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Analysis and Design of Marine Tourism Information System Using Rapid Application Development

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Abstract

The research addresses the growing need for efficient management of marine tourism activities in Indonesia, explicitly diving, snorkeling, and fishing. With the rapid expansion of marine tourism, there is a pressing need for innovative solutions to streamline information dissemination and enhance tourist experiences. This study proposes the development of a database and information system utilizing the Rapid Application Development (RAD) methodology to cater to the diverse needs of tourists engaging in marine activities. The Rapid Application Development approach comprises requirement planning, user design, construction, and cutover phases. Oracle Apex serves as the primary instrument for database design and system development. The findings suggest that implementing digital innovation in the form of information systems and databases significantly enhances the tourist experience in marine tourism destinations. Integrating GIS technology enables the visualization of location maps and valuable information, enriching the user experience and facilitating informed decision-making processes. Test results indicate that the application functions optimally and can be utilized effectively for destination management in Indonesia, emphasizing the practical implications of digital innovation in the tourism sector. In conclusion, designing and implementing a database and information system for marine tourism activities offer substantial benefits for destination management and tourist experiences in Indonesia. This research underscores the importance of technological advancements in optimizing destination management and fostering sustainable tourism development in coastal regions.

Keywords: Tourism; RAD; Marine; Special Interest; GIS

1. INTRODUCTION

Monitoring marine tourism activities is imperative in light of their ecological consequences. As marine tourism continues to burgeon worldwide, it brings forth a myriad of ecological impacts that necessitate vigilant oversight. Expanding recreational activities such as snorkeling, diving, and boating can exert substantial pressure on marine ecosystems, leading to habitat degradation, disturbance of wildlife, and alteration of fragile ecosystems. Consequently, the need for

comprehensive monitoring mechanisms to assess the ecological footprint of such activities becomes increasingly apparent. This monitoring should encompass regular assessments of key indicators such as biodiversity levels, water quality, and habitat integrity to gauge the overall health of marine environments. Through diligent monitoring efforts, stakeholders can better comprehend the ecological ramifications of marine tourism and devise informed strategies to mitigate negative impacts, thus fostering sustainable practices for the benefit of both ecosystems and future generations.

To monitor marine tourism activities, this research proposes designing a database and information system for marine tourism. The escalating prominence of marine tourism necessitates effective mechanisms for monitoring and managing associated activities. By developing a comprehensive database and information system tailored to the needs of marine tourism, stakeholders can enhance their capacity to monitor, assess, and regulate tourism activities in marine environments. This initiative reflects a proactive approach to ensuring sustainability and responsible management of marine tourism destinations. Thus, the proposed database and information system represent a significant step towards fostering informed decision-making processes and promoting sustainable practices within the marine tourism sector.

The allure of maritime tourist destinations lies prominently in the engaging activities of fishing and snorkeling. These recreational pursuits contribute to the overall appeal of such destinations and enhance the experiential quality for visitors seeking aquatic adventures [1]. The vibrant marine ecosystems, teeming with diverse aquatic life, provide an immersive backdrop for enthusiasts to engage in these activities [2]. Additionally, the opportunity to explore coral reefs and underwater topography during snorkeling excursions further underscores the multifaceted charm of maritime tourism [3]. The blend of captivating underwater landscapes and the thrill of engaging in water-related activities renders these destinations highly attractive to individuals with a penchant for marine exploration [4]. In conclusion, the combined appeal of fishing and snorkeling positions maritime tourist destinations as sought-after havens for those seeking a holistic and enriching experience amidst the wonders of the sea.

Fishing activity emerges as a compelling attraction within marine tourism, where tourists can relish the underwater beauty at island destinations [5]. The primary allure is in the engagement with this traditional pursuit, allowing visitors to experience the serenity of marine environments while actively participating in an age-old practice [6]. Moreover, fishing provides a unique opportunity for tourists to connect with the local culture and ecosystem, fostering a sense of appreciation for the maritime heritage of the destination [7]. In conclusion, the integration of fishing activities not only enhances the overall appeal of marine tourism but also

enables tourists to establish a meaningful connection with the natural and cultural aspects of island destinations.

Marine tourism, encompassing activities such as fishing, constitutes a multifaceted domain that intertwines recreational pursuits with environmental engagement [8]. The core of marine tourism lies in exploring and appreciating coastal and aquatic ecosystems, with fishing emerging as a prominent attraction [9]. This activity provides tourists with a unique experiential dimension and fosters a connection to the natural environment [10]. As an integral component of marine tourism, fishing enables individuals to interact with coastal communities, contributing to the sustainability of local economies [11]. In light of the increasing demand for experiential tourism, the fusion of marine tourism and fishing activities serves as a testament to the evolving preferences of modern travelers seeking immersive encounters with coastal environments [12]. In conclusion, the symbiotic relationship between marine tourism and fishing not only broadens the appeal of coastal destinations but also underscores the significance of sustainable practices to ensure the longevity of this dynamic relationship.

