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AI-Enhanced Business Model Canvas for Sustainable Tourism

Rosy Aprieza Puspita Zandra[1]*, Santi Widhiyanti[1]
[1]Accounting Departement, State Polythecnic of Malang, Jl. Soekarno Hatta No 9, Kota Malang, 65141, Indonesia
*Corresponding Email: rosy.zandra@polinema.ac.id

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ABSTRACT

This study extends previous research on the Plaza Bukit Surga tourism destination, which previously used the Business Model Canvas (BMC) and SWOT analysis to identify weaknesses in marketing and resource utilization. To enhance strategic decision-making, this study integrates Artificial Intelligence (AI) into the BMC framework, resulting in an AI-Enhanced Business Model Canvas for sustainable tourism development. Data were derived from studies conducted between 2022 and 2024, including visitor and revenue records, and were complemented with recent Google Maps reviews collected in 2025. The reviews were analyzed using AI to identify patterns in visitor perception. The findings show that 83.50% of visitors express positive sentiment, particularly noting natural scenery, hospitality, and affordability, while negative sentiments highlight accessibility issues and limited facility maintenance. Integrating AI-driven insights strengthens the Customer Relationship, Value Proposition, and Revenue Streams components, producing a more adaptive and data-driven business model. Overall, the study demonstrates that combining traditional qualitative approaches with AI-based sentiment analysis can enhance strategic planning and support sustainable management in community-based tourism destinations.

Keywords: Artificial Intelligence; Business Model Canvas; Sentiment Analysis; Strategic Management; Sustainable Tourism

JEL Classification: L38, M21, O33, C88, Q56

INTRODUCTION

The tourism sector plays a vital role in supporting national and regional economic growth. According to the Ministry of Tourism and Creative Economy, tourism contributes 4.3% to the national Gross Domestic Product (GDP) and provides employment for more than 22 million people (UNWTO, 2023). However, in the post-Covid-19 era, many community-based tourism destinations continue to face challenges in restoring visitor interest and improving the efficiency of their business strategies. This condition requires tourism managers to adapt to changes in consumer behavior, which are increasingly digital and data-driven.

Tourism also plays an important role in regional development by increasing local income and expanding employment opportunities. Despite this potential, many nature-based village tourism destinations still face limitations in strategic management and lack sufficient data to support evidence-based decision-making. Plaza Bukit Surga in Bareng Village, Nganjuk Regency, exemplifies this challenge. Although the destination is known for its scenic mountain views and cool atmosphere, its management remains reliant on traditional, intuition-based decision-making and conventional promotional methods. According to Ikenga & Egbule (2024), weaknesses in Customer Relationship, Channels, and Revenue Streams persist due to suboptimal digital marketing efforts and the absence of a structured customer feedback system.

Although Plaza Bukit Surga has strong tourism potential, several operational constraints continue to hinder its performance. Visitor numbers declined by 30% in 2024 compared to the 2022–2023 period, resulting in reduced revenue for the managing village enterprise (BUMDes). At the same time, the destination's natural beauty and strong community engagement remain significant strengths that can be further optimized. These conditions highlight the need for a strategic business transformation that integrates conventional management practices with digital technologies to enable more responsive and data-driven decision-making.

Previous research utilizing the Business Model Canvas (BMC) and SWOT frameworks successfully mapped nine core business elements but also revealed major weaknesses in marketing and resource optimization. With the growing shift toward smart tourism, recent studies emphasize the importance of integrating AI-based analytics to enhance strategic planning in a more dynamic, predictive manner (Topsakal, 2025). The application of Artificial Intelligence, particularly through sentiment analysis, offers new opportunities to analyze visitor behavior based on online reviews, social media content, and transaction data. These insights are valuable for improving promotional strategies, strengthening service quality, and developing more innovative tourism products.

Integrating AI into the BMC enables the framework to evolve from a static model into a dynamic, data-driven tool that continuously updates based on real-time visitor perceptions, travel trends, and public sentiment. This integration has the potential to support digital transformation and strengthen economic sustainability in community-based tourism destinations.

Based on this background, the focus of this study is to explore how Artificial Intelligence can be utilized to identify visitor sentiment patterns at Plaza Bukit Surga through AI-based text analysis, how these analytical results can be integrated into the elements of the Business Model Canvas to produce an AI-supported business model, and how the enhanced BMC can support sustainable tourism management. The purpose of this study is to identify visitor perception patterns using AI sentiment analysis, integrate these

findings into the BMC framework, and formulate a data-driven sustainable business model that can be effectively implemented.

This study differs from previous research by Pasaribu et al. (2023), which relied on qualitative mapping through BMC and SWOT. The present study introduces an Artificial Intelligence approach through sentiment analysis using Voyant Tools and Gemini, enabling continuous updating of the BMC elements and providing strategic recommendations based on real-time visitor data. Consequently, this study offers both empirical and methodological contributions to the application of the Business Model Canvas in the context of sustainable tourism development in Indonesia.

