

The use of big data analytics to discover customers' perceptions of and satisfaction with green hotel service quality

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Abstract

This study examined customers' green reviews on TripAdvisor and identified environmentally friendly themes and concepts. The differences among the 10 countries in terms of the volume of green reviews and customers' green satisfaction ratings were also analyzed. Using Leximancer analysis and multivariate analysis of a big dataset, we adopted a mixed research method to analyze 121,780 reviews posted on TripAdvisor for 87 green hotels from the top 10 tourism countries. The Leximancer analysis found that the most important themes mentioned in customers' green reviews are room, daily, hotel, staff, front, food, coffee, amazing, experience, and trip. The results also showed that highest satisfaction ratings were ranked in Italy, the USA, and Turkey, respectively, while the lowest ratings were from Germany and France. The results provide critical recommendations for hoteliers to truly comprehend what green practices are noticed and appreciated by their customers.

Keywords: Big Data, green hotels, green customer satisfaction, green service quality, online reviews, TripAdvisor

1. Introduction

Environmental sensitivity has played a significant role in the operations of hospitality firms that are increasingly generating unique creative attempts to diminish water usage, to improve rainwater harvesting premises, to recycle water for hygiene goals (Nimri et al., 2020) and to protect the ecology. In accordance with the World Tourism Organization (2012), more than 20% of CO₂ emissions are derived from the hotel industry. Thus, hotels' environmentally friendly practices that can meet the demands of environmentally and socially conscious stakeholders are gaining ground. Through adopting green practices and consumerism, hospitality organizations have stepped into the green innovative process on the basis of a win-win situation – namely, 'green and competitive' (Galeazzo et al., 2020).

On the other hand, previous research about the interrelation between customer satisfaction and service quality suggested service quality and, consequently, customer satisfaction as key strategies to retain existing customers and attract new ones (Nunkoo et al., 2020). Guest satisfaction, thus, has been one of the most systematically studied concepts in the tourism and hospitality literature (Assaker et al., 2020; Liu et al., 2017; Robinot & Giannelloni, 2010). Regarding customer satisfaction, green management has received much attention from tourism scholars and practitioners (e.g., Galeazzo et al., 2020; Gupta et al., 2019; Merli et al., 2019). For instance, Chang and Chen (2013) suggested that organizations need to adopt green strategies in order to increase customers' quality perceptions and satisfaction about their environmental expectations.

Although customers' satisfaction with green service quality is an important concept in hospitality, existing literature on the green dimension of service quality still remains inadequate. Scholars have just recognized that green leadership and human resources (HR) practices positively affect employee outcomes, such as organizational citizenship behaviors (e.g., Pham et al., 2019) and green creativity (e.g., Mittal & Dhar, 2016). Several scholars

also investigated the relationship of green services and customer trust (e.g., Gupta et al., 2019), intention to stay (e.g., Teng et al., 2018), and intention to visit (e.g., Eid et al., 2021). Particularly, to date, many studies have focused on examining green practices of hospitality firms through using customer surveys (e.g., Agag & Colmekcioglu, 2020; Lee & Cheng, 2018), some research has tested these environmental implications by analyzing hotel websites or reports (e.g., Okumus et al., 2020), and a few studies have used social media and user-generated content (UGC) – namely, the reviews about green hotels (e.g., Song et al., 2020). However, academic understanding of perceived green service quality and green satisfaction, which are considered as main criteria for achieving superior quality service (Oliver, 1999; Parasuraman et al., 1985; Yang et al., 2020), is still at an early stage. For instance, discovering a green dimension of service quality and customer satisfaction requires a comprehensive analysis, which involves a big volume of data and a large sample from all over the world, because big data offer a novel pathway to understand customers' perceptions of service quality and increases the predictive validity of the study results (Bleidorn et al., 2017). In this sense, Yu et al. (2017) suggested that 'researchers could include a broad range of green hotels of different types, sizes, scales and locations' (p. 1355). However, to our best knowledge, only limited studies have adopted big data analytics to investigate customers' green service quality perceptions and satisfaction. Therefore, the main purpose of this study is to fill the void by adopting big data analytics to expand the knowledge of customers' green service quality perceptions and satisfaction, drawing a macro perspective.

Taking this background into consideration, this study analyzes how environmentally friendly practices affect customers' green service quality perception and satisfaction at green hotels in the top 10 tourism countries, by using Lexmimancer analysis. More specifically, this study is among the first to reveal the differences in the volume of green reviews and customers' satisfaction ratings among the top 10 tourism countries, since environmental

policies and green practices in the tourism industry can differ significantly between countries (Usman et al., 2020). In delineating such points, this study has the following objectives:

1. To shed light on the dominant themes through which practices affect customers' green service quality perceptions and, consequently, their satisfaction level at green hotels selected from top-ten countries.
2. To reveal the volume of green reviews and satisfaction ratings in the selected countries.
3. To examine which concepts are linked with higher and lower value-for-money ratings from tourists' perspectives.

In pursuing these objectives, this present work provides potentially significant contributions to the literature. *First*, the majority of hotel satisfaction and service quality studies are limited by their sample sizes. Moreover, there is a paucity of customer green satisfaction and service quality perception research that considers the potential influence of territorial differences. In our paper, we sought to fill this research void through performing Leximancer analysis of a big dataset while testing country-level differences of customer green satisfaction. *Second*, whilst the big data approach has gained impetus among tourism and hospitality scholars, there is very little investigation of the concept of green hotels as a study area using big data. The extensive literature lacks larger sample and systematic studies involving a large set of countries. Thus, the present study contributes to the literature with the big data approach by using a large dataset comprising 121,780 online reviews of 87 green hotels from the top 10 countries in TripAdvisor. Through examining a large number of UGC reviews posted for green hotels, this research sheds light on such matters and thus presents valuable insights into the customers' green service quality perceptions and satisfaction.

The study is structured as follows. We first provide existing literature on green practices in the hospitality industry, and then present green service quality and green satisfaction literature. Second, we present our methodology. The study findings are then provided and discussed in detail, followed by theoretical and practical implications as well as recommendations for further investigation together with limitations.