The research gap in previous studies indicates limitations in examining community participation in managing marine tourism, with a concurrent constraint in developing supportive technologies [13]. The primary focus has been on community involvement, revealing a deficiency in comprehensive investigations into the multifaceted dynamics that characterize the intricate relationship between communities and the management of marine tourism activities [14]. While acknowledging the importance of community engagement, scant attention has been directed toward integrating technological advancements to enhance the efficiency and sustainability of marine tourism management practices [15]. This research lacuna suggests an unexplored avenue for scholarly inquiry into the potential synergies between community participation and technological innovation in marine tourism management [16]. In light of the evolving landscape of tourism practices, future research endeavors should strive to bridge this gap by adopting a more holistic approach that incorporates both the sociocultural aspects of community involvement and the untapped potential of technological solutions in marine tourism management.

The limitation of this research emphasizes the endeavor to design a database for marine tourism. While creating such a database is integral to enhancing the accessibility and organization of information for tourists seeking marine recreational activities, challenges persist in its implementation [17]. The primary constraint lies in marine environments' dynamic and ever-changing nature, necessitating continuous database updates and maintenance to ensure accuracy and relevance [18]. Furthermore, the effectiveness of the database may be impeded by factors such as limited resources, technological infrastructure, and stakeholder collaboration [19]. Despite these limitations, developing a comprehensive database

remains valuable in optimizing the tourist experience and promoting sustainable practices in the island tourism [20]. Efforts should thus be directed toward overcoming these challenges through strategic planning, stakeholder engagement, and technological innovation to realize the full potential of such initiatives [21].

The practical implications of this research aid island tourism destination managers in documenting captivating fishing and snorkeling sites for tourists. By systematically documenting these sites, destination managers can enhance the visitor experience by providing comprehensive and accurate information regarding marine recreational activities [22]. Such documentation facilitates informed decision-making for tourists, enabling them to optimize their itinerary and explore the destination's diverse offerings [23]. Additionally, it contributes to marine ecosystem conservation and sustainable management by directing tourist activities towards designated areas, thereby minimizing ecological impact [24]. Ultimately, the practical implications underscore the significance of strategic planning and resource management in fostering responsible tourism practices within island destinations.

2. METHODS

The method employed in designing the system is RAD (Rapid Application Development). The RAD methodology is chosen for its iterative and incremental approach, which allows for rapid prototyping and quick feedback loops, ensuring that the system development aligns closely with user requirements. This methodology emphasizes collaboration between developers and end-users, fostering greater user involvement throughout the development process. The utilization of RAD methodology signifies a pragmatic approach toward system design, enabling the timely delivery of a functional solution while accommodating evolving user needs and technological advancements. Consequently, adopting the RAD methodology enhances the efficiency and effectiveness of the system development process, ultimately leading to the successful implementation of the designed system.

The flexibility of RAD facilitates the process of identifying user requirements and designing interfaces more effectively. RAD methodology, characterized by its iterative and collaborative nature, enables developers to engage closely with end-users to gather feedback and refine system specifications iteratively. This iterative approach allows for the rapid exploration and validation of user needs, leading to a more accurate understanding of requirements and a clearer vision for interface design. As a result, RAD empowers developers to tailor interfaces to meet users' specific needs and preferences, ultimately enhancing user satisfaction and system usability. This approach allows for the rapid prototyping and iterative development of the database and information system, enabling efficient adaptation to evolving requirements and stakeholder feedback [19]. By leveraging RAD

methodology, developers can streamline the development process, reducing time-to-market and enhancing agility in responding to changing user needs [18]. Moreover, RAD facilitates collaboration between developers and end-users, fostering a participatory design process that ensures the system meets the specific needs and preferences of destination managers and tourists [25]. In conclusion, the flexibility afforded by RAD methodology significantly contributes to user requirement identification and interface design, ensuring the successful development of user-centric systems.

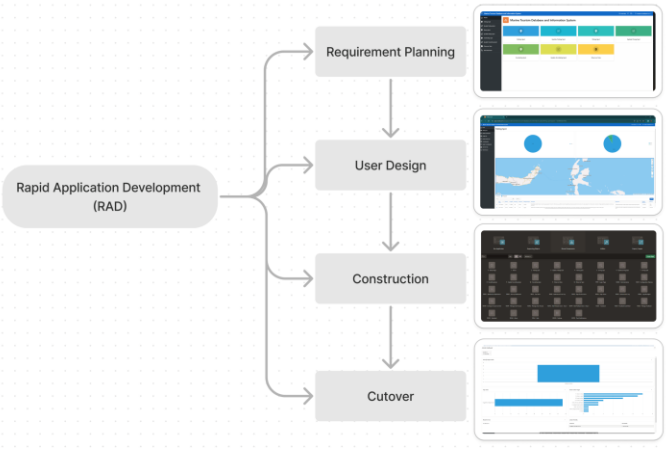

Figure 1. Rapid Application Development (RAD)

RAD comprises stages of requirement planning, user design, construction, and cutover. Initially, requirement planning involves identifying and defining project objectives, stakeholders, and functional specifications to guide system development. Subsequently, the user design phase focuses on creating user interfaces and workflows based on user feedback and usability considerations, ensuring alignment with user needs and preferences. Following this, the construction stage involves the actual development and implementation of the system, leveraging iterative prototyping and feedback loops to refine functionalities and address emerging requirements. Finally, the cutover phase marks the transition from development to operational deployment, encompassing testing, training, and system rollout to ensure a smooth transition to production. The structured progression through these RAD stages facilitates the rapid and iterative development of high-quality systems closely aligned with user requirements and organizational goals.

