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Evolving Impacts of Attribute Performance on Customer Satisfaction across the Covid-19 Pandemic: An Empirical Case Study in Hospitality

Hu Feng[1,a,*], Chen Keyi[2,b]

[1]*School of Business, Taizhou University, Taizhou, China*
[2]*College of Economics and Management, Zhejiang Normal University, Jinhua, China*
[a]*hufeng_1978@126.com*, [b]*koyarchen@163.com*
[*]*Corresponding author*

Abstract: *Previous literature has widely reported that the impact of service performance on customer satisfaction (CS) is asymmetrical. However, little is known about how the asymmetry of a service attribute changes at different usages. The tourism industry is highly vulnerable to pandemics. Numerous pieces of evidence show that customers' expectations of hospitality services have varied since the outbreak of COVID-19. It is reasonable to suppose that the asymmetry of a service attribute impacting CS evolves across pandemics. Based on scrutinizing 521,030 hotel reviews, this study investigates the differences in customer expectations and perceptions towards hospitality services before, within, and after the COVID-19 pandemic and uncovers the evolution of the impact mechanism of service performance on CS across time series. This study broadens existing asymmetry literature from a novel evolving perspective; the findings can help guide hoteliers in adjusting their service priorities according to the trend of pandemics.*

Keywords: *Hospitality; User-generated content; Text mining; Impact Asymmetry Analysis; Evolving impacts*

1. Introduction

Previous literature has shown that travelers who perceive a higher health risk are more likely to reduce their travel and tourism activities. During the COVID-19 pandemic, travelers were especially cautious and avoided crowded places to minimize the risk of infection [1]. This behavior change is likely to have affected the expectations and demands of hotel customers.

According to the ECT theory [2], customer satisfaction depends on whether the product or service experience meets their expectations. Hu et al. (2021) discovered that the pandemic and other external factors can lead to a continuous change in customer expectations [3]. If the expectations are met, customers will be satisfied. However, previous studies have shown that the relationship between certain service attributes and customer satisfaction is not linear [4]. Just because an attribute performs well does not necessarily mean that customers will be satisfied, and vice versa. Given the changing expectations of tourists due to the COVID-19 pandemic, along with the unequal impact of attribute performance on customer satisfaction, it's reasonable to assume that the link between attribute performance and customer satisfaction will differ during the pandemic. Specifically, the asymmetry of an attribute could change during this time.

This research project collected a set of 521,030 user-generated content (UGC) to analyze the relationship between customer satisfaction and hotel service attribute performance during different phases of the COVID-19 pandemic. Text mining and sentiment analysis were applied to process the data, and the Penalty-reward contrast analysis (PRCA) was employed to check the impact mechanism of service performance on CS [5].

2. Literature Review

2.1. The Changes in Tourists' Requirements across the COVID-19 Pandemic

Since the outbreak of the COVID-19 pandemic, there have been significant changes in consumer

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behavior and psychology regarding tourism. Research has found that COVID-19 has significantly impacted customers' confidence, behavior, and decision-making [6]. Scholars have studied the impact of COVID-19 on various fields, such as lodging expectations [3], restaurant demand [7], travel risk perception [8], etc. Previous findings uncovered that people's perception of travel risks has changed after the COVID-19 crisis, which will significantly influence customers' travel expectations and perceptions [9]. Therefore, even though the authorities have declared the end of the COVID-19 pandemic, it remains unclear whether tourists' preferences will return to their pre-pandemic state or if the COVID-19 pandemic will continue to have a long-term impact on tourist behavior.

2.2. The Asymmetric Impacts of Hospitality Services on Customer Satisfaction

Previous research has suggested that the relationship between customer satisfaction and attribute performance is not always straightforward. Kano et al. (1984) categorized product/service attributes into three types: basic, performance, and excitement factors [4]. The basic factor has a greater impact on dissatisfaction than satisfaction, while the excitement factor affects satisfaction more than dissatisfaction. If an attribute belongs to the performance factor, its impacts on satisfaction and dissatisfaction are equal. While the three-factor theory has been accepted and applied in various travel fields, some studies suggest that the degree to which an attribute affects customer satisfaction may vary in different contexts [10]. Chen et al. (2022) found that hotel attributes contributing to high/low customer ratings differed among hotels with different star ratings [11].

