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Data-Driven Insights from 10,000 Reviews: Fostering Sustainability through Rapid Adaptation to Guest Feedback

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Abstract: The present research aims to explore how customer satisfaction and discontent may influence the financial success of luxury hotels by analyzing more than 10,000 reviews from the Radisson Blu Hotel in Bucharest and financial data spanning a decade. Text mining and sentiment analysis were used in order to pinpoint crucial elements that could impact visitor experience and the way in which they might correlate with hotel revenues in the long run. Research has linked positive visitor evaluations to revenue growth, while negative feedback does not consistently lead to financial declines, suggesting that premium brands may be resilient to mild online criticism. Our research examines how customer feedback sentiment and business income are interconnected throughout time, emphasizing the significance of handling guest contentment in order to reduce resource spending and create a sustainable feedback loop between guests and businesses. Our analysis challenges the idea that negative evaluations always have a detrimental impact on financial performance and highlights the importance of long-term positive feedback in the hospitality sector. This study enhances comprehension of the influence of customer feedback on the luxury hotel business, providing valuable insights for service industry experts on utilizing reviews in the future in order to gain strategic benefits and also develop their businesses in a sustainable way.

Keywords: online reviews; sentiment trends; text mining; sustainable development; resource optimization

1. Introduction

Within the expansive global economy, the hospitality industry stands out prominently, with luxury hotels serving as the focal point of outstanding service and operational excellence. The crux of the issue in this domain is accurately comprehending what appeals to buyers and what repels them [1]. This is not mere idle curiosity, it is actually crucial for the profitability of high-end hotels, affecting their earnings and even their reputation in the luxury hospitality industry [2]. Understanding the subtle preferences of luxury hotel guests is vital for maintaining a competitive advantage and ensuring guest satisfaction, which can directly influence how certain hotels rank in the wider market [3]. Building on already existing quantitative research on luxury hotels in other parts of the world [4], which was focused on customized guest experiences, our study explores creative ways to extract meaningful information and improve responsiveness in the long run, ultimately contributing to a more nuanced understanding of online feedback. We delve into the intricacies of visitor happiness and discontent, with the goal of uncovering if and how these elements have a lasting impact on a hotel's well-being. As the digital era has greatly increased the visibility of client comments and opinions, there is compelling data out there indicating that internet comments may significantly influence potential visitors, affecting their perceptions and decision-making when choosing a place for their business trips or

holidays [5]. Modern technology, with its advanced algorithms and data analysis tools, allows us to extract valuable insights from guest evaluations [6]. Studies have shown the impact of customer experience on brand love and customer citizenship behavior, highlighting the importance of managing customer experiences to foster brand commitment and loyalty, which are crucial for a luxury hotel's success [7]. While online hotel reviews (OHRs) offer invaluable insights for consumers and service providers, their sheer volume, ever-growing nature (velocity), and potential for bias (veracity) often pose great challenges for effective implementation by management [8]. However, there is a catch—the internet review industry is a very controversial topic. Some believe that receiving several positive evaluations will lead to increased sales, while others are perplexed, indicating a more complex situation [9]. Current studies indicate that there is a significant discussion about whether negative feedback is more impactful than positive feedback, with this debate being rooted in various psychological theories and empirical studies [10]. This puzzle increases the level of mystery in the intricate interaction between consumer feedback and its influence on the hotel industry, as many high-end hotels also integrate IOT technologies that can enable swift and personalized service adjustments for each and every person [11]. The three-factor theory of customer satisfaction, which examines the asymmetric effects of customer satisfaction determinants, supports the notion that negative aspects may have a greater impact on overall satisfaction than positive aspects, highlighting the complexity of managing customer feedback in the hospitality industry [12]. Previous studies focused on reviews show that 62% of customers consider negative reviews to be extremely important when making a decision (in the service industry), indicating clearly that more often than not negative reviews carry significant weight in the decision-making process for customers [13]. Although existing studies suggest that analyzing guest satisfaction at the macro-level can mask crucial differences between guest segments, offering misleading conclusions when targeting specific guest groups [14], it is crucial to have an objective image of guest satisfaction as a whole before moving to micro-targeting specific guest segments. While there are several studies on text mining and sentiment analysis to understand customer feedback [15,16], there is a lack of research that connects these insights with financial performance in the long term. Our paper addresses three significant questions: what are the key factors influencing guest satisfaction and dissatisfaction; can guest experiences in the long term influence revenues in a luxury hotel; and how do the most positive and most negative words that occur in reviews fluctuate over time? Our findings reveal a complex relationship between visitor satisfaction and hotel profitability, with times when this correlation may become uncertain or hard to predict [17]. Engaging customers by creating a tailored guest experience can be crucial for achieving sustainable, long-term growth, but there are studies indicating that having a lot of managerial presence in the online environment can lead to negative outcomes [18]. The present paper is not just an academic incursion; it provides a new way of understanding large quantities of customer feedback, presenting a strategy and an analysis flow that might impact not only top hotel executives but also any service industry leader seeking to navigate consumer feedback challenges and extract meaningful knowledge out of it [19]. Although a luxury hotel is the main focus of the study, this research has far-reaching implications and provides valuable insights for professionals in almost any service industry, business experts, and inquisitive individuals [20,21].