2.1. Requirement Planning

During the requirement planning stage, user needs are identified to ensure that the snorkeling, diving, and fishing site database aligns with requirements. This phase

involves comprehensive stakeholder engagement and needs assessment to ascertain the functionalities, data structures, and user interface features necessary for the database system. By meticulously capturing user requirements, including preferences for site categorization, accessibility, and information presentation, developers can tailor the database to cater to the diverse needs and preferences of destination managers and tourists. This meticulous attention to user needs at the requirement planning stage lays the foundation for successfully developing and implementing a database system that effectively supports marine tourism management and enhances visitor experiences.

Table 1. Data Requirement

Snorkeling	This database aims to record information regarding locations suitable for snorkeling activities. It encompasses details such as the site's name, geographical coordinates, depth, water temperature, visibility, marine life commonly encountered, brief descriptions of the location, applicable regulations, and other pertinent information. This database assists snorkelers in exploring and experiencing intriguing underwater sites [5].
Diving	The purpose of this database is to maintain information about locations ideal for diving activities. It includes details such as the site's name, geographical coordinates, depth, water type, current intensity, marine life typically encountered, recommended diving techniques, brief descriptions of the location, applicable regulations, and other relevant information. This database aids divers in discovering and planning safe and captivating diving experiences [26].
Fishing	The objective of this database is to store information on locations suitable for fishing activities. It encompasses details such as the location's name, geographical coordinates, water type (saltwater, freshwater, etc.), fish species commonly found, fishing techniques, brief descriptions of the location, applicable regulations, and other pertinent information. This database facilitates anglers in planning and identifying suitable fishing locations according to their preferences and requirements [2].
Observer	The objective of this database is to manage information about individuals or entities engaged in observing or monitoring tourist locations such as fishing sites, diving sites, and snorkeling sites. It includes details such as observer names, email addresses, phone numbers, roles or positions, affiliations, and records of observations conducted. This database aids in tracking and coordinating observations, facilitating the management of information concerning contributions from various stakeholders in the monitoring and managing tourist locations [27].

Requirement planning indicates that all four datasets are necessary to display information related to marine tourism for snorkeling, diving, and fishing activities. Including fishing site data allows anglers to locate suitable areas for their pursuits while diving site data aids divers in selecting appropriate sites for their underwater explorations [28]. Additionally, snorkeling site data enables enthusiasts to identify captivating locations for snorkeling adventures [29]. The observer dataset serves a crucial role in monitoring and managing these marine tourism activities, ensuring compliance with regulations, and facilitating the sustainability of marine ecosystems [30]. In conclusion, the comprehensive integration of these datasets is essential for providing a holistic and informative platform for individuals engaging in marine tourism activities.

2.2. User Design

During the user design phase, the dashboard interface aligns with the use case diagram that connects users with activities such as managing fishing site data, diving site data, snorkeling site data, and observer data. This design approach ensures the dashboard layout is intuitive and user-friendly, allowing users to easily access and navigate the functionalities relevant to their roles and tasks. By incorporating use case scenarios into the dashboard design, the application enhances usability and efficiency, enabling users to interact seamlessly with the system and perform their tasks effectively. In conclusion, integrating use case diagrams with the dashboard design underscores the commitment to user-centered design principles, fostering a positive user experience and optimizing system usability.

