers are satisfied with friendly staff members~~tourists are less concerned with hospitality and more with room quality, in contrast with Western tourists, who were delighted by the staff behavior. We also found that Chinese tourists are ~~unsatisfied with~~concerned with the lack of a Chinese friendly environment, and ~~that~~ Western customers are unsatisfied with dirty rooms ~~,~~or the smell of ~~cigarette~~cigarettes.

1 Introduction

Japan has been known historically for its hospitality being the highest grade. The spirit of Japanese hospitality is celebrated around the world in a single Japanese word: *Omotenashi*. With roots in Japanese history and tea ceremony, their hospitality is famous around the world Al-alsheikh and Sato (2015). Therefore it would stand to reason that tourists visiting Japan would have this hospitality as their first and foremost satisfaction factor. However, it is known that customers from different countries and cultures hold different expectations Engel et al. (1990). Thus, it could be theorized that their satisfaction factors should be different. How will different cultures react and perceive hotels and their hospitality in this context? Our study attempts to bring light to this with two essential tourist populations that differ in culture to Japan: Chinese and Western tourists.

In the last couple of decades, the Japanese economy has been more and more affected by an increase in inbound international tourism (Jones et al. 2009) with a Year-on-Year Growth Rate of 19.3% in 2017, with a total of 28,691,073 inbound tourists that year (Japan National Tourism Organization

2019). From this total, the tourist population was mostly Asian (86.14%), and approximately a fourth of the total (25.63%) came from China. Western
[20] countries, counting English-speaking countries ~~in addition to~~ and the whole of Europe, make for 11.4% of the total, with a 7.23% of the total being countries where English is the official or the de facto national language. ~~Specifically for Chinese tourists , the effect~~ The effect of Chinese tourists on international economies ~~as well as~~ is increasing. From that, the number of researchers inter-
[25] ested in this phenomenon has been increasing as well. (Sun et al. 2017). With these and other multicultural ~~tourists~~ tourist populations, the tourist market is more and more diverse. Diversity in customers' cultural backgrounds means that their expectations when staying at a hotel will also be varied. Hotel management~~therefore~~, therefore, needs to cater to these ~~different~~ needs
[30] and expectations to increase ~~their customers'~~ customer satisfaction, maintain a good reputation, and ~~, therefore,~~ generate positive word-of-mouth.

However, recent studies on social sciences, ~~which includes~~ and thus, on tourist behavior, have been performed using surveys on populations that could be culturally biased for the western world (Nielsen et al. 2017; Jones 2010;
[35] Gunaratne 2009; Hogan and Emler 1978). Those that do include Asian populations in their analysis, most commonly study Chinese tourist behavior (e.g. Liu et al. 2019; Chang et al. 2010; Dongyang et al. 2015)~~, and a~~. The few that compare Asian to western tourist behavior (e.g. Choi and Chu 2000) ~~,~~ are commonly survey or interview-based studies with small samples, which~~while
[40] valid~~, while valid, can have its limitations. This gap in research creates a need for cross-cultural studies for the increasing Asian and Western tourist populations. It could be said that Westerners make for a smaller portion of the tourist population compared to Asians~~; however~~. However, according to Choi and Chu (2000), Westerners are known as "long-haul" customers, spending
[45] more than 45% of their budget on hotel lodging~~, compared to~~. In comparison, their Asian counterparts only ~~spending~~ spend 25% of their budget on hotels. ~~It is therefore important~~ Therefore, it is essential to study both Asian and Western tourist populations, their differences, and contrast the results with existing literature.

[50] With the advent of Web 2.0 and customer review websites, researchers realized the benefits of online reviews for research, and their importance for sales (Ye et al. 2009; Basuroy et al. 2003), customer consideration (Vermeulen and Seegers 2009) and perception of services and products (Browning et al. 2013), among other effects of online interactions between customers (e.g. Xiang
[55] and Gretzel 2010; Ren and Hong 2019). Consequentially, tourism research also began to use information collected online for data mining analysis, such as opinion mining (e.g. Hu et al. 2017), predicting hotel demand from online traffic (Yang et al. 2014), recommender systems (e.g. Loh et al. 2003), and more. Data mining, machine learning, and big data methodologies can increase
[60] the number of manageable samples per study. The increase can be from the hundred ~~or so~~ samples manually analyzed by researchers to the hundreds of thousands that are automatically analyzed by machines. This technology can

not only help confirm existing theories but also lead to finding new patterns and to knowledge discovery (Fayyad et al. 1996).

In this study, we take advantage of the availability of enormous amounts of online reviews of Japanese hotels by both ~~Chinese~~ Mainland Chinese tourists posting in *Ctrip*[1] and Western English-speaking tourists populations posting in *TripAdvisor*[2] . With this data, we can ~~both~~ confirm existing theories about their differences in behavior, as well as perform an exploration of the data to discover factors that could have been overlooked in the past. ~~For thispurpose~~In order to do this, we use machine learning to automatically classify review sentences as positive or negative opinions of the hotel~~, and~~. We then perform a statistical extraction of the topics that concerns the customers of each population ~~are mostconcerned about~~the most.

2 Research objective

~~The objective of this study~~This study's objective is to determine the difference in ~~preferences between Chinese-speaking~~ factors driving satisfaction and dissatisfaction between Chinese and English-speaking ~~customers of~~ tourists in the context of high-grade hospitality of Japanese hotels using text-mining techniques. We aim to determine a quantitative measure of similarity ~~(and therefore, difference)~~ between the satisfaction and dissatisfaction factors of both customer groups using a Rank-biased Overlap measure~~. Furthermore, we will measure if both customer groups have differences in priorities for the factors that are common to both groups. In addition~~, both in general and only considering their common factors. More importantly, we also ~~measure how intend to measure how~~ managerial and environmental attributes influence much satisfaction and dissatisfaction of both customer groups~~are influenced by managerial attributes (internal~~ . We define managerial attributes as those internal and modifiable to the hotel~~), as well as environmental attributes (external to the hotel)~~. In contrast, environmental attributes are external and unmodifiable, short of moving the hotel building in its entirety.

~~Furthermore, our~~Our proposal includes the use of large scale data from online hotel reviews in Chinese and English to study their differences in a statistical manner. In the past, survey-based studies have provided a theoretical background for a few specific tourist populations of a single culture or that travel with a single purpose~~; this~~. The short scope of those studies means that cultural and language differences often cannot be observed in a single study.

~~The difference in preferences that our study uncovers~~Our study attempts to uncover the difference in satisfaction and dissatisfaction factors between cultures. These factors can become the focal point for making improvements in the tourism and service industries ~~, increase the satisfactionof customers ,~~ ~~and influence them to write more satisfied~~ and increase customer satisfaction.

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[1] Ctrip: www.ctrip.com/

[2] TripAdvisor: www.tripadvisor.com/

Satisfied customers will then write more positive online reviews that will~~in turn~~, in turn, increase sales and attract new customers.

3 Theoretical background and hypothesis development

3.1 Japanese hospitality: *Omotenashi*

The spirit of Japanese hospitality, or *Omotenashi*, has roots in the countries history. However, to this day, it is regarded as the highest standard Ikeda (2013); Al-alsheikh and Sato (2015). There is even a famous phrase in customer service in Japan: *okyaku-sama wa kami-sama desu*, or translated "The customer is god". Some say that *Omotenashi* originated from the old Japanese art of the tea ceremony in the 16th century. However, other scholars found that its roots come from even earlier, in the form of formal banquets in the 7th century Aishima et al. (2015). The practice of high standards in hospitality has survived throughout the years. Today, it permeates all business practices in Japan, from the cheapest convenience stores to the most expensive ones. Manners, service, and respect towards the customer are taught to workers in their training, and high standards are always followed as to not fall behind in the competition. In Japanese businesses, hotels included, staff members are trained to speak in *sonkeigo*, or "respectful language", one of the most formal of the Japanese formality syntaxes. They are also trained to bow with different depths depending on the situation, where a light bow could be used to say: "Please, allow me to guide you". Deep bows are also used to apologize for any inconvenience the customer could have, followed by a very respectful apology as well. In fact, despite the word *omotenashi* being translated directly as "hospitality", it includes both the concepts of hospitality and service Kuboyama (2020).

It stands to reason that this high level of hospitality would be a positive aspect that would be at the top of satisfaction for any customer. However, in Japan, every business has this high level of hospitality, in differing levels of success. A simple convenience shop around the corner could be more hospitable if hotel management falls behind. Businesses have to strive to be the most hospitable, and hotels are not allowed to lag in this competition. Because of this, other factors such as proximity to a convenience store, or transport availability, or perhaps room quality might be more critical to a customer. Customers can always achieve satisfaction from hospitality elsewhere, so hotels need to be competitive in their hospitality.

Therefore we pose two hypotheses for our study:

Hypothesis 1a: *Chinese tourists are most satisfied with Japanese Omotenashi factors such as staff behavior or service.*

Hypothesis 1b: *Western tourists are most satisfied with Japanese Omotenashi factors such as staff behavior or service.*

However, Japanese hospitality comes from Japanese culture. Different cultures interacting with it could have a different reaction. While some might be

impressed by it, some might consider other factors more important to their
stay in a hotel. This point leads us to a derivative of the above hypothesis:

Hypothesis 1c: *Western and Chinese tourists have a different reaction to Japanese Omotenashi factors such as staff behavior or service.*

3.2 Customer satisfaction and dissatisfaction during hotel lodging

Customer satisfaction in tourism has been analyzed since decades past, Hunt
(1975) having defining customer satisfaction as the realization or overcoming
of expectations towards the service. Oliver (1981) defined it as an emotional
response to the provided services in retail and other contexts, and Oh and
Parks (1996) reviewed the psychological processes of customer satisfaction
for the hospitality industry. It is generally agreed upon that satisfaction and
dissatisfaction stem from the individual expectations of the customer~~, and as~~
. As such, Engel et al. (1990) ~~state that satisfaction and dissatisfaction are
therefore influenced by~~ states that each customer's background~~. This is why
Western and Asian, specifically Chinese , customers can~~, therefore, influences
satisfaction and dissatisfaction. Western and Chinese customers can then have
very different factors of satisfaction and dissatisfaction since they have different
backgrounds and cultures. These varying backgrounds will lead to varying
expectations of the ~~services that a hotel can provide for them~~hotel services,
the experiences they want to have while staying at a hotel, and the level
of comfort that they will have~~,~~. These expectations will be there from the
moment that they choose the hotel throughout their stay. These ~~contrasting~~
different expectations, in turn, will determine the ~~contrasting~~ distinct factors
of satisfaction and dissatisfaction for each kind of customer, as well as the
order in which they prioritize them.