2. Literature review

2.1. Research on green practices in the hotel industry

Recent studies have suggested that customer awareness of green practices is insufficient. For example, Tsai et al. (2020) argued that hoteliers can know the importance of environmentally friendly policies, but customers may not realize its importance. Therefore, ensuring hotel customers' awareness of these eco-friendly policies plays a significant role in their buying decisions (Yu et al., 2017). Hotel management should, thus, advertise their environmentally friendly practices and policies to their potential customers in order to enhance their knowledge and understanding. Many studies suggest that hotel companies have a significant effect on enhancing customers' understanding of green implications, and scholars also claim that several approaches could be adopted by hotel management teams to advertise their environmentally friendly endeavors (Assaker et al., 2020). Among these methods, online platforms and Internet technology are considered as the most influential ways for hotels to advertise green practices to their customers (Tanford et al., 2020). Similarly, having green certificates could also help customers to realize green hotels' eco-friendly endeavors (Cavero-Rubio & Amorós-Martínez, 2020).

Recently, green practices have gradually received scientific attention from tourism scholars. For instance, Wang's (2017) empirical study examined the determinants of customers' purchase behaviours towards green brands in food and restaurant industry.

Through collecting data from full-time hotel employees and hotel managers in Turkey, Gürlek and Tuna (2018) found green organizational culture is an important determinant for green innovation and competitive advantage. Gürlek and Koseoglu's (2021) review study also analyzed the progress in green innovation research in the hospitality and tourism domain. More recently, using a systematic review, Arici and Uysal (2021) examined leadership, green innovation and green creativity nexus and provided a taxonomy of mediator and moderator variables in the relationship between leadership and green innovation/creativity.

2.2. Green practices in the global hospitality industry

Green practices in the global hospitality industry can vary among countries, all of which show the different ecological duties their hotels undertake. A recent study has revealed that European countries lead in the green initiatives and green performance, followed by the USA, and China falls behind when compared to other countries (Chen et al., 2018). Moreover, most of the recent discussion on green hotels is limited to the context of a particular country, and the majority of the studies are based on the US hospitality industry followed by China (Song et al., 2020; Yu et al., 2017). For example, Song et al.'s (2020) study only considered green hotels from the US to examine customers' green reviews on TripAdvisor and clarify what green practices are mentioned by customers at resort-luxury and business-economy hotels. However, studies have not adopted a multi-country approach to generalize existing knowledge of green practices. To augment the existing understanding of the phenomenon, this research analyzes customer reviews on green hotels from the top 10 countries. Thus, this study addresses the following questions:

RQ1: Is there a significant difference in the amount of green reviews among the top 10 countries?

RQ2: What are the main themes which green hotel customers repeatedly address and express in their green comments?

2.3. Green satisfaction

Even though the antecedents of guest satisfaction have been extensively studied, it is crucial to consider that the main determinants could influence different customer groups in various forms. Gallarza et al.'s (2011) seminal work has set out the main differences between service quality perception and customer satisfaction. The authors suggested that dimensions underlying *quality* are fairly specific (mostly cognitive) and do not depend on experience, whereas *satisfaction* includes a broader range of dimensions (both cognitive and affective), and it is always post-consumption and experience based. The expectation-confirmation theory suggests that guest satisfaction can be accomplished by comparing the actual service performance with customers' expectations (Nunkoo et al., 2020). As a support for this argument, scholars found perceived value as an antecedent of guest satisfaction (e.g., Chen & Chen, 2010). Oh and Kim's (2017) review study considered three constructs – i.e. customer satisfaction, service quality, and perceived value – as important indicators of the customer's overall experience with products and services.

Moreover, customer perception is affected not only by the nature of the good and its physical aspects but also by the aspects of the service-delivery process (Oliver, 1977). Thus, consumers could have various degrees of satisfaction or dissatisfaction concerning the service quality in every service encountering experience. The theory suggests that customers initially have expectations concerning goods or services, and then their experience of using these goods or services enables customers to confirm or disconfirm their expectations (Lee & Kim, 2020). If the actual performance of the green hotel exceeds the expectation, the expectation is confirmed. On the contrary, if the actual performance is inferior to the customer expectation,

it is disconfirmed (Zhigang et al., 2020). According to expectation-confirmation theory, customer satisfaction and postpurchase intentions are derived from the confirmation or disconfirmation of customer expectations.

One can expect hotel guests who have diverse ecological concerns and give priority to green services to hold different expectations on lodging issues (Dolnicar & Grün, 2009), leading to distinct desires for hotels' green characteristics. In this case, green hotels need to take the unique expectations of guests into consideration in developing green practices, as perceived by guests. In a similar vein, a study proposed a new phenomenon, green satisfaction, that is described as 'customers' overall evaluation of environmentally friendly content based on their experience in a green hotel' (Wu et al., 2016, p. 2083). The concept of green satisfaction pays more attention to guests' evaluation of the eco-friendly practices. For example, Robinot and Giannelloni (2010) found that when such key attributes, as the waiting time for checking in, are evaluated positively they lead to customer satisfaction; but when they are evaluated negatively, they strongly lead to customer dissatisfaction. The authors also revealed that staff competence and attention, comfort dimension of the hotel and the room (i.e., facilities at the hotel, pleasant room, etc.), as well as the environmental attributes (i.e., beauty of the surroundings, reusing towels and linen, atmosphere of the hotel) strongly lead to 'negative' customer satisfaction when they are evaluated negatively. However, these attributes can weakly lead to 'positive' satisfaction when they are evaluated positively. Lee et al. (2018) suggested that hotels' environmental participation contributes to increment in guest satisfaction on the basis of good service quality. Barber (2014) also concluded that when seeking for green quality and satisfaction, customers have higher preferences for organic food. Yu et al.'s (2017) study found that several green practices, including energy efficiency, water conservation, purchasing local organic foods, and employee environmental education, significantly affect customer satisfaction with hotels. Assaker (2020) claimed that

green practices (comfort and environmental practices) implemented by a hotel positively influence consumers' satisfaction with their stay at the hotel.

