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Determinants of online hotel ratings: Evidence from consumer reviews in Hail City, Saudi Arabia

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ABSTRACT

The hospitality and tourism sector is a major source of revenue and employment worldwide. Saudi Arabia has significant potential to develop its tourism industry, which supports economic diversification and the expansion of non-oil revenues in line with the goals of Vision 2030. In the current digital environment, travelers increasingly depend on online platforms to evaluate hotel services and make booking decisions. Therefore, hotels' ability to attract and retain customers is strongly associated with customer satisfaction and positive online ratings. This study aims to identify the main factors influencing hotels' online rating performance in Hail City, Saudi Arabia. Hotels in developing countries such as Saudi Arabia can improve these factors to enhance their online ratings, attract more customers, increase revenue, and contribute to achieving the objectives of Vision 2030. The study analyzes online consumer reviews collected from major hotel booking platforms, including Booking.com and Agoda, focusing on hotels located in Hail City. The findings indicate that comfort, location, facilities, and value for money significantly influence hotels' online ratings. Comfort, location, and facilities are associated with the satisfier dimension of the two-factor theory, whereas value for money is identified as a dissatisfier factor.

1. Introduction

The Internet has an essential impact on tourism both for suppliers and customers (Tan et al., 2025). It has led to new market models and, in many cases, more choice and information for consumers (Sánchez et al., 2022). The Internet is playing a key role in marketing tourism destinations online. In recent years, the emergence of Web 2.0 technologies has facilitated the widespread creation of user-generated materials, such as digital travel narratives and customer-generated review content (Xiang et al., 2017). Given the intensive information nature of the tourism industry, these technologies have expanded new avenues that enable tourists to engage with one another and exchange experiential insights via digital platforms that were not previously possible (Standing et al., 2014). Such digital technologies integration in the tourism sector mirrors the broader trend of leveraging IT for collaboration and performance management, and information sharing in organizations. Online travel reviews by tourists are one of the key ways to collaborate and share information (Leung et al., 2013).

In the contemporary travel environment, tourists increasingly rely on online reviews to mitigate perceived risks involved in selecting hotels, restaurants, and tourist attractions. Evidence from TripAdvisor indicates that online travel reviews play a crucial role in booking decisions. The report shows that 72 percent of travelers refer to online reviews prior to selecting accommodation options, dining, or even visiting, while 81 percent rely on such reviews prior to making accommodation reservation decisions. According to a study by Raguseo and Vitari (2017), online review platforms have received increased market power and increased influence over customer purchase decisions. Potential customers often consider the volume of online reviews to decide the products or services that they want to purchase out of the vast selection of alternatives available online (Baum and Spann, 2014).

With the growing acceptance of online reviews, user-generated content (UGC) has become a reliable and valuable source of information for both travelers and hotel operators. Therefore, the travel websites that support online UGC help in the propagation of

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the electronic word of mouth (e-WOM). E-WOM is any positive or negative statement made by customers about a company or product, and it can be disseminated rapidly via the Internet (Hennig-Thurau, 2004). E-WOM has a much higher speed of interaction as compared to the traditional word of mouth (WOM) (Litvin et al., 2008). Along with influencing the booking decisions of customers, e-WOM helps to improve profits of the hospitality and tourism industries through market expansion and acceleration (Libai et al., 2013).

Globally, the hospitality and tourism industries represent a key sector for revenue generation and employment creation. Hospitality and tourism industries play an important role in the economic and social development of all countries, especially developing economies (FaladeObalade and Dubey, 2014). A developing economy like Saudi Arabia has significant potential to expand its tourism sector. As part of its Vision 2030, Saudi Arabia has been pursuing strategies to boost non-oil revenues. In this context, the tourism industry can play a vital role in supporting economic diversification and achieving the objectives of Saudi Vision 2030.

Hotels are a key component of the tourism industry. Research indicates that the tourism and hospitality industry plays a significant role in employment generation across multiple job categories, illustrating its importance in labor market dynamics and value creation within local economies (Näppä et al., 2025). The global hotel market generated USD 147.57 billion of revenue in 2018, and research expects this to increase to USD 211.54 billion by 2026.

Given the important role of tourism in supporting economic transformation in developing economies such as Saudi Arabia and considering hotels as a central element of the tourism sector, this study aims to examine the main determinants shaping hotels' online rating outcomes. Prior research on online ratings of hotels has been conducted in cities like Makkah (Singh and Alhamad, 2022; Singh et al., 2023); however, there is a shortage of research that focuses on emerging small but prominent cities like Hail. Accordingly, this study fulfills this research gap, and its empirical analysis focuses on hotels operating in Hail City, Saudi Arabia. By addressing these determinants, hotels in developing countries can enhance their online ratings, attract more customers, increase revenue streams, and support the strategic objectives outlined under Saudi Vision 2030. This study endeavors to answer the following research questions: (1) How can hotels leverage online consumer reviews to enhance customer satisfaction? (2) What are the hidden aspects of knowledge that hotels can decipher from online consumer reviews to enhance their competitiveness?

This study analyzes consumer-generated online review data collected from widely used hotel booking platforms, including Booking.com and Agoda, for hotels located in Hail, Saudi Arabia. The reviews available on these platforms evaluate hotel performance across several dimensions, including multiple service and facility-related attributes, which are considered in this study to examine their combined influence on hotels' online ratings. In addition, the conceptual model incorporates control variables such as hotel star rating, hotel budget category, and property type.We use the two-factor theory to build the conceptual model for this research (Herzberg et al., 1959; Johnston, 1995; Lee et al., 2022). Based on the four factors related to the satisfiers dimension and the four factors related to the dissatisfiers dimension of the two-factor theory, we form eight hypotheses for this research.