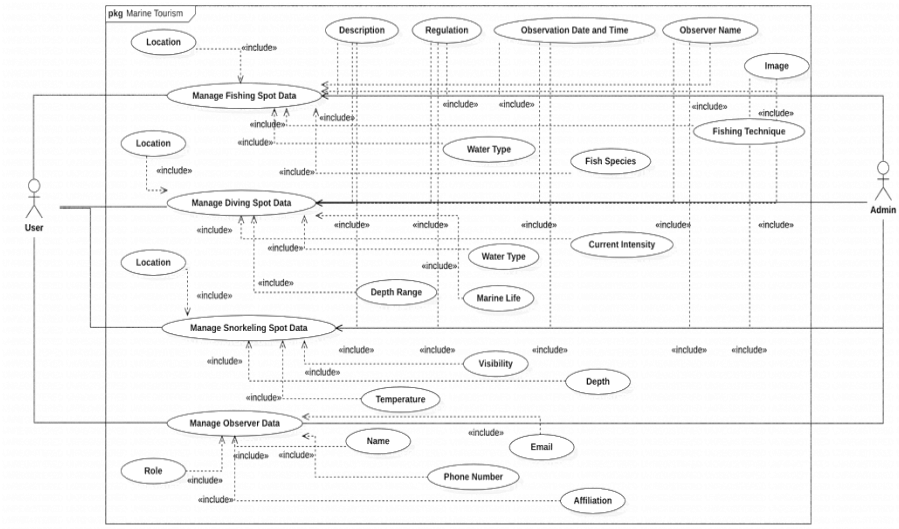

Figure 2. Use Case of Marine Tourism Information

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During the user design phase, developing a dashboard and data entry forms utilizing the Oracle APEX framework emerges as a pivotal endeavor. This stage entails the creation of user interfaces that facilitate seamless interaction with the underlying database systems, ensuring intuitive navigation and efficient data input processes. Leveraging Oracle APEX offers a robust platform for designing dynamic and responsive dashboards, providing users with comprehensive visualizations of pertinent information. Additionally, the utilization of forms within Oracle APEX streamlines data entry tasks, enhancing user productivity and accuracy in capturing essential data elements. In conclusion, integrating Oracle APEX in user design signifies a strategic approach to crafting user-friendly interfaces that optimize usability and functionality within database-driven applications.

2.3. Construction

During the construction phase, the design of the Oracle APEX database takes precedence, marking a critical step in the development process. This stage involves meticulously configuring database structures within the Oracle environment to support the envisioned application functionalities. The construction phase also entails defining data relationships, establishing data integrity constraints, and implementing security measures to safeguard sensitive information. Furthermore, this phase fosters seamless database integration with the Oracle APEX application framework, ensuring cohesive functionality and optimal performance. In conclusion, the construction phase is the foundation for Oracle APEX applications' robust and efficient operation, emphasizing the significance of meticulous database design in the development lifecycle.

Table 1. Database Design for Marine Tourism Destination

Diving Site Database	**Snorkeling Site Database**
CREATE TABLE DivingSites (SiteID INT PRIMARY KEY AUTO_INCREMENT, SiteName VARCHAR(100) NOT NULL, Location VARCHAR(255) NOT NULL, DepthRange VARCHAR(50), WaterType ENUM('Saltwater', 'Freshwater', 'Brackish'), CurrentIntensity ENUM('Low', 'Moderate', 'High'), MarineLife TEXT, Description TEXT, Regulations TEXT, Image BLOB, ObservationDate DATE, Observer VARCHAR(100));	CREATE TABLE SnorkelingSites (SiteID INT PRIMARY KEY AUTO_INCREMENT, SiteName VARCHAR(100) NOT NULL, Latitude DECIMAL(10, 8) NOT NULL, Longitude DECIMAL(11, 8) NOT NULL, Depth DECIMAL(5, 2), Temperature DECIMAL(5, 2), Visibility DECIMAL(5, 2), Description TEXT, Regulations TEXT, Image BLOB, ObservationDate DATE, Observer VARCHAR(100));
Fishing Site Database	**Observer Database**
CREATE TABLE FishingSites (SiteID INT PRIMARY KEY AUTO_INCREMENT, SiteName VARCHAR(100) NOT NULL, Location VARCHAR(255) NOT NULL, WaterType ENUM('Saltwater', 'Freshwater', 'Brackish'),	CREATE TABLE Observers (ObserverID INT PRIMARY KEY AUTO_INCREMENT, ObserverName VARCHAR(100) NOT NULL, ObserverEmail VARCHAR(255) NOT NULL, ObserverPhone VARCHAR(20),

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```
    FishSpecies TEXT,
    FishingTechniques TEXT,
    Description TEXT,
    Regulations TEXT,
    Image BLOB
    ObservationDate DATE,
    Observer VARCHAR(100) );
```