Several studies to date have counted on the phenomenon that the characteristics of a service could have a dissymmetrical effect on guests' green satisfaction. Therefore, they regard satisfaction as a dimensional concept (Robinot & Giannelloni, 2010; Voss et al., 2004) with the determinants which lead to green satisfaction as independent from the determinants which lead to dissatisfaction. That is, existence of a feature (e.g., a local organic food offered in an open buffet in a restaurant) could satisfy a guest, yet lack of this feature would not dissatisfy the same guest. Other classifications of features could include satisfaction and dissatisfaction determinants. These are hybrid determinants that have an effect on the green satisfaction, dissatisfaction, and moderate determinants that do not often have a strong effect, but that a guest appraises nevertheless (Zhang et al., 2015). The results of Robinot and Giannelloni's (2010) study recommended that the features should be differentiated based on guests' expectations and perceptions. They commendably demonstrated that environmental features were surprisingly considered as 'basic' features as an integral piece of the service offer, even though they were expected as 'plus' features. Thus, they called for more research using larger sample to identify the features (i.e., concepts) and levels of guest satisfaction with green practices. Considering this background, the following research question has been developed.

RQ3: Which concepts are linked with higher and lower levels of satisfaction from the green hotel guests' perspectives?

2.4. Green Service quality

Green perceived service quality refers to 'the customer's judgment about a brand's (or a product's) overall environmental excellence or superiority' (Chen & Chang, 2013, p. 66). The

expectation-confirmation theory argues that the variable ‘confirmation’ is a judgement that a customer makes by comparing the ‘expectation’ and the ‘perception’ (Sedera et al., 2017). Wu and Cheng (2017) also suggested that green perceived quality can be defined as a subjective evaluation of a guest’s perceptions of green practices at a green hotel. Green service quality is used to gauge whether green hotels pay attention to expectations of guests in providing green services and practices, as perceived by guests. Thus, green service quality is a subjective evaluation from the viewpoint of green hotel customers about the overall quality of the service delivered (Wu et al., 2016). Regarding this phenomenon, Yu et al. (2017) suggested that green hotels have the edge on their counterparts because guests would mostly choose a hotel that has adopted eco-friendly practices. Merli et al. (2019) also argued that adopting environmentally friendly practices would provide important advantages to a hotel, such as positive word of mouth (WOM), positive comments in social media and online travel blogs, the readiness to make additional payment, and the repurchase intention for the green service. Expectation-confirmation theory suggests that customer perception of quality is the immediate post-consumption state that captures the perceived, understood, or remembered understanding of their experience (Sedera et al., 2017).

Several scholars signal the gap in the literature generally and a paucity in the conceptual and empirical precision of current investigations on guests’ green satisfaction and green service quality perceptions (e.g., Mishra & Gupta, 2019; Wu et al., 2016). Indeed, an extensive view has focused on local and mono-country service marketing subjects, specifically in the field of guest satisfaction and service quality (e.g., Malhotra et al., 2005), and surprisingly a multi-country perspective has been scarcely considered (e.g., Voss et al., 2004).

Guests' green satisfaction and green service quality perception, such as environmental policies, green practices, and roles or attitudes of employees are culturally adapted and a country's culture could affect guest satisfaction with the service provided by green hotels (Chen et al., 2018). The authors also revealed that eco-friendly practices and green performance of hospitality firms vary among European countries, the USA, and China. Therefore, findings of studies which were performed in a single country or destination could not be generalized to other territories (Voss et al., 2004).

These investigations notice the significance of differentiating between green satisfaction and green service quality by country that results in differences in guests' green satisfaction. Further, Schuckert et al. (2015) suggested that many studies have used small samples. Recently, two studies (i.e., Song et al., 2020; Yu et al., 2017) called for more research to cover a broad range of green hotels and broader geographic locations to expand knowledge of customers' satisfaction and service quality perceptions in green hotels. Hence, considering Hofstede's (1980) theoretical guideline, this paper addresses the following research question:

RQ4: Do satisfaction ratings vary across the top 10 countries?

3. Methodology

3.1. Procedure

We utilized a mixed-method with a big data approach. We examined 121,780 reviews for 87 green hotels located in 10 different countries all over the world, all of which were available on TripAdvisor.com. The case selection process first included the selection of the most visited top 10 destinations in the world officially ranked according to the tourist arrivals (World Tourism Organization, 2019), which were respectively France, Spain, the USA,

China, Italy, Turkey, Mexico, Germany, Thailand and the United Kingdom (see Table 1). Second, hotels with TripAdvisor's GreenLeaders level were chosen from these countries with the exception of China, Thailand, and Turkey. Hotels from these three countries were chosen based on the 'hotel style' criterion on TripAdvisor. Hotels labeled as 'green' hotel style were considered. TripAdvisor introduced the GreenLeaders program in 2013 in the USA and later in 2014 in European hotels and B&Bs, which apply green practices like recycling, local and organic food, and electric car-charging stations (Song et al., 2020). The more eco-friendly activities and initiatives a hotel performs, the higher its TripAdvisor GreenLeaders level is. This program has not been adopted in the three excluded countries; instead, hotels were filtered and selected according to their style under 'green'. The data were conveniently collected from TripAdvisor by scraping the existing reviews in the English-language available for these 87 green hotels. A scraping tool (*WebHarvy*) was employed during the first 20 days of January 2021, and a total number of 121,780 reviews were scraped from January 2013 to January 2021. For each green hotel, all UGCs posted after January 2013, when TripAdvisor launched the GreenLeaders program, were considered and picked.

Through adopting the standards of the TripAdvisor GreenLeaders Program for examining green UGCs, which were posted on TripAdvisor, we coded each review utilizing a 0/1 system to extract green comments. These standards consist of the principles of towel reuse, linen reuse, recycling, energy, guest training, water, organic/local purchase, waste saving, electric car charge station, education and innovation, carbon emission, and using energy-efficient light systems. For instance, a review including one of the above-mentioned standards was coded 1 and considered as a green review, but when the review did not include one of these standards, it was coded 0. Customer satisfaction was also evaluated with TripAdvisor' customer satisfaction rating score on a five-point scale (bubbles) for each green hotel.

The data included more than one million words from the reviews written for the 87 hotels with GreenLeaders leaf sign and green title indicating the eco-friendly applications according to TripAdvisor's language. Of the 121,780 UGC reviews collected, 13,380 consisted of green related comments (see Table 1). Moreover, descriptive statistics for the green reviews show that there are 11,356 satisfaction reviews (rated with four and five bubbles), 1210 moderate reviews (three bubbles), and 814 customer dissatisfaction reviews (one and two bubbles) (see Table 2). As seen in the table, moderate reviews on TripAdvisor are perceived as more helpful than satisfaction reviews as they proportionally receive a higher number of votes for helpfulness.

