

Concept Paper

Enhancing Customer Satisfaction through Sentiment Analysis and Affect Recognition Using Computer Vision with Predictive Analytics for Blu Water Beach Resort & Parks

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Abstract

Purpose — The study aims to use innovative technologies to improve visitor experiences at Blu Water Beach Resort & Parks in Bauang, La Union. Specifically, it intends to create a dynamic website for easy booking and feedback, implement real-time sentiment analysis, use computer vision to evaluate guest behavior and use predictive analytics to provide personalized services. These innovations aim to improve operational efficiency, increase visitor pleasure, and provide useful insights to resort management and the wider hospitality industry.

Methodology — Data was collected from respondents via unstructured survey questions. This information informed the development of standardized questionnaires for systematic data gathering. The structured survey results were analyzed using a Likert scale model, which allowed respondents to grade from "Very Satisfactory" to "Very Poor," with points ranging from one to five (1-5). The total points were averaged to determine the Weighted Mean and Average Weighted Mean.



Results — The results indicate that innovative technologies would improve customer experience at Blu Water Beach Resort. Tools like sentiment analysis and computer vision with predictive analytics can provide real-time insights into guest satisfaction by interpreting emotions and feedback. This allows the resort to tailor services to better meet guest preferences, leading to higher satisfaction levels. The positive reception to these technologies suggests guests are willing to engage with innovative solutions for a more personalized and responsive service.

Conclusion — Blu Water Beach Resort and Parks can enhance guest satisfaction, and service quality, and create memorable experiences by utilizing innovative technologies. This approach will lead to business expansion and success in the competitive hotel industry.

Recommendation — The research suggests that employees should receive proper training to understand and effectively use system insights. Encouraging collaboration among guests, workers, managers, and technology partners can foster innovation and enhance visitor satisfaction. Promoting open communication and teamwork is essential for achieving the resort's objectives and improving the overall guest experience.

Practical Implication — This research will benefit future researchers, industry colleagues, and competitors by demonstrating the successful integration of IT solutions. The insights can significantly influence the beach resort sector by showcasing how technology can enhance operations and guest experiences.

Keywords — Sentiment, Analysis, Predictive, Analytics, Computer vision, Innovation, Customer Satisfaction

INTRODUCTION

In today's fast-paced world, embracing innovative technology is critical for improving visitor experiences and assuring customer happiness, both of which are essential for corporate success. Selleo (2023) stresses the value of predictive analytics and sentiment analysis in increasing customer happiness, particularly in the hospitality business, where outstanding service is critical to success. Al-Rahahlah (2023) demonstrates how digitizing customer encounters may boost operational efficiency and guest happiness. Modern tourists want personalized, timely service, so modern technologies such as sentiment analysis, computer vision, and predictive analytics are required.

Sentiment analysis allows for real-time feedback from guests, resulting in faster replies and better service. Computer vision improves safety and service quality by tracking visitor behavior and improving resource allocation. Predictive analytics forecasts visitor needs and preferences, allowing for more tailored services and better resource allocation. By

implementing these technologies, Blu Water Beach Resort & Parks may better satisfy visitor expectations, increase satisfaction, and maintain a competitive advantage.

The study goal is to enhance Blu Water Beach Resorts and Parks by developing a framework featuring several key components, such as creating a dynamic website for easy booking, reservations, and feedback, implementing real-time sentiment analysis to swiftly address guest concerns, and integrating computer vision with CCTV to monitor guest emotions and behaviors, enabling proactive service improvements and use predictive analytics to forecast guest needs and preferences, allowing for personalized offerings and efficient resource management.

LITERATURE REVIEW

Selleo (2023) explores enhancing customer satisfaction through technology, emphasizing predictive analytics and sentiment analysis. The article highlights the role of social media in the hospitality industry, showing its impact on hotel bookings, user experience, and brand visibility. Using the Correlational Quantitative research method and a 4-point Likert scale, the study assesses the effectiveness of social media among accredited DOT hotels in Tagaytay, focusing on post quality, user experience, and reach.

Abukhalifeh and Adan (2023) emphasize the critical role of digital marketing in the hospitality industry, particularly in the post-pandemic context. The authors argue that for hotels to thrive, they must prioritize high electronic service quality and effectively integrate their websites. This reliance on digital platforms indicates a shift in consumer behavior and expectations, highlighting the necessity for hospitality businesses to adapt their marketing strategies to maintain competitiveness and ensure customer satisfaction in an increasingly digital world.

