Research Note:

Understanding Guests' Multi-Sentiment Responses to Hotel Innovation

Abstract

Technological innovation has been consistently acknowledged as the driving force for organizational success and a potential means of fostering positive customer emotions. Drawing on technological determinism, this mixed-methods research takes a step further to assess the socio-technical dynamics of technology within a hotel innovation process on the basis of customers' emotional responses. Study 1 analyzes the influence of hotel innovation activities on consumers' multi-sentiment traits by gauging online reviews of a smart hotel using deep learning. Furthermore, to diagnose changes in sentiments that correspond to changes in hotel innovations, we adopted a longitudinal design to contrast pre- and post-innovation stages. Study 2 takes a qualitative approach to unlock the reasons that lie behind the mixed positive and negative sentiment responses to changes. The evidence from this investigation points to the double-edged impact of innovation. More importantly, they reflect technological somnambulism – in which customers do not seem to be sufficiently conscious of their choice of technology – highlighting the peril of the smart service encounter turning a hospitality oasis with rich human interactions into an AI-dominated environment.

Keywords: sentiment analysis, hotel, technology innovation, deep learning, smart service

INTRODUCTION

Innovation is regarded as the cornerstone of development and success in the hospitality industry (So & Li, 2023). It is almost always welcomed by organizations as the literature has predominately acknowledged that it is a fundamental strategic necessity for them (Fang et al., 2023). The diffusion of technology innovations, such as robots, presents an array of new opportunities that offer a competitive advantage over industry rivals (Ma et al., 2023). While the existing body of research underscores the impact of technological innovation on hotel operations, in real-world situations, practitioners consistently face the dilemma of whether or not to depart from the status quo when faced with the choice to pursue innovation. As Culp (2022) articulates in a Forbes report, this is due to the high costs and potential risks associated with innovation, which can lead to undesirable consequences and pose threats to organizational stability.

This research draws on technological determinism (TD) (Smith & Marx, 1994) as a guiding theoretical perspective in understanding the complex socio-technical environment and customer responses to technology innovations. On the one hand, TD views technology as the major driver of change which "exerts an effect on the world independent of human choice" (Dafoe, 2015, p. 1052). On the other hand, it also conceptualizes that changes in technology can bring unintended consequences due to "lack of foresight or concern by the designer" (Dafoe, 2015, p. 1054). It not only sheds new light on business models and operational efficiency but also scrutinizes the evolving host-guest relationship. In this context, the effectiveness of innovation is intricately linked to the evolution of consumer reactions (e.g., sentiments or emotions) after an innovation is deployed (e.g., Best, 2012). Taking the TD perspective, this inquiry seeks to address a void in the literature, in which existing studies often take a static view in assessing the outcome of innovation. This research, however, explores consumers' emotional discrepancies (i.e., before and after) when a hotel changes its business model from a service-oriented operation to a technology-oriented smart hotel model with a strong focus on intelligent devices.

To understand consumers' emotional responses, the prior literature has commonly framed emotion as a single entity; hence, emotional responses to innovation are often treated as a single factor (e.g., positive emotional valence) in most empirical studies (Horng et al., 2018; Prentice et al., 2020; So et al., 2023). This is also the case in studies that employ sentiment analysis, which focuses on positive or negative sentiments (i.e., emotions) (Duan et al., 2016; Mehraliyev et al., 2022). However, consumers' emotions are diverse, and they could be propagated through various channels, especially their social circles and online platforms. This research steers away from this tradition by moving beyond the conventional sentiment analysis.

Study 1 assesses multiple categories of consumer sentiments towards hotel innovations through a multi-sentiment analysis based on the deep-learning approach, indicating a blend of emotional responses to the innovations. To diagnose changes in sentiments that correspond to changes in hotel innovations, we further utilize a qualitative field study (i.e., Study 2) to gauge the reasons behind customer's mixed emotional valances in the change process.

In summary, based on a mix of deep-learning and field studies, this research provides insights to the literature by unlocking customers' multi-sentiment responses due to changes in the hotel business model and operations due to innovations. It highlights the perils of technology innovation while adding nuanced understanding from a TD perspective at the meso-micro level. It further offers timely knowledge to practitioners, warning against jumping onto the smart service bandwagon without considering the cost and other consequences associated with innovation adoption and implementation.

STUDY 1

Research Background

The research context was Hotel Kapok, a five-star property located in Shenzhen, China. Known for its integration of technology into the service experience, Hotel

Kapok is part of the Kapok Hotel Group, a subsidiary of China Resources Land Ltd (CR Land), which was ranked 233 on the Forbes Global 2000 list in 2024 (Forbes, 2024). In 2019, CR Land made a significant investment of 55.89 million Chinese yuan (approximately 7.8 million USD) in technology development initiatives. That same year, the company also collaborated with Huawei and China Telecom to build a 5G+ convergence innovation ecosystem, further promoting the development of smart cities. CR Land's business focuses on the development of sales business, the operational real estate business, and the asset-light business (China Resources Land Limited, 2024). Hotel Kapok represents CR Land's significant endeavor to integrate technological innovations into its hospitality offerings and serves as a testbed for the potential of smart hotels.