According to the findings of Hu et al. (2021), tourists' requirements have been significantly impacted by the COVID-19 pandemic, and their travel expectations will continue to change during different periods of the pandemic [3]. Therefore, it is reasonable to assume that the pandemic may affect how to attribute performance impacts customer satisfaction, meaning that the degree to which travel attributes affect satisfaction may change during the pandemic.

2.3. Investigating Tourist Experience by Mining User-generated Content

The internet has made it easy for people to share their experiences about a product or service, which is known as user-generated content (UGC). UGC is now the main source of information for both consumers and businesses to assess product satisfaction. This trend is also prevalent in the tourism industry. Before visiting a tourist attraction or hotel, travelers check online for reviews generated by other users. Such reviews have a significant impact on the purchasing decisions of potential customers [12]. Additionally, hotel managers can assess their performance and make informed operational decisions based on the review information found in UGC [13].

Researchers used questionnaires combined with the Likert scale to obtain customer perceptions of a particular attribute of the hotel, but this method had limitations, such as sample bias. UGC provides a solution to this problem as it offers a rich sample size that helps avoid this issue [14]. Scholars have proposed and utilized research methods focusing on UGC textual data, which has been widely acknowledged for its value in obtaining customer evaluations of hotel product or service attributes [3,13].

3. Methodology

The research process for this paper is divided into three stages: data collection, sentiment analysis, and Impact-asymmetry analysis. Initially, web crawler tools are utilized to gather user-generated reviews specifically from Ctrip.com. The reviews of all the five-star hotels located in Shanghai, listed on Ctrip.com before 2024, were selected as the research sample. After eliminating highly similar and worthless reviews that lack any meaningful content, a total of 183 five-star hotels were included, and 521,030 reviews were collected. These reviews are further divided into three parts based on the timeline: pre-Covid phase (before 2020), in-Covid phase (2020-2022), and post-Covid phase (2023).

In the second stage, sentiment analysis is conducted following Hu et al. (2021) approach, using "nouns" and "noun phrases" as part of speech (POS) to identify key attributes of hotels [3]. This research employed a term-extract module in the KH Coder program to detect the most important noun phrases (N-grams) mentioned in the reviews. 50 detected noun terms were manually categorized into 10 categories: service, room, food, location, environment, staff, front-desk, facility, value, and convenience. Next, sentiment analysis is performed to evaluate the emotional tone of reviews involving these key attributes. This study employed a three-point scale to record customers' subjectivity on attribute performance. That is, if a sentence received a positive emotion, the performance of the attribute

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mentioned in this sentence was recorded as "1"; if the emotion of this sentence was negative, its performance was recorded as "-1", and other performance will be recorded as "0". Finally, the average score of customers' subjective evaluations of each attribute was calculated, indicating the performance of these attributes.

In the second stage of this research, sentiment analysis was conducted using Hu et al. (2021) approach [3]. This involved identifying key attributes of hotels by looking at "nouns" and "noun phrases" as part of speech (POS). To detect the most important noun phrases (N-grams) mentioned in the reviews, a term-extract module in the KH Coder program was employed. 50 detected noun terms were manually categorized into 10 categories, namely service, room, food, location, environment, staff, front desk, facility, value, and convenience. Next, sentiment analysis was performed to evaluate the emotional tone of reviews involving these key attributes. A three-point scale was used to record customers' subjectivity on attribute performance. If a sentence conveyed a positive emotion, the attribute mentioned in that sentence was assigned a score of "1" to indicate good performance. Conversely, if the sentence conveyed a negative emotion, the involved attribute was assigned a score of "-1" to indicate poor performance. If the sentence conveyed a hybrid emotion, the involved attribute was assigned a score of "0".