Therefore we propose~~our first and second hypothesis~~:

Hypothesis 2a: *Chinese and Western tourists have different priorities in hotel attributes that lead to their satisfaction and dissatisfaction.*

Because of their different origins, expectations, and cultures, it stands to
reason Chinese and Western tourists could have completely different factors
to one another. Therefore, it could be that some factors do not appear in the
other reviews at all. For example, between different cultures, it can be that
a single word can express some concept that would take more words in the
other language. So we must measure their differences or similarities at their
common ground as well. For this, we prepare the following hypothesis:

Hypothesis 2b: ~~*The common satisfaction and dissatisfaction*~~ *The common factors identified for both Chinese and Western tourists will be placed at a different priority for each group.*

Studies on customer satisfaction (e.g. Truong and King 2009; Romão et al.
2014; Wu and Liang 2009) commonly use the Likert scale (Likert 1932) (e.g. 1
to 5 scale from strongly dissatisfied to strongly satisfied) to perform statistical

analysis of which factors relate most to satisfaction on the same dimension as dissatisfaction (e.g. Chan et al. 2015; Choi and Chu 2000). ~~This~~ The use of the Likert scale leads to correlation analyses ~~(either multivariate or single variable ones)~~ where one factor can lead to satisfaction, ~~while it is implied~~ implying that the lack of it can lead to dissatisfaction. However, a binary distinction (satisfied or dissatisfied) could allow us to analyze the factors that ~~solely~~ correlate to satisfaction ~~, as well as exploring factors which~~ and explore factors that are solely linked to dissatisfaction. There are fewer examples of this approach, but studies have done this in the past (e.g. Zhou et al. 2014). ~~While it is true that this method can~~ This method can indeed decrease the extent to which we can analyze degrees of satisfaction or dissatisfaction. However, it has the benefit that it can be applied to a large sample of text data via automatic sentiment detection techniques using artificial intelligence.

Previous research has also focused on factors that are controllable by the hotel managers and staff, i.e., hotel services, staff behavior, or facilities (e.g. Shanka and Taylor 2004; Choi and Chu 2001)~~, without focusing~~. However, little focus is put on factors that are uncontrollable by the hotel staff ~~, such as surroundings~~ that can play a part in the customers' choice behavior and satisfaction. Examples of these factors include the surroundings of the hotel, location, language immersion of the country as a whole, or ~~of~~ touristic destinations, as well as the integration of the hotel with tours available nearby, among other factors~~that can play a part in the customers choice behavior and satisfaction.~~.

This leads to ~~our third~~ the next hypothesis:

Hypothesis 3: *Satisfaction and dissatisfaction ~~stems~~ stem from both internal (managerial) and external (environmental) attributes of the hotel.*

The resulting proportions of managerial attributes to environmental attributes for each population could serve as a measurement of how much the improvement of management in the hotel can increase future satisfaction in customers.

3.3 Chinese and Western tourist behavior

In the past, tourist behavior analyzed from western samples ~~and surveys~~ was wrongly thought to be a representation of universal behavior across all cultures (Nielsen et al. 2017; Jones 2010; Gunaratne 2009; Hogan and Emler 1978). Recently, however, with the rise of Chinese outbound tourism, both academic researchers and businesses have decided to study Chinese tourist behavior (Sun et al. 2017). This ~~results~~ increase resulted in several studies focusing on only the behavior of this subset of tourists. To this day, cross-cultural studies and analyses for Asian and Western tourists are scarce. ~~A few examples are~~ One example is Choi and Chu (2000), where it was found that Western tourists visiting Hong Kong are satisfied more with room quality while Asians are satisfied with value for money~~;~~. Another is Bauer et al. (1993), where Westerners prefer the hotel health facilities while the Asian tourists were more

inclined to enjoy the Karaoke facilities of hotels, and both groups tend to have high expectations about the overall facilities. Another example is Kim and Lee (2000), where American tourists were found to be individualistic and motivated by novelty, while Japanese tourists were found to be collectivist and motivated by prestige and family, with an escape from routine and an increase in knowledge as a common motivator.

One thing to note with the above cross-culture analyses is that they were performed before the year 2000. The current Chinese economy boom is making an increase in the influx of tourists. However, that boom could have created a difference in the expectations of tourists. In turn, that boom could have influenced their satisfaction factors when traveling. Another note is that these studies were performed with questionnaires in places where it would be easy to locate tourists, i.e., airports. However, our study of online reviews takes the data that the hotel customers uploaded themselves.

More recent studies have surfaced as well. A cross-country study Francesco and Roberta (2019) using posts from U.S.A. citizens, Italians and Chinese tourists, determined using a text link analysis that customers from different countries indeed have a different perception and emphasis of a few predefined hotel attributes. According to their results, it appears that U.S.A. customers perceive cleanliness and quietness most positively and that Chinese customers perceive budget and restaurant above other attributes. Another couple of studies Jia (2020); Huang (2017) analyze differences between Chinese and U.S. tourists using text mining techniques and more massive datasets, although in a restaurant context.

These last three articles focus on U.S.A. culture, while our study focuses on Western culture. Another difference with our study is that of the context of the study. The first study Francesco and Roberta (2019) has the context of tourists from 3 countries staying in hotels across the world, the second choosing restaurant reviews from the U.S.A. and Chinese tourists eating in 3 countries in Europe, and the third analyzing reviews of restaurants in Bejing. Our study, on the other hand, focuses on Western culture, instead of a single Western country, and Chinese culture clashing with the hospitality environment in Japan, specifically. The importance of Japan in this analysis comes from the unique environment of high-grade hospitality that the country presents. In this environment, do customers hold their satisfaction to this hospitality regardless of their culture, or are other factors are more important to the customers overall? Our study measures this at a large scale across different hotels in Japan.

Other studies, perhaps recognizing that samples being comprised of people from Western industrialized countries are not representative, have gone further and studied people from many countries in their samples, and performed a more universal and holistic (not cross-culture) analysis. Choi and Chu (2001), for example, analyzed hotel guest satisfaction determinants in Hong Kong with surveys in English, Chinese and Japanese translations, with people from many countries in their sample. Choi and Chu

(2001) found that staff service quality, room quality, and value for money were the top satisfaction determinants. As another example, Uzama (2012) produced a typology for foreigners coming to Japan for tourism, without making distinctions for their culture, but their motivation in traveling in Japan. In another study, Zhou et al. (2014) analyzed hotel satisfaction using English and Mandarin online reviews from guests staying in Hangzhou, China coming from many different countries. The general satisfaction score was noticed to be different in those countries~~, but a deeper~~. However, a more in-depth cross-cultural analysis of the satisfaction factors wasn't performed. As a result of their research, Zhou et al. (2014) thus found that customers are universally satisfied by welcome extras, dining environments, and special food services.

Regarding Western tourist behavior, a few examples can tell us what to expect when analyzing our data. Kozak (2002) found that British and German tourists' satisfaction determinants while visiting Spain and Turkey were hygiene and cleanliness, hospitality, the availability of facilities and activities, and accommodation services. Shanka and Taylor (2004) found that English-speaking tourists in Perth, Australia were most satisfied with staff friendliness, the efficiency of check-in and check-out, restaurant and bar facilities, and lobby ambiance.

Regarding outbound Chinese tourists, academic studies about Chinese tourists have increased (Sun et al. 2017). Different researchers have found that Chinese tourist populations have several specific attributes. According to Ryan and Mo (2001) and their study of Chinese tourists in New Zealand, Chinese tourists prefer nature, cleanliness, and scenery in contrast to experiences and activities. ~~With some overlap,~~ Dongyang et al. (2015) studied Chinese tourists in the Kansai region of Japan and found that Chinese tourists are satisfied mostly with exploring the food culture of their destination, cleanliness, and staff. Studying Chinese tourists in Vietnam, Truong and King (2009) found that Chinese tourists are highly concerned with value for money. According to Liu et al. (2019), Chinese tourists tend to have harsher criticism when compared with other international tourists. ~~And~~ Moreover, as stated by Gao et al. (2017), who analyzed different generations of Chinese tourists and their connection to nature while traveling, Chinese tourists prefer nature overall~~, but~~. However, the younger generations seem to do so less than their older counterparts.

Although the studies focusing only on Chinese tourists or only on Western tourists have a narrow view, their theoretical contributions are valuable. We can see that depending on the study and the design of questionnaires, as well as the destinations~~,~~; the results can vary greatly. Not only that, but while there seems to be some overlap in most studies, some factors are completely ignored in one study but not in the other. ~~However, since~~ Since our study uses data mining, the definition of each ~~subject or~~ factor is left for ~~the~~ hotel customers to decide en masse via their reviews~~(instead of being defined by the questionnaire)~~. This means that the factors will be selected through statistical methods alone~~. This opened opportunities~~, instead of being defined by the questionnaire. Our method allows us to find factors that ~~the writers of this~~

~~study~~ we would not have contemplated~~, or avoid~~. It also avoids enforcing a factor on the mind of ~~reviewers~~ study subjects by presenting them with a question that they ~~didn't~~ did not think of by themselves. ~~In addition,~~ This large variety of opinions in a well-sized sample, added to the automatic findings of statistical text analysis methods, gives an advantage to our study compared to others with smaller samples. Besides, this study could help us analyze the satisfaction and dissatisfaction factors cross-culturally and compare them with the existing literature.

Undoubtedly previous literature has examples of other cross-culture studies of tourist behavior and to further highlight our study and its merits. A contrast is shown in Table 1. This table shows that older studies were conducted with surveys and had a different study topic. These are changes in demand Bauer et al. (1993), tourist motivation Kim and Lee (2000), and closer to our study, satisfaction levels Choi and Chu (2000). However, our study topic is not the levels of satisfaction but the factors that drive it, as well as dissatisfaction, which is overlooked in most studies. Newer studies with larger samples and similar methodologies have emerged, although two of these study restaurants instead of hotels Jia (2020); Huang (2017). One important difference is the geographical focus of their studies. While Francesco and Roberta (2019); Jia (2020); Huang (2017) have a multi-national focus, we instead focus on Japan. The focus on Japan is important because of its leading rank in hospitality across all types of businesses. This raises the question: in such an environment, will the customers be universally satisfied with this factor, or will they have differing views within their cultures? Our study brings light to the changes, or lack thereof, in different touristic environments where an attribute can be considered as excellent. The number of samples in other text-mining studies is also smaller to ours in comparison. Apart from that, every study has a different text mining method.