The results indicate that comfort, location, and staff with value for money also demonstrate a statistically significant association with hotels' online ratings. In contrast, free Wi-Fi, facilities, cleanliness, and breakfast do not demonstrate a significant relationship with online rating outcomes. Within the framework of the two-factor theory, comfort, location, and staff are categorized as satisfiers, whereas value for money is identified as a dissatisfier. These conclusions are derived while accounting for the effects of control variables, including hotel star rating, hotel budget, and property type.

In this study, we will analyze rich online consumer reviews data to predict key factors impacting online ratings of hotels. The primary objectives of this research include: 1. Investigate the importance of leveraging online consumer reviews data from popular hotel booking websites for enhancing customer satisfaction. 2. Determine key factors influencing online ratings of hotels. 3. Suggest strategies to improve customer satisfaction and enhance the competitiveness of hotels.

2. Theory and hypotheses

Customer satisfaction plays a significant role in creating a competitive advantage. Highly satisfied customers show brand loyalty, provide positive word of mouth, and help to increase sales (Pooser and Browne, 2018). Dis-satisfied customers show low brand loyalty, provide a negative word of mouth, and boycott the product class, brand, seller, or retailer (Sánchez-Rebull et al., 2018).

Several prior studies examining consumer satisfaction have employed theoretical perspectives such as the Expectations Confirmation Theory (ECT). More broadly, research on online hotel ratings and customer satisfaction can be categorized into three main streams: (1) studies focusing on the impact of online reviews on consumer decision-making, (2) research identifying service-related determinants of hotel satisfaction, and (3) studies applying structured theoretical frameworks, including the two-factor theory, to explain customer evaluations (Lan, 2017).

According to ECT, if the product or service perceived performance meets or exceeds the customers' service expectations, the customer is satisfied. If perceived performance is below expectations, the customer is dissatisfied.

2.1. Importance of online reviews of consumers

Several studies have reported that e-WOM plays a significant role in the accommodation reservation decisions of travelers (Mendes-Filho et al., 2010). E-WOM disseminated, in the form of travel reviews, affects the digital reputation of organizations (Jiang et al., 2010). E-WOM is highly influential in experience goods, like in the tourism and hospitality context, as online UGC becomes an essential and independent source of information for prospective travelers (Ismagilova et al., 2017). Yoo and Gretzel (2008) recognized e-WOM as the most valuable feedback platform in the hospitality industry. They have reported that the desire to help other customers mostly motivates customers to post the review. They further reported that customers post reviews because of concern for travel service providers and the need for enjoyment/positive self-enhancement. So, the online UGC generated by tourists is generally considered reliable and unbiased (Wu and Pearce, 2014). It is also very helpful in understanding new activities, novel markets, and sensitive topics (Langer and Beckman, 2005).

Ye et al. (2011) examined the impact of online reviews on hotel room sales. They noticed a positive relationship between the reservation rate of a hotel and the number of positive reviews posted on booking sites. They concluded that consumers tend to book a hotel if there are too many positive reviews. From the decision-making perspective, the appearance of user-generated reviews increases both the knowledge of the hotel and the views towards the hotel during posting an opinion (Vermeulen and Seegers, 2009).

Several researchers have reported that online UGC can have a considerable influence on other tourists (Kim et al., 2011). Lipsman (2007) conducted a study on more than 2000 US Internet users in October 2007. The results of the study showed that consumers were willing to pay 20 percent more for hotel services that received a 5-star or "excellent" rating as compared to the same service receiving a 4-star or "good" rating. The study also showed that more than 87 percent of customers use online UGC to make booking decisions of hotels, which is higher than other product categories like restaurant (79%), travel (84%), automotive (78%), home (73%), medical (76%), legal (79%), etc. 82% of consumers use online UGC (particularly reviews by other users) before making purchases in stores. Filieri and McLeay (2014) have reported that product review is the strongest predictor of travelers' adoption of information.

2.2. Factors influencing online ratings of hotels

Previous research has reported the specific predictors of customer satisfaction for hotel reviews. Insufficient facilities or reduced levels of comfort within hotel rooms are associated with lower levels of customer satisfaction (Li et al., 2013). The comfort level is the primary feature of the hotel and, in turn, improves the attitude of customers towards the hotel (Abdulaali et al., 2025). Lower service efficiency of hotels leads to a lower level of customer satisfaction. Staff and their attitude act as a critical factor that affects customer satisfaction (Ananto and Purnami, 2025). Collectively, these studies suggest that experiential and service-related attributes consistently shape customer evaluations in the hospitality sector.

O'Connor (2008) examined e-WOM comments for 100 hotels in London. According to this study, the most frequent concerns of reviewers are the size of the room, breakfast, staff, location, bathroom, bed, and shower. According to the study conducted by Raguseo and Vitari (2017), the hospitality of the staff, the level of comfort and rooms' cleanliness, the quality of the facilities and services offered to customers (such as swimming pools, conference rooms, and gym), and the value of the room compared to its price are dimensions of hotel quality.

Öğüta and Cezara (2012) reported that online customer ratings complement star features. It is possible to examine hotel quality dimensions, including the friendliness of hotel staff, the level of comfort and cleanliness of hotel rooms, the facilities and services provided to customers, the value for money relative to hotel quality, and the hotel's location. Consumers usually provide a higher rating on location and cleanliness, followed by room, service, and sleep quality (Wąsowicz-Zaborek, 2025).