```
    ObserverRole ENUM('Manager', 'Researcher',
'Tourist', 'Local'),
    ObserverAffiliation VARCHAR(255)
);
```

In this stage, the database is tailored to align with the outcomes of the interface design, marking a crucial aspect of the development process. This phase involves refining the database schema and optimizing data structures to seamlessly integrate with the designed user interfaces, ensuring coherence and functionality across the system. By harmonizing the database with the interface design, developers can enhance data accessibility, streamline user interactions, and optimize overall system performance. Consequently, this alignment fosters a cohesive user experience and facilitates efficient data management within the application. In conclusion, the synchronization between the database and interface design underscores the meticulous attention to detail and the commitment to delivering a user-centric and effective solution.

2.4. Cutover

During the cutover phase, an evaluation process concerning access rights and application traffic usage on Oracle APEX is conducted, marking a pivotal aspect of the deployment process. This phase entails assessing the allocation of user permissions and roles within the application, ensuring that appropriate access controls are in place to safeguard sensitive data and functionalities. Additionally, the evaluation includes monitoring and analyzing application traffic patterns to identify potential bottlenecks or performance issues, enabling proactive measures to optimize system performance. By meticulously evaluating access rights and application traffic during the cutover phase, organizations can mitigate security risks, enhance user experience, and ensure the smooth transition of the application into production. In conclusion, the comprehensive assessment of access rights and traffic usage underscores the commitment to delivering a secure, efficient, and user-friendly Oracle APEX application.

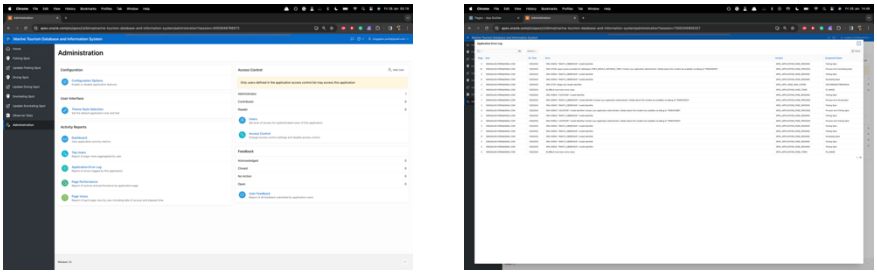

Figure 3. Administration Page for Access Control

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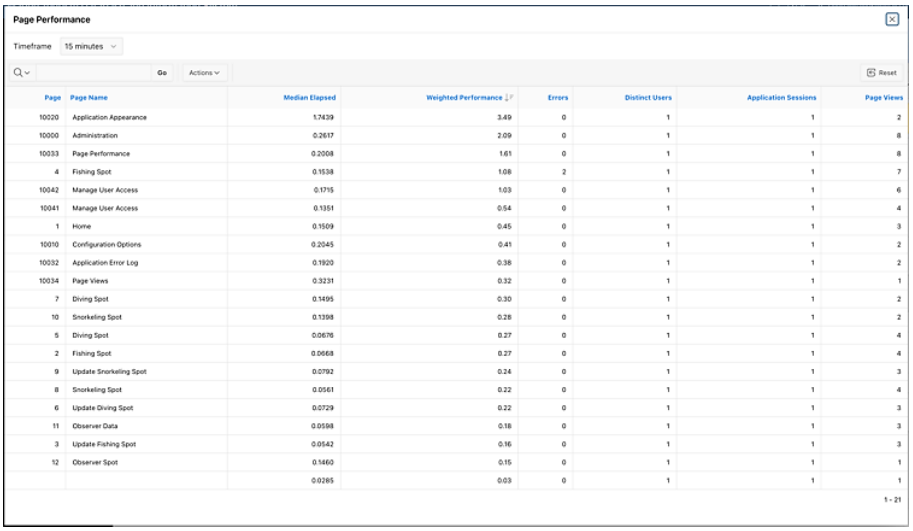
The outcomes of the cutover phase indicate that the application operates effectively, with each feature functioning as intended, underscoring a successful transition into operational use. This phase's evaluation confirms that the application meets performance expectations, demonstrating responsiveness and reliability across various functionalities. Furthermore, the comprehensive testing and validation conducted during cutover validate the application's readiness for production deployment, instilling confidence in its usability and functionality. Overall, the positive results of the cutover phase affirm the application's capability to meet user requirements and operational demands, marking a significant milestone in its lifecycle.



Page Performance

Timeframe 15 minutes

Go Actions Reset

Page	Page Name	Median Elapsed	Weighted Performance	Errors	Distinct Users	Application Sessions	Page Views
10020	Application Appearance	1.7439	3.49	0	1	1	2
10000	Administration	0.2617	2.09	0	1	1	8
10033	Page Performance	0.2008	1.61	0	1	1	8
4	Fishing Spot	0.1538	1.08	2	1	1	7
10042	Manage User Access	0.1715	1.03	0	1	1	6
10041	Manage User Access	0.1351	0.54	0	1	1	4
1	Home	0.1509	0.45	0	1	1	3
10010	Configuration Options	0.2045	0.41	0	1	1	2
10032	Application Error Log	0.1920	0.38	0	1	1	2
10034	Page Views	0.3231	0.32	0	1	1	1
7	Diving Spot	0.1495	0.30	0	1	1	2
10	Snorkeling Spot	0.1398	0.28	0	1	1	2
5	Diving Spot	0.0676	0.27	0	1	1	4
2	Fishing Spot	0.0668	0.27	0	1	1	4
9	Update Snorkeling Spot	0.0792	0.24	0	1	1	3
8	Snorkeling Spot	0.0561	0.22	0	1	1	4
6	Update Diving Spot	0.0729	0.22	0	1	1	3
11	Observer Data	0.0598	0.18	0	1	1	3
3	Update Fishing Spot	0.0542	0.16	0	1	1	3
12	Observer Spot	0.1460	0.15	0	1	1	1
		0.0265	0.03	0	1	1	1

1 - 21

Figure 4. Error Log of the Application

All features functioned adequately based on the testing results; however, an error was detected in the fishing spot data update, which has since been rectified. This finding underscores the importance of rigorous testing protocols in software development to identify and address potential issues before deployment. Despite the minor setback encountered with the fishing spot data update, the successful resolution of the error highlights the responsiveness and efficiency of the development team. In conclusion, the testing process serves as a critical quality assurance mechanism, ensuring the reliability and functionality of the system for end-users.

