

# Booking and Reservation System: A Unified Application Using Location-Based Services for Sustainable Tourism Networks

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**Abstract:** *The LakByahe Application offers a ground-breaking solution to revolutionize tourism in Nasipit, Agusan del Norte, Philippines. It is a unified application aiming to address existing challenges by incorporating user-centric features. Through an advanced location-based services and streamlined booking processes, the application intends to enhance efficiency, accessibility, and sustainability in the tourism sector. By providing real-time tracking, efficient transit solutions, and a comprehensive directory of establishments, the LakByaheapp fills information gaps and fosters economic growth by connecting tourists with local businesses. The study adopts a mixed-method research approach, combining quantitative techniques with qualitative methods to comprehensively investigate and enhance the booking and reservation system. The software development life cycle for the application involves critical stages such as requirement analysis, design, implementation, testing, deployment, and maintenance. Suggestions and recommendations based on survey responses include incorporating augmented reality experiences, offering curated tour packages, creating community forums, and ensuring offline access to maps. The ongoing collaboration with local businesses and tourists, regular updates, user training sessions, and a well-crafted marketing strategy are recommended to amplify the app's impact. Overall, the LakByahe App presents a comprehensive solution to improve the province's tourism industry, fostering economic growth and sustainable development in the region.*

**Keywords:** Sustainable Tourism Network, Unified Application, Location-Based Services, Tourist Booking and reservation

## I. INTRODUCTION

The LakByaheapplication is a unified booking and reservation system that addresses tourism challenges in the Municipality of Nasipit in Agusan del Norte. It aims to provide a dedicated web-based platform as the current travel industry rely on social media for updates because there is a lack of organized source of information for local insights. Significantly, the application can fill information gaps by acting as a dedicated source. It enhances travel experiences with user-friendly features, real-time tracking, and efficient transit solutions, aligning with modern trends. Additionally, it fosters economic growth by connecting tourists with local businesses. The app aims to revolutionize travel and transportation booking, offering a seamless rental experience and overcoming tourist difficulties in these municipalities. The LakByahe App's development is justified by the identified need for a dedicated platform and the challenges faced by tourists. Key features include registration, search, booking, payment options, and real-time tracking. The comprehensive approach to economic development and connectivity makes it an impactful solution for the local and tourists.

## II. OBJECTIVES OF THE STUDY

The objectives of the study are as follows:

- To identify the challenges faced in the current booking and reservation system of tourism networks.

- To propose a unified online application that integrates the location-based services for sustainable tourism networks.
- To formulate recommendations for further improvement of the booking and reservation system among the tourism networks in the Local Government Unit of Nasipit, Agusan del Norte.

### **III. RELATED LITERATURE**

The tourism sector has become a dominant global sector, leading to the development of Smart Tourism [1]. This concept focuses on providing proper services to users at the right time and place [2]. Over the years, significant researches have been conducted in this field, identifying key concepts like smart phones, mobile applications, social media, recommendation systems, and big data [3].

The use of smart phones, mobile applications, and social media are becoming prevalent in the modern times. Several studies proved the usefulness of smart phones to provide tourism experiences in various countries such as Iran [4], Greece [5], and Pakistan [6]. The travellers' perceived behavioural control directly and positively influences their choice to travel. The study explores the potential of mobile location-based AR applications in tourism, specifically in Western Macedonia, Greece.

The mobile application guides tourists, entertains, and educates them about the region's sights and cultural heritage [5]. The application includes various types of AR (marker-based, markerless, and location-based). The study provides valuable feedback for future AR applications in tourism. Mobile applications can also support disabled tourists in their travel activities by providing tailored information and interaction mechanisms. This can enhance accessibility to tourism and travel. Preliminary recommendations include a collaborative system framework and ongoing prototype development [7]. The existence of social media has created another medium for sharing information and influencing traveller's decisions. The impact of social media on tourists' travel decisions, specifically analyzing four distinct roles: Need Generator, Supporter, Guider, and Approver, is far greater than expected. Some studies have collected implicit data from social media channels, using sensor data and applications, and applying semantic web technologies and multi-criteria decision-making theories for personalization. The research shows male respondents prefer mobile applications and social media for vacation planning [7].