LITERATURE REVIEW

Tourism

Sustainable tourism has become a global priority agenda that emphasizes a balance among economic, social, and environmental dimensions. The UNWTO 2022: A Year in Review report highlights that the post-pandemic period marks a turning point in transforming the tourism sector toward a "greener, smarter, and more inclusive" paradigm, encouraging every destination to adapt through digital innovation, resource efficiency, and social sustainability (UNWTO, 2022). Meanwhile, the Agenda Item 4(b): Implementation of the General Programme of Work 2022–2023 document (UNWTO, 2023) explains that current global policies focus on implementing tourism strategies that integrate digitalization, sustainability, and cross-sector inclusiveness. These changes provide an important context for tourist destinations such as Plaza Bukit Surga, which must develop business strategies not only to increase revenue but also to maintain ecological and social balance through intelligent, adaptive, and data-driven management.

Digitalization has become the main driver of transformation in the tourism sector. A systematic review by Rodrigues et al. (2023) found that the use of smart technologies, data analytics, and destination information systems plays a major role in improving efficiency, visitor experience, and contributions to sustainable development. Similarly, Santarsiero et al. (2024) emphasize that the success of digital transformation in tourism depends on a destination's ability to integrate technology into its business model supported by adaptive leadership. Thus, digitalization is not merely an operational tool but a core strategy in building a sustainable tourism business model that can adjust its management direction based on data and visitor behavior. To address the challenges of digitalization and sustainability, a comprehensive business model framework is needed to describe how value is created and delivered to visitors. One widely adopted framework in this context is the Business Model Canvas (BMC).

Business Model Canvas (BMC)

The Business Model Canvas (BMC) is a strategic framework that describes how an organization creates, delivers, and captures value in a systematic manner through nine key elements: customer segments, value propositions, channels, customer relationships, revenue streams, key resources, key activities, key partnerships, and cost structure (Osterwalder & Pigneur, 2011). BMC functions as a visual tool that helps managers understand the interconnections among business activities while effectively communicating the organization's overall strategy. In the tourism context, BMC is widely used to map business models for destinations because it helps identify value elements and potential resources relevant to visitors (Harfiani & Pasaribu, 2019; Dewi et al., 2023).

Furthermore, BMC has proven effective in fostering innovation and adaptability in the digital era because it provides a holistic view of the relationship between value creation,

customers, and internal operations. Vaska et al. (2021) showed that digital transformation has brought fundamental changes to how organizations create, deliver, and capture value, reinforcing BMC's role as a flexible conceptual tool that supports digital business model innovation. Likewise, Matricano and Liguori (2024) introduced the concept of a digital BMC to reflect the experimental and adaptive nature of modern businesses. A bibliometric analysis by Zare and Persaud (2025) confirms that integrating digital transformation with BMC-based innovation enhances an organization's capability to design value strategies that are more responsive to market dynamics and consumer behavior. Therefore, BMC remains relevant in the digital era as an adaptive strategic framework that integrates innovation, consumer dynamics, and data-based decision-making to support sustainable tourism business models. However, the increasingly dynamic tourism market requires an approach that is even more adaptive and data-oriented. For this reason, Artificial Intelligence (AI) plays an important role in strengthening analytical capabilities and decision-making processes in tourism business management.

Artificial Intelligence and Sentiment Analysis

Artificial Intelligence (AI) has become one of the key elements driving digital transformation in the tourism sector. Sentiment Analysis (SA), a branch of text mining, focuses on the computational process of identifying and categorizing opinions within text—especially from social media—to understand customer perceptions of products, services, and market trends. This capability makes SA an important analytical tool for organizations to process both structured and unstructured data and to improve decision-making quality based on customer feedback (Kumar et al., 2023). Over the past decade, sentiment analysis has been conducted using various techniques, including lexicon-based approaches and machine learning and deep learning models (Jurafsky & Martin, 2000).

Through sentiment analysis, AI can extract valuable information from textual data such as online reviews and social media posts to understand tourists' perceptions, emotions, and satisfaction levels. Puh and Bagić Babac (2023) found that deep learning algorithms such as BiLSTM (Bidirectional Long Short-Term Memory) are effective for classifying sentiments and predicting tourist ratings with high accuracy, helping industry practitioners identify visitor satisfaction and make faster, more adaptive decisions for destination management.

Li et al. (2023) stated that AI-based sentiment analysis increases the accuracy of tourism trend forecasting compared to traditional methods because it reflects visitor perceptions in real time. Nawawi et al. (2024) supported this finding through aspect-based sentiment analysis that maps service components such as facilities, comfort, and pricing that most influence tourist experiences. Integrating sentiment analysis into decision-making systems enables destination managers to develop strategies that are more predictive, responsive, and sustainable. Therefore, applying AI in sentiment analysis becomes a key foundation for developing the Business Model Canvas (BMC) as an intelligent business model that connects tourist behavior data with innovation for sustainable tourism strategies. To ensure that BMC implementation aligns with organizational conditions, a strategic analysis tool is needed to identify strengths, weaknesses, opportunities, and threats. In this context, SWOT analysis plays an important role in supporting the formulation of sustainable tourism business strategies. When integrated with AI-based analysis, BMC evolves into the AI-Enhanced Business Model Canvas.