We utilized ANOVA tests to answer RQ1 and RQ4. For the other research questions (i.e., RQ2 and RQ3) Leximancer software was used as a content analysis tool on the big data scraped from TripAdvisor. Leximancer identifies concepts through gathering the related automatic textual definitions. It forms a thesaurus including associated words, which are connected to the concepts with the help of word counts (Cretchley et al., 2010).

The reliability of Leximancer is rather high since it prevents bias and enables researchers to interpret a textual content. The analysis is performed automatically, and visual results are illustrated as concept maps like clustered bubbles. Given the fact that it generates more reliable and sophisticated outcomes and can figure out related concepts from the UGCs, Leximancer has a more incremental application rate in tourism and hospitality-related qualitative research (e.g., Thomsen & Jeong, 2020).

4. Results

We performed the ANOVA test on RQ1 regarding whether the amount of green reviews differ among the top 10 countries (see Table 3). The results show that there is a statistically significant difference in the amount of green reviews among the 10 countries. The effect size

is at 0.196, which is higher than the threshold of 0.14 (Cohen, 1988). Post-hoc comparisons using the Tukey HSD (honestly significant difference) test provided in Appendix A show that the mean scores for the USA, Turkey, and Mexico are significantly different from other countries, while among European countries, such as France, Spain, Italy, and UK, there is no significant difference. Moreover, the mean score of Spain is significantly different from the USA, Italy, Turkey, Mexico, and Germany. There is, therefore, no significant difference in the amount of green reviews between most of the European countries, while inter-continental differences have been observed in the quantity of green reviews. Overall, there are fewer green reviews for green hotels from European countries, including Germany, the UK, France, and Spain, except for Turkey than American and Asian countries, such as Mexico, USA, and China (Appendix C). It can be concluded that Mexico, Turkey, the USA, and China are more successful than others in stimulating their customers to post green comments about their services. This finding implies that these countries put more emphasis on green practices. As also seen in Table 1, among the European countries, green hotels from Italy, France, and Spain, respectively, seem to be greener than their counterparts from Germany and the UK. Another important conclusion can be regarding customers' awareness of the green practices. Countries that have more green-related reviews can be considered as the ones that have achieved more in promoting and offering their green-oriented services and products, which in turn leads customers to post more green-related comments. Last, the cultural dimensions proposed by Hofstede (1980) can also possibly represent research tracks to explain these differences. Hofstede's cultural dimensions suggested that western countries, such as the UK are indulgent societies which seek gratification of basic and natural human desires to fulfil the need to enjoy life and have fun. Contrary to the western culture, China tends to suppress gratification of immediate needs for the sake of sustained, long-term benefits (He & Filimonau, 2020).

To answer RQ2 and clarify the main themes and concepts arising from the green reviews of hotel customers from the top 10 countries, Leximancer software was used to group concepts within themes and generate a colored bubble map. As seen in Figure 1, the most important themes mentioned in customers' green reviews are *room*, *daily*, *hotel*, *staff*, *front*, *food*, *coffee*, *amazing*, *experience* and *trip*. All themes, except for *trip*, include other concepts and are connected to each other in some way. While the theme *room* includes the adjectives like *clean*, *comfortable*, *large*, and *nice*, the words like *water*, *light*, *floor*, and *use* come up as other concepts, which indicate a connection to the energy-saving applications of green hotels. The concept of *water* having a strong connection with the theme *daily*, which points to the daily use of water, has been mentioned frequently and these words travel close to each other in the text. For example, a customer indicated that

the smaller energy saving ideas, like reusable bottled waters are nice and the beds are so comfortable.

On the other hand, *energy* has a connection with the theme *front* and the concepts *area* and *lobby*, which contributes to the interpretation of the relation between the energy use in the areas of front desk and lobby. Moreover, *energy* has an indirect connection with *water* and *daily*, thus strengthening the proof of green applications. A customer stated that

the hotel is very environmentally conscious, with reusable glass water bottles and incentivizing you to use less energy.

The map in Figure 1 also plots a pathway between the themes *daily* and *food* as well as the adjective concepts of *local* and *organic*. Furthermore, *restaurants*, *pool*, *bar*, *breakfast*, *buffet* and *drinks* are connected to the concepts and themes, which might indicate that the food and beverage served in pool bars and restaurants are local and organic, supporting the green service of the hotels. For example, a user said:

The hotel genuinely tries to be a sustainable hotel, for example breakfast is organic.

Regarding the restaurant menu, another customer said:

... energy efficient and ethical hotel. Can't comment on the bar and restaurant but the menu looked tempting and organic.

The link among the theme *staff* and the concepts *responsive, helpful, friendly, time, and best* indicates the importance of having well-trained, punctual, and experienced personnel adding to the value of daily service. This value might also suggest that daily green service practices can be more meaningful with trained staff. Finally, this map shows that perceptions of green hotel customers were proved by a connection between the themes of *room, daily, food* and *staff* as green with linked concepts of *water, light, energy, use, local, organic, responsive, and helpful*. As expected, *room, daily, food, and staff* dominated the green mentions of customers. For instance, a customer indicated that 'the staff were friendly, the room decor was quirky, super comfortable bed and very close to the tube station. It's also a great concept being energy conscious, yet we still had everything we needed'.

The customer green reviews were categorized into three groups according to the rating as satisfaction, moderate, and dissatisfaction. *Satisfaction* reviews constituted the majority with the percentage of 84.87 (11,356 reviews), while the *moderate* and *dissatisfaction* reviews received 9.04% and 6.08%, respectively (see Table 2). These findings are congruent with previous studies, and a positive skew is consistent with a bias toward positivity in the language (Jurafsky et al., 2014). The final numerical output is also shown in Table 4, while the related conceptual maps can be seen in Figures 2, 3, and 4. Themes are acknowledged as the most effective factors on customers' positive, negative, or moderate reviews. The three figures clearly indicate how various themes mentioned by customers are related to one another to describe green hotels providing different levels of customer satisfaction.