A web-based application for travel and tour packages is a catalyst for promoting the tourism sector [8]. It enables visitors to obtain precise and pertinent information about the tourist destinations [9] particularly on arranging vacation home reservations [10] and making itineraries [11] that lower their stress [12]. It also empowers the travel agencies to simplify the creation of flexible tour packages, handling of bookings, and cost management on customer's desires [13]. The creation of this application involved Rapid Application Development [14] and Unified Modeling Language (UML) [15]. The steps involved are requirements analysis, interface design, system development utilizing the Laravel framework and PHP programming language, MySQL database integration, and testing [16]. There are also technical requirements, practical case studies, and conceptual framework which highlighting its applicability and promise [17].

The Travel Recommendation System is a user-centric web application that simplifies trip planning by incorporating user details like destination, companions, and dietary preferences. It curates personalized travel itineraries, including recommendations for accommodations, attractions, and restaurants [18]. The system uses Machine Learning for intelligent recommendations and continuous enhancement based on user feedback. It democratizes travel planning, empowering users with organized travel details and ensuring stress-free and enjoyable travel experiences [19]. Recommender systems (RSs) are valuable tools in smart tourism to provide personalized recommendations based on tourists' preferences and interests. These systems can be personalized, content-based, collaborative, knowledge-based, or hybrid. However, developing these systems is complex and time-consuming, requiring significant investment in human resources. A possible solution is to develop these systems through a software factory, which increases quality, productivity, efficiency, and maintainability while reducing time and effort. Assets include domain-specific languages, frameworks, patterns, tools, and utilities. An agent technology-driven hybrid recommendation system is crafted with an eye on online interaction with various segments within the tourism sector, including the tourism supply chain and agency entities [20].

#### IV. METHODOLOGY

##### 4.1 Research Approach and Design

This study adopts a mixed-method research approach to comprehensively investigate and enhance the booking and reservation system. The research approach combines quantitative techniques, involving the collection of numerical data through surveys and structured questionnaires to assess the current system's effectiveness, with qualitative methods focusing on gathering rich, descriptive insights into tourist' experiences and recommendations through in-depth interviews and focus group discussions.

##### 4.2 Survey Questionnaire

The research instruments of the study include a structured online questionnaire and semi-structured interview. The questionnaire serves as a structured tool for quantitative data collection, comprising closed-ended and Likert scale questions designed to quantify tourist views on various aspects of the system, such as user experience, efficiency, and reliability. It also includes tailored questions to assess challenges, preferences for improvements, and perceptions of the proposed application integrating location-based services for sustainable tourism networks in Nasipit. In addition, the semi-structured interviews enable qualitative data gathering, providing a platform for tourist to express their experiences, challenges, and recommendations regarding the system in more depth. This combination of quantitative and qualitative instruments ensures a comprehensive evaluation of the booking and reservation system for the LakByahe App.

##### 4.3 Participants of the Study

The participants of this study include a diverse group of tourists involved in the tourism sector of Nasipit, Agusan del Norte. The participants were comprised of local business owners, such as hotel and accommodation managers, who play a crucial role in the current booking and reservation systems. Additionally, tourists who have visited or are planning to visit Nasipit were also invited to provide insights into their experiences and challenges with the tourism industry. The representatives from the local government unit of Nasipit also offered perspectives on current tourism policies and infrastructure. By engaging these varied participants, the study was able to gather comprehensive data to evaluate the current systems and propose effective solutions through the LakByahe App.

##### 4.4 Sampling Method

A non-probability sampling approach was employed to select participants involved in the tourism sector of Nasipit, Agusan del Norte. Specifically, a purposive sampling method was utilized to ensure that participants were selected based on their relevance and contribution to the research objectives.

##### 4.5 Data Gathering Procedure

The data gathering procedure for this study began with the selection of participants from key tourists involved in the tourism sector of Nasipit, Agusan del Norte. These participants included local business owners, hotel and accommodation managers, tourists, and local government representatives. They were chosen based on their relevance, accessibility, and availability. The participants were provided with comprehensive information about the study's objectives, procedures, and their rights as research subjects, and informed consent was obtained. Surveys and structured questionnaires were administered to quantify their experiences and challenges with the current booking and reservation systems. These instruments were designed to gather quantitative data on various aspects such as user satisfaction, system efficiency, and areas needing improvement. The data collection process was conducted either in-person or remotely, ensuring confidentiality and anonymity.

##### 4.6 Data Analysis

The analysis of the gathered data employed both statistical methods and thematic analysis. Quantitative data from surveys and questionnaires were analysed using descriptive statistics to identify trends, patterns within the current booking and reservation systems. This statistical analysis helped to provide an objective measure of the data, highlighting key areas of success and those requiring improvement. The qualitative data from interviews was

transcribed and analyzed thematically. This process involved identifying recurring themes and significant insights regarding the challenges faced by tourists and potential solutions. The thematic analysis provided a deeper understanding of the qualitative aspects of the current systems, offering detailed insights into user experiences and operational challenges. Table 1.0 presents the guide to determine the assessment level of the different respondents involved in the booking and reservation.