Bulchand-Gidumal et al. (2011) conducted a study in Europe to consider the effect of free Wi-Fi on hotel ratings. Bulchand-Gidumal et al. (2011) reported that the availability of free Wi-Fi can enhance hotel ratings by as much as 8 percent. They further suggested that hotels should provide Information Technology (IT) based services (like Wi-Fi) to clients. These services should be reasonably priced and updated continuously.

Accordingly, prior research highlights a range of service and facility-related determinants, including breakfast, cleanliness, comfort, facilities, locale, staff, pricing, and Wi-Fi, as key determinants of hotels' online ratings.

2.3. Two-factor theory

In this study, we use the two-factor theory to build the study's conceptual model. The beginning of the two-factor theory can be found in Herzberg et al.'s (1959) work. According to Herzberg et al. (1959), job satisfaction and performance are influenced by two categories of factors: Motivation factors, commonly referred to as satisfiers, and hygiene factors, which are called dissatisfiers. Satisfiers and dissatisfiers are mutually exclusive and affect workplace motivation in different ways. Satisfiers encourage employees to work harder and lead to job satisfaction. The presence of dissatisfiers does not cause job satisfaction, but their absence

causes dissatisfaction. The work by Herzberg et al. (1959) showed that the satisfiers and dissatisfiers do not lie on a continuum and are individually independent. Extending Herzberg et al. (1959), Soliman (1970) conceptualized satisfiers as needs linked to higher-level psychological fulfillment, whereas dissatisfiers were associated with more basic functional requirements. Consequently, environmental conditions influence how satisfiers and dissatisfiers operate. Zhang and Von Dran (2000) found support for Herzberg et al.'s (1959) two-factor theory in website design. They found factors like enjoyment, cognitive outcome, credibility, etc., as satisfiers. They found factors like technical aspects, navigation, privacy, security, etc., as dissatisfiers. The two-factor theory posits that satisfiers and dissatisfiers consist of distinct and independent sets of determinants (Herzberg et al., 1959; Johnston, 1995; Lee et al., 2022). This theoretical premise has motivated researchers to analyze online consumer reviews to identify separate determinants of customer satisfaction and dissatisfaction (Kim and Kim, 2022; Xiang et al., 2017).

2.4. Prior empirical evidence on two-factor theory across industries

The two-factor theory has been widely employed in studies examining positive and negative customer evaluations to clarify the distinction between satisfying attributes and factors associated with unfavorable outcomes across different research contexts (Herzberg et al., 1959; Crompton, 2003). The research by Swan and Combs (1976) applied the two-factor theory in the clothing industry. They found that satisfiers and dissatisfiers are distinct and can be accounted for by the gap between expectations from a product and its performance. They reported that satisfiers perform equal to or above expectations, while dissatisfiers perform below expectations. Maddox (1981) took a more heterogeneous sample from customers who purchase clothing, personal care, and durable products to replicate the study of Swan and Combs (1976). They found mixed support for the two-factor theory. Babin and Griffin (1998) applied the two-factor theory to a broad range of service industries in Malaysia. This study emphasized that satisfiers and dissatisfiers need not be the same. These studies show that satisfiers and dissatisfiers are distinct.

Several studies have examined the characteristics of satisfiers and dissatisfiers within the two-factor theory framework. For example, Chen and Chen (2010) applied the two-factor theory as a framework to examine the determinants influencing visitors' satisfaction with recreational experiences. They reported that the physical attributes of tourism and recreational facilities provide a tangible physical environment necessary for an event, and act as dissatisfiers. They further reported that the quality of the event provides a psychological recreation environment to visitors and acts as a satisfier. Crompton (2003) conceptualized the influence of satisfiers and dissatisfiers on individuals' perceptions of event quality. He identified dissatisfiers as generic infrastructure elements that provide the basis for an event. Further, he identified satisfiers as distinctive features that attract people to an event. Johnston (1995) applied the two-factor theory in the context of bank management. This study was conducted in the United Kingdom. This study found a distinct set of satisfiers and dissatisfiers. This study also stated that satisfiers are linked to interpersonal service features and dissatisfiers are linked to operational or physical features. Chan and Baum (2007) applied the two-factor theory in the context of the eco-lodge service industry. They reported that the satisfiers and dissatisfiers are distinct and unrelated. They stated satisfiers as intangible elements and related to the ecolodge's external environment. Examples of satisfiers include wildlife viewing experiences, lodge natural environment, participation in eco-activities, and services from experienced and well-informed tour guides. They identified dissatisfiers as tangible elements and related to the eco-lodge's internal as well as external environment. Examples of dissatisfiers include cleanliness, safety, comfort, and operational standards of the lodge; functionality of riverboat trips; control over noise, air, and water pollution; and lack of a bumpy road journey to the lodge.

Drawing on service quality research, Johnston (1995) demonstrated that customer evaluations are shaped by two distinct categories of service attributes. Basic service elements function as sources of dissatisfaction when absent or poorly delivered, whereas higher-level service attributes contribute to positive evaluations when present. Extending this logic to the hospitality context, Ali et al. (2016) showed that functional attributes such as pricing fairness, physical facilities, cleanliness, and complementary amenities operate as baseline expectations, while relational and experiential elements such as staff recognition, a sense of belonging, service flexibility, and service orientation serve as performance-enhancing attributes that elevate guest evaluations.

2.5. Two-factor theory and factors influencing online ratings of hotels

Prior studies grounded in two-factor frameworks indicate that positive and negative evaluative attributes operate as separate and non-overlapping dimensions influencing consumer judgments (Herzberg et al., 1959; Li et al., 2013; Lee et al., 2022). Empirical evidence across multiple sectors further supports the view that these dimensions consist of distinct groups of determinants rather than representing opposite ends of a single continuum.