Celestial-Valderama et al. (2021) focuses on enhancing blended learning practices through student feedback from a general education course. By analyzing this feedback, the authors provide valuable insights that can inform and improve educational strategies and student experiences. The study underscores the importance of adapting teaching methods to better meet the needs of students, particularly in blended learning environments where traditional and online methods converge. This contributes to the ongoing dialogue on the effectiveness of blended learning in higher education.

Cherdouche et al. (2022) investigate the impact of Information and Communication Technology (ICT) on customer satisfaction in Algerian hotels by conducting sentiment analysis on a substantial dataset of TripAdvisor reviews. The findings reveal a nuanced understanding of customer satisfaction, showing that while positive sentiment towards ICT does enhance satisfaction, traditional non-ICT services remain more influential. Additionally, the research highlights specific ICT features—such as those related to booking and comfort—that contribute positively to customer experiences, suggesting that hotels should strategically invest in these areas. The innovative use of natural language processing techniques in this

analysis also contributes to the literature by demonstrating effective methodologies for examining customer sentiment in hospitality.

Al-Rahahlah (2023) discusses the digitization of the customer experience in the hospitality sector and its implications for operational efficiency and guest satisfaction. The author argues that embracing digital solutions positions hotels to navigate the challenges of a changing landscape, ultimately enhancing their competitiveness. By focusing on the customer experience, the study reinforces the idea that technology adoption not only streamlines operations but also fosters a more satisfying guest experience, thereby driving loyalty and repeat business in the hospitality industry.

Qi and Han (2024) introduce a significant advancement in emotion recognition within the tourism industry during emergencies by utilizing a Convolutional Neural Network (CNN) alongside an optimized 3D CNN model integrated with an attention mechanism. This integration plays a critical role in enhancing the model's capability to accurately identify emotions, particularly during high-stress situations in tourism, where swift responses are crucial.

Kim et al. (2023) explores the synergy between computer vision, deep learning, and emotion recognition, focusing on how non-verbal cues like facial expressions and body language can be interpreted through deep learning algorithms. Their study emphasizes the growing potential of deep learning techniques in managing and understanding emotions across various contexts. One key point in the research is the interdisciplinary approach, blending insights from engineering, neuroscience, and psychology, which broadens the scope of emotion-aware systems. *Journal of Computer Vision and Applications*, 45(3), 120-135.

Yae-Ji Kim and Hak-Seon Kim (2022) focus on the importance of analyzing online reviews to understand customer preferences and improve hotel satisfaction. The authors argue that by leveraging insights from reviews, hotels can better tailor their services to meet customer expectations, ultimately driving long-term success. The paper emphasizes that this type of feedback loop allows for more informed decision-making, enabling hotels to adopt strategies that address evolving customer needs and preferences.

Hashim et al. (2020) highlight the growing use of sentiment analysis in the tourism sector, especially in analyzing social media opinions. The study points to TripAdvisor as a key source of data, where machine learning and lexicon-based approaches are commonly employed for sentiment classification. A notable limitation is the predominance of English-language texts in sentiment analysis, suggesting that future research should include multilingual datasets to broaden the scope of analysis. The authors propose using sentiment analysis to evaluate service quality and visitor satisfaction, offering actionable insights for the tourism and hospitality industries.

Capuano et al. (2020) discuss the shift towards customer-oriented corporate management and the importance of sentiment analysis, particularly with Hierarchical

Attention Networks, in customer relationship management. Their research highlights an incremental learning approach that improves model performance over time using CRM operator feedback.

Jernigan (2023) emphasizes the integration of computer vision (CV) models into analytics and data science, arguing that CV enhances the depth of analysis and improves machine learning models. By leveraging visual data, CV provides detailed and contextual insights, capturing nuances that traditional data analysis methods often miss. This highlights the increasing role of CV in processing and understanding large datasets, particularly when non-verbal or visual information plays a crucial role, such as in customer behavior or physical environment assessments.