In the final stage, the Penalty-reward contrast analysis (PRCA) is employed to calculate the impact asymmetry (IA) index of each attribute. PRCA is a widely applied approach for examining the impact-asymmetry of attributes proposed by Mikulić and Prebežac (2008) [5]. Based on a dummy regression analysis, the impact of hotel attributes on overall ratings at both low- and high-performance levels was examined. The equation of this method is presented as follows. Wherein, IA is used to indicate the asymmetry of an attribute, the category of the attribute will be classified based on its IA value.

$$R_i = \text{reward index for attribute i} \quad (1)$$

$$P_i = \text{penalty index for attribute i} \quad (2)$$

$$\text{Impact Range (IR)} = R_i + |P_i| \quad (3)$$

$$\text{Satisfaction generating potential } (SGP_i) = R_i / IR \quad (4)$$

$$\text{Dissatisfaction generating potential } (DGP_i) = |P_i| / IR \quad (5)$$

$$\text{Impact Asymmetry } (IA_i) = SGP_i - DGP_i \quad (6)$$

4. Findings

The sentiment analysis method introduced in section 3 can help us determine how customers perceive the performance of hotel attributes during different stages of the pandemic. Appendix A shows the performance levels of each attribute at different stages. Each attribute's attribute asymmetry at different pandemic stages was calculated. The details are shown in Appendix B, C, and D. According to the study of Mikulić and Prebežac (2008) [5], if the penalty index's magnitude of an attribute is greater than that of the reward index, then this attribute is classified as a dissatisfier. Conversely, if the reward index is greater than the penalty index's magnitude, then the attribute is classified as a satisfier. If the magnitudes of the penalty and reward indices are approximately equal, then the attribute is classified as a hybrid. To obtain a more detailed picture of how the IA category of an attribute has changed, the threshold classification of the IA in this study was set as the following formula, and Table 1 presents the overall changes of attributes in the impact asymmetry at different pandemic stages.

$$\text{Frustrators: } IA < 0.4 \quad (7)$$

$$\text{Dissatisfiers: } 0.4 \leq IA < 0.1 \quad (8)$$

$$\text{Hybrids: } 0.1 \leq IA \leq 0.1 \quad (9)$$

$$\text{Satisfiers: } 0.1 < IA \leq 0.4 \quad (10)$$

$$\text{Delighters: } IA > 0.4 \quad (11)$$

As depicted in Table 1, it is clear that seven out of ten attributes have significantly changed in impact-asymmetry after experiencing the pandemic. Only three "Satisfiers" attributes, "service", "food," and "staff," were assessed as having no significant change across the three stages of the COVID-19 pandemic. Analysis reveals that the impact asymmetry of certain attributes has declined over time, such as "Convenience" and "Environment". The "Delighter" attribute "Convenience" in the Pre-pandemic stage turned to "Satisfier" in the following two stages. The "Delighter" attribute of "Environment" was

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assessed as “Hybrids” in the Pre- and In-pandemic stages, but dropped to the “Dissatisfiers” category in the Post-pandemic stage.

Table 1: The Changes of Impact Asymmetry and Range across COVID-19 Pandemics.