Table 1: Comparison between cross-culture or cross-country previous studies and our study

	Bauer et.al (1993)	Choi and Chu (2000)	Kim and Lee (2000)	Huang (2017)	Francesco and Roberta (2019)	Jia (2020)	Our study
Comparison subjects	Asians vs Westerns	Asians vs Westerners	Anglo-Americans vs Japanese	Chinese vs English-speakers	USA vs China vs Italy	Chinese vs US tourists	Chinese vs Westerners
Study topic	Changes in demand	Satisfaction Levels	Tourist Motivation	Dining experience of Roast Duck	Perception and Emphasis	Motivation and Satisfaction	**Satisfaction and Dissatisfaction**
Geographical focus	Asia Pacific region	Hong Kong	Global	Beijing	Multi-national	Multi-national	**Japan**
Industry	Hotels	Hotels	Tourism	Restaurant (Beijing Roast Duck)	Hotels	Restaurants	Hotels
Study subjects	Hotel managers	Hotel customers	Tourists arriving in airport	Diners online reviews	Hotel customers online reviews	Diners online reviews	Hotel customers online reviews
Sample method	surveys	surveys	survey	text mining	text mining	text mining	text mining
Number of samples	185 surveys	540 surveys	165 Anglo-American 209 Japanese	990 Chinese reviews 398 English reviews	9000 reviews (3000 per country)	2448 reviews (1360 Chinese) (1088 English)	**91,172 reviews (49,561 Chinese) (41,611 English)**
Study method	statistics	VARIMAX	MANOVA	Semantic Network Analysis	Text Link Analysis	Topic modeling (LDA)	**SVM and Rank-biased overlap**
Subject nationality	Asians: China, Fiji, Hong Kong, Indonesia, Malaysia, Singapore, Taiwan, Guam, Tahiti, Thailand Westerners: Australia, New Zealand	Asians: China, Taiwan, Japan, South Korea, South-East Asia Westerners: North America, Europe, Australia, New Zealand	USA, Japan	English-speakers: U.K., USA, Australia, New Zealand, Canada, Ireland Chinese-speakers: China	USA, China, Italy	USA, China	Chinese-speakers: China English speakers: (U.K., USA, Australia, New Zealand, Canada, Ireland)

3.4 Data mining, machine learning, knowledge discovery and sentiment analysis

In the current world, data is presented to us in larger and larger quantities. Today's data sizes were commonly only seen in very specialized large laboratories with supercomputers a couple of decades ago. However, they are now standard for market and managerial studies, independent university students, and any scientist that can connect to the Internet. Such quantities of data are available to study now more than ever. Nevertheless, it would be impossible for researchers to parse all of this data by themselves. As Fayyad et al. (1996) summarizes, data by itself is unusable until it goes through a process of selection, preprocessing, transformation, mining, and evaluation. Only then can it be established as knowledge. With the tools available to us in the era of information science, algorithms can be used to detect patterns that would take researchers too long to recognize. These patterns can, later on, be evaluated to generate knowledge. This process is called Knowledge Discovery in Databases.

Now, there are, of course, many sources of numerical data to be explored. However, perhaps what is most available and interesting to managerial purposes is the resource of customers' opinions in text form. Since the introduction of Web 2.0, a never before seen quantity of valuable information is posted to the Internet at a staggering speed. Text mining has then been proposed more than a decade ago to utilize this data (e.g. Rajman and Besançon 1998; Nahm and Mooney 2002). Using Natural Language Processing, one can parse language in a way that translates to numbers so that a computer can analyze it. Since then, text mining techniques have improved over the years. This has been used in the field of hospitality as well for many purposes, including satisfaction analysis from reviews (e.g Berezina et al. 2016; Xu and Li 2016; Xiang et al. 2015; Hargreaves 2015; Balbi et al. 2018), social media's influence on travelers (e.g. Xiang and Gretzel 2010), review summarization (e.g. Hu et al. 2017), perceived value of reviews (e.g Fang et al. 2016), and even predicting hotel demand using web traffic data (e.g Yang et al. 2014).

More than only analyzing patterns within the text, researchers have found how to determine the sentiment behind a statement based on speech patterns, statistical patterns, and other methodologies. This method is called sentiment analysis, or opinion mining. A precursor of this method was attempted decades ago (Stone et al. 1966). With sentiment analysis, one could use patterns in the text to determine whether a sentence was being said with a positive opinion, a critical opinion. This methodology could even determine other ranges of emotions, depending on the thoroughness of the algorithm. Examples of sentiment analysis include ranking products through online reviews (e.g Liu et al. 2017; Zhang et al. 2011), predicting political poll results through opinions in Twitter (O'Connor et al. 2010), and so on. In the hospitality field, it has been used to classify reviewers' opinions of hotels in online reviews (Kim et al. 2017; Al-Smadi et al. 2018, e.g.).

The algorithm used for sentiment analysis in our study is called a Support Vector Machine. It is a form of supervised machine learning used for binary classification. This means a sample of labeled training data is given to the algorithm to detect patterns in the data and use those patterns to establish a method for classifying other unlabeled data automatically. Machine learning is a general term used for algorithms that, when given data, will automatically use that data to "learn" from its patterns and apply them for improving upon a task. Learning machines can be supervised, as in our study, where the algorithm has manually labeled data to know the correct task result template. Machine learning can also be unsupervised, where without any pre-labeled data. In this latter case, the machine will analyze the structure and patters on the data and perform a task based on its conclusions on its own. Our study calls for a supervised machine since text analysis can be intricate. Many patterns might occur, but we are only interested in satisfaction and dissatisfaction labels. Consequently, we teach the machine through previously labeled text samples.

Machine learning and data mining are two fields with a significant overlap since they can use each other's methods to achieve the task at hand. Machine learning methods focus on the prediction of new data based on known properties and patterns of the given data. Data mining, on the other hand, is discovering new information and new properties of the data. Our machine learning approach will learn the sentiment patterns of our sample texts showing satisfaction and dissatisfaction, and using these to label the rest of the data. We are not exploring new patterns in the sentiment data. However, we are using sentiment predictions for knowledge discovery in our database. Thus our study is a data mining experiment based on machine learning.

Because the methodology for finding patterns in the data is automatic and statistical~~in nature~~, it is both reliable ~~,~~ and unpredictable. Reliable in that the algorithm will find a pattern by its nature~~, and unpredictable,~~. Unpredictable in that because it has no intervention from the researchers in making questionnaires, it can have different results from anything that the researchers could expect. ~~This is~~ These qualities determine why, much like actual mining, data mining is mostly exploratory~~in nature~~. One can never be sure that ~~something can be found, but~~ one will find a specific something. However, we can make predictions and estimates about where to find knowledge, and what kind of knowledge ~~can be uncovered.~~ we can uncover. The exploration of large opinion datasets with these methods is essential. The reason being we can discover knowledge that could be missed by looking at a localized sample rather than a holistic view of every users' opinion. In other words, a machine algorithm can find the needles in a haystack that we did not know were there from taking small bundles of hay at a time.

In this study, we can predict that several things might occur. Our data could show satisfaction and dissatisfaction factors that are universal, and it could also find strictly cultural ~~preferences, but~~ factors. However, we expect that both of these options will present themselves. We can also assert that ~~, if the previous literature is correct in their findings,~~ we could arrive at very

similar results ~~, albeit~~ to previous literature if they are correct in their findings. However, we are using a database of several orders of magnitude larger. We can also expect that, because of the lack of questionnaire design and ~~freedom of users~~ users' freedom to record their pleasures and grievances, ~~it is possible that we will~~ we may discover patterns that ~~were previously unnoticed by researchers~~ researchers previously noticed.

4 Methodology

We have extracted a large number of text reviews from a Chinese portal site *Ctrip*[3], as well as the travel site *TripAdvisor*[3] ~~and~~. We then determined the most commonly used words that would contribute the most to positive and negative opinions in a review. We did this using Shannon's entropy to extract keywords from their vocabulary. These positive and negative keywords allow us to perform a Support Vector Machine (SVM) based emotional classification of the reviews in large quantities, saving time and resources for the researchers. ~~After classifying~~ We classified the sentences in the extracted reviews as emotionally positive or negative ~~with~~, using an optimized SVM~~, we also~~. We then observed the weight values of each keyword in the machine~~, and~~. We observed the frequency of the terms in ~~all of the reviews~~ the dataset to extract the most utilized words in either kind of ~~reviews~~ review. We show an overview of this methodology in Figure 1 (Alemán Carreón et al. 2018). Finally, we used this ranking in frequency to perform a Rank-biased overlap test and make observations for the hypothesis testing.

4.1 Data collection

In the data collection stage for Chinese reviews in *Ctrip*, a total of ~~5938~~ 5774 review pages of hotels in Japan were collected. From these pages, we extracted a
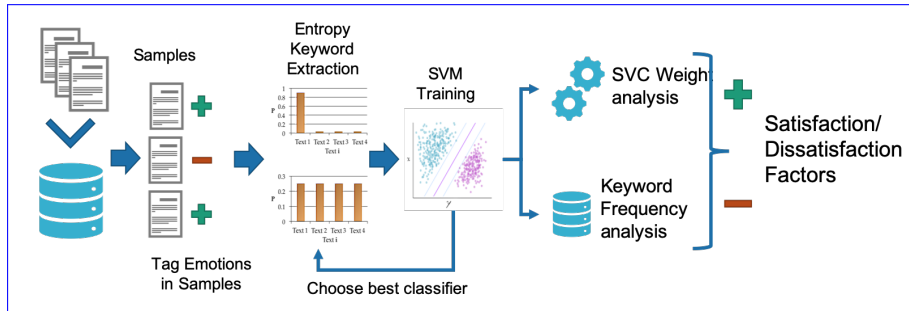

Fig. 1: Overview of the methodology to quantitatively rank satisfaction factors.