The hotel first launched as a traditional type hotel in 2012 and then reopened on October 17, 2018 after a year of renovations to transform it into pioneering technology-enhanced accommodation. In particular, the hotel provides state-of-the-art smart technologies ranging from smart toilets and room amenities to a range of robotic services available throughout the property. As the hotel general manager remarked (interview details are available upon request), there are four major areas of innovation that are noteworthy, namely in the areas of product, process, organization, and marketing. Details germane to these four areas of innovation are presented in Appendix 1. The repositioning of the hotel has paid off as it is able to command a premium, with a higher average room rate than most other hotel brands in the city. Yet, growth has stagnated in terms of occupancy rate.

Data Collection

In this study, we employed a tool named "Web Scraper," a browser extension developed by Google, to extract data. This utility, powered by crawlers, is adept at harvesting web content, encompassing text, charts, and hyperlinks. For the purpose of gathering user-generated content (UGC) pertaining to a specific hotel, we targeted six prominent online travel agencies (OTAs) in June 2020. The selected repositories of

UGC were Ctrip, Yilong, Tuniu, TongCheng, TripAdvisor, and Quner. Notably, Ctrip, which was ranked eighth in the Fortune Future 50 list in 2019 according to the Boston Consulting Group, stands as China's foremost online travel platform, reflecting the voice of a vast contingent of Chinese travelers. It is important to note that the data scraping process followed the guideline from Ullah et al. (2018).

The data corpus contained a total of 3,834 reviews (i.e., the test data), including 1,012 entries from Ctrip, 904 from Yilong, 138 from Tuniu, 877 from TongCheng, 100 from TripAdvisor, and 803 from Quner. Following the exclusion of trivial comments consisting solely of punctuation and emoticons, we were left with 226 comments for Time 1 (prior to the hotel's renovation in October 2019) and 3,510 comments for Time 2 (subsequent to the hotel's renovation). The delineation of these two temporal intervals was primarily predicated on the hotel's significant innovation initiatives. With data procured from both junctures, we were able to juxtapose user commentary to elucidate shifts in patterns concerning the hotel's innovative measures. Details of our deep-learning model training are presented in Appendix 2.

Findings

Through the method of mechanical learning, we analyzed the emotional distribution of customer reviews on OTAs to review changes in hotel guests' emotions after the focal hotel's introduction of innovations, as follows:

Multi-Sentiments Before Innovation (Time 1)

Four major categories of emotional valences were extrapolated from the data corpus. In terms of proportion, Good (77.71%) was highest, followed by Hate (15.17%), Happy (5.26%), and Sad (1.86%). Three other major emotional categories – Anger, Surprise, and Afraid – did not manifest through the comments. The analysis revealed that positive emotions represented by Good and Happy (82.97%) dominated the UGC extracted from the data corpus. Yet, it was also alarming that about 17% of the comments fell into the Hate and Sad categories.

To provide more insights into guests' sentiments, we followed the aforementioned procedure (see Appendix 2) of the LSTM model (Long Short-Term Memory model), a specialized type of recurrent neural network (RNN) designed to effectively model and learn from sequential data (Zhang et al., 2018), to further extrapolate subcategories of the four major categories of emotional valence. The results revealed that in terms of proportion, Praise (64.40%) was highest, followed by Cheerful (8.05%), Love (7.74%), Reproach (5.57%), Boredom (4.64%), Suspect (3.10%), Trust (1.55%), Disappointed (1.24%), Wish (1.24%), Respect (0.93%), Abhor (0.62%), Ease (0.62%), and Sad (0.31%). It is important to note that not all emotions from Table 1 were identified from the data corpus due to the fact that the extracted comments tended to be positive while the emotions expressed through social media also tended to be biased toward certain aspects of the hotel evaluations.

Multi-Sentiments After Innovation (Time 2)

Regarding the proportion of emotions after the innovation initiatives, the proportion of Good (78.86%) increased and remained the highest and the proportion of Hate (7.72%) decreased significantly, while the proportion of Happy (12.34%) increased significantly and the proportion of Sad (1.08) decreased slightly. Positive emotions increased from 82.97% to 91.2% after the hotel innovations were implemented, while negative emotions dropped from 17.03% to 8.8%.