Concept of AI-Enhanced Business Model Canvas

Integrating Artificial Intelligence into the Business Model Canvas framework has led to the development of the AI-Enhanced Business Model Canvas. Jorzik et al. (2024)

emphasize that AI serves as a key driver of business model innovation by transforming how organizations design value propositions, manage customer relationships, and make strategic decisions using predictive analytics. This approach transforms the BMC from a simple visual planning tool into an adaptive system capable of responding to market changes through machine learning and continuous data analysis. Similar concepts are now offered through digital platforms such as Visual Paradigm Business Model Canvas Builder and Creately AI Business Model Canvas, which allow users to create, update, and visualize business canvases automatically using AI. Features such as automated block recommendations, customer data-based updates, and real-time collaboration illustrate the practical implementation of AI-enhanced business modeling.

Pasaribu et al. (2023) further explain that integrating AI into BMC optimizes the entire value cycle through automation and the use of real-time customer data to support strategic decision-making. Toorajipour et al. (2024) likewise stress the importance of an AI-based data ecosystem in facilitating information exchange among business actors, enabling organizations to convert customer data into sustainable value innovation. These findings strengthen the position of the AI-Enhanced BMC as a strategic instrument that not only improves operational efficiency but also expands business innovation capabilities.

SWOT Analysis

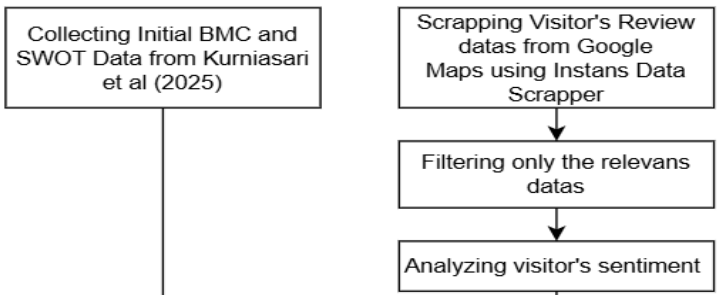
SWOT analysis is a strategic tool used to assess an organization's internal and external conditions through four main dimensions: Strengths, Weaknesses, Opportunities, and Threats. According to ScienceDirect Topics (2024), SWOT supports organizations in understanding their competitive position and identifying factors that influence the effectiveness of their strategies. Sooampon (2025) describes SWOT as an important tool for strategic decision-making that highlights all four dimensions while considering potential biases in managerial interpretation. SWOT is widely used to identify an organization's strengths, weaknesses, opportunities, and threats (Widowati & Andrianto, 2022), and integrating SWOT with BMC can clarify strategic priorities based on real conditions (Yulianto & Putri, 2021).

Furthermore, Palazzo and Micozzi (2024) explain that SWOT acts as a continuously evolving decision-making model, especially when integrated with data-driven digital approaches. In the tourism sector, Gasga (2022) demonstrated that SWOT helps local destinations identify key potentials and develop strategies based on community participation. Jeelani and Shah (2024) emphasize the importance of SWOT in designing sustainable tourism strategies that involve stakeholder collaboration and environmental risk mitigation. Meanwhile, Chakrabarty (2024) criticizes the static nature of traditional SWOT and highlights the need for integration with data analytics and AI to enable real-time and adaptive analyses. Palazzo and Micozzi (2024) reinforce this argument by stressing the importance of data-driven approaches that allow SWOT to evolve into a more dynamic system. Such integration opens opportunities for developing an enhanced BMC—an intelligent business model that combines SWOT results with AI to design predictive, responsive, and sustainability-oriented tourism strategies.

Conceptual Framework

The study framework model is depicted in Figure 1.

Figure 1. Research Framework



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Source: Data Processed by the Researcher (2025)

RESEARCH METHOD

This study employs an exploratory qualitative approach combined with quantitative text analysis supported by Artificial Intelligence (AI). The research is conducted using a single case study design focusing on Plaza Bukit Surga in Nganjuk Regency. The data consist of secondary information sourced from previous research by Pasaribu et al. (2023), which includes visitor numbers and revenue records for the 2022–2024 period. In addition, Google Maps reviews from 2025 were analyzed using AI-based tools, namely Voyant Tools and Gemini AI, to identify dominant themes and word frequency patterns.

The data used in this study comprise primary secondary data in the form of 206 visitor review texts obtained from Google Maps, along with supporting secondary data such as internal documents and previous BMC and SWOT reports covering the 2022–2024 period. Data collection was carried out through web scraping and text extraction techniques, supported by an extensive literature review and document analysis to strengthen contextual understanding.