Research in tourism and hospitality contexts suggests that experience-enhancing attributes are typically associated with unique and value-adding

features, whereas dissatisfaction is more commonly linked to deficiencies in fundamental infrastructure and functional provisions (Li et al., 2013; Ali et al., 2018a). Similarly, prior service research indicates that relational and experiential elements tend to drive positive evaluations, while operational and physical aspects primarily serve as baseline requirements (Chan and Baum, 2007). On the basis of distinctive characteristics of satisfiers stated in the research of Crompton (2003), Johnston (1995), Chan and Baum (2007), and Balmer and Baum (1993), we prepared Table 1 to depict the factors related to the satisfiers and dissatisfiers dimensions of the two-factor theory.

2.5.1. Factors related to the satisfier dimension

Comfort is an important attribute for the satisfaction of hotel guests. These findings were buttressed by Abdulaali et al. (2025), who found comfort critical for the satisfaction of hotel customers. As comfort represents a psychological and intangible attribute (Table 1), it is classified as a satisfier in this study.

Singh and Alhamad (2022) employed two-factor theory and analyzed online hotel ratings in Makkah to inform that hotel location could be causative factor in customer satisfaction. Singgalen's (2024) study also informed that a good hotel location positively influences the guests' satisfaction. The location of the hotel can be its distinctive feature (Table 1). So, we consider location as a satisfier.

Singh et al. (2023) conducted a comparative study of hotels in religious (Makkah) and commercial (Alkhobar) destinations and emphasized that the attitude of the staff plays an important role in customer satisfaction. The importance of staff services for customer satisfaction was also emphasized in Ananto and Purnami's (2025) hotel industry study. Further, the services offered by staff are intangible, distinctive, interpersonal, and sophisticated in nature (Table 1). Accordingly, staff-related services are treated as a satisfier in this research.

Balmer and Baum (1993) categorized service orientation as a satisfier in the hotel context. As per Ashraf et al. (2026) study, reliable technology services (such as Free Wi-Fi) can play a critical role in customer satisfaction. In this study, the provision of free Wi-Fi is viewed as an indicator of a hotel's service orientation, particularly when the quality of the service is high. Given that free Wi-Fi represents a distinctive and sophisticated service attribute (Table 1), it is classified as a satisfier.

2.5.2. Factors related to the dissatisfier dimension

According to Ali et al. (2018b) and Rady et al. (2023) studies, price fairness acts as a basic expectation of customers, and may not necessarily lead to their satisfaction. Further, pricing (or value for money) represents a basic service feature (Table 1). In this study, pricing is operationalized as value for money and is therefore classified as a dissatisfier.

According to Aurellia and Hermansyah (2025), hotel facilities act as basic expectations that prevent customer dissatisfaction but may not lead to their contentment. Thus, hotel facilities are considered dissatisfiers, as they constitute basic, physical, infrastructure-related, and tangible attributes (Table 1).

According to Zoghi (2025), hotel cleanliness acts as a basic service expectation, whose absence could be a cause of customer discontent. Therefore, cleanliness is categorized as a dissatisfier, as it represents a basic and tangible service attribute (Table 1).

Balmer and Baum (1993) classified freebies or extra services as dissatisfiers. In this study, free breakfast is treated as a basic amenity or extra service. This is consistent with Liu et al. (2020), who suggested that free add-ons (like breakfast) serve as basic amenities and can contribute marginally to customer satisfaction in the competitive hotel industry. As breakfast represents a basic and tangible attribute (Table 1), it is classified as a dissatisfier.

Table 1: Factors related to satisfiers and dissatisfiers dimensions

Dimension	Characteristics	CO	LO	ST	FW	VM	FA	CL	BR
Satisfiers	Psychological attribute	✓							
	Distinctive feature		✓	✓	✓				
	Interpersonal service feature			✓					
	Intangible element	✓		✓					
	Sophisticated feature			✓	✓				
Dissatisfiers	Physical attribute						✓		
	Infrastructure element						✓		
	Operational feature						✓		
	Tangible element						✓	✓	✓
	Basic feature					✓	✓	✓	✓

Cells marked with ✓ indicate that the variable in the column is associated with the characteristic in the row

2.6. Conceptual model of the study

To systematically examine the determinants shaping hotels' online ratings, a conceptual model is developed in this research. The development of the conceptual model follows a structured, step-by-step approach outlined below. First, we identified eight factors that influence online ratings of hotels (Section 2.2). Second, selected two-factor theory for this research and examined its application in research conducted on various industries (Sections 2.3 and 2.4). Third, we examined the distinctive

dimensions of satisfiers and dissatisfiers of the two-factor theory (Section 2.5). Fourth, we identified distinct factors related to the satisfiers dimension (Section 2.5.1). Fifth, we identified distinct factors related to the dissatisfiers dimension (Section 2.5.2). Finally, identified control variables of star rating of the hotel, budget of the hotel, and property type from Booking.com and Agoda.com, and included them in the conceptual model of this research.

2.7. Research hypotheses

The literature review has given eight factors that can influence hotel ratings. These factors have been clubbed into two dimensions of satisfiers and dissatisfiers in the study's model. The factors associated with the satisfiers dimension include comfort, location, staff services, and the availability of free Wi-Fi. These four determinants are employed to formulate the first set of hypotheses (H1-H4) in this study, as outlined below:

H1: Hotel comfort is positively associated with hotels' online ratings.
H2: Hotel location is positively associated with hotels' online ratings.
H3: Services provided by hotel staff are positively associated with hotels' online ratings.
H4: The availability of free Wi-Fi is positively associated with hotels' online ratings.