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3. RESULTS AND DISCUSSION

3.1 Marine Tourism

Marine tourism, characterized by activities such as diving, snorkeling, and fishing, exerts a multifaceted impact on the environment. The primary consequence lies in the potential degradation of marine ecosystems due to increased human interaction and exploitation of marine resources [31]. The escalating popularity of marine tourism destinations poses a challenge in maintaining the delicate balance of these ecosystems [32]. Furthermore, the potential for physical damage to coral reefs and disruption of marine life through anchor drops and the accumulation of waste further exacerbates environmental concerns [33]. While marine tourism can contribute significantly to local economies, the associated environmental impact necessitates a balanced approach that integrates conservation efforts and sustainable tourism practices [34]. In conclusion, acknowledging and mitigating the environmental repercussions of marine tourism are imperative to ensure the long-term health and sustainability of coastal ecosystems and the communities dependent on them.

Monitoring emerges as a strategic imperative in mitigating ecological damage arising from marine tourism activities. The burgeoning expansion of marine tourism necessitates vigilant oversight to comprehend and address the ecological consequences associated with this industry [35]. Implementing comprehensive monitoring mechanisms allows for the continual assessment of critical indicators, including biodiversity levels, water quality, and habitat integrity. Such proactive monitoring not only facilitates a real-time understanding of the impact of marine tourism but also enables the formulation of targeted conservation strategies [36]. Integrating robust monitoring systems is paramount to fostering sustainable practices and preserving the ecological integrity of marine environments [37]. In conclusion, a strategic and systematic monitoring approach represents an indispensable tool in minimizing the ecological footprint of marine tourism, ensuring the long-term viability of coastal ecosystems, and sustaining the benefits of marine tourism activities.

One practical approach to monitoring marine tourism activities involves engaging diverse stakeholders as both contributors and readers of data. In light of the complex and interconnected nature of marine ecosystems, collaboration among various stakeholders, including government agencies, local communities, scientific researchers, and tourism operators, is essential to gather comprehensive and reliable data [38]. By involving stakeholders as contributors, valuable local knowledge and expertise can be integrated into monitoring efforts, enhancing the relevance and accuracy of collected data. Additionally, engaging stakeholders as readers of data fosters transparency and accountability, allowing for greater scrutiny and interpretation of monitoring results. This collaborative approach

enhances the effectiveness of monitoring efforts and promotes a sense of ownership and responsibility among stakeholders toward the sustainable management of marine tourism destinations [39]. In conclusion, involving diverse stakeholders as contributors and readers of data represents a holistic and participatory approach to monitoring marine tourism activities, ultimately leading to more informed decision-making and improved conservation outcomes.

Through an integrated database system, policymakers can establish regulations and programs tailored to the specific conditions of marine tourism in each region. The centralization of relevant data within a comprehensive database enables policymakers to access a wealth of information concerning the ecological, economic, and social aspects of marine tourism. It facilitates evidence-based decision-making in formulating regulations and initiatives addressing unique challenges and opportunities for individual regions [40]. Integrating a database system provides a structured platform for policymakers to analyze trends, assess the impact of existing regulations, and devise targeted interventions for sustainable marine tourism management. In conclusion, an integrated database system serves as a vital tool for policymakers, empowering them to craft nuanced and context-specific measures that contribute to the responsible and sustainable development of marine tourism in diverse localities.

3.2 Marine Tourism Application Design