2. Materials and Methods

As we have already mentioned in the introduction section above, our research made use of an extensive dataset containing 10,072 reviews submitted on Google Reviews for the Radisson Blu Hotel in Bucharest. Using the Apify data scraper, a powerful tool for extracting structured information from websites, data were gathered methodically and then structured with the help of Excel. The dataset was then subjected to a thorough cleaning procedure in order to guarantee the accuracy and quality of the data for analysis by eliminating any duplicates, errors or irrelevant information. Based on the review ratings, the clean dataset was then divided into three separate subsets: reviews with one star, which

indicate that the visitors were not at all pleased with their stay at the hotel; 2-star and 3-star reviews, which show opinions from visitors who experienced interactions that were unfavorable but not totally negative; and reviews with four and five stars depicting the opinions of visitors who were either totally satisfied or had a few small grievances.

Voyant Tools, a web-based environment renowned for its capacity for text reading, analysis and the visualization of large datasets, was used for the primary data analysis. To find recurring themes and patterns, the subsequent subsets of each of the three groups were examined using Cirrus Word Clouds, allowing us to visualize the top 55 terms by frequency for each subset. This approach made it easier to find the most common terms linked to visitor interactions at different satisfaction levels. Then, Links Tool Network Graphs were used together with the top five terms from each subset of the cirrus analysis. With keywords mapped in blue and collocates in orange, this tool generated networks of high-frequency terms and their proximity graphs for us. The purpose of this analysis was to gain deeper insights into the factors that contribute to guest satisfaction and dissatisfaction, as well as the contextual relationships between the key terms.

Expanding upon the preliminary investigation into guest satisfaction and dissatisfaction, we examined the possible enduring influence of guest experiences on revenue by scrutinizing the entire dataset, comprising 10,072 reviews from 2014 to 2024. This analysis made use of the Voyant "Trends" tool, which was selected for its ability to graphically represent the frequency of particular terms over time, providing a quantitative lens through which to view changes in guest sentiment. Attention was placed on the terms "Bad" and "Good," with the goal of distilling the essence of visitor experiences and how they changed over the designated time frame. This decision made it easier to conduct a simple but insightful investigation into the variations in favorable and unfavorable reviews over a ten-year period. Simultaneously, we included a summary of the hotel's income information for the same period of time (except for the year 2023, as the financial data for this year was not public at the time of this study), linking the monetary values to the sentiment analysis obtained from the evaluations. The monetary performance data were obtained from publicly available records at www.listafirme.ro by combining the managerial transition made from Bucuresti Turism SA (2014–2019) to Nemo Investment Vehicle SA (2019–present). This step was essential in creating a baseline by which the sentiment trends could be evaluated and in offering a dual viewpoint that blends quantitative revenue outcomes with qualitative insights from guest reviews.

The purpose of this analytical approach was to identify any possible trends or correlations that might point to a connection between the positive experiences that guests had, as evidenced by their reviews, and the hotel's revenue gains. Through a systematic mapping of "Bad" and "Good" sentiment occurrences against annual revenue data, the study sought to shed light on the broader implications of customer satisfaction and dissatisfaction for luxury hotels' financial health.