The data analysis process began with preprocessing, which involved filtering and cleaning the textual datasets to ensure accuracy and consistency. This was followed by AI-assisted sentiment analysis to classify review texts into positive, negative, and neutral categories, along with the calculation of sentiment distribution percentages. Keyword frequency analysis was also conducted to generate a word cloud and identify key recurring terms such as “beautiful,” “view,” “cool,” “affordable,” and “road.” These analytical results were then interpreted through thematic analysis by mapping positive and negative sentiments into the nine elements of the Business Model Canvas (BMC). The final stage of the analysis involved formulating an AI-Enhanced Business Model Canvas by integrating the sentiment findings into the BMC structure to generate strategic recommendations aligned with sustainable tourism development.

RESULTS

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Overview of the Plaza Bukit Surga Tourist Destination

Plaza Bukit Surga is a tourist destination located on the slopes of Mount Wilis, an area known for its stunning natural scenery and cool, refreshing air. Established in 2020 by the local community, the site was created to promote the village and highlight its local potential to a wider audience. Plaza Bukit Surga is situated in Jabon Hamlet, Bareng Village, Sawahan District, Nganjuk Regency, East Java Province, 64475.

Since 2022, the management of Plaza Bukit Surga has continued to add attractions and improve facilities to enhance the visitor experience. Five new facilities have been developed, including a karaoke hall or multipurpose room that can be used for various events such as celebrations and community gatherings. The newly built swimming pool provides a fun place for children to relax and play, while the fish therapy pond offers a unique and calming experience for visitors.

The tall torch tower has become one of the main icons of Plaza Bukit Surga, allowing visitors to climb to the top to take photos or enjoy unobstructed panoramic views. In addition, the beautifully designed love stone garden serves as a favorite spot for couples to take pictures and enjoy romantic moments surrounded by nature.

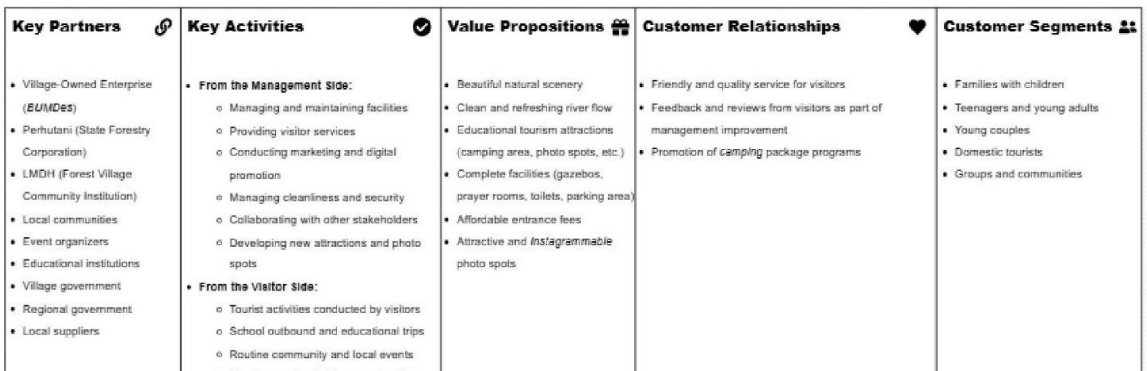
Revenue data from July to December 2024 shows that Plaza Bukit Surga earned a relatively low net income, ranging from 5 to 9 million rupiah per month. This figure represents a decline compared to the same period in 2023, when net income ranged from 8 to 18 million rupiah per month. The decrease reflects the challenges faced by management in achieving higher revenue targets. Despite its large market potential, the results indicate that the business strategies implemented by the management are still not optimal.

Several factors contribute to this low income, the most significant being the lack of effective promotional or marketing strategies to attract more visitors. In the tourism and entertainment industry, visibility and appeal are crucial to increasing visitor numbers. The management could optimize various marketing channels such as social media, online advertising, or partnerships with travel agencies to potentially boost visitor arrivals and revenue.

Overall, the low income earned by Plaza Bukit Surga during this period highlights the need for evaluation and improvement in its business strategies. Through in-depth analysis and well-planned actions, it is expected that revenue can increase and the destination can reach its full potential in the future.

The existing business model analysis of Plaza Bukit Surga is formulated using the Business Model Canvas (BMC) framework. This model serves as a visual representation of the key elements that define the operations and value proposition of the destination, as shown in Figure 2.

Figure 2. BMC Analysis



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Source: Kurniasari et al. (2025)

SWOT analysis was also conducted to evaluate internal factors, which include strengths and weaknesses, as well as external factors, which consist of opportunities and threats faced by Plaza Bukit Surga.