The application showcases integrated features with GIS, enabling users to visualize coordinate points of fishing sites and tailor them to anglers' interests, exemplifying robust functionality. This integration enhances user experience by providing geospatial context to fishing locations, allowing users to explore and analyze fishing sites efficiently. Moreover, the application's adaptability to cater to anglers' preferences signifies a user-centric approach, fostering engagement and satisfaction among users. In conclusion, incorporating GIS functionality enriches the application's capabilities, offering users valuable insights and personalized experiences navigating fishing sites. Furthermore, snorkeling and diving sites are integrated with GIS to provide coordinate points and other supporting information, exemplifying an enhanced functionality. This integration expands the application's scope by offering users geospatial data on snorkeling and diving locations, facilitating informed decision-making and exploration. Additionally, the integration with GIS demonstrates a commitment to leveraging advanced technologies to enhance user experience and provide comprehensive information.

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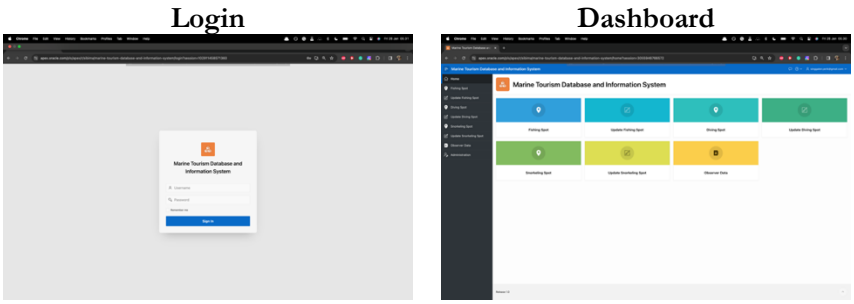

Figure 5. Login and Dashboard Page of Application

The login page and dashboard are designed to facilitate the navigation process for users towards the desired pages. This design approach prioritizes user experience by offering a streamlined and intuitive interface that enhances accessibility and usability. The login page serves as a secure entry point, ensuring authenticated access to the application. At the same time, the dashboard provides users with a centralized hub to access relevant information and features efficiently. By incorporating user-friendly design principles, such as clear navigation paths and intuitive layouts, the application optimizes user interaction and fosters a positive user experience. In conclusion, the emphasis on navigation ease through the login page and dashboard underscores the commitment to enhancing user satisfaction and usability within the application.

The dashboard of the marine tourism application is designed to be simple for easy comprehension by users. This user-friendly design prioritizes clarity and intuitiveness, facilitating efficient navigation and interaction with the application's features. Such simplicity enhances user experience and promotes usability, especially for individuals with varying levels of technological proficiency. The emphasis on simplicity in dashboard design reflects a thoughtful approach toward accommodating diverse user needs and preferences, ultimately contributing to the effectiveness and adoption of the marine tourism application.

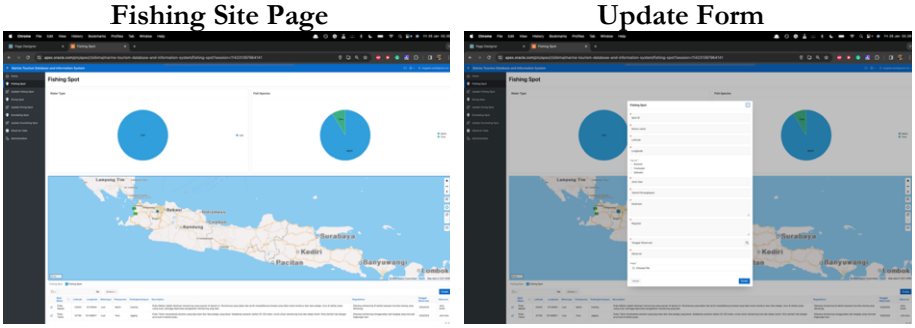

Figure 6. Fishing Site and Update Form Page

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The fishing site page is designed to facilitate tourists in customizing their preferences for fishing locations and the types of fish they intend to catch at the tourist sites, thereby providing tourists with more directed experiences. This design feature aims to enhance user engagement by offering a personalized and tailored approach to fishing activities, allowing tourists to select sites that align with their interests and objectives. By empowering tourists to make informed decisions regarding their fishing excursions, the fishing site page contributes to a more fulfilling and rewarding tourism experience. In conclusion, the emphasis on customization and personalization within the fishing site page underscores the commitment to enhancing user satisfaction and promoting enjoyable tourism activities.

Fishing sites must be documented to analyze patterns and factors contributing to changes in fishing locations due to climate and fish migration over time. This documentation is a valuable resource for understanding the dynamics of marine ecosystems, including the impact of environmental variables and migratory patterns on fish populations and their habitats. By systematically recording fishing site data, researchers and policymakers can identify trends, assess the resilience of fisheries to environmental changes, and develop informed management strategies to promote sustainable fishing practices. In conclusion, documenting fishing sites is crucial in enhancing our understanding of marine environments and supporting evidence-based decision-making in fisheries management.

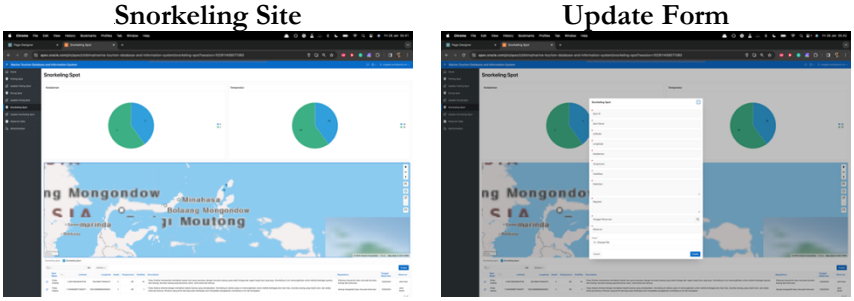

Figure 7. Snorkeling Site and Update Form Page