**Table 1.0** The Interpretation of Range of the Weighted Mean

Range of the Weighted Mean	Interpretation
4.51 – 5.00	Strongly Agree (for the questions asked)
3.51 – 4.50	Agree (for the questions asked)
2.51 – 3.50	Moderately Agree (for the questions asked)
1.51 – 2.50	Disagree (for the questions asked)
1.50 and below	Strongly Disagree (for the questions asked)

## V. RESULTS AND DISCUSSION

This chapter presents the research findings, detailing the analysis and interpretation of the gathered data on tourism networks booking and reservation. It meticulously validates the results to uncover potential solutions to the challenges faced by the respondents in this area.

### 5.1 Demographics Profile of the Respondents

**Table 2.0** The Profile of the Respondents in terms of Roles in the Tourism Industry

Stakeholders/Roles	Frequency	Percentage %	Rank
Community Members	58	34	1
Tourist	50	29	2
Local Government Unit (LGU)	20	11	3
Travel Agencies	18	10	4
Tourism Service Providers	17	10	5
Environmental Organization	10	6	6
<b>TOTAL</b>	<b>173</b>	<b>100</b>	

Table 2 presents the profile of the respondents in terms of their roles in the tourism networks, specifically focusing on booking and reservation processes. The table lists the corresponding frequency and percentage of representation among the respondents. The Community Members are the most represented group, with 58 respondents, constituting 34% of the total, suggesting high engagement or multiple affiliations. Tourists follow with 50 respondents (29%), while Local Government Units (LGUs) rank third with 20 respondents (11%). Travel Agencies and Tourism Service Providers have 18 (10%) and 18 respondents (10%), respectively. The Environmental Organizations have the least representation, with 10 respondents, making up 6%. The total number of respondents is 173. This breakdown highlights the involvement and significance of each group in the tourism booking and reservation process, emphasizing the diverse perspectives and roles contributing to the industry's functionality.

**Table 3.0** Demographic Profile of the Respondents

Age	Frequency	Percentage %
Below 17	17	10
18-30	135	78
31-50	21	12
Total	173	100
Gender		
Male	103	60
Female	70	40
Total	173	100
Length of Experience in Tourism		

<b>Industry</b>		
less than 1 year	50	29
1-5 years	70	41
6-10 years	16	9
10 years above	37	21
Total	173	100%
<b>Income Level</b>		
Less than ₱20,000	125	73
₱21,000 - ₱60,000	35	20
₱61,000 - ₱100,000	9	5
More than ₱100,000	4	2
Total	173	100
<b>Cultural Background/Ethnicity</b>		
Visayan (Cebuano)	138	80
Tagalog	23	13
Foreigner	3	2
Lumad (Indigenous People)	9	5
Total	173	100

The table 3 provides the demographic profile of the research respondents showing various details about the tourism network involved. Most of them, about 78%, are between 18 and 30 years old. There are fewer, 10%, who are below 17 years old, and 12% are between 31 and 50 years old. More males, around 60%, took part compared to females, which made up about 40%. In terms of work experience in tourism, 41% have worked for 1 to 5 years, while 29% have less than a year of experience, 21% have over 10 years, and 9% have 6 to 10 years of experience. Financially, the majority, 73%, earn less than ₱20,000, with 20% earning between ₱21,000 to ₱60,000, 5% between ₱61,000 to ₱100,000, and only 2% earning more than ₱100,000. Culturally, most identify as Visayan (Cebuano), making up 80%, followed by Tagalog (13%), Lumad (Indigenous People) (5%), and Foreigners (2%). This breakdown helps understand who the study's participants are and how they may relate to the proposed LakByahe App for sustainable tourism networks.