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[3]~~Ctrip: www.ctrip.com/~~
[3]~~TripAdvisor: www.tripadvisor.com/~~

total of ~~44,177 reviews, which were comprised of 572,218~~ 245,919 reviews, from which 211,932 were detected to be standard Mandarin Chinese from mainland China. Since a single review can have sentences with different sentiments, we separated sentences using punctuation marks. The Chinese reviews were comprised of 187,348 separate sentences.

In the ~~TripAdvisor~~ *TripAdvisor* data collection, we collected data from ~~21,154~~ 21,380 different hotels. In total, we collected 295,931 reviews~~in English, which~~, from which 295,503 were detected to be in English. Similarly to the Chinese data, we then separated ~~into 2,697,086~~ these English reviews into 2,694,261 sentences using the *gensim* python library. For the language detection in both cases we used the *langdetect* python library.

However, we needed to make the data and comparisons we draw from each of these datasets fair. For that purpose, we filtered both databases only to contain reviews from hotels in both datasets, using their English names to do a search match. We also filtered them to be in the same date range and cut off reviews outside of each other's date ranges. After filtering, we found that the number of hotels in common in the data collected was 580 and that the overlapping date range for reviews was from July 2014 to July 2017. We also found that the price for a night in these hotels ranges from low priced capsule hotels at 2000 yen per night, to high-end hotels 188,000 yen a night as the far ends of the bell curve. Within this range, from *Ctrip* there was 49,561 reviews comprised of 105,076 sentences, and from *TripAdvisor* there was 41,611 reviews comprised of 352,022 sentences.

We found that after filtering the data, the number of reviews was similar for both English and Chinese reviews, but that English reviews tend to be longer in general.

4.2 Text processing

To parse Chinese words and separate them, we used the Stanford Word Segmenter (Chang et al. 2008) program developed by the Stanford NLP Group[3]. In the case of texts in English, however, only using spaces is not enough to correctly collect concepts. ~~Because~~ The English language is full of variations and conjugations of words depending on the context and tense. Thus, a better segmentation is achieved by using lemmatization, which returns the dictionary form of each word. For this purpose, we used the *gensim* library with the English texts.

4.3 Sentiment analysis

The sentiment analysis was performed using the methodology described in Alemán Carreón et al. (2018). Keywords are determined by a comparison of Shannon's entropy (Shannon 1948) between two classes by a factor of α for

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[3]The Natural Language Processing Group at Stanford University

one class and α' for the other, and then they are used in an SVM (Cortes and Vapnik 1995), optimizing keywords to select the best performing classifier using the F_1-measure Powers (2011). The selected SVM ~~'s~~ keywords would then clearly represent the user ~~preferences~~ driving factors leading to positive and negative emotions. ~~Examples of tagged sentences are shown in Table 4, and~~ We also performed experiments to choose the best value of the parameter C used in the SVM. C is a constant that affects the optimization process when minimizing the error of the separating hyperplane. Low values of C give some freedom of error, which minimizes false positives. However, depending on the data, it can increase false negatives. Inversely, high values of C will likely result in minimal false negatives, but a possibility of false positives. SVM performance results are displayed in ~~section ??.~~ Tables 2 and 3. Examples of tagged sentences are shown in Table 4.

Table 2: Best performing SVC 5-fold cross-validation Chinese text classifiers.

Keyword List	Classifier emotion	C	F_1 μ	F_1 σ
Satisfaction keywords ($\alpha = 2.75$)	Satisfaction	2.5	0.91	0.01
Negative keywords ($\alpha' = 3.75$)	Dissatisfaction	0.5	0.67	0.11
Combined (α=2.75, α'=3.75)	**Satisfaction**	**0.5**	**0.95**	**0.01**

Table 3: Best performing SVC 10-fold cross-validation English text classifiers.

Keyword List	Classifier emotion	C	F_1 μ	F_1 σ
Satisfaction keywords ($\alpha = 1.5$)	Satisfaction	1.75	0.82	0.02
Dissatisfaction keywords ($\alpha' = 4.25$)	Dissatisfaction	3	0.80	0.03
Combined (α=1.5, α'=4.25)	**Satisfaction**	**2**	**0.83**	**0.02**

Shannon's entropy can be used to observe the probability distribution of each word inside the corpus. A word that is included in many documents will have a high entropy value for that set of documents. Opposite to this, a word appearing in only one document will have an entropy value of zero.

An SVM is trained to classify data based on previously labeled data, generalizing features of the data by defining a separating (p-1)-dimensional hyperplane in a p-dimensional space in which each dimension is a feature of the data. The separating hyperplane, along with the support vectors, divides the multi-dimensional space and minimizes the error of classification.

In our study, we used the linear kernel of the SVM classification process, defined by the formula (1) below. Each training sentence is a point of data, a row in the vector x. Each column represents a feature; in our case, the quantities of each of the keywords in that particular sentence. The labels of previously known classifications (1 for positive, 0 for negative) for each sentence comprise the $f(x)$ vector. The Weight Vector w is comprised of the influences each point has had in the training process to define the angle of the hyperplane. The bias coefficient b determines its position, as explained in section 4.4.

$$f(x) = w^\top x + b \tag{1}$$

We tagged 159 Chinese sentences and 2357 English sentences as positive or negative. The entropy comparison factors α and α' were tested from 1.25 to 6 in intervals of 0.25. After classification, our data contained ~~506,452~~ 91,239 positive Chinese sentences, ~~65,766~~ 13,837 negative Chinese sentences, ~~1,288,098~~ 167,224 positive English sentences and ~~1,408,988~~ 184,798 negative English sentences.

4.4 SVM weight analysis

During the SVM learning algorithm, each ~~point of data~~ data point that is classified incorrectly causes a change in the weight vector to ~~better~~ classify new data correctly. These changes to the weight vector are ~~strong for features that~~ greater for features close to the separating hyperplane. These features have stronger changes because they needed to be taken ~~account of~~ into account to classify with a minimal error~~, those close to the separating hyperplane~~. Sequentially, the weight vector can be interpreted as a numerical representation of ~~the effect each feature had for~~ each feature's effect on each class in the classification process. Below we show the formula for the weight vector w (2)~~.~~

Table 4: Examples of positive and negative sentences used for training SVM

Language	Emotion	Sentences
Chinese	Positive	酒店 的 服务 很 好 和 我 住 过 的 所有 日本 酒店 一样 各 种 隐形 服务 非常 厉害 (translated as: "The service of the hotel is very good. All the services of the Japanese hotels I have stayed in are extremely good.")
		有 一 个 后门 到 地铁站 非常 近 周边 也 算 方便 酒店 服务 和 卫生 都 很 好 (translated as: "There is a back door to the subway station very close to it. The surrounding area is also convenient hotel service and health are very good")
	Negative	酒店 旁边 很 荒凉 连个 便利 店 都 要 走 很远 (translated as: "The hotel is very bleak, and you have to go very far to go to the nearest convenience store.")
		唯一 不 足 是 价格 太高 (translated as: "The only negative is that the price is too high.")
English	Positive	It was extremely clean, peaceful and the hotel Hosts made us feel super welcome
		Location is very good, close to a main road with a subway station, a bakery, a 7 eleven and a nice restaurant that is not too expensive but serves good food
	Negative	The only downside: our room was labeled "non-smoking" but our duvet reeked of smoke.
		A bit pricey though

where x is the training data and each vectorized sentence x_i in the data is labeled y_i. Each cycle of the algorithm alters the value of w by α to reduce the number of wrong classifications. This equation shows the last value of α after the end of the cycle.

$$w = \sum_{i=1}^{N} \alpha_i y_i x_i \tag{2}$$

4.5 Rank-biased Overlap

In order to compare the similarity between two ranked lists, most cases would call to action a statistical measure such as Kendall's τ. However, the lists are not necessarily of the same length or necessarily have the same contents. They are also top-weighted (where the first rank is the most important to know, and are less and less important as the ranks continue). Therefore, we propose that it is necessary to use another measure of similarity. Webber et al. (2010) proposed a Rank-biased Overlap (RBO) measurement. It takes all of these factors into consideration when calculating a value from 0 to 1, where zero means completely different lists, and one means the two lists are an exact match. Because our Chinese keywords (their translations, at least) do not match our English keywords one to one, it is necessary to use this method. Webber's RBO produces three measurements: a minimum RBO, a residual RBO, and an extrapolated RBO. The residual RBO allows us to know the maximum RBO. In contrast, the extrapolated RBO is calculated by assuming the list would continue in the same pattern of similarity towards infinity. The formula for the extrapolated RBO is shown in (3). S and T are listings, d is their depth, k is their evaluation depth, p is a parameter that controls the top-weightedness of the lists, and X is the overlap between the lists. The evaluation depth p can also be understood as $1 - p$ being the probability to stop looking at the next item in the list. The complete process is described at length by Webber et al. (2010).

$$RBO_{EXT}(S, T, p, k) = \frac{X_k}{k} \cdot p^k + \frac{1-p}{p} \sum_{d=1}^{k} \frac{X_d}{d} \cdot p^d \tag{3}$$

5 Data Analysis

5.1 Frequent keywords and their SVC weight values

To understand the satisfaction and dissatisfaction factors of Chinese tourists and English-speaking tourists when lodging in

Japan, we study both the frequency of the words they use~~in relation to the number of total reviews~~, and their weight in the Support Vector Classifier (SVC). Following that, to know the relevance of a keyword as a preference for each group, we observed the frequencies of each entropy-based keyword in our complete data set and their SVC weight value. The frequency of the keywords in the database shows the level of priority it has for customers~~, and the~~. The weight value allows us to observe the sentiment it relates to by its positive or negative sign. We ranked the keywords by frequency, and use their SVC weight for analyzing the related sentiment~~(~~. A positive weight means positive sentiment, and a negative weight signifies negative sentiment).

We observed the top 10 words with the highest frequencies for keywords that were linked by entropy to satisfaction and dissatisfaction in emotionally positive and negative statements to study~~and quantitatively rank~~. The keywords are the quantitative rank of the needs of Chinese ~~customers, as~~ and English speaking customers. This is shown in the Tables ~~?? and ??~~ 5 for positive keywords and 6 for negative ones (however, the ~~latter~~ negative Chinese keyword list does not have more than ~~7~~ seven keywords available)~~; and for English-speaking customers, as shown in Tables ?? and ??~~.