Figure 3. SWOT Analysis

Internal Factors	**S**	**Strengths:** ● Beautiful natural scenery with a cool and refreshing atmosphere, accompanied by the soothing sound of a flowing river. ● Availability of unique attractions such as camping areas, cafés, swimming pools, and fish therapy ponds that are not commonly found in other tourist destinations in Nganjuk Regency. ● A positive image among visitors due to friendly service and a clean environment. ● Relatively affordable entrance ticket prices.
	W	**Weaknesses:** ● Limited facilities such as gazebos, restrooms, and tables or chairs in the canteen area, making visitors feel less comfortable. ● During peak visitor periods, service from staff is sometimes perceived as slow or less responsive. ● Lack of promotion on social media, resulting in low visibility of the tourist destination among potential visitors.
External Factors	**O**	**Opportunities:** ● Adding glamping facilities, which are currently very popular among younger visitors. ● Establishing partnerships with travel agencies or companies to develop tour packages in the Sawahan District area. ● Office gatherings and company outings could serve as potential market segments, considering the increasing number of visitors coming from outside the local area.

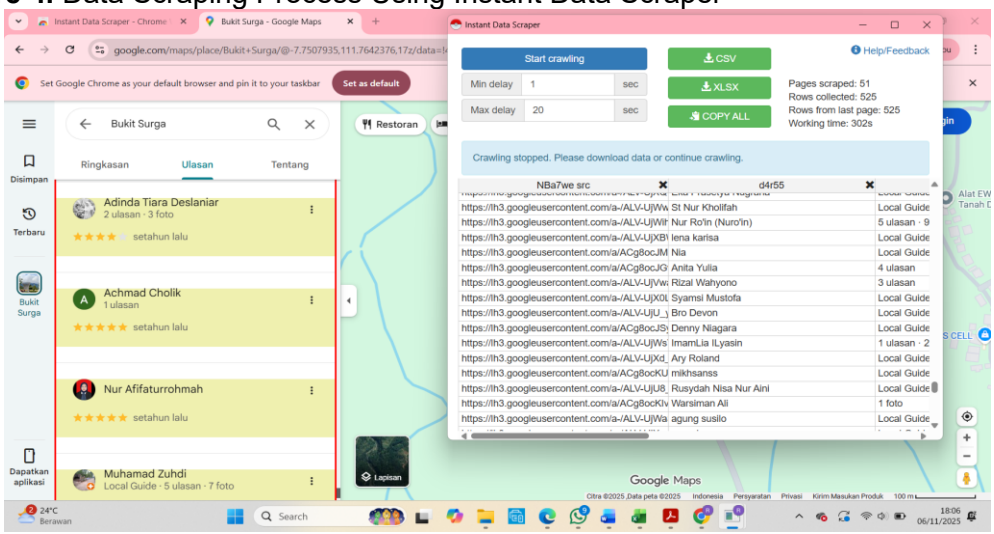
	T	**Threats:** ● The emergence of new tourist destinations in Nganjuk Regency with similar concepts, along with regulations from the forestry authority (Perhutani), may create potential competition. ● The surrounding area poses a risk of landslides because the site is located on a hillside and near mountainous terrain. ● The hilly location can make access difficult for visitors from outside the area or for those unfamiliar with mountainous routes.

Source: Kurniasari et al (2025)

Research Findings

This study conducted data scraping of Google Maps reviews for Bukit Surga using the link https://www.google.com/maps/place/Bukit+Surga and the Instant Data Scraper extension on Google Chrome. The scraping process collected approximately 500 visitor ratings, consisting of star ratings and written comments. Reviews that contained only star ratings without accompanying text were excluded from the dataset to ensure the relevance and quality of the analysis. After filtering, a total of 206 reviews with both written comments and star ratings were retained as the final dataset for further examination.

Figure 4. Data Scraping Process Using Instant Data Scraper



Source: Data Processed by the Researcher (2025)

This study used AI-based tools, namely Voyant Tools and Gemini, to assist in sentiment analysis. The results of this analysis are presented in the following table.

Table 1. Most Frequently Appearing Keywords

Keywords	Frequency	Main Category
Bagus	90	Quality/Praise
Pemandangan	56	View
Sejuk	51	Atmosphere/Air
Tempat	47	Location/Destination
Murah	29	Price/Affordability
Indah	28	Aesthetics
Cocok	24	Suitability (Family/Refreshing)
Keluarga	20	Target Market
Jalan	18	Accessibility (Negative/Positive Context)

Bersih	17	Facilities/Cleanliness
Nyaman	16	Comfort/Atmosphere
Spot Foto	15	Attraction
Akses	11	Accessibility
Asri	11	Nature
Toilet/KM	10	Facilities/Basic Needs
Camping	9	Facilities/Activities
Enak	9	Culinary/Experience
Ramah	8	Services
Lengkap	8	Facilities/General
Mantap/Keren	8	Quality/Praise

Source: Data Processed by the Researcher (2025)

Table 1 presents the top 20 keywords (after stop-word removal) most frequently used by visitors, reflecting the main attributes associated with their perceptions of the destination. The dominance of positive sentiment is supported by several key factors revealed through the word cloud and keyword frequency analysis. The three most frequently mentioned keywords are *"Bagus"* (Good), which appears 90 times; *"Pemandangan"* (View), appearing 56 times; and *"Sejuk"* (Cool), appearing 51 times. These findings reinforce the destination's core value proposition, which is rooted in its natural beauty and refreshing mountain atmosphere, consistent with its geographical location on the slopes of Mount Wilis.