In order to answer our third research question, we sought to determine how visitors' usage of the most and least favorable terms, which were extracted from the corpus of 10,072 reviews spanning a decade, varied. Using the complete dataset, the analysis concentrated on charting the top three terms found in the reviews that were classified as positive and negative. This approach was new in the sense that it used relative frequencies for plotting rather than raw frequencies, a methodological decision intending to draw attention to the differences in the frequency with which these words were mentioned, especially underlining their increasing or decreasing rarity over time. The study sought to offer a more nuanced perspective of the sentiment trends by concentrating on relative frequencies, which would enable a perceptive comparison of the occurrences of strongly positive and strongly negative terms. By using this technique, we made sure that words with a high sentiment value but a low frequency of occurrence were also sufficiently represented in the temporal analysis. A visual narrative of how guest experiences shifted in response to different factors, possibly including changes in hotel management, service quality or outside events, was provided by the graphical representation of these

sentiments over the course of the last decade. Our study aimed to reveal patterns and insights that could contribute to a better understanding of the temporal dynamics of guest satisfaction and dissatisfaction by mapping the trajectories of these important sentiment indicators against the passage of time. By providing a thorough analysis of how particular expressions of praise and criticism have fluctuated over the course of a decade, this phase of the analysis aims to enhance the larger investigation into the potential relationship between guest sentiment and financial performance. Our methodology employs a powerful combination of big data analysis techniques (Cirrus Word Clouds, Voyant Tools, https://voyant-tools.org/docs/#!/guide/about-section-software-libraries, accessed on 1 February 2024) with a focus on relative frequency analysis in order to explore the nuanced dynamics of guest sentiment in online reviews. This approach leverages the vast amount of raw data from over 10,000 reviews, allowing for a comprehensive overview of guest experiences and their potential connection to a hotel's financial performance over time. Our approach aligns with previous research highlighting the value of big data and text analysis in uncovering hidden patterns within guest feedback [22,23]. Moreover, our methodology extends the knowledge base by examining the potential long-term impact of guest sentiment on hotel revenue, offering valuable insights for the hospitality industry. Special ethical considerations were addressed to ensure privacy and compliance with data use policies, given the study's reliance on publicly available data. The data collection and analysis processes were designed to anonymize personal information, focusing solely on the content relevant to the research objectives.

3. Results

Exploring the key factors that could influence guest satisfaction and dissatisfaction at the Radisson Blu 5-star Hotel in Bucharest, the analysis of the 10,072 guest reviews revealed distinct lexical patterns within varying levels of guest feedback. As you can see in Figure 1 below, we managed to obtain three "Cirrus" word clouds generated from the Voyant Tools analysis, representing the most frequently mentioned terms across the three subsets of guest reviews presented in the materials and methods above.
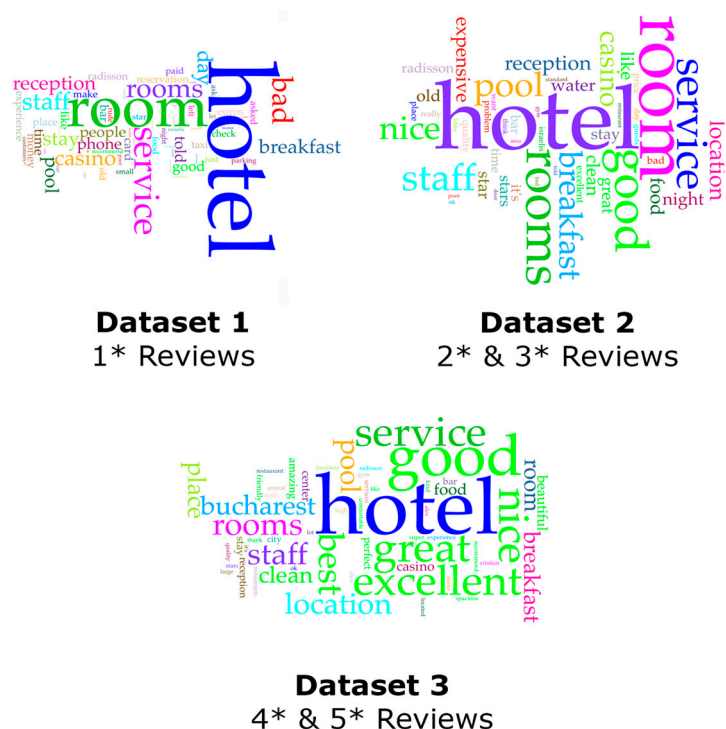

Dataset 1
1* Reviews

Dataset 2
2* & 3* Reviews

Dataset 3
4* & 5* Reviews

Figure 1. Cirrus for each of the three reviews' sub-datasets. Source: author's own research.