~~There were many more keywords than shown in most cases, however, and some showed to be high in weight but low in frequency. This could mean they were useful for classification (the emotional reaction is more extreme) but aren't as important a preference for users (there aren't many cases in that the keyword was applicable). In the appendix, Table ?? shows some keywords that have a relatively high weight value for both positive and negative extremes and their translations in the relevant context. In Table ?? we show keywords for the English classifier with high weight values as well.~~

Table 5: Top 10 ~~frequent~~ positive ~~Chinese~~ keywords in ~~satisfaction~~ positive sentences~~.~~

Positive Chinese Keywords			
Word	Translation	Frequency	SVC Weight
大	big	10155	0.623
干净	clean	6918	0.638
交通	transportation	6765	0.586
日本	Japan	5889	0.495
早餐	breakfast	5726	0.495
近	close	5348	0.028
地铁	subway	4491	0.18
购物	shopping	4206	0
下次	next time	3596	0.247
推荐	recommend	3574	0.495

Positive English Keywords		
Word	Frequency	SVC Weight
staff	13583	0.537
location	10127	0.842
clean	7636	1.886
helpful	5271	1.999
friendly	5060	1.199
comfortable	4948	1.724
shopping	4884	1.308
train	4778	0
subway	4405	1.951
recommend	3812	1.158

~~Top 10 positive English keywords in satisfaction sentences.~~

~~High negative weight English keywords in dissatisfaction sentences.~~

Table 6: ~~Frequent~~ Top 10 negative ~~Chinese~~ keywords in ~~dissatisfaction~~ negative sentences~~.~~

Negative Chinese Keywords			
Word	**Translation**	**Frequency**	**SVC Weight**
价格	price	1908	-2
中文	Chinese language	744	-0.714
地理	geography	710	-0.812
距离	distance	440	0
陈旧	old-fashioned	338	0
老	old	323	0
华人	Chinese person	16	-0.5

Negative English Keywords		
Word	**Frequency**	**SVC Weight**
dated	426	0
working	350	-0.557
pricey	327	-1.614
slow	306	-1.281
carpet	224	-0.507
cigarette	220	-0.435
uncomfortable	207	-2.423
paper	185	-0.503
smallest	168	-1.035
dirty	163	-1.275

5.2 Rank-biased Overlap

In order to calculate the similarity between the ranked lists shown in ~~Tables ?? and ??~~ Table 5, and the lists in ~~Tables ?? and ??~~ Table 6, we calculated the extrapolated Rank-biased Overlap between the English keyword lists and the English translation of the Chinese keyword lists at different cutoff points. Additionally, we prepared and modified the lists so that words that are similar but would not overlap otherwise would overlap in this analysis. For example, in the English keyword lists, the word is "pricey," while in the Chinese keywords it is translated as "price~~", and as such, it was changed~~," so we changed it to "pricey" to match the English keywords. ~~This was~~ We did this change purely to overlap the most words possible, and so it could have been ~~very well~~ modified the other way around with the same effect. The results of these calculations are shown in Table 7. In the case of Chinese dissatisfaction keywords, which is only comprised of 7 keywords, the list remains complete in all cutoff points except 5. ~~Since the~~ The RBO measure can work regardless of the length of each list, ~~this is~~ so there was not a problem in its calculation.

Table 7: RBO results between Chinese and English keyword lists, $p = 0.9$.

List cutoff	Emotion	RBO_{EXT}
None	Satisfaction	~~0.265~~ 0.217
	Dissatisfaction	~~0.299~~ 0.137
Top 20	Satisfaction	~~0.265~~ 0.216
	Dissatisfaction	~~0.293~~ 0.132
Top 10	Satisfaction	~~0.266~~ 0.257
	Dissatisfaction	~~0.285~~ 0.128
Top 5	Satisfaction	~~0.221~~ 0.176
	Dissatisfaction	~~0.321~~ 0.176

6 Results

6.1 ~~Comparison of Chinese~~ Experiment results and ~~English-speaking tourists' preferences~~testing the hypotheses

From the observation of the top-ranking subjects for Chinese tourists, we can assert that keywords relating to service and staff friendliness are not on the top 10 satisfaction factors. Besides, there are complaints about a Chinese friendly environment. This makes our hypothesis 1a rejected. On the other hand, the word "staff" tops the list of satisfaction factors in English-written reviews, followed by a few other keywords lower in the top 10 list, such as "helpful" or "friendly". This confirms our hypothesis 1b. Since we found that these two populations are different in their satisfaction with Japanese hospitality, our hypothesis 1c is confirmed.

The extrapolated Rank-biased Overlap (shown in Table 7) ranged from ~~0.221 to 0.265~~ 0.176 to 0.257 in satisfaction lists, and from ~~0.285 to 0.321~~ 0.128 to 0.176 in the dissatisfaction lists, which are low similarity values ($RBO_{EXT} < 0.5$). This means that, while there is some similarity, the ~~preferences~~ satisfaction and dissatisfaction factors are fundamentally different if we consider them as top-weighted~~,~~; that is, the first elements are the most important in the lists, and therefore in their similarity measurement as well. This confirms our hypothesis ~~??~~2a, that the priorities for satisfaction and dissatisfaction are different for Chinese and English-speaking tourists.

~~From observation, however, we can assert that both~~ Both Chinese and English-speaking tourists in Japan have different priorities~~, but~~. However, both populations consider the location of the hotel and the availability of transport ~~nearby, such as subway or trains, as a~~ (subways and trains) nearby, as secondary but still ~~important point~~ essential points in their satisfaction ~~of~~ with a hotel. The Chinese customers are primarily satisfied with the room quality in spaciousness and cleanliness~~, while~~. In contrast, the English-speaking customers are easily upset by any lack of cleanliness and smoke smell from cigarettes. English-speaking tourists, on the other hand, value staff friendliness over room quality when considering their satisfaction.

The lists for Chinese and English-speaking tourists are quite different~~, but~~. However, if we compare the lists, we find that "clean", "recommend~~", "subway,"~~ "subway," "shopping," and "price" are ~~common~~ shared factors to both customer groups. Their place in the ranked list is the ~~exact~~ same for most of them, and only ~~1 out of 4 factors is different in rank~~"shopping" and "subway" are exchanged in priority. Furthermore, when arranging both lists by eliminating all ~~uncommon~~ unique elements, the lists become almost identical with an RBO of ~~1.0 for both satisfaction and~~ 0.906 for the top 20 and top 10 satisfaction keywords and 1.0 for the dissatisfaction lists. The lists become dissimilar when there is no cutoff point. However, it's still an RBO of 0.575 for the satisfaction list and 1.0 for the dissatisfaction list. This means hypothesis ~~??~~ 2b is rejected ($RBO_{EXT} > 0.5$), where ~~the similar~~ we hypothesized shared aspects in both customer groups ~~were hypothesized~~ to be different in their priority.

We also can observe some keywords that ~~aren't~~ are not considered by their counterparts. For example, mainland Chinese tourists are very satisfied with breakfast inclusion~~, while~~. At the same time, English-speaking customers are satisfied with ~~free amenities~~the staff and service. On the other hand, English-speaking customers mentioned tobacco smell in many reviews, while it wasn't statistically identified as a problem at all for their Chinese counterparts.

~~As to~~ We can observe the top 10 satisfaction and dissatisfaction keywords ~~themselves we can observe~~ and determine whether they are managerial attributes internal to the hotel, that is, ~~managerial in nature, or~~ or environmental attributes external to it~~, environmental in nature. We can see these results in Table ??.~~. We manually labeled the top keywords of each language into either managerial or environmental by considering how the word would be used when writing a review. If the word implies an issue that could be solved or managed by the hotel staff or management, we consider it managerial. If the word is describing factors that are unchangeable by the staff or management, we consider them environmental. The interpretation of these keywords is shown in the ~~Appendix in~~ Tables 8 and 9.

Table 8: ~~Managerial and Environmental nature of~~ Hotel attribute types for the ~~most frequent~~ top 10 satisfaction keywords

Hotel Attribute Type	Chinese satisfaction keywords (translation)	English satisfaction keywords	Hotel Attribute Type
managerial	big	staff	managerial
managerial	clean	location	environmental
environmental	transportation	clean	managerial
unidentified	Japan	helpful	managerial
managerial	breakfast	friendly	managerial
environmental	close	comfortable	managerial
environmental	subway	shopping	environmental
environmental	shopping	train	environmental
unidentified	next time	subway	environmental
unidentified	recommend	recommend	unidentified

Table 9: Hotel attribute types for the top 10 dissatisfaction keywords

Hotel Attribute Type	Chinese dissatisfaction keywords (translation)	English dissatisfaction keywords	Hotel Attribute Type
managerial	price	dated	managerial
managerial	Chinese language	working	managerial
environmental	geography	pricey	managerial
environmental	distance	slow	managerial
managerial	old-fashioned	carpet	managerial
managerial	old	cigarette	managerial
managerial	Chinese person	uncomfortable	managerial
		paper	managerial
		smallest	managerial
		dirty	managerial

For our purposes, hypothesis ~~??~~ 3 states that the satisfaction and dissatisfaction factors would stem from both managerial and environmental attributes to the hotel. This is confirmed for all but one list. The exception is the English-speaking tourists' top 10 dissatisfaction factors, which are all managerial~~in nature~~. However, this is only regarding the top 10 items ~~in the list, and lower in the listthere are~~ on the list. Lower on the list, we can observe some environmental factors. We can see the summarized results in Table 10.