Additionally, the keyword *"Murah"* (Affordable), which appears 29 times, is noteworthy as it indicates that affordability remains an important consideration for visitors, especially among family-oriented tourist segments.

Table 2. Sentiment Summary

Sentiment	Strengths (Positive)	Weaknesses and Suggestions (Negative)
View and Atmosphere	"Bagus" (Beautiful), "Indah" (scenic), and "Sejuk" (cool) atmosphere (located on the slopes of Mount Wilis, ideal for relaxation and short getaways).	Lack of shade and small trees that do not yet provide sufficient cover.
Price and Service	Affordable prices, accessible for all visitors, low-cost food, and friendly service.	Slow service in the food court, very basic canteen menu, food quality issues such as greasy meatballs and less fresh fried chicken
Facilities and Access	Complete facilities (toilets, prayer room, camping ground, mini café), clean and tidy restrooms, and many photo spots.	Access road to the site is steep and uneven, with some sections still rocky or damaged; pool and restroom water often dirty; attractions poorly maintained; lack of trash bins and limited restroom availability.

Source: Data Processed by the Researcher (2025)

Although positive sentiments were highly dominant, the AI-based sentiment analysis also identified several weaknesses that require strategic attention and managerial intervention. Negative visitor experiences were primarily concentrated on two key issues.

The first issue relates to accessibility, where the keyword *"Jalan"* (road), which appeared 18 times, was frequently associated with complaints about steep slopes, difficult terrain, and sections of the access road that remain unpaved. These conditions create a significant barrier in the customer journey and may discourage repeat visits, particularly among families or visitors using smaller vehicles. The second issue involves facility cleanliness. Although the keyword *"Bersih"* (clean) appeared 17 times as a positive appreciation, a closer examination of negative comments revealed inconsistencies in cleanliness, especially concerning cloudy or dirty pool water, unmaintained restrooms, and the limited availability of trash bins. These issues indicate areas where service quality needs to be strengthened to meet visitor expectations.

Table 3. Sentiment Analysis and Percentage

Sentiment	Number of Reviews	Percentage
Positive	172	83.50%
Negative	23	11.17%
Neutral	11	5.34%
Total	206	100.00%

Source: Data Processed by the Researcher (2025)

The sentiment analysis of 206 Google Maps reviews showed a strong dominance of positive sentiment toward Plaza Bukit Surga. Overall, 83.50 percent of the reviews were classified as positive, while only 11.17 percent reflected negative sentiment, and the remaining 5.34 percent were neutral. This high level of satisfaction confirms Plaza Bukit Surga's position as a well-received and popular tourist destination among visitors.

DISCUSSION

Application of Artificial Intelligence (AI) in Visitor Sentiment Analysis

The use of Artificial Intelligence (AI), particularly through text-based sentiment analysis techniques, enabled the identification of visitor sentiment patterns from Google Maps reviews of Plaza Bukit Surga. The AI model functioned as a strategic diagnostic tool capable of processing hundreds of text entries rapidly, transforming raw unstructured data into structured and measurable insights. Through AI analysis of 206 reviews, the study identified a highly dominant sentiment distribution consisting of 83.50 percent positive sentiments and 11.17 percent negative sentiments.

This pattern highlights two core findings. First, the main strengths of the destination are reflected through positive sentiment clusters centered around the keywords *"Pemandangan"* (view), *"Sejuk"* (cool), and *"Murah"* (affordable). These results confirm that Plaza Bukit Surga's primary value propositions lie in its natural environment and affordability—factors that were previously identified in the SWOT analysis as strategic strengths and opportunities. Second, the critical points requiring managerial attention are identified through negative sentiment clusters focused on accessibility and cleanliness. The keyword *"Jalan"* (road) consistently appears in complaints about steep slopes, rough road conditions, and unpaved access routes. Meanwhile, cleanliness-related criticisms highlight issues such as cloudy pool water, unmaintained restrooms, and insufficient waste bins. The advantage of AI in this context lies in its ability to pinpoint and quantify specific weaknesses, whereas conventional SWOT analysis tends to generalize these issues without providing measurable indicators.

These findings align with the study of Muktafin, Kusrini, and Luthfi (2020), who demonstrated that AI through Natural Language Processing (NLP) can more accurately identify specific issues requiring strategic improvement than traditional survey methods. In the tourism context, Brown (2025) further supports that AI-generated insights derived

from visitor reviews serve as strong predictors of customer satisfaction and revisit intention. Therefore, the application of AI at Plaza Bukit Surga has successfully identified valid and operational sentiment patterns.

Compared to Martiani (2024), although the initial SWOT analysis had already identified accessibility and human resource quality as weaknesses, the AI-based sentiment analysis in this study provides quantitative evidence regarding the frequency and intensity of visitor concerns. AI does not replace qualitative data; instead, it enhances reliability by offering frequency-based metrics and focused thematic insights that conventional observations or interviews cannot fully capture. The contribution of AI lies in bridging the gap between strategic analysis and operational improvements through precise identification of priority issues.