N	Attributes	Impact Asymmetry Index (IA)						
		Pre-Pandemics (2018-2019)		In-Pandemics (2020-2022)		Post-Pandemics (2023)		Variation (Time series)
1	Service	0.139	Satisfier	0.179	Satisfier	0.111	Satisfier	Pre = In = Post
2	Room	0.255	Satisfier	0.419	Delighters	0.419	Delighters	Pre < In = Post
3	Food	0.300	Satisfier	0.301	Satisfier	0.328	Satisfier	Pre = In = Post
4	Location	0.365	Satisfier	0.408	Delighters	0.427	Delighters	Pre < In = Post
5	Environment	0.099	Hybrids	0.042	Hybrids	-0.161	Dissatisfiers	Pre = In > Post
6	Staff	0.275	Satisfier	0.369	Satisfier	0.306	Satisfier	Pre = In = Post
7	Front-desk	0.328	Satisfier	0.508	Delighters	0.520	Delighters	Pre < In = Post
8	Facility	0.083	Hybrids	0.138	Satisfier	0.077	Hybrids	Pre < In > Post
9	Value	0.387	Satisfier	0.382	Satisfier	0.554	Delighters	Pre = In < Post
10	Convenience	0.403	Delighters	0.384	Satisfier	0.256	Satisfier	Pre > In = Post

Some attributes’ impact asymmetry shows an increasing trend across three pandemic stages, such as “Room”, “Location”, “Front-desk” and “Value”. Attribute “Room”, “Location”, and “Front-desk” were evaluated as “Satisfier” before the COVID-19 pandemic, but they changed to “Delighter” factors in the In- and Post-Pandemic stages. The attribute “Value” was assessed as “Satisfier” in the Pre- and In-pandemic stages, but turned into the “Dissatisfiers” category in the Post-pandemic stage. Interestingly, the attribute “Facility” showed a special response to Covid-19. Its impact asymmetry was assessed as “Hybrids” in both Pre- and Post-pandemic stages but changed to “Satisfier” in the In-pandemic stage.

5. Conclusions

5.1. Discussions

The symmetric theory known as the "service quality theory" assumes that CS is directly proportional to the performance of service attributes [15]. This means that enhancing the performance of service attributes can improve service quality. Whereas a few studies suggest that this relationship between CS and service attributes is not always linear [4,5]. Some attributes have a greater potential to create dissatisfaction than satisfaction, while others have a greater potential to create satisfaction than dissatisfaction. These attributes are referred to as “dissatisfiers” (“must-be”, basic factors) and “satisfiers” (attractive, excitement factors) respectively. When the impact asymmetry of attributes is close to zero, they are referred to as “hybrids” (one-dimensional factors). Therefore, it’s important to consider the impact of service attributes on creating satisfaction and dissatisfaction when deciding on priorities for improvement. If the primary objective of service improvements is to decrease overall dissatisfaction, and if both attributes perform poorly, the “dissatisfiers” should be improved first. On the contrary, if the primary objective of service improvements is to increase overall satisfaction, and if both attributes perform not badly, the “satisfiers” should be optimized first.

By examining user reviews of high-star hotels before, during, and after the COVID-19 pandemic, this study observes a change in customers’ accommodation needs and impact asymmetry index of service attributes impacting CS. The pandemic has affected the relationship between the performance of service attributes and CS—namely, the impact mechanism of service performance on CS changes across the COVID-19 pandemic. The findings indicate that hoteliers may apply distinct improvement strategies for the same service attribute in different pandemic stages. For instance, “Facility” was classified as “Hybrids” before and after the pandemic, which means that customer satisfaction increased/declined with the level of attribute performance. However, during the pandemic period, it was assessed as "Satisfier," which means that high performance of this attribute will lead to customer satisfaction, while poorer performance can be forgiven in certain periods. Therefore, the service improvement strategies for “Facility” that were used before the pandemic may not be useful in the pandemic situation. Hotel managers should adjust their operational strategies promptly to maximize resource utilization.

This study examined user reviews of high-star hotels before, during, and after the COVID-19 pandemic to observe changes in customers' accommodation needs and the impact of service attributes on customer satisfaction. The study found that the pandemic has affected the relationship between service performance and customer satisfaction. Specifically, the impact mechanism of service performance on

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customer satisfaction changes across the COVID-19 pandemic. The findings suggest that hoteliers need to apply different strategies to improve the same service attribute in different pandemic stages. For instance, the "Facility" attribute was classified as "Hybrids" before and after the pandemic, which means that customer satisfaction increased/decreased with the level of attribute performance. However, during the pandemic period, it was assessed as a "Satisfier," which means that high performance of this attribute leads to customer satisfaction, while poorer performance can be forgiven in certain periods. Therefore, the service improvement strategies for "Facility" that were used before the pandemic may not be effective during the pandemic. Hotel managers need to adjust their operational strategies promptly to make the best use of their resources.