In contrast, the dissatisfiers dimension comprises value for money, facilities, cleanliness, and breakfast quality. These factors form the basis for the second set of hypotheses (H5-H8), which are stated as follows:

H5: Value for money demonstrates a statistically significant positive relationship with hotels' online ratings.
H6: Hotel facilities demonstrate a statistically significant positive relationship with hotels' online ratings.
H7: Hotel cleanliness demonstrates a statistically significant positive relationship with hotels' online ratings.
H8: Breakfast quality demonstrates a statistically significant positive relationship with hotels' online ratings.

3. Research design and methodology

3.1. Data sources and collection procedures

In this paper, online hotel rating data were obtained from widely used booking platforms, specifically Booking.com and Agoda, for hotels operating in Hail City, Saudi Arabia, in 2023. Other sites like kayak.com, hotels.com, expedia.com, trivago.com, tripadvisor.com, etc. had fewer hotels for the Hail city of Saudi Arabia, and the data was not rich enough. However, Booking.com and Agoda.com provide richer data. Also, the number of hotels is more in these two for the Hail city of Saudi Arabia. So, we selected these two websites to collect data for our study. We collected online rating data of 31 hotels from these two websites.

Both Booking.com and Agoda provide overall ratings for the listed properties, which are treated as the dependent variable in this study. On Booking.com, property evaluations are derived from multiple service-related dimensions, including cleanliness, comfort, location, facilities, staff performance, perceived value for money, breakfast, and the availability of complimentary Wi-Fi. In contrast, Agoda employs a slightly different evaluation structure that emphasizes cleanliness, facilities, location, service quality, value for money, room comfort, and overall quality. The factors of cleanliness, location, facilities, and value for money are the same in Booking.com and Agoda.com. The factor of comfort is referred to in agoda.com as room comfort. We refer to it as comfort, as stated on Booking.com. We consider the factors of staff (from Booking.com) and service as the same (from Agoda.com). The factors of breakfast and free Wi-Fi are not mentioned on agoda.com. So, they were collected from Booking.com. Overall, we collected data from the two websites of eight determinants, which are treated as independent variables in this research.

We also collected data regarding control variables from the two websites. The control variables used in the study are the star rating of the hotel, the budget of the hotel, and the property type.

3.2. Data preparation

To facilitate hypothesis testing, a dataset was constructed for this research. The overall ratings and the eight determinants are recorded as numerical rating values and therefore do not require additional preprocessing. However, we need to prepare a dataset for our control variables.

The star classifications of the 31 hotels included in the analysis comprised unrated properties as well as three-, four-, and five-star establishments. A numerical coding scheme was applied, where unrated hotels were assigned a value of 0, three-star hotels a value of 3, four-star hotels a value of 4, and five-star hotels a value of 5.

According to data obtained from the two websites for the 31 hotels under study, there are five budget categories: 0-54 USD per night, 54-100 USD per night, 100-160 USD per night, 160-210 USD per night, and >210 USD per night. If we add the number of hotels by budget categories, the total number of hotels exceeds 31. It is because certain hotels can be found in multiple budget categories. Such hotels have different types of rooms, and different types of rooms could fall under different categories. So, we classify the budget into five categories: Very low budget (B1), low budget (B2), average budget (B3), high budget (B4), and very high budget (B5).

Each of the budget categories (from B1 to B5) is taken as a control variable. For each category of B1 to B5 control variables, the data is represented by a 'yes 'or 'no' answer. As an example, for B1, 'yes' means that the accommodation belongs to the 0-54 USD per night category. 'No' means that the accommodation does not belong to the 0-54 USD per night category. According to data obtained from the two websites for the 31 hotels under study, there are two property types: Hotels and apartments. If we add the number of accommodations by the property type, the total number of accommodations exceeds 31. That is because certain accommodations belong to multiple property types. So, we classify property types into two categories: Hotels (H) and apartments (A). For each of these two control variables (H and A), the data represented by a 'yes' or 'no' answer. As an example, for H, 'yes' means that the accommodation belongs to the hotel category. 'No' means that the accommodation does not belong to the hotel category. The data for various variables collected from Booking.com has been matched with agoda.com, and accordingly, we prepared the dataset in Microsoft Excel.

3.3. Variables

The dataset prepared in Microsoft Excel contains eight independent variables, eight control variables, and one dependent variable. We show it in Table 2.

3.4. Methods of data analysis

We use correlation analysis to determine the type of correlation between the variables. Correlation measures the extent to which the variables are related. Pearson's correlation coefficient (r) is a measure of linear correlation. A correlation coefficient is a number between 1 and 1 that summarizes the magnitude as well as the direction (positive or negative) of association between two variables. Cohen (1988) and Evans (1996) proposed empirical classifications to depict the nature of the relationship between two variables based on levels attached to the r. Cohen (1988) classified the value of r between 0.1 and 0.3 as a weak correlation, 0.3 and 0.5 as a moderate correlation, and above 0.5 as a strong correlation. Following Evans (1996), correlation coefficients below 0.20 indicate a very weak association, values ranging from 0.20 up to 0.39 reflect weak relationships, coefficients between 0.40 and 0.59 suggest moderate associations, while values from 0.60 to 0.79 denote strong correlations, and 0.8 and higher represent a very strong relationship. In the correlation analysis of our research, we adopt the classification given by Evans (1996) as it has better sensitivity as compared to Cohen's (1988) classification.