After examining the 1-star reviews, it appears that a number of people were extremely dissatisfied with a few things, particularly how "bad" their experiences were. It is also evident from the frequent mention of the terms "breakfast", "rooms" and "staff" that the guests' expectations were particularly not met in these service areas. Things become somewhat more irregular when examining the 2- and 3-star reviews. Although the term "bad" persists, we have begun to encounter more positive terms such as "nice" and "good". This indicates that even if the visitors were not entirely satisfied, they still thought that some aspects of their stay were reasonable or even somewhat enjoyable. As expected, the atmosphere totally shifts for the 4- and 5-star reviews. It is common to see terms like "excellent", "great" and "good" in addition to "service" and "location." This indicates that guests thoroughly enjoyed these parts of their stay, making them extremely content with their experience. It is evident that excellent service and a prime location can significantly impact guests' impressions of their stay. Diving deeper into the contextual relationships between the terms, Figure 2 elucidates the associations and frequencies of the top five terms from each dataset. The word "staff" is really present here but not in a particularly good way. It is linked to negative words like "unpleasant" and "unprepared". This means that when people did not like their stay, a big reason was often because they had a bad interaction with the hotel staff. The word "rooms" also comes up a lot, but, again, it is associated with really negative words like "impossible" and "cockroaches". This tells us that many guests were very unhappy with their rooms, encountering big problems that made their stay uncomfortable. So, from this deeper look into the keywords and their collocates, it is clear that bad experiences with the staff and the condition of the rooms played a big part in why guests left 1-star reviews. These are key areas that really affect whether guests have a good or bad stay, and they should be addressed as fast as possible by the management. As an illustration of the mixed nature of visitor input in these categories, the "Links" visualization for the 2- and 3-star evaluations displays a combination of positive and negative collocates surrounding "service" and "rooms" with "clean" and "old", which are both connected to "room" for example. Figure 2 above highlights the crucial role that overall hotel excellence and service quality play in ensuring client satisfaction for the positively rated 4- and 5-star evaluations. It does this by showing "service" and "hotel" to relate to strongly positive adjectives like "excellent" and "great". A thorough understanding of the phrases that have the greatest impact on visitor contentment and discontent is provided by analyzing the results displayed in Figures 1 and 2. The considerable differences between the datasets in terms of frequency and sentiment association emphasize the complexity of guest experiences and point out certain areas that the hotel's operations need to strengthen and enhance.

In order to answer our second research question, "*Can guest experiences in the long term influence revenues in a luxury hotel?*", we combined the Voyant Tools "Trends" analysis with the hotel's revenue data over a nine-year period. The reason we only have nine years of revenue data is because the hotel financial data for the most recent year (2023) was not made public yet. The combined results are shown graphically below in Figure 3, where the hotel's annual revenues are superimposed above the frequency trends of the terms "Bad" and "Good" plotted from the 10,072 reviews we had. A strong visual association between visitor satisfaction and hotel income can be observed by the longitudinal analysis shown. While the phrase "good" has become more common during the past ten years, the prevalence of the term "bad" has typically decreased. Over time, the reviews seem to reflect an increase in overall guest experiences, or at the very least, a more favorable expression. Through the use of Voyant Tools' "Trends" function, our analysis makes it possible to compare these variables directly along the temporal axis of the dataset. The occurrence of an inverse link between hotel income and the frequency of the term "bad" during the course of the decade can be observed in Figure 3, with lower frequencies of "bad" often coinciding with times of higher revenue. The trend line for "Good" indicates a positive relationship between revenue and usage; the hotel's income rises in tandem with the presence of "Good" during the stable periods of the period studied. These parallel movements suggest that