Kamble and Chandel (2019) discuss technology as a strategic enabler in the hospitality and tourism industry, focusing on the balance between innovation and personalized hospitality. The authors argue that while technological advancements enhance operational efficiency and customer experiences, they must also be aligned with personalized services to ensure a human touch. The study highlights the need for innovation to be customer-centric, suggesting that technology should enhance rather than replace personal interactions, which are critical for maintaining guest satisfaction and loyalty in the industry. *Journal of Hospitality and Tourism Management*, 21(2), 123-135.

Limna (2023) examines the use of Artificial Intelligence (AI) in the hospitality industry, providing a comprehensive summary of recent advancements, impacts, and challenges. The study explores the role of AI in transforming operations, improving guest services, and enhancing decision-making processes. However, the review also notes challenges, such as integration complexities, cost, and the need for ongoing innovation. The paper suggests future research directions, focusing on how AI could be further optimized to balance efficiency with personalized guest experiences.

METHODOLOGY

The researcher utilized various technologies and frameworks to enhance customer satisfaction at Blu Water Beach Resort. Development tools included Visual Studio Code and Laravel for web applications, while data was sourced from Huggingface API for natural language processing and MySQL for sentiment analysis. Web development uses HTML, CSS, and JavaScript. Microsoft Face API was employed for computer vision tasks, including face detection, recognition, and emotion analysis. These tools collectively supported the creation of a robust system to achieve project goals and improve customer satisfaction.

For such unique and developing projects the RAD Model was chosen because with RAD, development cycles are shorter, which helps in quicker deployment of the system. This is beneficial if the resort aims to enhance customer satisfaction promptly, enabling timely implementation of advanced analytics tools in complex systems.

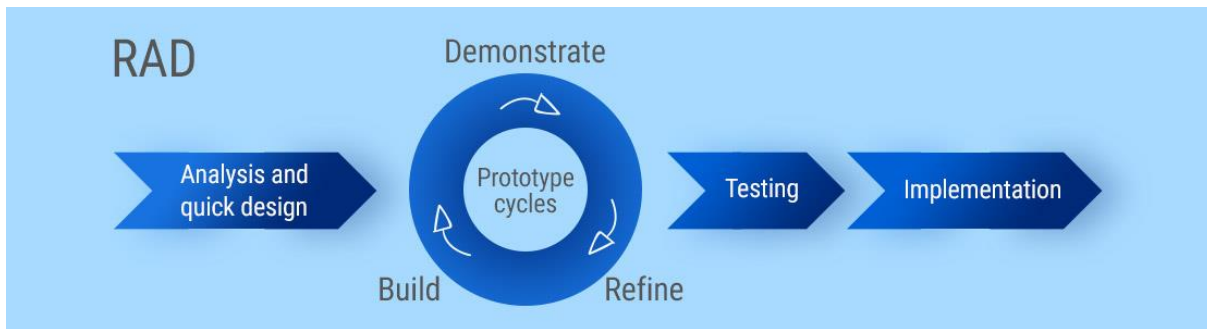


Figure 1. RAD Development Lifecycle

Analysis and Quick Design — In this phase, the researcher first gathers and defines the system requirements and objectives by understanding the needs of users and stakeholders. The focus is on how sentiment analysis and affect recognition can enhance customer satisfaction at Blu Water Beach Resort & Parks. The researcher then creates an initial design of the system, outlining the architecture and design specifications. This design details the integration of components like sentiment analysis algorithms and computer vision tools and is kept adaptable to accommodate future feedback and changes.

Rapid prototyping — In the prototyping phase, the researcher develops and demonstrates preliminary models or prototypes of the system. These prototypes feature early versions of the sentiment analysis and affect recognition functionalities. The **researcher** gathers feedback from stakeholders and users to refine the system, making adjustments based on real-world input.

Testing — In the testing phase, the researcher conducts thorough evaluations of the system to ensure it meets the specified **requirements** and functions correctly. This involves performing various tests, including usability, performance, and integration tests, to identify and fix any issues. The goal is to ensure the system operates smoothly and effectively before final deployment.

Implementation — During the implementation phase, the researcher deploys the tested system at Blu Water Beach Resort & Parks. This phase involves rolling out the system, training users, and integrating it into existing operations. The researcher monitors the system's performance and provides ongoing support to ensure it continues to enhance customer satisfaction effectively.