Table 10: Managerial and Environmental nature of the 10 most frequent keywords

Emotion	Customer group	Managerial Factors	Environmental Factors	Unidentified
Satisfaction	Chinese speakers	30%	40%	30%
	English speakers	50%	40%	10%
Dissatisfaction	Chinese speakers	71.4%	28.6%	0%
	English speakers	100%	0%	0%

7 ~~Discussion~~

~~The results indicate that our main hypothesis - Chinese and Western tourists have different priorities in hotel attributes that lead to their satisfaction and dissatisfaction - is correct. Below we explore what those differences were, what is the possible cause for them, and what they imply for the industry, as well as discussing similarities between the two groups. We also discuss the differences between managerial and environmental elements of the hotel and how they contribute to the satisfaction of customers in light of the results from our third hypothesis - Satisfaction and dissatisfaction stems from both internal (managerial) and external (environmental) attributes of the hotel~~

6.1 Chinese tourists - A big ~~,~~ and clean space~~, and Chinese friendly~~

We found that mainland Chinese tourists are satisfied mostly by a big and clean space provided by the Japanese hotels. From ~~further inspection~~inspecting random samples, we also find that ~~while~~ this is mostly relating to the rooms~~, there are~~. There are also many references to the public bathing facilities in the hotel. In Japan, there is what is called *sentō*, which are artificially made public bathing facilities, on occasions including saunas and baths with ~~special~~ unique qualities. On the other hand, there are natural hot springs, called *onsen*~~, which can be either~~. They can either be bathing in the natural source of the water ~~,~~or using the ~~hot-spring water~~ hot springs in artificially made bath facilities. It is a Japanese custom and culture that all customers use the facilities after cleaning themselves in a shower and go into the baths without any clothes.

~~This~~ It can be a cultural shock for many tourists, but ~~still, this is an important~~ this is a fundamental attraction for many.

From these two first ranking keywords ("big" and "clean"), we can assert that room quality is the most ~~important~~ critical satisfaction factor for Chinese customers. ~~This means that Chinese tourists have an expectation of spaciousness and cleanliness when coming to Japan, be it by reputation, previous experiences, or cultural backgrounds. Whichever is the case, it appears that Chinese tourists are satisfied, which means their expectations regarding the rooms are being met. We can compare this result with previous literature, where traveling Chinese tourists choose their destination based on several factors, including cleanliness, nature, architecture, and scenery (Ryan and Mo 2001). This other few factors found in previous literature could be linked to the keyword "environment~~However, the word "big" ~~as well.~~ is widespread in the language and could be used in different contexts to point out positive and negative aspects. Since we are interested in how the word is a keyword of positive sentences, we took a small sample of the positively classified sentences that contained the word "big" in Chinese. A team of Chinese speaking lab members then pointed out the usage of the word. Generally speaking, it was used for the spaciousness of rooms, bathtubs, and communal bath facilities.

One key component we found in Chinese customer ~~preferences~~ satisfaction factors is the inclusion of breakfast within the hotel. ~~This can be inferred from the high frequency with which this keyword was included in the sentences emotionally classified as positive.~~ While other food-related words were extracted, most of them were general~~in nature~~, like "food" or "eating~~",~~." and in a lower ranking. In contrast, the word "breakfast" ~~, which is referring to a specific time and very possibly~~ refers possibly to its inclusion in the hotel commodities, was ~~very~~ frequently used in positive texts compared to other food-related words.

~~Moreover, Chinese tourists have expectations about the treatment towards the Chinese visitors that aren't being met. Be it Chinese language pamphlets, Chinese texts on instructions for the hotel room and it's appliances and features (T.V. channels, Wi-Fi setup, etc), or just the treatment towards Chinese people, it seems that their expectations are not being met. This is natural, since traveling in a strange land without knowledge of the language can be a daunting experience. Ryan and Mo (2001) also found that communication difficulties was one of the main reasons Chinese customers would give for not visiting again~~A recommended strategy for hotel management is to invest in the inclusion or betterment of hotel breakfast.

6.2 Western tourists - A friendly face, and absolutely clean

From the satisfaction factors of English-speaking tourists, we can see that at least ~~3~~ three words relate to staff friendliness and services. The word "staff" is the most frequently used word for satisfied customers, while "helpful" and "friendly" follow it lower in the list at the ~~4th and 6th place. Japan is famous~~

~~for their customer service all over the world. Staff members are trained to speak in *sonkeigo*, or "respectful language", one of the most formal of the Japanese formality syntaxes. They are also trained to bow with different depths depending on the situation, where a light bow could be used to say "Please, allow me to guide you", and a deep bow to apologize for any inconvenience the customer could have, with a very respectful apology as well. This is all very different from Westerner experiences and while it could be a culture shock to some, it is mostly seen positively. After all, Japanese staff treats all customers in this respectful manner, but for some customers, this could very well be the best they have been treated until that moment. We can also see that Kozak (2002) and Shanka and Taylor (2004) have also found that hospitality and staff friendliness is an important determinant in the satisfaction of Western tourists. On another note, we can also observe that the word "free" is present in the satisfaction keywords, which after observing a few examples in the database, we concluded that it relates to the free amenities in a hotel room, such as cosmetics, soaps, coffee, tea, and so on.~~ fourth and fifth place. Japanese high standards in hospitality very likely influenced this result.

~~However, we can see from the rest of the keywords that most of the dissatisfaction with Japanese hotels stems from a lack of hygiene and room cleanliness. Where Chinese customers were completely satisfied, English-speaking customers have found many places unacceptable to their standards . The most common complaint regarding cleanliness was about the carpet, followed by complaints about stains, and cigarette stench in the curtains. Kozak (2002) also found that hygiene and cleanliness were important satisfaction determinants for Western tourists. However, in the previous literature, this was linked merely to satisfaction. In comparison, our research uncovered that it is mostly linked to dissatisfaction and that westerners could be said to have high standards of hygiene when compared to their Chinese counterparts.~~ Aside from cleanliness, we can also observe the word "~~renovation~~working" is written ~~lower in~~ higher on the list, as well as the word "paper~~".After observation of~~." We observed the samples, and it is often used with the expression "paper-thin walls", which could mean the customers can easily hear their neighbors~~easily~~. Regarding the word "~~renovation",some~~ working," we also took a sample of the texts to see its context. It seems to be related mostly to construction work near or at the facilities. Some cities in Japan (e.g., Osaka) are currently ~~going under~~ undergoing a large number of renovations, which are also extending to the hotel facilities. Customers staying in places in renovation or near a ~~renovation construction~~ construction site can be expected to wake up to construction noises, have their view obstructed by metal bars, and other unpleasant experiences. Another keyword there is "slow", which upon inspection of example reviews, we concluded that it reflects the speed of the Internet connection in the hotel rooms.

6.3 ~~Price, the common enemy~~

An interesting detail of the keyword ranking is that the word "comfortable" is high on the list of satisfaction factors and "uncomfortable" high on the dissatisfaction factors. It seems that in general, western tourists are highly sensitive to comfort levels in the hotels and whether it reaches their expectations.

For both customer groups, the main reason for dissatisfaction is price, which can be interpreted as a concern about value for money. A paper studying Chinese tourists found that they had this concern (Truong and King 2009), but our results indicate that in the case of Japanese hotels, this is less of a cultural attribute, and has more to do with the pricing of hotels overall. The tourists coming to Japan could be both experienced travelers or first-time travelers, but the fact is that their expectation of the price for hotels was lower than what they found in Japan. In general, Japan is an expensive place to visit, which could have an impact in this placement in the ranking

6.3 Tobacco, what's that smell?

A ~~main~~ concern for Western tourists was the smell of tobacco in their room. Upon manual inspection of a sample of reviews with this keyword, we found that ~~it was often the case that the room was~~ the room was often advertised as non-smoking, ~~and yet~~yet, the smell permeated the room and curtains. Another common complaint was that there ~~wasn't any~~ were no non-smoking facilities available at all~~, to begin with. This~~. The smell of smoke can completely ruin some customers' stay ~~,~~ and give a bad impression ~~for~~ to review writers, which can lower the number of future customers.

However, in comparison, Chinese customers seem ~~to not~~ not to be bothered by this at all. We consulted studies involving the use of tobacco in different countries. Previous research states that 49 - 60% of Chinese men (and 2.0 - 2.8% of women) currently smoke or have smoked before, taken from a sample of 170,000 Chinese adults in 2013-2014, which is high compared to many English-speaking countries (Zhang et al. 2019; World Health Organization 2015). Japan itself has a polarized view on smoking, and despite being one of the world's largest tobacco markets, its use has been decreasing in recent years. ~~While smoking~~ Smoking in public spaces is prohibited in some wards of Tokyo (namely Chiyoda, Shinjuku, and Shibuya). However, it is generally only urged and not mandatory to have smoking restrictions in restaurants, bars, hotels, and public areas. However, there are many places where "smoking rooms" are available to keep the smoke to an enclosed area and avoid bothering others. Despite this, businesses, especially those who cater to certain kinds of customers, will generally be discouraged from having smoking restrictions if they want to keep their clientele. If Japanese hotels want to cater to all kinds of customers, Western and Asian alike, they must provide spaces without tobacco smell. After all, even if it ~~doesn't bother some~~ does not bother a few customers, the lack of smell would ~~not bother any existing~~ make it an appropriate space for all kinds of customers.

6.4 Location, location, location

The location of the hotel, closeness to the subway and public transport, and availability of nearby shops were observed to be of importance to both Chinese and English-speaking tourists. While it was not the priority for either of them, we can assert that the hotel's location is a secondary but still important point in the hotel's satisfaction. However, since this is an external factor to the management of the hotel, it is not often considered in the literature. Upon inspection of examples from the data, we found that most customers were satisfied if the hotel was near to at least two other subjects: subway, train, and convenience stores.

Japan is a country with a peculiar public transport system. The rush hour makes for a subway filled to the brim with people in suits making their commute, and trains and subway stations in Tokyo create a confusing public transport map for a visitor. Buses are also available, although less used than the rail systems in the big cities. These three are unusually affordable in price. Then there are the more expensive transports, such as the bullet train *shinkansen* for traveling across the country, and taxis. Taxis in Japan are a luxury compared to other countries. Where in less developed countries the taxi is the cheap method of transport of choice, in Japan, taxis are made to provide a high-quality experience, with a matching price. This means that for tourists, subway availability and maps or GPS applications, as well as a plan to travel the city, are of utmost necessity.

Japanese convenience stores, on the other hand, are also famous worldwide. Japanese convenience stores are a haven for the traveler in need. It offers anything, from drinks and snacks to full meals, copy and scanning machines, alcohol, cleaning supplies, personal hygiene items, underwear, towels, international ATMs, and so on. If some trouble occurred, or a traveler forgot to pack a particular item, it is almost sure that they can find it.