The snorkeling site page is designed to facilitate tourists intending to enjoy coral reefs on specific islands, as the database and information system enable tourists to select snorkeling locations according to their preferences. This feature aims to enhance user experience by providing comprehensive information about snorkeling sites, including details about coral reef health, marine biodiversity, and accessibility. By empowering tourists to make well-informed decisions based on their preferences, the snorkeling site page contributes to a more enjoyable and fulfilling snorkeling experience. In conclusion, incorporating a database and

information system within the snorkeling site page underscores the commitment to enhancing user satisfaction and promoting responsible tourism practices.

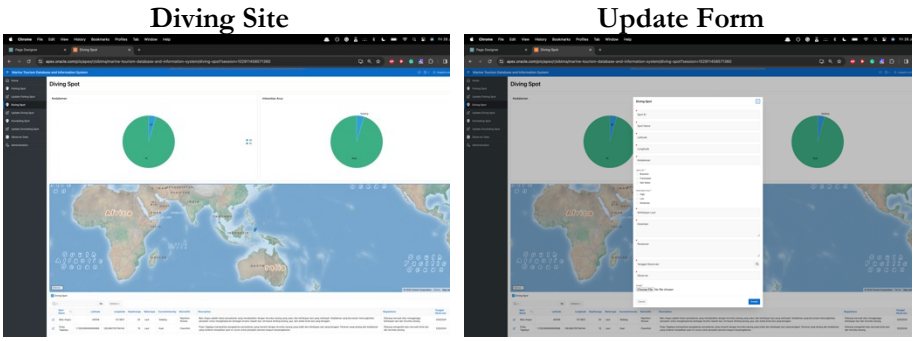

Figure 8. Diving Site and Update Form Page

The diving site page is designed to facilitate the exploration process of coral reefs and fish species at specific depths, thereby aiding local travel operators in designing marine tourism packages for diving activities. This functionality aims to streamline the planning and organization of diving excursions by providing detailed information about underwater landscapes, marine life diversity, and diving conditions. By offering a comprehensive overview of diving sites, including depth profiles and species richness, the diving site page empowers travel operators to curate immersive and memorable diving experiences for tourists. Consequently, integrating such features enhances the attractiveness and competitiveness of local marine tourism offerings, contributing to the sustainable development of the tourism industry.

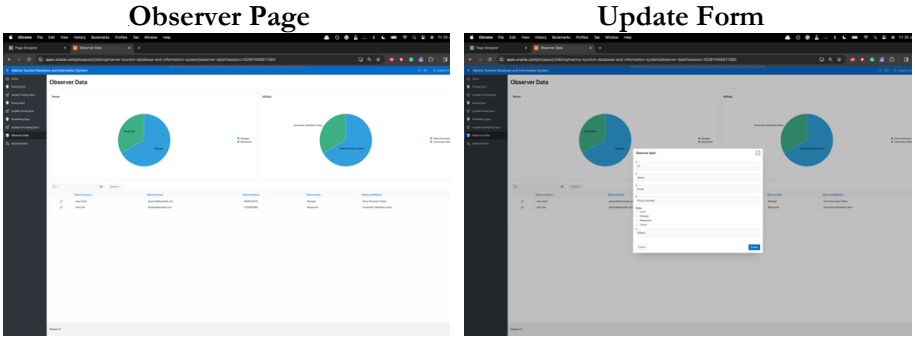

Figure 9. Observer and Update Form Page

The observer page plays a crucial role in documenting the identities of observers who discover exciting sites for fishing, diving, and snorkeling activities. In this

context, observers can range from destination management to local travel businesses, tourists, and the local community. This functionality enhances transparency and accountability in identifying and documenting noteworthy marine tourism sites, ensuring that valuable contributions from various stakeholders are duly recognized and recorded. By facilitating the documentation process, the observer page promotes collaboration and knowledge-sharing among stakeholders, ultimately contributing to the sustainable management and promotion of marine tourism destinations.

Conceptually, this application encapsulates the integration of interests or collaboration among stakeholders in the tourism sector, mainly marine tourism, wherein each actor can contribute data as valuable information for the sustainability of tourism. This conceptual framework emphasizes the importance of inclusivity and cooperation in managing and promoting tourism destinations, fostering a sense of shared responsibility and collective action toward achieving sustainable tourism goals. By providing a platform for stakeholders to collaborate and share information, the application promotes transparency, efficiency, and synergy in managing marine tourism resources, thereby enhancing the overall sustainability and resilience of the tourism industry.

4. CONCLUSION

The findings of this research underscore the crucial role played by marine tourism information databases, which encompass snorkeling, diving, and fishing sites, in optimizing tourism activities. These databases provide tourists with comprehensive and easily accessible data on marine attractions, including coral reefs, underwater landscapes, and fish species, enabling them to make informed decisions and plan their activities meticulously. This wealth of information enhances the overall tourism experience, promotes sustainable tourism practices, and contributes to preserving marine ecosystems. Implementing the Rapid Application Development (RAD) method, particularly utilizing Oracle Apex and case diagrams, has facilitated swift and iterative development, fostering efficient collaboration among stakeholders, and enabling prompt adaptation to evolving requirements. Leveraging the capabilities of Oracle Apex has streamlined the implementation of database structures and functionalities, ensuring a robust and scalable application architecture. In summary, the successful integration of RAD methodology with Oracle Apex highlights its effectiveness in expediting the development lifecycle and delivering a tailored solution to meet the needs of marine tourism stakeholders.

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