The integration of AI into the Business Model Canvas (BMC) strengthens the managerial dimension by shifting traditional intuition-based decision-making toward a data-driven approach. This finding is consistent with Harfiani and Pasaribu (2019) and Dewi et al. (2023), who emphasized the importance of digital innovation in tourism business models. Through this enhanced BMC model, the management of Plaza Bukit Surga can identify visitor behavior patterns, optimize digital promotional strategies, and predict facility needs through simple predictive analytics.

Integration of AI Sentiment Analysis Results into the BMC

The integration of AI-generated insights into the Business Model Canvas framework has transformed the previously static business model of Plaza Bukit Surga into a more adaptive AI-Enhanced Business Model Canvas. This integration ensures that each strategic element of the BMC aligns with visitors' real-time perceptions obtained from online reviews. The sentiment distribution—83.50 percent positive and 11.17 percent negative—serves as a strategic data source to update key BMC components, particularly the Customer Relationship and Value Proposition elements.

Table 4. Integration Map of Sentiment Analysis Results into the Nine BMC Elements

No	BMC Element	Integrated AI Sentiment	Discussion and Strategic Adjustments
1.	Value Proposition	Positive: View, Cool, Affordable Negative: Cleanliness (Dirty Water)	The value offered is strengthened by focusing on eco-tourism and sustainable nature experiences. This includes highlighting natural strengths such as scenic views and cool air while addressing environmental issues like water cleanliness and waste management mentioned in visitor reviews, making them part of a responsible selling point.
2.	Key Activities	Negative: Road, Cleanliness, Slow Service	Core activities are redesigned to address pain points. Priority 1: Road improvement and paving, especially on rough segments. Priority 2: Implementing a daily checklist-based cleanliness management system for restrooms and pools. Priority 3: Service training and standardization to improve food court response time.

3	Customer Relationships	Negative: Slow Service, Google Maps Reviews	Customer relationships are strengthened through a digital feedback system based on online reviews. This involves using platforms such as Google Maps and social media to respond quickly and transparently to negative feedback, particularly regarding service and cleanliness, demonstrating managerial accountability.
4.	Revenue Stream	Positive: Affordable Negative: Limited Attractions	Revenue streams remain focused on affordable pricing but are optimized through a bundling model for tickets and food court vouchers. This model aims to increase average transaction value without significantly raising ticket prices while maximizing income potential from new key activities such as camping rentals.
5.	Key Resources	Positive: Scenic View, Large Area Negative: Poorly Maintained Facilities	Key resources need improvement through additional investment in road infrastructure and pool filtration systems. Human resources should receive training to standardize service quality.
6.	Customer Segments	Positive: Suitable for Families and Young Couples	Confirmed and maintained with a focus on family visitors and tourists seeking relaxation or healing experiences.
7.	Channels	Positive: Social Media, Google Maps	Channel utilization should be strengthened through quick responses to negative reviews on Google Maps and promotional content on social media that highlights infrastructure improvements such as before-and-after visuals of road repairs.
8.	Key Partners	Negative: Road	Key partnerships should focus on collaboration with local government or infrastructure contractors to improve road access.
9.	Cost Structure	Negative: Maintenance	The cost structure should be adjusted to allocate a fixed budget for road maintenance and operational expenses related to cleanliness and water filtration systems.

Source: Data Processed by the Researcher (2025)

The integration of these insights strengthens the AI-Enhanced BMC by contributing to three strategic repositioning outcomes. The first is sustainable value creation, where the shift in the value proposition toward eco-tourism and sustainable nature experiences becomes central to long-term viability. Sentiment data, especially concerning cleanliness, encourages management to adopt environmentally responsible practices,

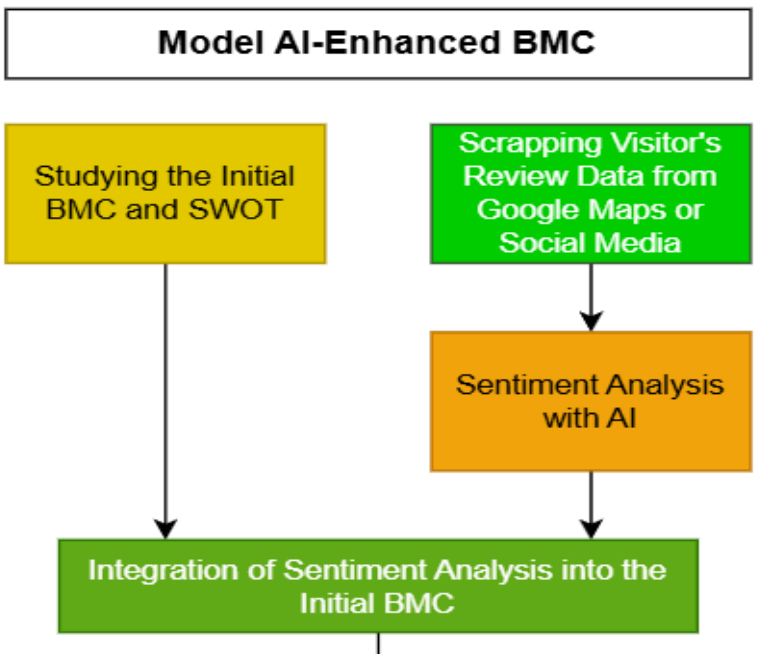
transforming weaknesses into added value. The second is digital relationship management. Strengthening customer relationships through digital feedback ensures that AI becomes an integral part of daily operations rather than a one-time analytical tool. This aligns with the Smart Tourism Destination concept, which emphasizes interactive and data-driven visitor engagement. The third is revenue model innovation. The proposal for bundled tickets and food court vouchers directly responds to the strengths of affordability while addressing revenue challenges. This strategy allows the destination to increase income without compromising its community-oriented identity, a finding reinforced by AI insights.