**Table 4 :Profile of the Respondents in terms of Frequency use of Booking & Reservation Services**

<b>Frequent use of booking and reservation services</b>	<b>Frequency</b>	<b>Percentage</b>
Daily	51	30
Weekly	44	25
Monthly	41	24
Yearly	37	21
<b>Total</b>	<b>173</b>	<b>100%</b>

The table 4 above shows the frequency of use of booking and reservation services among different respondents. The respondents were asked about their frequency of utilizing booking and reservation services, and the table categorizes their responses into four groups: Daily, Weekly, Monthly, and Yearly. Among the total of 173 respondents, the majority indicated a frequent use of booking and reservation services, with 30% reporting daily usage, 25% using them weekly, 24% using them monthly, and 21% using them yearly. This data provides valuable insights into the usage patterns of booking and reservation services among the target population, which can inform the development of the LakByahe App and its integration of location-based services to cater to the needs of sustainable tourism networks. The high frequency of booking and reservation service usage indicates a strong demand for user-friendly booking systems. This suggests that Lakbyahé, a proposed unified booking app, can effectively meet this demand by offering a convenient platform for

tourism services. Furthermore, the frequent use of these services highlights a tech-savvy target audience, aligning perfectly with the app's intended user base of tourists likely to utilize mobile applications for sustainable tourism activities.

### 5.2 Assessment of the Current Booking and Reservation System of Tourism Networks

*Table 5.0 The Assessment of Tourism Network Booking and Reservation System*

No	Description	WM	Category Value	Description
<b>LIMITED AVAILABILITY:</b>				
1	I frequently find my preferred booking dates or options unavailable.	3.59	<b>3.63</b>	Agree
2	Limited availability significantly affects my booking decisions.	3.66		
<b>COMPLEX BOOKING PROCESSES:</b>				
3	The booking process is easy to understand and navigate.	3.86	<b>3.88</b>	Agree
4	The booking process could be simplified for a better experience.	3.90		
<b>LANGUAGE BARRIERS:</b>				
5	I often encounter language barriers during the booking process.	3.61	<b>3.72</b>	Agree
6	The booking process could be improved to better support my language preference.	3.83		
<b>UNCLEAR PRICING:</b>				
7	The pricing information during the booking process is clear and transparent.	3.83	<b>3.77</b>	Agree
8	The pricing information during the booking process is clear and transparent.	3.71		
<b>PAYMENT SECURITY:</b>				
9	I feel confident about the security of my payments during booking.	3.80	<b>3.84</b>	Agree
10	Additional measures should be taken to increase my confidence in payment security.	3.88		
<b>LACK OF FLEXIBILITY:</b>				
11.	I find the booking policies to be flexible.	3.85	<b>3.89</b>	Agree
12.	The booking experience would be improved with more flexible options.	3.93		
<b>LIMITED OPTIONS:</b>				
13.	I am satisfied with the range of options available for booking.	3.90	<b>3.92</b>	Agree
14.	I would like to see more options available for booking.	3.94		
<b>TECHNICAL ISSUES:</b>				
15.	I experience technical issues during the booking process.	3.61	<b>3.75</b>	Agree
16.	Improving technical aspects would enhance my booking experience.	3.90		
<b>CANCELLATION POLICIES:</b>				
17.	The cancellation policies are fair and reasonable.	3.78	<b>3.71</b>	Agree
18.	I have encountered difficulties when trying to cancel a reservation.	3.63		
<b>POOR CUSTOMER SERVICE:</b>				

No	Description	WM	Category Value	Description
19.	I receive prompt and helpful assistance when contacting customer service.	3.80	3.83	Agree
20.	My reservation experience would improve with better customer service.	3.86		
<b>Overall Weighted Mean</b>			<b>3.79</b>	<b>Agree</b>

Table 5 shows the assessment of the booking and reservation system within the context of evaluating tourism networks. The table categorizes various aspects of the booking and reservation process, including booking, limited availability, complex booking processes, language barriers, unclear pricing, payment security, lack of flexibility, limited options, and technical issues. Similarly, reservation aspects such as cancellation policies and customer service are evaluated. The weighted mean scores indicate the level of agreement or disagreement with each statement, with a higher score indicating stronger agreement. Overall, the assessment suggests general agreement with the efficiency and effectiveness of the booking and reservation system, with room for improvement in areas such as simplifying the booking process, enhancing language support, and providing more flexible options.