To investigate RQ3 and identify which concepts are linked with higher and lower levels of satisfaction from the green hotel guests' perspective, concept maps were used. Figure 2

shows that the most important themes that customers mention to describe their satisfaction in their reviews are *staff*, *room*, *pool*, *hotel*, *water*, *restaurant*, *lovely*, *trip*, and *shows*. All themes include multiple concepts and are connected to each other as well. Most of the concepts related to *staff* travel along the text with adjective concepts, such as *helpful*, *friendly*, *responsive*, and *lovely*. For example, a guest indicated that ‘overall it was a great place to stay and the staff really are very friendly and helpful’. These connections show high levels of satisfaction with the staff of green hotels, who respond in a positive way. This shows that employees’ knowledge, skills, and capabilities about green practices and how to communicate with customers efficiently throughout their green experience are important determinants affecting customer satisfaction levels in green hotels. That is, green hotel customers put more emphasis on interpersonal relationships with service providers, referring to interaction quality suggested by Lockyer and Tsai (2004).

Moreover, the theme *pool* includes *daily*, *service*, *bar*, *local*, and *breakfast* strongly connected to the theme of *restaurant* including the concepts of *food* and *organic*. For example, a customer stated that

we had breakfast which I would recommend . In fact, it was the best Granola I have ever had (think it was homemade).

These close connections might suggest that daily service of local and organic food in restaurants and pool bars points to the eco-friendly applications. This implies that food quality is considered as another important determinant of customer satisfaction with green practices. Yu et al. (2017) suggested that customers place higher priorities on organic foods, when looking for quality in green practices. That is, when hotels purchase local and organic foods, customers’ green service quality perceptions are positively affected, leading to higher levels of satisfaction.

Figure 3 shows the concept map of green hotel customers' dissatisfaction, referring to the ratings of one and two bubbles. The most important themes customers mentioned to describe their dissatisfaction and why they wrote negative customer reviews are *room, time, hotel, daily, water, pool, food, better, and pay*. For example, a customer indicated that

despite management's claim that they are trying to improve their check-in process, the line to check-in is still indeed one hour... That's lack of hospitality, a nuisance, but what's inexcusable is the lack of housekeeping! We stayed for three nights and had been offered the 'eco-friendly' option.

It seems that customers have been mostly dissatisfied with long check-in times. As for the green applications, it can be inferred from the map that the concepts of *spa, shower, and use* within the theme of *water* and their connection with the theme of *room* present the green hotel guests' dissatisfaction. This finding can be related to the service quality dimension of *facility* (Hoare & Butcher, 2008). Facility quality can be an important factor that leads to dissatisfaction when a green hotel cannot operate its practices according the environmentally friendly expectations of customers. Furthermore, the theme *daily* covers the concept of *waste*, sharing it with the theme of *pool*, and also with the other theme of *food*, indicating the unfavorable practices of wasting food.

Figure 4 presents the concept map of satisfaction that customers exhibit at moderate levels. The most important themes appear to be, respectively, *hotel, room, pool, staff, day, food, night, water, better, and shower*. Indeed, *hotel* with its red color appears as the most important theme, and its connection to the concept *lights* implies the green practices of energy. For example, a customer commented:

I totally fail to understand why modern hotels feel the need for complicated lighting systems that require instructions re operation. When I finally got a blackout in the room, the bathroom area lights remained full on.

The other theme *pool* includes the concepts of *drinks, bar, energy, waste, and area* proving to be quite relevant to the green practices of hotels. A guest stated that

while I'm very comfortable with re-use and of course it is completely the norm to see signs about the environment, this goes to a completely new level. Little is said that water wasted in pool area could somehow be reduced.

It can be concluded from this scenario that in the pool area and pool bar, the waste of energy was witnessed by the guests that hindered them to indicate high satisfaction levels in their comments. These findings show the importance of facility quality in affecting customer satisfaction. Moreover, the link between *day* and *use* and the indirect connection with the themes *water* and *shower* and the concept *clean* are signs of green practices. In addition, the theme of *staff* includes the concepts *friendly*, *service*, *breakfast*, and *people* and the theme *food* contains the concepts *restaurant*, *local*, and *buffet*. This finding implies that customers hesitate to declare complete satisfaction with hotel employees' behaviors and attitudes, particularly during breakfast service. This obviously shows that hotel employees are one of the strongest determinants influencing customer satisfaction with green practices.

We used the ANOVA test to analyze the last research question (RQ4) (see Table 5). The results illustrate that there is a statistically significant difference in satisfaction ratings among 10 countries. The effect size is at 0.330, which is much higher than the cut-off level (>0.14) (Cohen, 1988). Post-hoc comparisons also demonstrate that the mean scores for Italy are significantly different from other countries, while between two European countries – (France and Germany) – there is no significant difference (see Appendix B). Moreover, the mean scores of the USA, China, Turkey, Thailand, and the UK reveal that satisfaction ratings of these countries are not significantly different. The results also show that satisfaction ratings of most of the European countries (i.e. France, Spain, Italy, and Germany) are different from other countries. Mean scores display that the highest satisfaction ratings were ranked in Italy (4.63), USA (4.47) and Turkey (4.42), respectively, while the lowest ratings were from Germany (3.93) and France (3.95) (Appendix D). This finding aligns with RQ1 revealing that Turkey, the USA, and Italy are the most successful countries in achieving their

customers' awareness of green services and products. In other words, countries that can increase customers' awareness of green practices can also increase their satisfaction levels. As suggested by Song et al. (2020), these customers could be more enthusiastic about promoting the green hotel via electronic word-of-mouth on TripAdvisor.

5. Discussion

This study analyzed a total of 121,780 UGC reviews posted on TripAdvisor. RQ1, first, sought to determine customer UGCs, and analyzed green implications, which are indicated by customers at green hotels from ten countries. Our findings showed that there is a statistically significant difference in the amount of green reviews among top ten countries, and customers provided more green-specific comments for green hotels from American countries, such as Mexico (19.65%) and USA (14.43%) followed by Turkey (16.48%). The rate of hotel customers' green reviews was lower than the average value (10.80%) in European countries, including Germany (6.74%), UK (7.41%), Spain (8.24%), France (8.51%), and Italy (9.67%). The descriptive statistics showed that the average value of the number of green reviews were 17.04% for American countries, 8.45% for Asian countries, and 9.51 % for European countries. Previous studies analyzing customer reviews for 10 green hotels from the USA found that approximately 10% of customer reviews included green-specific comments and recommended that more studies including big data from different locations be conducted (Song et al., 2020; Yu et al., 2017). Likewise, our multi-country study provides a response to the call and confirmed that, in total, 10.80% of green hotel customers from the top 10 countries mentioned green practices in their UGCs. Hence, this research adds to the green literature on the awareness and perceptions of customers about hotels' environmentally friendly practices, confirming the previous results.