We followed the same procedure to further partition emotions on the basis of LSTM. The results indicated that the highest proportion of responses came under the category of Praise (60.43%), followed by Cheerful (11.51%), Love (9.03%), Boredom (6.84%), Trust (4.27%), Reproach (3.16%), Ease (1.79%), Abhor (0.71%), Wish (0.66%), Disappointed (0.60%), Sad (0.46%), Suspect (0.46%), and Respect (0.09%).

By comparing the two time periods, we found that changes in emotions with respect to Praise, Suspect, Disappointed, Wish, Respect, and Reproach declined after the innovation (i.e., Time 2). However, Ease, Sad, Boredom, Cheerful, Love, Trust, and Abhor increased.

STUDY 2

Data Collection

To understand why there was a mixture of emotions regarding changes in the innovation process, we conducted a qualitative field inquiry. Semi-structured interviews were collected at the lobby café and another restaurant located inside Hotel Kapok by two field investigators who stayed in the hotel to foster better interactions with the guests. A total of 15 participants were recruited, eight females and six males. Their ages ranged from 18 to 55, the average being 35. The participants had spent at least one night in the hotel. The interviews lasted about 30 minutes on average. A token of appreciation was presented to each participant after completion of the interview. The bulk of the interview protocol pertained to the following questions: Why did they select the hotel? How did they feel about the hotel's technology innovations? And what were some memorable experiences encountered during their stay?

Findings

Use of technology can result in different emotional outcomes. This situation is reflected in the paradoxical feelings about the smart devices that advanced technology brings to guests' experience. On the positive side, technology affords a sense of convenience (i.e., ease), while, as one informant commented, some guests adore (i.e., love) the cuteness of robots: "The robotic delivery service is rather interesting. The robot is fast and convenient. It is cute looking, and I love it." (Female, 31). Overall, many guests genuinely feel enthusiastic and cheerful about the futuristic lifestyle that technology brings to them, as another participant acknowledged:

> I can tell that this hotel put a lot of effort into designing a modern environment that caters well to our stay. From room amenities to entertainment facilities, these services project a sense of future living that is empowered by technology. (Female, 55)

Technology is often viewed as a conduit that can bring ease to human lives. Accordingly, people may set high expectations for innovations, especially when providers put them at center stage as a key marketing appeal. Yet, technology may bring hassle rather than ease and pleasure to the guest experience when it is difficult to use. For example, one informant noted:

> There is a rather sharp discrepancy between what the hotel advertised and what I encountered. Although many of the advanced services are documented in the user manual, I can only experience about 40% of them. Also, some technologies are not that "smart" per se, and this is rather unpleasant and sad. (Female, 30)

Another guest expressed abhorrence by revealing a series of unexpected issues with the toilet seat:

> It opened while I was just looking at the mirror. And when I needed to use the toilet, it just did not open. I had to give it several tries before it finally opened. This is rather annoying and something that I would despise. (Male, 28)

Adopting a smart service business model has brought drastic changes to the hotel and its operations. On the one hand, the hotel has upgraded its smart devices, trying to accommodate various guest needs through automatic and self-service technologies. On the other hand, the hotel has downsized its frontline staff. Unfortunately, since the hotel positions itself as offering five-star full-service accommodation, many guests still expect some services from regular employees. Lack of service from human staff certainly dissolves the guest–employee relationship. The lack of "human touch" may also create a sense of boredom and disrespect amid machine-driven hotel operations. One informant remarked on this situation:

> I think there is still a need for human employees. They are more flexible than machines and can communicate better with me, whereas a machine is rigid, and once it goes beyond its scope, it starts to not know what to do. Also, personally, it feels rather cold talking to a machine all the time. (Male, 45)

In addition, smart devices actually may not function in a "smart" way if they prove difficult to use and lack personalized information and functionalities, and thus they may annoy users. For example, one guest commented: "the 'magic mirror' in the washroom is not functioning well as there is no 'return' key. So, it is stuck in the middle. Also, the news that it broadcasts is not updated." Such issues present a multitude of challenges to smart hotels, with various implications for hotel operations, and these challenges are discussed in detail in the following sections.

DISCUSSION

This study underscores the complex emotional landscape of guests in response to technological innovations in hospitality. Firstly, in Study 1, our analysis of 3,834 hotel reviews collected from six major OTAs identified distinct emotional responses before and after the hotel's renovation. Using an LSTM deep-learning model, we further categorized these emotions into subcategories. Before the renovation, "Praise" was the most prevalent response, followed by "Cheerful" and "Love." After the renovation, "Praise" remained the highest response, with "Cheerful" and "Love" also increasing. However, "Ease," "Sad," "Boredom," "Trust," and "Abhor" saw an uptick, indicating a mix of reactions to the hotel's technological innovations. Secondly, qualitative interviews (i.e., Study 2) with 15 hotel guests provided insights into the guest experience. While many guests appreciated the convenience and modernity of the technology, others expressed frustration with its complexity and the lack of a personal touch. Study 2 further found that smart devices might not live up to their "smart" label if they are hard to use or lack personalized features, and this can lead to user annoyance. Our investigation highlights the diversity of guests' emotions towards technology in hospitality, which has implications for academic scholars and hotel practitioners.