there could be a direct correlation between the hotel's financial performance and the level of visitor satisfaction, as measured by the frequency of the term "good" in reviews. The phrase "Good" seems to rise at times when revenue is rising, indicating that satisfied customers are likely to play an important role in the hotel's profitability. On the other hand, income declines seem to coincide with increases in the frequency of "Bad", which are especially apparent in the middle of the studied decade (segment 5 of the dataset). This decline in income may be related to unfavorable visitor experiences or other outside variables not included in this dataset. We can see a significant divergence in the dataset in the seventh section, which likewise relates to the year 2020, with a massive drop in revenue that coincides with the start of the COVID-19 pandemic. The rapid decline in income, in spite of the persistent patterns in guest satisfaction, disturbs the observed connection and underscores the pandemic's substantial influence on the hospitality sector. As the sector starts to recover after the first pandemic phase, the trend lines seem to return to their previous patterns. This argument supports the theoretical relationship between revenue and visitor experience by implying that, in the long run, the opinions expressed in reviews—both favorable and negative—reflect and may have an impact on the hotel's financial success.
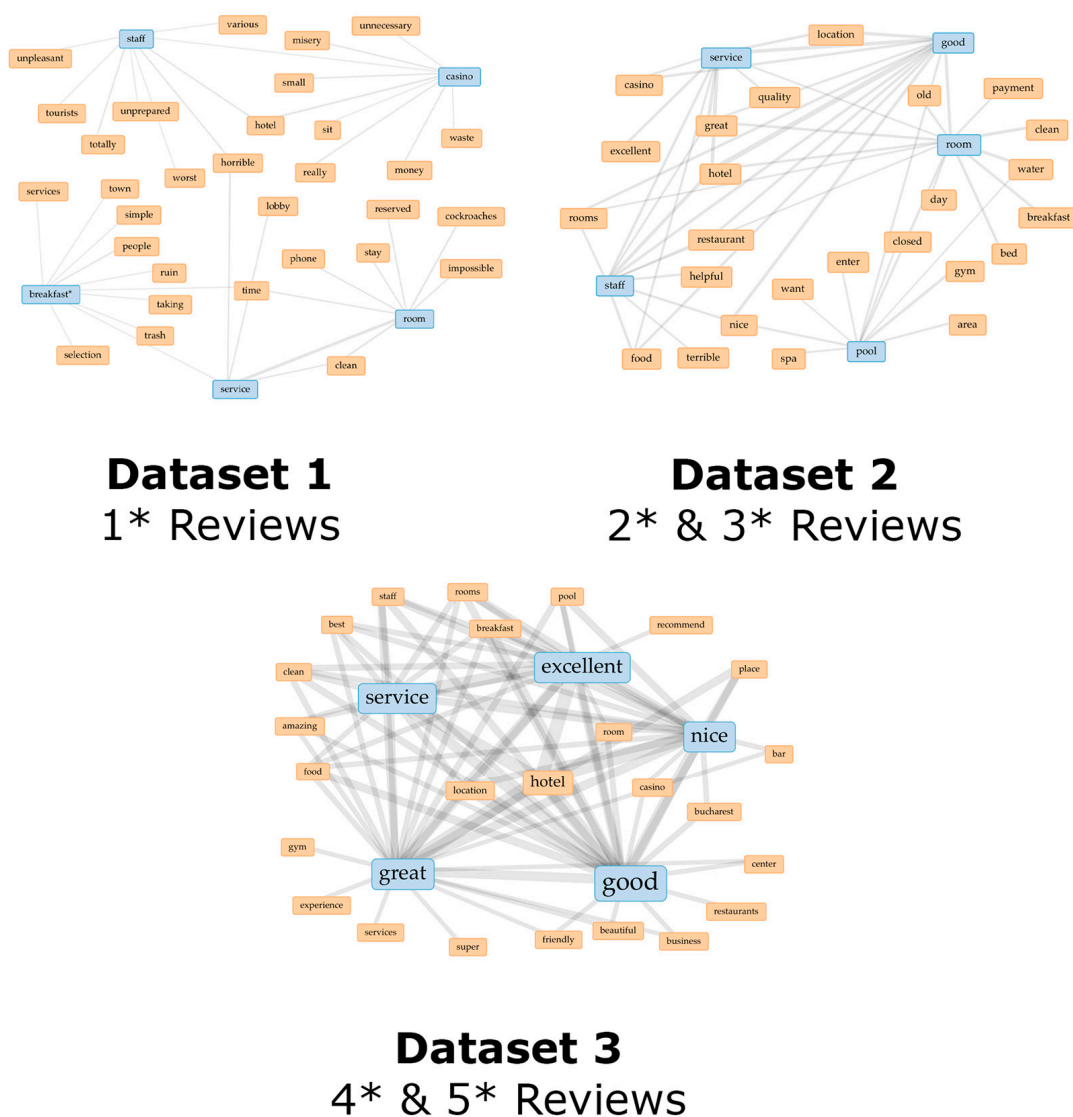