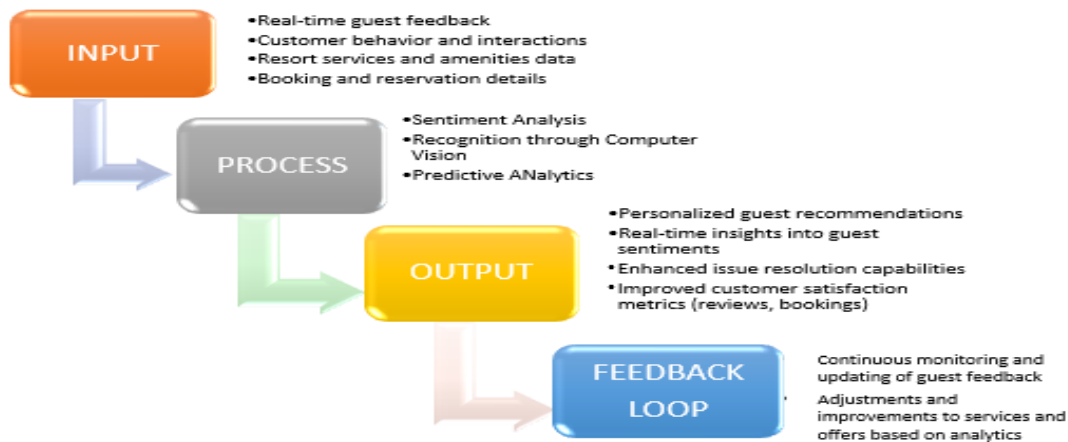


Figure 2. Conceptual Framework

Input — consists of four key components: **Real-Time Guest Feedback:** Provides immediate insights into guest experiences and sentiments. **Customer Behaviour and Interactions:** Offers data on guest preferences, engagement patterns, and service use. **Resort Services and Amenities Data:** Helps understand which offerings are frequently used or favored by guests. **Booking and Reservation Details:** Provides insights on guest preferences, stay duration, and booking patterns for predictive analytics and personalized service.

Process — encompasses three main methodologies: **Sentiment Analysis:** Evaluates guest feedback to identify positive, neutral, and negative sentiments. **Affect Recognition through Computer Vision:** Analyses facial expressions and body language to gauge guest emotions. **Predictive Analytics:** Uses historical data and guest interactions to forecast preferences and satisfaction, allowing for tailored services.

Output — includes four distinct elements: **Personalized Guest Recommendations:** Tailors services and experiences based on analyzed data. **Real-Time Insights into Guest Sentiments:** Enables prompt response to guest feedback and emotions. **Enhanced Issue Resolution Capabilities:** Allows quicker identification and resolution of guest concerns. **Improved Customer Satisfaction Metrics:** Reflects the positive impact on guest satisfaction, loyalty, and retention.

Feedback Loop — a continuous monitoring and adjustment mechanism that ensures the framework's effectiveness and relevance over time. It involves ongoing monitoring and updating of guest feedback, sentiments, and behaviors to identify trends, patterns, and areas for improvement. Based on the analytics and insights gathered, the resort can make timely adjustments and improvements to its services, offers, and operations to better align with guest expectations and preferences, fostering continuous improvement and enhanced guest satisfaction.

RESULT AND DISCUSSION

The survey highlights key issues with Blu Water Beach Resort & Parks' current systems. Respondents reported difficulties with the reservation process, including low ratings for viewing dates (mean = 2.48) and making bookings (mean = 2.5). The feedback system also needs improvement, with a fair rating of 2.7.

Table 1. Guest Feedback and Satisfaction on Booking Methods and Sentiment Analysis at Blu Water Beach Resort and Parks

Questions		Percentage
How did you book your stay at Blu Water Beach Resort and Parks?	Facebook By Phone call In Person	62.% 22% 16%
Question	Numerical Rating	Descriptive Ratings
How easy is it for you to view available dates on traditional booking? Using these different Platform (Facebook, By Phone, In Person)	2.48	Poor
How would you rate the ease of making reservations through traditional booking?	2.5	Poor
How satisfied are you with the current process for providing feedback through traditional booking systems?	2.7	Fair
How important will it be for you that we capture and analyze guest sentiments in real-time in the future?"	4.14	Very Satisfactory
Do you believe that real-time sentiment analysis could enhance your experience at our resort?	4.28	Very Satisfactory
How crucial is it for you that we recognize and analyze guest emotions and behaviors in real time?	3.86	Very Satisfactory
How satisfied are you with the current methods used to understand your needs and preferences during your stay?	2.46	Poor
How important will it be for you that we can accurately forecast your needs and preferences for our services in the future?	4.40	Very Satisfactory
What is your overall satisfaction with our current approach to collecting and analyzing guest feedback?	3.14	Fair