The body of literature on innovation has received substantial attention over the years due to innovation's positive impact on organizations (Chen, 2017; Enz, 2012; Horng et al., 2018). It is certainly true that the introduction of new measures and

approaches are initiatives that are intended to improve existing operations and marketing propositions (Kuo et al., 2017). However, innovations could be a double-edged sword for organizations. This mixed-methods inquiry showcases empirical evidence extrapolated from social media and interview data manifested as guests' sentiments to identify how changes in emotions may follow from the implementation of new technology. While the key positive emotional valences induced from such initiatives are reflected by changes in guests' feelings (e.g., cheerful, love, and ease), key negative emotions induced from such improvisation also arise, including sad, boredom, and abhor.

This dichotomy provides new insights into the literature by offering new nuances to the outcomes of innovations. In particular, the findings suggest that innovations are not always a panacea as there are hindering factors that could undermine organizational success. This evidence adds insights to the TD scholarship. Although TD is commonly reflected by social relationships that are shaped by new technologies at the society level, this research takes a micro-meso approach to evaluate how an organization's innovation initiatives not only bring new revelations to its business model and its operational efficiency but also change the host–guest relationship, with outcomes that may not be desirable. For example, as self-service and smart devices dominate the service encounter, guests now can dwell in a wonderland featuring a futuristic lifestyle, surrounded by robots and AI-based facilities without interactions from traditional employees. Yet, as Wong et al. (2024) remark, complete automation could turn a hospitality establishment into a cold environment, a place where guests may feel isolated and helpless. At the same time, the results reflect technological somnambulism, in which customers do not seem to be sufficiently conscious of their choice of technology. This phenomenon may bring a number of negative outcomes to organizations, which TD suggests are "unintended consequences."

Organizations often assume that technology can be a cure for all issues and that it can always produce positive results for organizations, along with the benefits reaped by

customers. Yet, the hospitality industry is a people-oriented business that requires some level of human touch and a feeling of warmth in being served by real employees. As our findings suggest, a lack of such human interactions could erode customer satisfaction and patronage due to an alienated social relationship between the provider and the guests. By utilizing a multi-sentiment analysis, we are able to help disentangle the various facets of guests' emotional valences and hence help organizations to be more ready to deal with customers who suffer emotional dissonance and loathing from an excess of technology innovations. In essence, human emotions are not only constrained within positive and negative valences; they are also manifested through a symbiotic, divergent array of expressions such as cheerful, praise, love, sad, abhor, reproach, and more. By automating textual analysis through the *multi-sentiment analysis* in the present research, we are able to pave the way for the better evaluation of automated textual contents through artificial intelligence.

From a practical perspective, hotels can use different types of intelligent devices to stimulate customers' good and happy feelings and reduce their negative emotions. The number of user-generated comments received from the data source indicated that customers paid a good amount of attention to hotel innovations. Our findings further demonstrate an improvement in average sentiment and thus the overall experience, as we mentioned above. It is therefore logical to suggest that innovations that are aimed at inducing a favorable customer experience could not only reduce costs but also foster favorable customer outcomes. However, for some clienteles, excessive or immature innovation may backfire, leading to feelings such as abhorrence, sadness, and boredom. For example, some guests could be dissatisfied with the inflexibility of autonomous robots and other imposed apparatus, which may result in negative feelings, such as coldness and lack of human touch. As Reinders et al. (2008) point out, if consumers have no other choice but to use self-service, it may cause them to have a negative reaction to both the service innovation and the service provider. Therefore, in the process of applying innovative measures in hotels, it is necessary to make the

innovative behavior responsive to customers' needs. On the other hand, it is important to recognize that there are groups of people who are skeptical of any innovations (Rosenbaum & Wong, 2015).

Limitations and Future Research

The main limitation of this study is that the sample came from a single hotel. This issue certainly limits the generalizability of this study. Secondly, the sample of hotel review data that could be scraped before the application of innovative activities in this study was small, which limits the model's prediction accuracy. The research data should be expanded in future research, and the hotel review data of different sentiments used to train the LSTM model should be of a similar size to improve accuracy. Thirdly, data for the second wave of Study 1 were collected during a period when COVID-19 was still a major factor in hotel bookings. Study 2 alleviated this issue with data collected in 2024. Nevertheless, future research could explore how a crisis or other extenuating circumstances could impact the effectiveness of innovation in the hospitality setting.

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