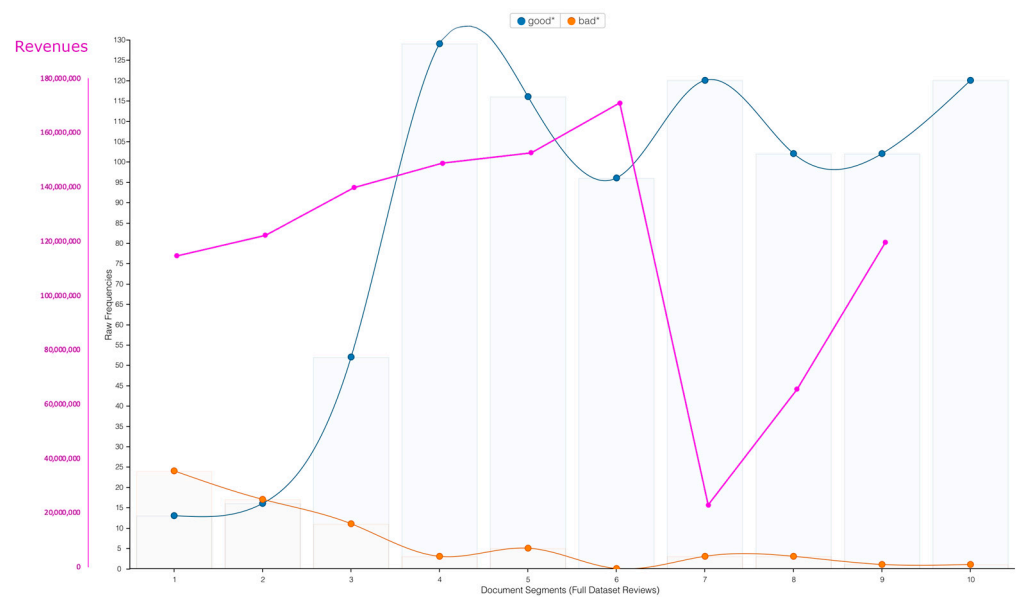**Figure 2.** Links for the top 5 terms in each subset of reviews. Source: author's own research.

Figure 3. Visual correlation between guest sentiment and hotel revenues. Source: author's own research.

This nine-year study indicates that although visitor experiences, as expressed in review sentiments, can be associated with revenue results, the relationship is nuanced and can be subject to many other external influences. Overall, the information shown in Figure 3 supports the idea that, in the luxury hotel market, customer happiness is a major factor in profitability by suggesting that raising guest satisfaction could be a strategic lever for raising revenue in the long run.

In order to investigate our third and last research question, "*How do the most positive and most negative words that occur in reviews fluctuate over time?*", we used the Voyant Tools "Trends" feature again in order to create a visual representation of the relative frequencies showing the top three positive and negative words mentioned in the 10,072 reviews over the entire dataset ten-year period. Using relative frequencies this time rather than raw frequencies, the top three positive terms ("good", "great" and "nice") and the top three negative terms ("bad", "problem" and "expensive") were plotted in order to illustrate the temporal changes in the sentiment of guest reviews (Figure 4). The relative frequencies approach was selected in order to draw attention to the term's proportionate incidence within the dataset, highlighting their presence or absence over the course of the ten-year period. As can be observed in Figure 4 below, the positive terms, plotted with green lines, display an overall growing tendency, suggesting that visitors have been using more positive language in their reviews over time. Remarkably, there is an increase in the term "good" in the later years, indicating that visitor experiences or impressions have improved. The consistent prevalence of "good" together with "great" and "nice" demonstrates a positive feeling that persisted throughout the second part of the studied decade. In contrast with that, the negative terms, plotted with red lines, show unpredictability throughout time, exhibiting a general drop or plateau but with sporadic peaks in their relative frequency. This is especially noticeable with the phrase "bad", which significantly declines in the later portions of the dataset under analysis. While "problem" shows minor variations over time, possibly reflecting shifting operational concerns, the relative frequency of "expensive" stays generally stable over time, indicating that visitors' perceptions of price are a constant concern. Although some negative characteristics sporadically appear and cost worries continue to be a recurring theme in evaluations, the overall feeling has swung in favor of the positive, as seen by the way the positive and negative terms interact. This move can be a sign of actual gains in customer happiness and service quality, or it may represent adjustments in customer expectations and review practices over time. Our methodology provides a comprehensive understanding of the manner in which visitor attitudes, summed