Through categorizing green hotels by country, our study clarified main themes and concepts in terms of customers' service quality perceptions and satisfaction. RQ2 sought to determine the themes and concepts utilized by green hotel customers indicating environmentally friendly practices of green hotels in their reviews. The results show that the main themes are *room, daily, hotel, and staff, front, and food*. The main concepts are also *hotel, room, staff, daily, water, pool, and food*. This map points out that green hotel customers pay more attention to the three green service quality standards: (1) energy saving practices, (2) local and organic foods (purchasing), and (3) staff training. This finding also reveals complexity among studies that found significant differences in customer quality perception of green services. For example, Millar and Baloglu (2011) found that hotel guests recognized 'linen reuse' and 'energy efficiency' more as green service quality criteria, while another study revealed 'energy', 'purchasing' and 'education & innovation' as the most referred-to environmentally friendly services by hotel customers (Yu et al., 2017). The reason behind the inconsistencies can be the lack of a commonly accepted standard of green services. A second reason can be limited awareness of customers about the green services that is congruent with Tsai et al.'s (2014) study, which suggests that hotel managers can be familiar with green practices, but customers may not be aware of them. This confirms a necessity for clear standards of green services provided by hotels. Future attempts can focus more on developing a more comprehensively accepted list of green services in the industry that could minimize the confusion.

Furthermore, the results showed that customers with high levels of satisfaction with green practices provided information about staff, room, pool, hotel, water, and restaurant. These 'satisfaction' comments then gave information about local and organic food in restaurants and pool bars as well as helpful, friendly, and responsive staff. The results reveal (1) the importance of purchasing and offering locally produced organic foods in customer

green service quality perception and satisfaction, confirming previous study findings that customers have higher priorities for organic foods, when seeking for green quality and satisfaction (e.g., Barber, 2014); (2) that employee competence and attention play a significant role in increasing customer green satisfaction, consistently with previous research (e.g., Robinot & Giannelloni, 2010; Yu et al., 2017). This finding also endorsed the empirical findings of a previous study (e.g., Hoare & Butcher, 2008). Past research also found that purchasing organic foods, staff and guests, and education about green practices have more immediate and direct effects on customers' green experiences (e.g., Yu et al., 2017). In line with these previous findings, the study results demonstrate that customers are satisfied with competent staff and organic foods as regards green services.

In dissatisfaction reviews, themes including *room*, *time*, *hotel*, *daily*, and *water* all signify the long waiting time of customers for check-in. This finding reveals a strong relationship between wasting time and customer dissatisfaction, confirming previous research findings that when the waiting time for checking in is evaluated negatively, it strongly contributes to increased customer dissatisfaction (Robinot & Giannelloni, 2010). The results also show that green hotel customers are mostly dissatisfied with water use in the room (i.e., bathroom) and spa. This finding demonstrates that spa activities can lead to dissatisfied customers for green hotels if water saving measures cannot be ensured. This is congruent with the previous research revealing that customers have negative reactions about the hotels' water-saving practices (e.g., Song et al., 2020). In line with the existing literature (e.g., Hoare & Butcher, 2008), it can be concluded that facility quality is a significant determinant that can negatively affect customer satisfaction, if it is implemented in an unfavorable way. In addition, in the dissatisfaction reviews, the theme *daily* emerged – practices and operations within the day, in agreement with past research (Robinot & Giannelloni, 2010), revealing that comfort dimension of the hotel (i.e., facilities at the hotel) strongly lead to customer

dissatisfaction when they are evaluated unfavourably. *Daily* is associated with *waste*, *pool*, and *food*, possibly indicating undesired practices of wasting food that leads to negative quality perceptions about the food service in the pool area. In fact, in the dissatisfaction reviews, *pool* emerges as a separate theme from *hotel*, indicating that when satisfaction is low, customers distinguish clearly between hotel and its departments for evaluating green services.

In the moderate satisfaction reviews, *lights* within the theme *hotel* emerges as a green practice of energy in the green hotel. Themes such as *pool*, *water*, and concepts of *energy*, *waste*, *day*, and *use* show that customers are not satisfied with the waste of energy that prevented them from writing positive reviews. This confirms previous research findings that some environmental attributes (i.e., energy, water usage, towel reuse, and recycling) are identified as neutrals (e.g., Cadotte & Turgeon, 1988). The results also revealed that customers are not fully satisfied with breakfast offered as open buffet service in a restaurant, because they rather expect organic and local foods and helpful and trained employees. In line with previous studies (e.g., Lu & Stepchenkova, 2012; Yu et al., 2017), our findings suggested that hotels need to consider these moderate-level comments, since they can become ‘dissatisfiers’ if they are practiced poorly or possibly become ‘satisfiers’ with practitioners’ extraordinary efforts in the future. This finding also resonates with the study of Hoare and Butcher (2008) suggesting that service quality dimensions of interaction and food directly influence customer satisfaction.

The findings also revealed that there are significant differences in satisfaction ratings among the 10 countries. This implies that having a different cultural background may influence customers’ satisfaction levels with green hotel practices. Similarly, Berezan et al. (2013) conducted customer surveys, and found that there are differences in green attributes

that satisfy different nationality groups – Americans, Mexicans, and others. However, some studies have found no major differences among various groups of travelers (Berezan et al., 2013; Millar & Baloglu, 2011). This requires further academic effort to crystallize the effects of various demographic factors, including cultural background and language, on customers' green satisfaction.