### 5.3 The Proposed Unified Online Application that Integrates the Location-Based Services for Sustainable Tourism Networks of the Municipality of Nasipit

#### 5.3.1 Functions and Features of the Lakbyahe Application

**Table 6.0** Functions and Features of the Lakbyahe App: A Unified Online Application that Integrates the Location-Based Services for Sustainable Tourism Networks in the Municipality of Nasipit

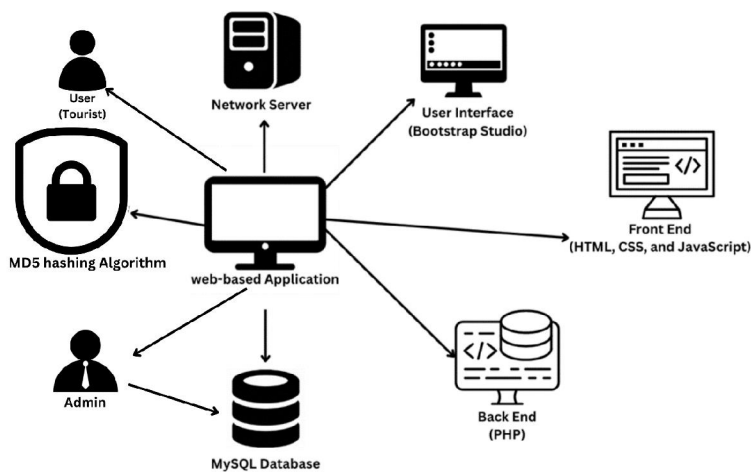
Functions and Features	Frequency	Percentage	Rank
Location-Based Recommendations	99	57.2%	1
Sustainable Transportation Options	75	43.4%	2
Local Community Engagement	73	42.2%	3
Environmental and Cultural Education	66	38.2%	4
Interactive Maps and Navigation	65	37.6%	5
Sustainable Booking and Reservation	65	37.6%	5
Alerts and Notifications	65	37.6%	5
Community Feedback and Interaction	64	37%	6
User Reviews and Ratings	63	36.4%	7
Rewards and Incentives	47	27.2%	8
Carbon Footprint Calculator	32	18.5%	9

Table 7 outlines the essential functions and features of the proposed Lakbyahé app, emphasizing its focus on integrating location-based services for sustainable tourism networks in the Municipality of Nasipit. The most demanded feature, location-based recommendations, is preferred by 57.2% of respondents, highlighting the importance of personalized and relevant suggestions for tourists. Sustainable transportation options, with a 43.4% preference, reflect the community's desire for eco-friendly travel solutions. Local community engagement and environmental and cultural education are also significant, with 42.2% and 38.2% respectively, indicating a strong interest in immersive and educational tourism experiences. Interactive maps and navigation, sustainable booking and reservation, and alerts and notifications all share a 37.6% preference, underscoring the necessity for practical and user-friendly tools within the app. Community feedback and interaction, along with user reviews and ratings, ranked at 37% and 36.4%, respectively, demonstrate the value placed on user-generated content and peer recommendations, enhancing trust and informed decision-making. Rewards and incentives, preferred by 27.2%, suggest that while important, they are less critical compared to the other features. Finally, the carbon footprint calculator, with an 18.5% preference, shows a niche yet notable interest in tracking and reducing environmental impact.

This statistical analysis reveals that the Lakbyahé app should prioritize features like location-based services, sustainable transportation, and community engagement to meet user expectations and support sustainable tourism in Nasipit. The varied preferences also highlight the need for a comprehensive and multifaceted app that caters to different aspects of the tourism experience, promoting both convenience and sustainability. By integrating these features, the Lakbyahé app can become a comprehensive platform that not only promotes sustainable tourism but also empowers travelers to make informed decisions and contribute positively to the destinations they visit.

### 5.3.2 The System Architecture of the Proposed System

The system architecture of the proposed system is shown in Figure 1.0. It portrays the overall view and relationships among the components of the system. The LakByahe App is used by various tourist of the Tourism Networks in the Municipality of Nasipit.



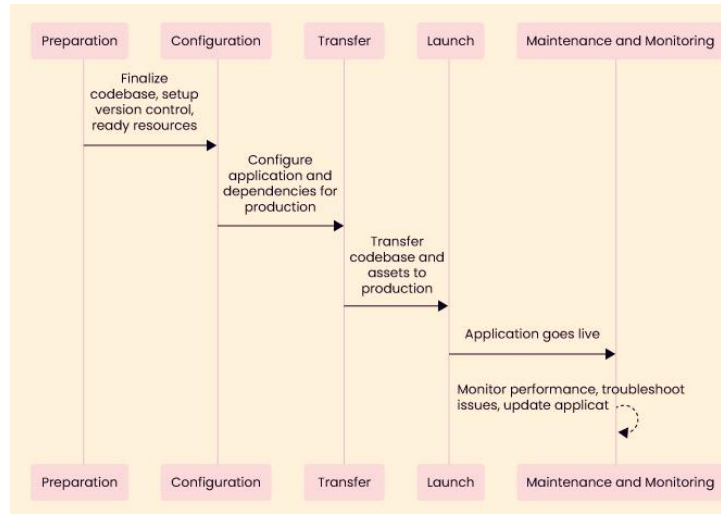
**Figure 2. System Architecture of the Proposed LakByahe App: A Unified Location-Based Service Platform for Tourism Network Booking & Reservation**

System architecture refers to the high-level design of a complex system, detailing how its components and modules are organized and interact to achieve the overall objectives of the system. It serves as a blueprint that guides the construction and evolution of the system.