up in significant descriptive terms, change over time. The relative frequency data emphasize how dynamic the market for luxury hotels is because visitor perceptions are always shifting. The relative frequency of these six terms indicates how the landscape of guest feedback is changing, and management can utilize these shifting insights to better and more quickly respond to it. This approach could potentially allow them to implement swift modifications for reputation management and service enhancement in real time, thus improving their reputation and revenues.
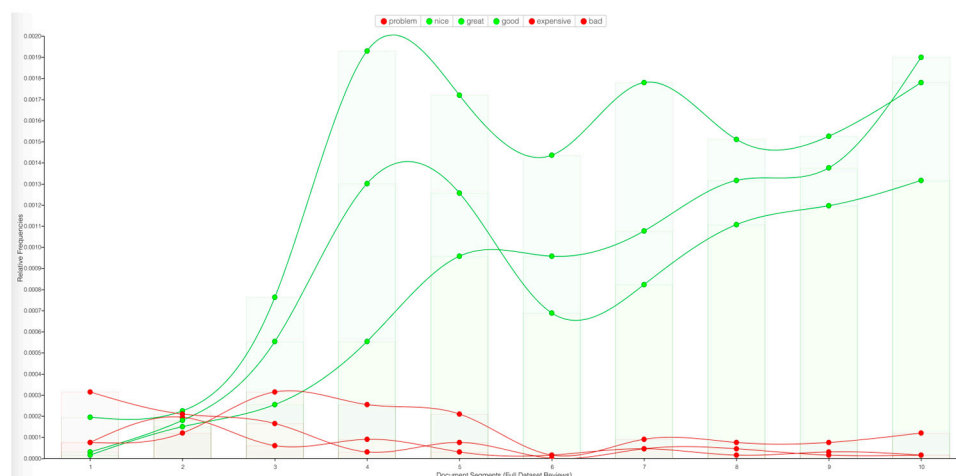
Figure 4. Decade-long feedback trends: positive and negative review occurrence. Source: author's own research.

4. Discussion

As presented above, our research tries to explore the relationship between guest satisfaction and hotel income in the long run, highlighting the complex interplay between customer satisfaction and financial success in the high-end hotel sector. The findings of the analysis, especially those shown in Figures 1, 3 and 4, revolve around the idea that visitor experiences, whether positive or negative, can have an impact on the financial well-being of a business. Consistent with previous studies [21], positive ratings have been found to be associated with higher revenue, supporting the notion that great visitor experiences are likely to enhance business profitability.

However, the connection is not one-sided and has its complexities. As we could observe in Figures 3 and 4 presented above, negative terms do not always predict a decrease in income, indicating that luxury hotels may have a natural ability to withstand unfavorable feedback if given enough time. This resiliency may stem from the brand equity that luxury hotels usually possess, which helps mitigate the effects of unfavorable evaluations [24]. These findings question prior claims that negative feedback always harms corporate performance. The oscillation of the terms "good" and "bad" over the 10-year research timeframe also reveals a complex pattern evolving around consumer experiences that the hotel management (in this case) has to analyze and address accordingly. The consistent occurrence of positive terms in the latter years of the dataset may even suggest a potential change in guest expectations or possibly an increase in the service quality provided by the staff. On the other side, the constant frequency of negative terms such as "expensive" throughout the measured time frame of the study could potentially suggest a lasting concern about the value that this particular luxury hotel provides to its customers [25]. Our study can also be applied beyond the operational realm and be used for predicting potential strategic consequences. Service businesses may use favorable visitor feedback as a strategic advantage, but it could be very useful to be aware in near real time of any unhappiness that may arise, despite an overall positive feeling in the recent past. The substantial drop in revenue that can be observed in Figure 3, coinciding with the start of the COVID-19 epidemic, shows us how exogenous shocks can disrupt even the close