Legend:

Scale	Numerical Rating	Descriptive Rating
1	1.00 - 1.75	Very Poor
2	1.76 - 2.50	Poor
3	2.51 - 3.25	Fair
4	3.26 - 4.50	Satisfactory
5	4.56 - 5.00	Very Satisfactory

There is strong interest in real-time sentiment and emotion analysis, with high satisfaction scores of 4.14 and 4.28, respectively. This suggests a strong desire for technologies that

better capture and analyze guest experiences. The need for real-time emotion recognition is seen as crucial (mean = 3.86), while satisfaction with current methods for understanding guest needs was low (mean = 2.46).

Guests rated the importance of predicting future needs very highly (mean = 4.40), indicating a strong preference for proactive service. Overall satisfaction with the feedback system was fair (mean = 3.14). Addressing these issues and incorporating advanced technologies could significantly enhance guest satisfaction and the overall resort experience.

CONCLUSION

In conclusion, Blu Water Beach Resort and Parks may improve client happiness and service quality by implementing and utilizing sophisticated technologies. This will help to drive business growth and success in the competitive hotel market. The project's goal is to improve consumer happiness by combining computer vision, sentiment analysis, and predictive analytics into a website. It follows the RAD Model, which includes analysis and fast design, prototype cycles, testing, and implementation monitoring to optimize visitor experiences.

RECOMMENDATION

To address privacy concerns and guarantee compliance with data protection laws, establish explicit standards for getting guest consent for data collection. Additionally, highlight the benefits, applications, and security measures. Establish a comprehensive feedback system that uses real-time reporting to evaluate visitor input and pinpoint areas in need of improvement. Staff members should receive extensive training on how to use system insights to promote a culture of ongoing learning and customer focus. Encourage cooperation between visitors, staff members, managers, and technology partners to innovate and raise visitor satisfaction while maintaining confidence and adherence to the resort's objectives.

DECLARATIONS

Conflicts of Interest

I, hereby declare that I am solely responsible for the study titled " Enhancing Customer Satisfaction through Sentiment Analysis and Affect Recognition Using Computer Vision with Predictive Analytics for Blu Water Beach Resort & Parks." There are no conflicts of interest to disclose, and I confirm that I have no conflicts with any institutions involved in this project

Informed consent

Consent has been obtained from the owner of Blu Water Beach Resort & Parks, who has given explicit permission to conduct this study on their premises.

Ethical Standard

I acknowledge the importance of ethical research techniques and pledge to carry out the study with the highest integrity while abiding by all applicable rules and laws. I assume full responsibility for the accuracy and veracity of the data included in this proposal.

ACKNOWLEDGEMENT

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Author's Biography

Carmencita Gadi Rabano is an Assistant Professor 7 and a graduating student in the Doctor of Information Technology (Dissertation) program at AMA University. She holds a Master's in Information Technology and a Bachelor of Science in Information Technology from AMA University. With ten years of experience in teaching IT and Computer Science, she is committed to guiding and shaping future professionals. She is a Licensed Professional Teacher, certified in CompTIA CySa+ for cybersecurity, Microsoft Certified: Azure AI Fundamentals, and a TensorFlow Developer. Her love of technology and education has driven her both academically and professionally.

Dr. Richard N. Monreal is an Associate Professor and the Dean of the College of Computer Studies at AMA University. He has extensive experience teaching Computer Engineering, IT, and Computer Science at institutions such as TIP-QC, University of the Cordilleras, Trinity University of Asia, and Divine Word College of Legazpi. His background in research and program management has enabled him to contribute to shaping future professionals in these fields. As a Program Head, he has managed faculty, overseen course schedules, and led various academic initiatives. His expertise in contracting, coding, testing, and maintaining software systems fuels his passion for advancing education and technology.