Thus, the AI-Enhanced BMC functions as a data-driven governance framework, enabling strategic decisions to be derived from customer feedback analyzed through AI rather than relying solely on managerial intuition. This approach transforms traditional BMC and prior SWOT results—such as those identifying limited accessibility—into actionable mandates in Key Activities, including specific plans for road improvement and cleanliness management.

In the context of sustainable tourism, this integration ensures that revenue streams are supported through affordable pricing while simultaneously increasing value through improved infrastructure and service quality. Enhancing accessibility and cleanliness not only increases visitor satisfaction but also reflects social responsibility toward the local community that depends on tourism, thereby contributing to social sustainability. Additionally, the prioritization of facility cleanliness and waste management supports environmental sustainability by ensuring that tourism development does not compromise the natural assets that serve as key resources for the destination.

Overall, the results of AI-based sentiment analysis serve as real-time data input that directly enhances alignment between the Value Proposition (scenic view and cool climate) and Key Activities (road improvement and cleanliness management), enabling Plaza Bukit Surga to pursue more effective and measurable sustainability goals. The following section presents the resulting AI-Enhanced Business Model Canvas developed through this study.

Figure 5. AI-Enhanced BMC Model



Source: Data Processed by the Researcher (2025)

CONCLUSION

This study develops an AI-Enhanced Business Model Canvas as an advancement of the traditional BMC by integrating AI-based sentiment analysis to provide objective and measurable interpretations of visitor perceptions. The findings strengthen the Value Proposition of Plaza Bukit Surga, particularly its natural scenery, cool climate, and affordability, while simultaneously identifying critical weaknesses in accessibility and facility cleanliness that require managerial attention. The integration of AI insights transforms the business model into a more adaptive and data-driven framework, improving key strategic components such as infrastructure-related activities, sustainable eco-tourism positioning, digital customer relationship management, and optimized revenue strategies. This enhanced model supports more responsive and sustainable tourism management across economic, social, and environmental dimensions.

The study further contributes to the business model literature by demonstrating a solid framework for integrating AI-based sentiment analysis into the BMC, resulting in an AI-Enhanced BMC that is relevant and applicable to the tourism sector. It offers a practical, evidence-based tool for community-based tourism managers to identify strategic priorities, address operational weaknesses, and allocate resources more efficiently. The managerial implications encourage improvements in road access, the implementation of strict cleanliness procedures, service quality enhancement through staff training, and the effective use of digital feedback systems to strengthen visitor engagement. Future research is suggested to compare the effectiveness of the AI-Enhanced BMC across different destinations and to explore more advanced AI integrations that incorporate real-time operational variables for more accurate strategic planning.

LIMITATION

The review data used in this study were obtained from a single platform, Google Maps, and consisted solely of text-based comments. Future research may incorporate data from additional platforms such as TripAdvisor or Instagram and include visual content such as images or videos to provide a more comprehensive analysis. This study focuses exclusively on sentiment analysis and keyword frequency, without conducting in-depth qualitative interviews with managers or visitors that could have offered richer insights into the reasons behind certain sentiment patterns. The findings are also specific to Plaza Bukit Surga, meaning that applying this model to other destinations may require substantial modification to match different contextual conditions.

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DECLARATION OF CONFLICTING INTERESTS

The authors have declared no potential conflicts of interest concerning the study, authorship, and/or publication of this article.

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ABOUT THE AUTHOR(S)

1st Author
Rosy Aprieza Puspita Zandra is a lecturer at the Accounting Department at Malang State Polytechnic, and previously completed her Master's degree in Accounting at Universitas Pembangunan Veteran Surabaya, Indonesia.
Email: rosy.zandra@polinema.ac.id
ORCID ID: 0000-0002-5336-1198

2nd Author
Santi Widhiyant is a lecturer at the Accounting Department at Malang State Polytechnic, and previously completed her Master's degree in Accounting at Airlangga University Surabaya, Indonesia.
Email: santi.widhiyanti@polinema.ac.id