5.2. Implications

We have found through previous research that changes in environmental factors can affect travel behavior and attitudes. The COVID-19 pandemic has had a significant impact on the psychology and travel decision-making of tourists. To investigate this impact, we analyzed the same batch of high-star hotels' guest reviews across the pre-, in-, and post-pandemic stages. Our study verified that tourists' perceptions of hotel attributes changed across different stages of the pandemic. Furthermore, these effects are profound and do not revert to pre-pandemic levels following the end of the pandemic.

We also found that the pandemic led to a dynamic change in the formation mechanism of customer satisfaction, specifically asymmetry. The asymmetric impact of hotel attribute performance levels on customer satisfaction varies after experiencing the pandemic period. Even if the pandemic disappears, the attribute asymmetry after the pandemic will not recover to the same level as before, and its impact is far-reaching. Our research has made up for the lack of attention given to this aspect of the pandemic's impact on customer satisfaction.

Our study has revealed important insights that can be beneficial for future research and practical applications. The COVID-19 pandemic has had a profound impact on the attitudes and behaviors of tourists, which have not returned to their pre-pandemic levels. When conducting future research on hotel attribute enhancement strategies, it is crucial to consider the differences in data across various pandemic periods. This is especially important when using user-generated content as a research object. Concluding the pandemic based on data from the during-pandemic or pre-pandemic period may lead to misleading results. Therefore, hotel managers should not assume that they should employ the same service strategies as before the pandemic when adjusting their strategies in the post-pandemic stage.

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Appendix

Appendix A: Changes in Perceived performance (sentiment) across COVID-19.

N	Attributes	Perceived Performance (Mean, lower limit and upper limit at 95% confidence level)			Performance Differences		
		Pre-Pandemics (2018-2019)	In-Pandemics (2020-2022)	Post-Pandemics (2023)	Pre VS In	In VS Post	Post VS Pre
1	Service	0.701 [0.693, 0.709]	0.713 [0.705, 0.721]	0.769 [0.76, 0.777]	n.s.	*	*
2	Room	0.598 [0.59, 0.607]	0.558 [0.548, 0.567]	0.632 [0.62, 0.644]	*	*	*
3	Food	0.644 [0.634, 0.653]	0.585 [0.574, 0.596]	0.613 [0.597, 0.63]	*	*	*
4	Location	0.756 [0.748, 0.764]	0.738 [0.727, 0.749]	0.766 [0.751, 0.78]	n.s.	*	n.s.
5	Environment	0.870 [0.862, 0.877]	0.850 [0.841, 0.859]	0.860 [0.85, 0.871]	*	n.s.	n.s.
6	Staff	0.523 [0.508, 0.538]	0.541 [0.526, 0.557]	0.634 [0.617, 0.652]	n.s.	*	*
7	Front-desk	0.533 [0.517, 0.549]	0.584 [0.57, 0.599]	0.687 [0.672, 0.702]	*	*	*
8	Facility	0.598 [0.584, 0.612]	0.525 [0.508, 0.541]	0.567 [0.549, 0.586]	*	*	n.s.
9	Value	0.651 [0.638, 0.665]	0.636 [0.62, 0.653]	0.645 [0.62, 0.671]	n.s.	n.s.	n.s.
10	Convenience	0.566 [0.552, 0.58]	0.567 [0.549, 0.586]	0.622 [0.597, 0.648]	n.s.	*	*

Appendix B: Attribute impact-range and asymmetry (pre-pandemics).