Evans' (1996) classification shows a very strong correlation at 0.8 or above between independent variables. If there is a high correlation between independent variables, then there is a problem of multicollinearity. Multicollinearity increases the standard error of predictor coefficients and consequently inflates their variance. Variance Inflation Factor (VIF) can measure and quantify the inflation of variance. VIF can be calculated by the Stata software as part of regression analysis. The negative value of VIF shows a conclusion; a value of 1 shows no correlation, a value between 1 and 5 shows moderate correlation, and a value above 5 shows a high correlation (Daoud, 2017). If multicollinearity is detected among control variables, it does not bias coefficient estimates but may affect precision; therefore, results should be interpreted with caution (Johnston et al., 2018).

We use multiple linear regression models to examine causal relationships between the independent variables and the dependent variable. The multiple linear regression equation can be depicted as:

$$Y = b_0 + b_1X_1 + b_2X_2 + \ldots + b_nX_n + \varepsilon_n$$

where, Y is the expected value of the dependent variable, X_1 to X_n are distinct independent variables, b_0 is the value of Y when all independent variables have a value of 0, and b_1 to bn are estimated regression coefficients. ε_n are realizations of the error variable ε.

Table 2: Variables table

Variable	Definition
	Dependent variable (DV)
Online review rating	An aggregated online rating reflects the performance of a lodging property based on online customer evaluations.
	Independent variables
Comfort (CO)	Global evaluation of the comfort of the lodging
Location (LO)	Global evaluation of the location of the lodging
Staff (ST)	Global evaluation of the staff of the lodging
Free Wi-Fi (FW)	Global evaluation of the free Wi-Fi in the lodging
Value for money (VM)	Global evaluation of the perceived value by customers
Facilities (FA)	Global evaluation of the facilities and services of the lodging
Cleanliness (CL)	Global evaluation of the cleanliness of the lodging
Breakfast (BR)	Global evaluation of the breakfast at the lodging

The regression coefficients state the mathematical relationship between each predictor variable and the response variable. The p-values of the regression coefficients suggest whether the mathematical relationships are statistically significant or not. If the p-value is less than 0.05 at 95% confidence interval, then the results are statistically significant. Similarly, if the p-value is less than 0.01 at a 99% confidence interval, then the results are statistically significant.

A standard assumption of the linear regression model is that the errors are independently identically distributed, i.e., they are homoscedastic. If they are not independently identically distributed, then errors are heteroscedastic (Wilcox and Keselman, 2006).

4. Estimation results

4.1. Statistics and correlations

Table 3 reports the descriptive statistics and correlation results for the study variables. The mean overall review score is 7.31. Regarding service attributes, breakfast has an average rating of 1.95, cleanliness records a mean score of 7.22, comfort is rated at 7.29, and facilities have an average value of 6.96. Location shows a mean rating of 7.61, while staff services receive the highest average score of 7.86. The mean rating for value for money is 6.98, and free Wi-Fi records an average score of 6.75. Table 3 also presents pairwise correlation values among the independent variables. Strong associations are observed between comfort and cleanliness (r = 0.88), facilities and cleanliness (r = 0.94), comfort and facilities (r = 0.87), as well as facilities and staff (r = 0.88). Based on Evans' (1996) classification, these coefficients indicate very strong correlations, suggesting the presence of multicollinearity concerns.

4.2. Multicollinearity diagnostics and variance inflation factor (VIF)

In experiment 1, a regression model was specified that incorporated the full set of eight explanatory variables, along with eight control variables and a single dependent variable. The VIF values for all variables in this experiment are reported in Table 4. The mean VIF score in experiment 1 is 8.28. It shows a high correlation between independent variables (Daoud, 2017). The VIF value of the independent variable facilities is 24.77. So, we conduct experiment 2 by ignoring the independent variable "facilities." The updated VIF values are presented in Table 5. After experiment 2, the mean VIF score is 6.11. The correlation between independent variables has reduced after ignoring the independent variable "facilities." So, "facilities" can be ignored as it highly correlates with other independent variables. However, the VIF score is still high, which shows there is still a high correlation between independent variables (Daoud, 2017). The VIF value of "cleanliness" is 17.11. So, we experiment 3 by ignoring the independent variable "cleanliness." The resulting VIF values are reported in Table 6.

Table 3: Summary statistics and correlation matrix for study variables (N = 31 Hotels)

Variable	Mean	SD	RS	BR	CL	CO	FA	LO	ST	VM	FW	SR
Review score (RS)	7.31	0.67	1									
Breakfast (BR)	1.95	2.91	0.32	1								
Cleanliness (CL)	7.22	0.92	0.95	0.30	1							
Comfort (CO)	7.29	0.82	0.90	0.28	0.88	1						
Facilities (FA)	6.96	0.79	0.97	0.32	0.94	0.87	1					
Location (LO)	7.61	0.58	0.70	0.25	0.64	0.52	0.61	1				
Staff (ST)	7.86	0.77	0.89	0.32	0.77	0.74	0.88	0.60	1			
Value for money (VM)	6.98	0.6	0.84	0.05	0.79	0.72	0.79	0.53	0.73	1		
Free Wi-Fi (FW)	6.75	1.46	0.05	0.12	-0.04	0.08	0.09	-0.09	0.21	-0.06	1	
Star rating (SR)	0.7	1.5	0.11	0.62	0.17	0.16	0.12	-0.01	0.09	-0.14	0.04	1