Therefore, considering that both transport systems and nearby shops are points of interest for Chinese and Western tourists, Japanese hotels have to carefully choose their location from the moment they are constructed. While not a top priority, this is a universal factor for both customer groups, and it can be an instant way to generate positive reviews.

7 Discussion

The results indicate that our hypothesis - Chinese and Western tourists have different priorities in hotel attributes that lead to their satisfaction and dissatisfaction - is correct. Furthermore, they indicate that, in the context of Japanese hospitality, only Western customers show satisfaction from staff and service amongst

their top detected factors. Below we explore the possible interactions with *Omotenashi*, what the differences between Chinese and Western tourists were, what is the possible cause for them, and what they imply for the industry. We also discuss the differences between managerial and environmental elements of the hotel and how they contribute to the satisfaction of customers in light of the results from our third hypothesis - Satisfaction and dissatisfaction stem from both internal (managerial) and external (environmental) attributes of the hotel.

7.1 Western and Chinese tourists in the *Omotenashi* environment

To this day, scholars continue to correct our historical bias towards the west. In this time, studies have determined that different cultural backgrounds lead to different expectations, which in turn influence the satisfaction of tourists. Meaning, tourists of a particular culture will have different leading satisfaction factors across different destinations. However, Japan presents a particular environment. The spirit of hospitality and service, *Omotenashi*, excels, and is considered the highest standard across the world. Can such an environment affect different cultures equally? Or is it only attractive to certain cultures? Our study brings light to these questions.

Our results indicate that Western tourists are the most satisfied with friendly and helpful staff in Japan. As explained earlier in this paper, Japan is famous for its customer service all over the world. Respectful language and bowing are not exclusive to high priced hotels or businesses and can even be found in convenience stores. The level of hospitality in even the cheapest of convenience stores is starkly different from Westerner experiences. While it could be a culture shock to some, it is mostly seen positively. After all, the Japanese staff respectfully treats all customers. However, for some customers, this could be the best way they have been treated until that moment. We can also see that Kozak (2002) and Shanka and Taylor (2004) have also found that hospitality and staff friendliness is a vital determinant in the satisfaction of Western tourists.

However, we can see from the rest of the western keywords that a big part of the dissatisfaction with Japanese hotels stems from a lack of hygiene and room cleanliness. Although Chinese customers only had positive keywords about cleanliness, English-speaking customers have found many places unacceptable to their standards. The most common complaint regarding cleanliness was about the carpet, followed by complaints about cigarette stench, and general dirtiness. Kozak (2002) also found that hygiene and cleanliness were essential satisfaction determinants for Western tourists. However, in the previous literature, this was linked merely to satisfaction. In comparison, our research uncovered that words relating to cleanliness are mostly linked to dissatisfaction. Westerners could be said to have a high standard of room cleanliness when compared to their Chinese counterparts.

According to previous research, we can see that Western tourists are already inclined to appreciate hospitality for their satisfaction. When presented with Japanese hospitality, this expectation is met and overcome. However, we can see from our results that Chinese tourists had less focus on hospitality, staff, or service and were more concerned with room quality. We could theorize that despite being presented with high standard hospitality, it is ignored. It could be that their culture does not hold the expectation initially. That is, when an expectation that is not held is met, the satisfaction that stems from this is less than if it was expected.

On the other hand, we have the phenomenon of a "nice surprise": When an unknown need is unexpectedly met, there is more satisfaction. It is necessary to note the difference between these two phenomenons. The "nice surprise" fulfills a need unexpectedly, while perhaps the hospitality grade in Japan is not fulfilling a high enough need for the Chinese population, resulting in less satisfaction. For greater satisfaction, the existence of a need being met is necessary.

However, another possibility presents itself when we observe the Chinese tourists' dissatisfaction factors. Chinese tourists may have expectations about the treatment towards the Chinese visitors that are not being met, even in this high standard hospitality environment. Japan is known worldwide for their hospitality, but they are also known historically to be monolingual and have a relatively large language barrier Heinrich (2012); Coulmas and Watanabe (2002) . While the Japanese effort to accommodate English speakers is slowly taking shape, Chinese accommodations can be lagging. Chinese language pamphlets, Chinese texts on instructions for the hotel room, and its appliances and features (e.g., T.V. channels, Wi-Fi setup), or just the treatment towards Chinese people could be examples. It is natural to be dissatisfied, since traveling in a strange land without knowing the language can be a daunting experience. Ryan and Mo (2001) also found that communication difficulty was one of the main reasons Chinese customers would state for not visiting again. It seems like this is a problem that is not singular to Japan.

Our initial question was whether the environment of high-grade hospitality would affect both cultures equally. This study brought us closer to the answer. On the one hand, there is a possibility that Chinese customers did have high-grade hospitality and did not get equally satisfied with Westerners. In that case, it appears that the difference stems from a psychological place. Expectation leads to satisfaction and a lack of expectation results in lesser satisfaction. On the other hand, there is also a possibility that Chinese customers are not receiving the highest grade of hospitality because of cultural friction between Japan and China.

It is unclear from our results which of these could be the case. One thing is clear for hotel managers, however. Competing in *Omotenashi* does include language services, especially in the international tourism industry. Better multilingual support can only improve that already high standard in Japan. Considering that most of the tourists in Japan come from other countries in Asia, this is an endeavor that truly can bring benefits to their investment. Proposals for

this endeavor include hiring Chinese speaking staff, preparing pamphlets in Chinese, or have a translator application readily available with staff trained in interacting through an electronic translator.

7.2 Managerial vs. Environmental satisfaction

As we stated in section 3.2, previous research is focused mostly on internal or managerial attributes of the hotel and their influence on customer satisfaction. ~~For example,~~ Examples of managerial attributes include staff behavior, facilities, commodities, amenities, and appliances that can be improved within the hotel (e.g. Shanka and Taylor 2004; Choi and Chu 2001). However, external or environmental attributes, such as the location of the hotel relative to public transport and shops, language immersion of the country, noise pollution, ~~weather, and so on,~~ or weather, are not usually analyzed in satisfaction studies. Because our study left the satisfaction factors to be decided statistically via customers' online reviews, we can see in their priorities the ~~amount of importance that~~ importance of those environmental or managerial attributes~~can have~~.

From Table ~~??~~ 10 and appendix Tables 8 and 9, we can see that in regards to satisfaction, ~~60~~40% of keywords used by Chinese tourists are of an environmental nature (namely "~~environment~~transportation", "~~periphery~~", "close", "~~transportation~~subway", ~~"nearby~~and "shopping"~~, and "subway"~~), while ~~the remaining~~ a lower 30% is managerial in nature (and an undefined ~~10~~30%). However, ~~two of~~ these managerial words are all concentrated at the top of the list ("big", "clean"~~, "breakfast~~). Chinese tourists could expect spaciousness and cleanliness when coming to Japan. That expectation could be caused by reputation, previous experiences, or cultural backgrounds. Some scholars argue that different cultures have different room size perceptions Saulton et al. (2017). Although the study subjects are German and South Korean, the study presents the results as differences influenced by Asian and Western cultures. We argue that one country is not representative of others' cultures, so there can be differences between South Korea and China in room size perception. However, an interesting point appears. It could be that a different room size perception affects the satisfaction of Chinese tourists in contrast with Westerners. The dissatisfaction list for Western tourists could indicate that they perceive the rooms or bathtubs as small compared to Chinese tourists that praise them. We can compare these results with previous literature, where traveling Chinese tourists choose their destination based on several factors, including cleanliness, nature, architecture, and scenery (Ryan and Mo 2001). These other few factors found in previous literature could be linked to the keyword "environment" ~~).~~ as well.

In comparison, English speakers are mostly satisfied with managerial attributes of the hotel, with keywords such as "staff", "clean~~","helpful",and "free~~," "helpful," and "friendly," to name a few. English-speaking customers also have managerial attributes at the very top of their list~~. This means that~~

~~if one considers the satisfaction of~~, except for the environmental nature of the location of the hotel. If one considers both Chinese and Western tourists' satisfaction, a hotel ~~has the ability to~~ can improve in ways that will attract more customers in the future. If it was the other way around, and the satisfaction was ~~to be~~ related more with environmental attributes overall, hotels would have to compete solely on their location.

For both customer groups, the main reason for dissatisfaction is pricing, which can be interpreted as a concern about value for money. A paper studying Chinese tourists found that they had this concern (Truong and King 2009), but our results indicate that in the case of Japanese hotels, this is less of a cultural attribute, and has more to do with the pricing of hotels overall. The tourists coming to Japan could be both experienced travelers or first-time travelers, but the fact is that their expectation of the price for hotels was lower than what they found in Japan. In general, Japan is an expensive place to visit, which could impact this placement in the ranking. Space is scarce in Japan, and capsule hotels with cramped spaces of 2 x 1 meters cost around 3,000 to 6,000 yen per night. Bigger business hotel rooms are expensive, ranging from 5,000 to 12,000 yen per night. For comparison, hotels in the USA with a similar quality can be half the price.

Similarly, most of the dissatisfaction is caused by issues that could be solved with improved management. Of course, this could be staff training (perhaps in language), hiring professional cleaning services for rooms with smoke smells, or improving the bedding, all of which can be costly. However, if hotels want to attract more ~~and more~~ customers, this paper provides a good guideline for which factors to consider first, and which ones will be best suited to which customer groups.

Now, a point of interest in this study is the difference in how managerial and environmental factors concern Chinese and Western tourists. We can see that for Chinese customers, while the top positive keyword is managerial, the size of a room is hardly modifiable once the hotel's construction is complete. The second keyword follows as a managerial factor as well. Except, this time, hotel management can readily improve the cleanliness of their hotel. The rest of the positive keywords, however, are either undefined or environmental. Once the location and construction of the hotel are set, not much can be done to satisfy a Chinese tourist further. On the other hand, one can turn the dissatisfaction factors into satisfaction by focusing on those for improvement. As mentioned before, Chinese language availability is another managerial attribute that can be improved with investment in staff and training.

Western tourists, on the other hand, are all around both satisfied and dissatisfied with mostly managerial factors, with a 50% of the top 10 satisfaction factors and a 100% of the top 10 dissatisfaction factors coming from managerial attributes. The room for improvement for Western tourists is more extensive than their Chinese counterparts, and as such, present a bigger investment opportunity. As mentioned earlier in this paper, Westerners are known as "long-haul" customers, spending more than 45% of their budget on hotel lodging. On the other hand, their Asian counterparts only spend 25% of their

budget on hotels Choi and Chu (2000). With bigger returns on managerial improvements, it seems like investing in improving attributes that dissatisfy Western customers, such as cleanliness and removing tobacco smell. Making more hotel facilities tobacco-free and deodorizing the rooms can be a low-cost investment that could increase returns many times over.