N	Attributes	Reward indices	Reward_Sig.	Penalty indices	Penalty_Sig.	IR	SGP	DGP	IA
1	Service	0.410	0.000 ***	-0.310	0.000 ***	0.720	0.569	-0.431	0.139
2	Room	0.423	0.000 ***	-0.251	0.000 ***	0.674	0.628	-0.372	0.255
3	Food	0.390	0.000 ***	-0.210	0.000 ***	0.600	0.650	-0.350	0.300
4	Location	0.413	0.000 ***	-0.192	0.000 ***	0.605	0.683	-0.317	0.365
5	Environment	0.278	0.000 ***	-0.228	0.000 ***	0.506	0.549	-0.451	0.099
6	Staff	0.464	0.000 ***	-0.264	0.000 ***	0.728	0.637	-0.363	0.275
7	Front-desk	0.484	0.000 ***	-0.245	0.000 ***	0.729	0.664	-0.336	0.328
8	Facility	0.390	0.000 ***	-0.330	0.000 ***	0.720	0.542	-0.458	0.083
9	Value	0.437	0.000 ***	-0.193	0.000 ***	0.630	0.694	-0.306	0.387
10	Convenience	0.456	0.000 ***	-0.194	0.000 ***	0.650	0.702	-0.298	0.403

Appendix C. Attribute impact range and asymmetry (in-pandemics).

N	Attributes	Reward indices	Reward_Sig.	Penalty indices	Penalty_Sig.	IR	SGP	DGP	IA
1	Service	0.320	0.000 ***	-0.223	0.000 ***	0.543	0.589	-0.411	0.179
2	Room	0.303	0.000 ***	-0.124	0.000 ***	0.427	0.710	-0.290	0.419
3	Food	0.231	0.000 ***	-0.124	0.000 ***	0.355	0.651	-0.349	0.301
4	Location	0.183	0.000 ***	-0.077	0.000 ***	0.260	0.704	-0.296	0.408
5	Environment	0.200	0.000 ***	-0.184	0.000 ***	0.384	0.521	-0.479	0.042
6	Staff	0.380	0.000 ***	-0.175	0.000 ***	0.555	0.685	-0.315	0.369
7	Front-desk	0.380	0.000 ***	-0.124	0.000 ***	0.504	0.754	-0.246	0.508
8	Facility	0.255	0.000 ***	-0.193	0.000 ***	0.448	0.569	-0.431	0.138
9	Value	0.246	0.000 ***	-0.110	0.000 ***	0.356	0.691	-0.309	0.382
10	Convenience	0.191	0.000 ***	-0.085	0.000 ***	0.276	0.692	-0.308	0.384

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Appendix D: Attribute impact range and asymmetry (post-pandemics).

N	Attributes	Reward indices	Reward_Sig.	Penalty indices	Penalty_Sig.	IR	SGP	DGP	IA
1	**Service**	0.311	0.000 ***	-0.249	0.000 ***	0.560	0.555	-0.445	0.111
2	**Room**	0.335	0.000 ***	-0.137	0.000 ***	0.472	0.710	-0.290	0.419
3	**Food**	0.263	0.000 ***	-0.133	0.000 ***	0.396	0.664	-0.336	0.328
4	**Location**	0.182	0.000 ***	-0.073	0.000 ***	0.255	0.714	-0.286	0.427
5	**Environment**	0.190	0.000 ***	-0.263	0.000 ***	0.453	0.419	-0.581	-0.161
6	**Staff**	0.395	0.000 ***	-0.210	0.000 ***	0.605	0.653	-0.347	0.306
7	**Front-desk**	0.386	0.000 ***	-0.122	0.000 ***	0.508	0.760	-0.240	0.520
8	**Facility**	0.280	0.000 ***	-0.240	0.000 ***	0.520	0.538	-0.462	0.077
9	**Value**	0.282	0.000 ***	-0.081	0.000 ***	0.363	0.777	-0.223	0.554
10	**Convenience**	0.189	0.000 ***	-0.112	0.000 ***	0.301	0.628	-0.372	0.256