connections between consumer mood and revenue, making it crucial for businesses to be able to swiftly react in the presence of external factors that may damage their operations [26]. Our research aims to provide valuable insights from a sustainable perspective by shedding some light on the intricate relationship between guest satisfaction and hotel income in the long run. Sustainable practices in the hospitality industry can encompass not only environmental considerations but economic and social dimensions as well. Prior studies have emphasized the significance that sustainability has when it comes to augmenting the enduring feasibility and adaptability of companies [27]. Our findings contribute to this discourse by demonstrating that maintaining high levels of guest satisfaction over a long period of time can not only maintain financial success but also promote sustainability by fostering customer loyalty, reducing resource wastage through efficient operations and enhancing the overall reputation and brand equity of luxury hotels. By learning the complex connections that exist between guest experiences and business financial gains, managers can make informed decisions that could potentially optimize and help develop sustainable practices, such as investing in employee training and well-being, implementing eco-friendly initiatives mentioned by company customers in the reviews and even engaging with local communities. The incorporation of sustainable practices into strategic decision-making processes can be crucial for the hospitality sector, as it is one of the few concepts that could potentially guarantee relevant, timely, sustained growth in a rapidly changing global environment [28].

The analysis presented in our study was concentrated on analyzing over 10,000 reviews for a single luxury hotel, providing a small-scale representation of the much larger issues and dynamics encountered by service businesses worldwide. Future research could investigate in greater detail the causal mechanism that links consumer feedback to revenue by adding even more variables, such as prices, market competition and the state of the economy in that particular geographic area, which might provide even more practical insights for business managers.

5. Conclusions

The analysis undertaken on the Radisson Blu 5-star hotel reviews in Bucharest provides us with important insights into the ways in which internet reviews and guest satisfaction might influence revenues in the service sector. Using a thorough analysis of more than 10,000 guest evaluations spread over a period of 10 years, the present study sheds some light on the complex relationship between customer experiences and business revenue, emphasizing the vital role that strategic feedback management and quality service have in the hospitality industry. Earning gains were found to be positively correlated with positive reviews, highlighting the practical benefits of providing exceptional visitor experiences. On the other hand, our findings challenge the widely held belief that negative reviews always damage financial performance by pointing out that luxury hotels can be somewhat resilient to criticism by leveraging their premium brand name in the long run. This study also highlights the dynamic relationship that can occur between guest satisfaction and business income over time, which is significant because it underscores just how important it is to adjust to evolving customer expectations and external factors such as the COVID-19 epidemic. The ability to swiftly adapt is essential in order to preserve financial stability and service quality in the face of unanticipated challenges. The analysis of sentiment-associated term patterns over a decade indicates a variable structure of guest experiences, reinforcing the need for hotel management to consistently track and address visitor feedback in order to augment customer satisfaction and develop brand loyalty. Our understanding of the strategic importance of customer feedback in the high-end hotel sector is strengthened by the present study, as it additionally establishes a precedent for service-oriented entities to use customer reviews for both operational and strategic development. Our study sets a precedent for harnessing customer reviews for operational enhancement and strategic advancement within service-oriented businesses, thus making an important contribution to the study of sustainability and strategic management in the hospitality industry from a

scientific standpoint. By recognizing the innate value of guest feedback as a resource for efficiency development, this research embodies a shift towards more sustainable practices in the service sector. Not only does it highlight how crucial ongoing feedback management is [29], but it also shows the potential for utilizing large quantities of data in order to drive long-term sustainability efforts. As businesses navigate an increasingly dynamic landscape, the insights uncovered in our research pave the way for the development of practical solutions aimed at promoting sustainable development and strengthening resilience in the service sector [30]. Our proactive methodology not only benefits academia by enriching the understanding of sustainable business practices but also holds significant implications for industry practitioners seeking to optimize their operational effectiveness while concurrently contributing to broader societal and environmental goals.

In order to provide top managers with practical solutions for developing resilience and sustainable development, we would advise future research to further investigate the causal links between customer reviews, staff changes and financial success in more detail and with a wider range of financial and market variables. We consider that the methodology and the results obtained in the present study are a step forward that might help to better leverage consumer reviews in order to increase revenues and overall quality for service-oriented businesses.

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