The opposite argument could also be made, however, that Chinese customers provide a more significant number of customers, even though they tend to spend less on lodging. Attracting a large number of Chinese customers can be a viable strategy for hotels. However, as mentioned before, they tend to focus more on environmental attributes, leaving language barrier-breaking as one of the few strategies to accomplish this.

The basic premise of this study is that different cultures lead to different expectations and satisfaction factors. This premise also plays a role in the differentiation between the preference of managerial or environmental attributes. Perhaps the cultural background of Chinese tourists emphasizes their surroundings and their place in nature and the environment. Chinese historical backgrounds of Confucianism, Taoism and Buddhism permeate the thought processes of Chinese populations. However, scholars argue that the changes in generations and their economic and recent history gives less importance to these concepts in their lives Gao et al. (2017). However, one could argue that there is a Chinese cultural attribute that emphasizes the environment and the place one is in towards satisfaction, rather than the way one is treated. According to previous research, Chinese tourists are collectivist, while Westerners are individualists Kim and Lee (2000). A more anthropocentric and individualistic Western culture could result in more of their expectations and priorities be related to how one is treated in social circumstances, rather than the environment one is in.

7.3 Implications for hotel managers

Our study presents two important conclusions: one about hospitality and cultural differences, and another about managerial decisions towards two different populations. Chinese tourists are not experiencing the best that *Omotenashi* has to offer. Either they do not get much satisfaction from hospitality or feel that basic language and communication needs are not being met. On the other hand, Western tourists are elated with Japanese hospitality. The other conclusion is that managerial decisions will mostly benefit Western tourists, except that Chinese language improvements and breakfast inclusion can satisfy more Chinese customers. Japan is recently seeing an increase in Chinese students as well as Western students of universities. Hiring students as part-time workers could increase the language services of a hotel.

To satisfy both customer types, hotel managers need to invest in cleanliness, deodorizing, and making hotel rooms tobacco-free. It could also be recommended to invest in breakfast inclusion and multilingual services and staff preparedness to deal with Chinese and English speakers. Western tourists were also observed

to have high standards in comfort, which can be improved upon managerially for better reviews. Perhaps it could be suggested to perform surveys of the bedding that is most comfortable for Western tourists. However, not all hotels can invest in all of these factors simultaneously. Our results suggest that satisfying cleanliness needs can satisfy both customer types and that a low-cost investment could be to make the facilities tobacco-free.

Environmental factors, while not manageable after a hotel has finished its construction, are essential to consider for managers as well. As previously stated, transport systems and nearby shops are points of interest for both Chinese and Western tourists. Japanese hotel managers have to consider the location and surroundings since before the hotel is constructed. A suggestion could be to purchase land and start the construction after plans to make new subway lines are made.

It is left to the managers to consider their business model for the next strategy. One option could be attracting more Chinese customers in number with their observed low budgeting. Another could be attracting more high budget Western customers is on par with their business model. For example, investing more on cleanliness could improve on Western customers looking for high-quality lodging, even though the price per night would increase.

8 Limitations and Future Work

This paper is not without its limitations. We analyzed keywords of satisfaction and dissatisfaction statistically based on whether they appeared on satisfied reviews or dissatisfied ones. Following that, we ~~performed observations of sentences with those words, in an attempt~~ attempted to understand the context that these words were being used in by taking samples and observing them manually. However, because of the large number of sentences in our data being analyzed, we could not perform a complete analysis of the context of these sentences across the database. Another limitation is that a ~~big~~ large portion of the Asian tourists coming to Japan ~~are~~ is Taiwanese and Korean~~, of which we couldn't do an analysis because of team members not knowing~~. We could not analyze these populations because our team members do not know those languages. Aside from that, because of the ~~anonymous~~ nature of the data collected, further typology analysis ~~couldn't~~ could not be made (for example, Chinese men and women of different ages ~~,~~or their Westerner counterparts).

In future work, we plan to investigate further into this topic. We plan to extend our data to research for different trends for different regions of Japan and in different kinds of hotels, as well as between customers traveling alone or in groups, for fun or work. Another point of interest in the future of this study is to use word clusters with similar meanings instead of single words.

9 Conclusion

In this study, our objective was to analyze the differences in satisfaction and dissatisfaction between Chinese and English-speaking customers of Japanese hotels. We extracted keywords from their online reviews uploaded to the portal sites *Ctrip* and *TripAdvisor* using Shannon's entropy calculations. We used these keywords for sentiment classification via an SVC. We then measured the Rank-biased Overlap of the top 10 most frequently used keywords in satisfied and dissatisfied sentences to find the differences between Chinese and Western tourists.

In the context of Japanese hospitality, we found that Western tourists had the most satisfaction with staff behavior, confirming our hypothesis 1b. However, we found that Chinese customers had other concerns than hospitality when studying their satisfaction. As such, our hypothesis 1a is rejected. Since both cultures have a different reaction to this environment of hospitality, our hypothesis 1c is confirmed. From this, we discussed two possible theories on why Chinese tourists respond differently to Westerners in this environment of *Omotenashi*. One theory is that they are not being treated well enough, and this environment is not compatible with them because of language or culture barriers. The second possible theory is that they react differently to hospitality since they do not have the same expectations to be satisfied in the same way. We theorize that a lack of expectations could result in lessened satisfaction, even if the same service is presented.

We obtained values ranging from 0.176 to 0.257 in satisfaction lists and from 0.128 to 0.176 in dissatisfaction lists at different cutoff points. These are low values ($RBO_{EXT} < 0.5$), so we can assert that the satisfaction and dissatisfaction factors of Chinese and English-speaking tourists are different, confirming our hypothesis 2a. We then measured the similarity in ranking from the words that were common satisfaction or dissatisfaction factors for both Chinese and English speakers. We found that from the four words that were common amongst both groups ("clean", "recommend," "subway," and "price"). When these shared terms were isolated, both lists were almost identical at the cutoff point of 20 words. This resulted in an RBO ranging from 0.906 to 1.0. This means our hypothesis 2b is rejected ($RBO_{EXT} > 0.5$), and that the common ground within both customer groups is also similar in ranking.

Lastly, we measured the amount of satisfaction and dissatisfaction factors that were referring to managerial attributes of a hotel or environmental attributes of the hotel. Managerial attributes are those that they can be changed via managerial decisions without relocating. On the other hand, environmental attributes are things like location, closeness to shops, or public transport. We found that both are included in the satisfaction and dissatisfaction of both customer groups, confirming our

hypothesis ~~2?~~3. We also found that most of the Western customer satisfaction (~~60~~50% of the top 10 words) and dissatisfaction (100% of the top 10 words) stems from managerial attributes of the hotel~~, while~~.

In contrast, environmental attributes only make for a smaller portion of the factors (~~30~~40% of the top 10 satisfaction keywords). In the case of Chinese customer satisfaction, the top of the list was managerial ~~in nature~~ (30% of the top 10 words)~~and a bigger~~, and a more significant portion, although lower in its ranking, was environmental ~~in nature (60~~(40%). For Chinese customer dissatisfaction, however, 71.4% of the keywords were managerial~~in nature~~, while the other 28.6% were environmental~~in nature.~~

~~.~~ We discussed how these distributions in managerial or environmental factors having priorities in either population could lead to different management strategies. One possible approach is to try to improve the satisfaction levels of Chinese tourists, who dedicate less percentage of their budget to hotels but are more abundant in number. They are less satisfied with managerial factors but have an identifiable method of improving satisfaction by lessening language barriers and providing breakfast. Another approach we discussed was focusing on the cleanliness and comfort that Western tourists expect, as well as making the hotels tobacco-free. With this strategy, we favor "long-haul" Western tourists who spend almost half of their budget on hotels. While Westerners are less in number than Chinese tourists, it could prove to have more substantial returns. The reason for this being that Chinese customers also favor cleanliness as a satisfaction factor, and both populations could be pleased. ~~Our~~ In this paper, we provide results and discussion that can be utilized as a guideline for managerial decisions when considering Chinese and Western tourists in Japan, and we can observe their stark differences ~~, as well as their common attributes. In future work we plan to investigate further into this topic, extending our data set and researching for different trends for different regions of Japan and in different kinds of hotels, as well as between customers traveling alone or in groups, for fun or work. Another point of interest for the future of this study is to use word clusters with similar meanings instead of single words.~~ and shared attributes.

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Appendices

A Sentiment analysis training data examples

Examples of positive and negative sentences used for training SVM

A Entropy keyword extraction experiment results

As explained in section 4.3, we performed experiments with different entropy values to extract keywords from the vocabulary. Then we chose the best performing classification machine based on those keywords as shown in the Tables 2 and 3. We also performed experiments to choose the best value of the parameter C used in the SVC. C is a constant that affects the optimization process when minimizing the error of the separating hyperplane. Low values of C give some freedom of error, which minimizes false positives, but depending on the data it can increase false negatives. Inversely, high values of C will likely result in minimal false negatives, but a possibility of false positives.

Best performing SVC 5-fold cross-validation Chinese text classifiers.

Best performing SVC 10-fold cross-validation English text classifiers.

A Keywords with high SVM weights regardless of frequency

There were many more keywords than shown in Tables ?? and ??. Some showed to be high in weight but low in frequency. This could mean they were useful for classification but aren't as important a preference for users. Table ?? shows some keywords that have a relatively high weight value for both positive and negative extremes and their translations in the relevant context. In Table ?? we show keywords for the English classifier with high weight values as well.

Chinese keywords with high SVM weights regardless of frequency.

English keywords with high SVM weights regardless of frequency.

A Managerial and Environmental keywords

As explained on ??, we identified the nature of each keyword in the top 10 lists of both satisfaction and dissatisfaction for Chinese and English-speaking tourists and summarized them in Table ??. The detailed identification of each keyword is shown in Tables 8 and 9 below.

Hotel attribute types for the top 10 satisfaction keywords

Hotel attribute types for the top 10 dissatisfaction keywords