Table 4: Experiment 1-VIF values with 8 independent variables

FA	CL	VM	SR	A	ST	CO	B1	B4	B3	BR	LO	B2	B5	FW	H
24.77	23.1	17.13	12.2	11.9	10.9	9	4.5	3.6	2.9	2.8	2.7	2.2	1.8	1.7	1.3

Table 5: Experiment 2-VIF values with 7 independent variables

CL	SR	A	VM	CO	ST	B1	B4	B3	BR	LO	B2	B5	FW	H
17.11	11.9	11.9	11.28	9	7.1	4.4	3.6	2.9	2.8	2.6	2.2	1.7	1.7	1.3

Table 6: Experiment 3-VIF values with 6 independent variables

A	SR	VM	ST	CO	BR	B1	LO	B4	FW	B5	B3	B2	H
8.4	7.3	4.9	4.6	3.9	2.7	2.5	2.27	2.1	1.6	1.58	1.55	1.44	1.3

After experiment 3, the mean VIF score is 3.18. The correlation between independent variables has further reduced after ignoring the independent variable "cleanliness." So, "cleanliness" can be ignored as it highly correlates with other independent variables. The results of experiment 3 show a moderate correlation between independent variables (Daoud, 2017). The VIF values of variables "apartment" and "star ratings" are 8.4 and 7.3, respectively. However, they are control variables, and multicollinearity issues can be ignored between them (Johnston et al., 2018). There are moderate multicollinearity issues in independent variables like value for money, staff, comfort, breakfast, etc. So, these multicollinearity issues can be ignored.

In Table 7, we present the results of the regression analysis after ignoring the independent variables – "facilities" and "cleanliness."

4.3. Testing the hypotheses

The testing of hypotheses is done based on correlation analysis (Table 3), VIF results in three experiments (Tables 4 and 5), and regression results (Table 7). H1: Comfort provided by the hotel has a positive and statistically significant influence on

hotels' online ratings. We draw the inference that, based on the p-value of 0.00 (Table 7), the linear regression model confirms that the comfort provided by the hotel demonstrates a positive and statistically significant association with its online ratings. The result is valid at 95% and 99% confidence interval. Therefore, hypothesis H1 is supported.

Table 7: Regression results

Variable	Coefficients	SE	t-statistic	p-value	Lower 95% CI	Upper 95% CI
Intercept	-0.14	0.61	-0.24	0.81	-1.46	1.16
Breakfast	0.00	0.01	0.59	0.56	-0.01	0.03
Comfort	0.31	0.06	4.72	0.00***	0.17	0.46
Location	0.17	0.05	2.98	0.00***	0.05	0.30
Staff	0.26	0.07	3.41	0.00***	0.09	0.42
Value for money	0.29	0.14	2.02	0.06*	-0.01	0.59
Free Wi-Fi	-0.00	0.01	-0.5	0.62	-0.05	0.03
Star rating	0.02	0.05	0.47	0.64	-0.08	0.13
B1	-0.04	0.09	-0.47	0.64	-0.25	0.16
B2	-0.08	0.06	-1.15	0.26	-0.22	0.06
B3	-0.01	0.07	-0.16	0.87	-0.17	0.14
B4	-0.04	0.13	-0.34	0.74	-0.34	0.24
B5	-0.00	0.06	-0.09	0.93	-0.14	0.13
Hotel	0.00	0.14	0.04	0.96	-0.29	0.30
Apartment	-0.01	0.20	-0.07	0.94	-0.44	0.42

***: $p < 0.01$; *: $p < 0.1$; N = 31; $F(14,16) = 783.11$; Prob > F = 0.0000; Root MSE = 0.03; Ci: Confidence interval

H2: Hotel location is positively and significantly associated with hotels' online ratings. We draw the inference that, based on the p-value of 0.00 (Table 7), the linear regression model confirms that hotel location shows a positive and statistically significant relationship with hotels' online ratings. The result is valid at 95% and 99% confidence interval. Therefore, hypothesis H2 is supported.

H3: The staff of the hotel has a significant positive association with hotels' online ratings. We draw the inference that, based on the p-value of 0.00 (Table 7), the linear regression model confirms that hotel staff services have a positive and significant influence on hotels' online ratings. The result is valid at 95% and 99% confidence interval. Therefore, hypothesis H3 is supported.

H4: Free Wi-Fi provided by the hotel does not demonstrate a significant effect on hotels' online ratings. We draw the inference that, based on the p-value of 0.62 (Table 7), the linear regression model confirms that free Wi-Fi provided by the hotel does not demonstrate a statistically significant association with hotels' online ratings review. Therefore, hypothesis H4 is not supported.

H5: Value for money provided by the hotel is positively and significantly associated with its online ratings. We draw the inference that, based on the p-value of 0.06 (Table 7), the linear regression results confirm that value for money provided by the hotel exerts a statistically significant influence on hotels' online ratings at the 90% confidence level. Therefore, hypothesis H5 is supported.

H6: Facilities provided by the hotel have a positive and statistically significant association with hotels' online ratings. In experiment 1, the independent variable "facilities" scored a VIF value of 24.77 (Table 4). The correlation analysis showed that facilities highly correlate with cleanliness, comfort, and staff. So, we ignore facilities due to multicollinearity problems. Therefore, hypothesis H6 is not supported.

H7: Hotel cleanliness is positively and significantly related to hotels' online ratings. In experiment 2, the independent variable "cleanliness" scored a VIF value of 17.11 (Table 5). The correlation analysis showed that cleanliness highly correlates with comfort (Table 3). So, we ignore cleanliness due to multicollinearity problems. Therefore, hypothesis H7 is not supported.

H8: The hotel fails to show a statistically significant relationship with hotels' online ratings. We draw the inference that, based on the p-value of 0.56 (Table 7), the linear regression model confirms that breakfast provided by the hotel does not have a statistically significant influence on hotels' online ratings review. Therefore, hypothesis H8 is not supported.