5.1. Theoretical implications

The novelty of the proposed framework lies in its focus on the themes of green satisfaction, which includes the customer's evaluation of green hotels' environmentally friendly practices. From the perspective of expectation-confirmation theory, our significant results linking green satisfaction and online expectation confirmation to the writing of positive or negative comments, provide a thematic map for the influence of hotel green practices on customer green satisfaction and subsequently, their online comments. To our best knowledge, the expectation-confirmation theory has scarcely been adopted by hospitality scholars to investigate customer satisfaction about service innovation (e.g., Truong et al., 2020), restaurant service (e.g., Lee & Kim, 2020), and online meal delivery platforms (e.g., Belarmino et al., 2021). The differences in customers' perception of green satisfaction levels through their post-purchase online comments is heretofore not yet explored in literature, and therefore a portion of our contribution. We suggest further attempt to more thoroughly examine the paths in which online reviews may stimulate or contribute to future, additional reviews of green hotel customers. This could further contribute to the expectation-confirmation theory.

Though expectation-confirmation theory has been adopted in various consumer satisfaction studies (e.g., Fu et al., 2018; Gupta et al., 2021; Lin et al., 2009), to the authors' best knowledge, few attempt has been conducted on the link between the expectation from

green hotels' environmentally friendly practices and the confirmation from real-life experiences.

Our research further illustrates the role of the expectation-confirmation theory in exploring the role of confirmation on post-online-behavioral intentions, that is, positive, negative, or moderate level review intentions. In particular, our findings not only provided green-specific satisfactory, dissatisfactory, and moderate-level themes, but also common themes that could lead customers to provide positive (i.e., confirmation), negative (i.e., disconfirmation), or moderate-level comments (see Figure 5). This finding shows that some green products or services have been perceived as unique for indicating either green-specific satisfaction or dissatisfaction (e.g., staff, food, time), while some appears as both confirmed and disconfirmed themes (e.g., hotel, water, pool, room) by customers depending on their expectatons. One plausible justification could be that green hotel guests perceive these green attributes and services, such as water save, energy-saving lights, and sensors to control lighting in the rooms, as standard attributes and practices, recommending they do not directly contribute to customers' satisfaction (Assaker, 2020). Another possible reason could be derived from customers' cultural differences that can significantly affect their green-specific expectations. This finding, thus, calls further attempt to empirically explore how (i.e., through which mechanisms) and when (i.e., under which circumstances) these green-specific themes lead to customer satisfaction or dissatisfaction. Revealing potential mediators and moderators in these relationships could enable scholars to better understand the factors affecting customers' satisfaction (confirmation) and dissatisfaction (disconfirmation) with green products and services. These attempts could additionally contribute to the expectation-confirmation theory. Thus, we encourage further research in this direction.

Our research provides that main customers' green-oriented expectations that confirmed by the green products or services are organic foods and breakfast at restaurants, friendly and responsive hotel employees, energy saving rooms, and water usage, while disconfirmed green-related expectations are time waste, daily energy waste, food waste at pool bars and service, redundant hot water use in spa, as well as long waiting during check-in and payment. The present research expands the implication of expectation-confirmation theory in green hotel contexts by revealing which green practices were confirmed and disconfirmed by customer green experiences that leads to green satisfaction or dissatisfaction. From a theoretical point of view, the present research has categorized the themes and concepts of the green satisfaction that is comprising three levels: satisfactory (confirmed), dissatisfactory (disconfirmed), and moderate-level (partially confirmed) green experiences, leading to green satisfaction or dissatisfaction (see Figure 5). The novelty of the proposed framework lies in its focus on the determinants of customer green satisfaction, which includes the customer's evaluation of green hotel attributes, products, and services. The framework responds to the call for development of new theories for green service (Arici & Uysal, 2021).

In this comparative study, green practices were more pronounced in their comments for tourists staying in American and Asian countries than for the European countries. This may potentially indicate that, to date, the American and Asian hoteliers have been more successful in raising consumer awareness of their green services. Our finding supports the theory of Hofstede by establishing collectivism as an important driver of 'greener' consumer awareness and highlighting the individualistic culture's negative role in promoting green practices to enhance customer awareness. Congruent with previous research (e.g., He & Filimonau, 2020), our finding shows that individualism has a negative effect on consumers' (un)willingness or unawareness to post comments about hotels' green services.

Another important finding also shows variations in customers' satisfaction ratings among the 10 countries. Satisfaction ratings of most of the European countries (i.e., France, Spain, Italy, and Germany) are different from those of the other countries. This represents simultaneously an interesting theoretical contribution as it suggests operating green hotels from different countries but with similar patterns in terms of satisfaction levels. Similar cultural background resulted in similar satisfaction ratings for green hotels. Although national culture is considered a well-established factor, which has the potential to shape tourist attitudes in the context of more environmentally sustainable tourism, the related research agenda is under-developed (He & Filimonau, 2020). Through rectifying this knowledge gap, this study provides theoretical contributions to the cultural dimensions defined by Hofstede (1980). From the expectation-confirmation theory perspective, by presenting a conceptual map that the green-related themes and concepts for writing satisfactory or dissatisfactory comments vary, we further contribute to explanations of green customers' post-purchase evaluation. Whilst previous research has demonstrated evidence for the effect of positive and negative online comments on customers, scholars have not thoroughly demonstrated green experiences and customer online comments. Our research therefore advances scholars' comprehension about customer green-specific satisfaction by illustrating unique themes, leading customers to provide positive, negative, and moderate-level comments.

Another theoretical contribution is associated with using big data analytics. This multi-country research is among the first in green hospitality literature to explore and compare the customers' green service quality perception and green satisfaction levels among the 10 countries. In doing so, our study confirms previous studies that a very limited ratio of customers are aware of green services provided by green hotels (Song et al., 2020; Yu et al., 2017). In addition, our work provides a macro perspective to hospitality scholars.

5.2. Managerial implications

The research has several managerial implications for both owners and managers of green hotels. *First*, the study detects main themes and concepts, which green hotel guests have utilized to mention their different levels of green satisfaction. It could aid websites and microblogs to decide factors that guests pay attention to and their responses to the service delivered according to their green satisfaction levels. This information could also help green hotels to develop their green service quality.