### 5.3.3 The System Development Process of the Proposed System

The Software Development Process for the tourist booking app consists of several stages critical for addressing complex booking and reservation challenges. The preparation phase identifies traveler issues such as availability, pricing, and security concerns. The configuration focuses on creating a user-centric interface that emphasizes intuitive navigation, seamless transactions, and cultural adaptability. It also involves coding the app using technologies like PHP, HTML, CSS, JavaScript, and Python to ensure compatibility and responsiveness. The transfer phase identifies and resolves potential issues such as security vulnerabilities and UI/UX inconsistencies. Launching follows a strategic plan for a smooth rollout, providing user support and feedback channels. Maintenance and monitoring include regular updates based on user feedback, new technologies, and changing industry standards, enhancing the booking experience over time. This structured approach ensures an efficient, reliable, and user-friendly app that supports tourism industry growth.





**Figure 3: System Development Process of the Proposed System**

#### 5.4 Suggestions and Recommendations for Further Improvement of the Booking and Reservation System among the Tourism Networks in the Local Government Unit of Nasipit, Agusan del Norte

Based on the survey responses, several key recommendations can enhance the booking and reservation system among the tourism networks in Nasipit. First, incorporating augmented reality experiences can engage users with interactive and immersive content, while a robust user reviews and ratings feature will help tourists make informed decisions based on peer feedback. Offering curated tour packages that highlight local attractions and products will boost tourism and support local businesses. Creating community forums for travelers to share tips, experiences, and recommendations can foster a sense of community and enhance the overall user experience. Additionally, ensuring offline access to maps and other essential features will assist tourists in areas with limited internet connectivity. Providing real-time updates on weather, traffic, and local events will help tourists plan their trips more effectively. Including educational resources and guides about local culture, heritage, and sustainable practices can enrich the tourist experience and promote responsible travel.

Utilizing GPS for location-based services and feedback can enhance navigation and provide valuable data for sustainable tourism management. Offering translations and multi-language support will make the app more accessible to international tourists. Integrating sustainability metrics that promote green transportation, eco-friendly accommodations, and responsible tourism practices aligns with the goals of sustainable tourism. Including emergency assistance features can ensure tourist safety and provide peace of mind. Furthermore, offering flexible booking policies, including discounts for specific groups like seniors and students, can attract a broader range of tourists. Using data analytics and AI to provide personalized recommendations can enhance the user experience by aligning with individual preferences and interests. By incorporating these features, the Lakbyahé app can become a comprehensive platform that not only meets the needs of tourists but also supports sustainable tourism practices in Nasipit. Implementing these suggestions will help create a user-friendly, informative, and engaging system that promotes local tourism and contributes positively to the community.

### VI. CONCLUSIONS AND RECOMMENDATIONS

In summary, the researchers have successfully identified the gaps in localized tourism solutions, crafting a platform tailored to the specific needs of tourists in Nasipit. The proposed LakByahe App represents a pioneering effort to transform the tourism landscape in Nasipit through innovative technology. By addressing the current system's shortcomings and incorporating user-centric features, the app aims to improve efficiency, enhance accessibility to tourist information, and foster sustainable tourism networks. It tackles significant challenges related to user experience,

efficiency, and reliability by integrating advanced location-based services, streamlining the booking process, and ensuring robust data security.

The app's focus on sustainability promotes equitable tourism practices and supports under-resourced areas. Additionally, the LakByahe App provides tools like an interactive dashboard, a comprehensive directory of establishments, and the capability to generate monthly statistical reports, enabling stakeholders to monitor and enhance the tourism network continuously. The incorporation of features such as statistical reporting and a comprehensive directory of establishments adds layers of functionality, contributing to an enhanced tourism experience. Overall, this comprehensive approach will not only improve the booking and reservation system but also sets a robust framework for future advancements in Nasipit's tourism sector, ensuring a seamless and sustainable tourist experience.

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