5. Discussion

This research aims to identify the key determinants shaping hotels' online ratings. We find that the factors that impact hotels' online ratings are primarily shaped by comfort, location, staff services, and value for money. The factors that do not significantly impact online ratings of hotels are free Wi-Fi, facilities, cleanliness, and breakfast. The factors of comfort, location, and staff belong to the satisfiers dimension of the two-factor theory, and value for money belongs to the dissatisfiers dimension of the two-factor theory. These findings provide additional support for the application of the two-factor theory in the hospitality context, highlighting the stronger influence of experiential and relational attributes on overall customer evaluations.

The factors of comfort, location, staff, and value of money were considered important in influencing online ratings of hotels in the research conducted. However, some findings of our research do not match those of some other research. Our research did not find free Wi-Fi to be significant in influencing online ratings of hotels. The reason for this mismatch could be that most of the hotels these days provide free Wi-Fi to customers. This suggests that free Wi-Fi may now function as a basic expectation rather than

a differentiating factor in hotel evaluations. Our research findings also do not match some of the research findings in the aspects of facilities, cleanliness, and breakfast, as they were not considered significant. We ignored facilities and cleanliness due to multicollinearity issues, and this could be due to a small number of hotels in our research. From a managerial perspective, the results emphasize the importance of prioritizing core service experience dimensions that directly enhance perceived comfort and service interaction.

This study makes an important contribution to theory. This research finds a distinct set of factors for satisfiers and dissatisfiers dimensions of the two-factor theory. So, these results are consistent with prior studies grounded in the two-factor theory (Herzberg et al., 1959; Johnston, 1995; Lee et al., 2022). In this study, the two-factor theory is applied to distinguish determinants across the satisfiers and dissatisfiers dimensions, focusing on hotel ratings.

This study underscores the role of online consumer reviews as a critical information source for hotels seeking to enhance their online ratings. The hotels in developing countries like Saudi Arabia can focus on key factors like comfort, location, services, and price competitiveness to increase their online ratings. This research creates knowledge for the hotel industry to focus on these key factors, which in turn would enable them to satisfy the customers better and enhance their competitiveness. The findings of this research could be very fruitful for a developing economy like Saudi Arabia, as it has been trying to enhance the revenue stream of its hospitality and tourism sectors as part of broader national efforts aligned with Saudi Vision 2030 to diversify revenue sources.

6. Conclusion

Overall, this study highlights the critical role of online consumer review analysis in strengthening hotel competitiveness and improving customer satisfaction. Hotels are a key component of the hospitality and tourism industry. Therefore, the findings offer meaningful insights for developing economies such as Saudi Arabia, where the hospitality and tourism sectors are being promoted as part of national efforts to diversify income sources in line with Vision 2030.

Through the application of statistical methods to online consumer review data, this study uncovers tacit insights embedded within customer evaluations. Drawing on review data from 31 hotels located in Hail City, Saudi Arabia, obtained from Booking.com and Agoda, the analysis identifies key determinants shaping hotels' online ratings. The empirical results lead to three principal conclusions: (1) comfort, location, staff services, and value for money are significantly associated with hotels' online ratings; (2) comfort, location, and staff operate as satisfiers within the two-factor theory; and (3) value for money functions as a dissatisfier under the same theoretical framework. These findings reinforce the broader role of analytics-driven insights in supporting value creation and performance-oriented decision-making in service industries, consistent with prior research in digital performance contexts.

The tenets of this research contribute to theory regarding online ratings of hotels by establishing that there is a distinct set of factors under the satisfiers and dissatisfiers dimensions of the two-factor theory. The research contributes to practice by identifying a narrow set of factors for enhancing the satisfaction of hotel industry customers.

7. Limitations and future research

In this study, we collected datasets from online review ratings given by customers on popular booking websites of Booking.com and Agoda.com. We selected the Hail City of Saudi Arabia to collect online data. However, Hail is a small city and only 31 hotels could be found in this city on the two booking websites. It led to a small dataset for this research. Future researchers can address this limitation by selecting bigger cities in Saudi Arabia, like Riyadh, Jeddah, Dammam, etc.

In this study, we focused only on numerical ratings. The review comments of customers also provide another useful source of information. The review comments can be text-mined in future research and can further enhance the findings of this research.

In this research, we selected only one city in Saudi Arabia. To generalize the findings and to have a better understanding of the key factors, future research can take multiple cities in Saudi Arabia. There is also a scope of conducting research by taking online review data from popular cities in different countries. Such cross-country research will further enrich the findings.

List of abbreviations

A	Apartment
b_0	Regression intercept
B_1	Very low budget category
b_1 to b_n	Regression coefficients
B2	Low budget category
B3	Average budget category
B4	High budget category
B5	Very high budget category
BR	Breakfast
CL	Cleanliness
CO	Comfort
df	Degrees of freedom
DV	Dependent variable
e-WOM	Electronic word of mouth
ECT	Expectations confirmation theory
FA	Facilities
FW	Free Wi-Fi
H	Hotel
IT	Information technology
LO	Location
MS	Mean square
N	Number of observations
r	Pearson correlation coefficient

Root MSE	Root mean square error
RS	Review score
SD	Standard deviation
SE	Standard error
SR	Star rating
SS	Sum of squares
ST	Staff
UGC	User-generated content
VIF	Variance inflation factor
VM	Value for money

Compliance with ethical standards

Ethical considerations

This study utilized publicly available, anonymized aggregate online review ratings from Booking.com and Agoda. No primary data were collected from human participants, and no questionnaires or interviews were administered. Therefore, ethical approval for human subjects research was not required.

Conflict of interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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