Second, green hotel managers from countries where the number of green reviews is lower than others should focus on improving customers' awareness of their environmentally friendly practices. Research suggested that while hotel managers are familiar with green practices, customers may not be aware of them (Tsai et al., 2014). Customers' awareness of environmentally friendly practices in hospitality facilities significantly influences customers' booking intentions (Yu et al., 2017). Thus, it is important for green hotel managers to promote their green attributes and practices to enhance customers' awareness. To do this, hotel managers could choose a sample of volunteer customers and provide them with training to develop their awareness of green services. In doing so, they can not only improve these customers' green awareness, but customers can also provide positive UGCs. Hotel managers can use several methods to promote their green attributes. For instance, hotels could use brochures, exhibitions, ecological corners, webinars, and multimedia presentation kiosks to deliver eco-friendly knowledge and to increase their customers' understanding of green practices (Bohdanowicz, 2006; Yu et al., 2017). New-generation technologies, social media, and microbloggings can be considered as an efficient way for hoteliers to send green information to their customers. Likewise, having green certificates could aid customers acknowledge hospitality organizations' green attributes and practices. Further, as suggested

by Kim et al. (2017), hotels need to utilize reliable and truthful sources with a favourably framed message when they announce and advertise green products and services to customers. Another method can be staff training through establishing green-oriented meetings and developing green-focused work trainings. Employees' awareness of the hotel's current green efforts and services could also increase customers' awareness of these practices.

Third, another important finding which can provide a guide for green hotel managers is the check-in process. During check-in, customers should be informed about green practices and service delivered in the hotel to improve their awareness because dissatisfied customers complain that front office personnel do not provide adequate information even though they wait a long time for check-in. Hotel managers need to consider providing sufficient information via front office personnel about their green service so that customers feel that they are really in a green hotel.

Forth, our findings suggest that purchasing and offering local and organic foods could be acknowledged as an important green attribute that can confirmed customer expectations when well implemented, leading to customer satisfaction and behavioral intentions (i.e., writing positive comments). Thus, hoteliers should put special emphasis on purchasing and offering locally produced organic products as an approach to mitigate ecological footprints and bolster up local society that could be better understood by their customers. It helps increase customers' confirmation of the quality of green attributes, products and, services and subsequently their satisfaction with the green hotel and provide positive online comments.

Fifth, though our findings show that some environmental attributes, such as energy, water usage, and recycling are demonstrated as neutrals, hoteliers need to put emphasis on them, since they could lead to customer dissatisfaction if they are implemented

unsuccessfully or possibly contribute to customer satisfaction if hoteliers focus on developing these practices in the future.

Sixth, such green practices as room, pool, and water usage are quite controversial since customers perceive them in both satisfactory and dissatisfactory experiences. This implies that when customers perceive that these green practices do not benefit them, they could unfavourably react to these practices. It would be beneficial when hotel managers could alter the framing of communications through addressing how environmentally friendly attributes benefit customers and aid hoteliers protect the environment. If successfully applied, these efforts could enhance guest green satisfaction, but, if these are unsuccessfully executed, they could result in customer dissatisfaction. Therefore, these green practices could be more difficult to achieve, they require a greater endeavor from hoteliers since they have a great potential to increase hotels' sustained competitive advantage in the market. Hence, hoteliers need to ensure to pursue good achievement about these environmentally friendly implications to prevent guest dissatisfaction.

The *last* recommendation for green hotel managers is that employees' skills and knowledge of green service should be improved. Previous research also supports our recommendation that training including environmental issues and concerns could improve personnel's green understanding, therefore enhancing customers' awareness of eco-friendly services (Yu et al., 2017). This may be the most important task of hoteliers because if customer-contact employees do not possess sufficient knowledge, they cannot offer a green service very well; moreover, these workers cannot effectively introduce eco-friendly service to customers. Hence, green hotel managers should make sure that personnel have sufficient knowledge of how to offer green services and how to contact customers efficiently throughout their accommodation.

5.3. Limitations and future research directions

This study has several limitations. First, even though using Leximancer in data analysis mitigates the degree of subjectivity in the findings due to its adaptation of a standard method, the tests might still suffer from a level of subjectivity because of the nature of the qualitative research method.

Another limitation is related to the internal validity of the factors of guest green satisfaction. The single measure overall satisfaction rating (i.e. bubbles) for a green hotel rated by hotel guests on TripAdvisor was regarded as a gauge of green satisfaction level of guests, and the review was thus considered guest green satisfaction. Further investigation can test these internal validity subjects through checking potential relationships with other gauges of the identical factors.

Lastly, this study has only been employed for English reviews on TripAdvisor. Various cultures and travelers from different cultural backgrounds could play an important role in developing green practices. Similarly, residents can have different viewpoints in evaluating the same green hotels. Future research can focus on examining green hotel experiences across various cultures and nationalities by considering online reviews written in other languages.

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Table 1. Green hotels from top-ten countries

Rank	Country	Number of Hotels	Total number of reviews	Green reviews	%
1.	France	9	10658	907	8,51
2.	Spain	8	11038	909	8,24
3.	USA	9	12830	1851	14,43
4.	China	9	13466	1257	9,33
5.	Italy	8	10726	1037	9,67
6.	Turkey	10	11580	1908	16,48
7.	Mexico	9	14262	2803	19,65
8.	Thailand	8	13172	997	7,57
9.	Germany	8	10641	717	6,74
10.	U.K.	9	13407	994	7,41
Total		87	121,780	13,380	10,80*

Note: *Average value of the percentage.

Table 2. Descriptive statistics

review rating (bubbles)	Customer satisfaction	No. of reviews	Votes for helpful reviews	Helpful votes to no. of reviews %
1-2	Dissatisfaction	814	13997	17,20
3	Moderate	1210	77741	64,25
4-5	Satisfaction	11356	322427	28,39

Table 3. ANOVA test results of green reviews

	Sum of squares	df	Mean square	F	sig.	Effect size
Between groups	229,36	9	25,484	265,67	0.000	0.196

Table 4. Counts of themes in green reviews by customer satisfaction ratings

Satisfaction		Dissatisfaction		Moderate	
Themes	Counts	Themes	Counts	Themes	Counts
Staff	33072	Room	2578	Hotel	4279
Room	32286	Time	2421	Room	2998
Pool	30137	Hotel	2366	Pool	2906
Hotel	28154	Daily	1431	Staff	2424
Water	15453	Water	1039	Day	2184
Restaurant	13587	Pool	868	Food	1723
Lovely	7167	Food	717	Night	1699
Trip	5194	Better	593	Water	1397
Shows	975	Pay	571	Better	641

Table 5. ANOVA test results for satisfaction ratings

	Sum of squares	df	Mean square	F	sig.	Effect size
Between groups	404,16	9	44,906	50,20	0.000	0.330