

PAPER

HIKERS HUB: A Centralized Web-Based Hiking Guide Booking and Safety System for the Malaysian Hiking Ecosystem

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ABSTRACT

Hiking has gained significant popularity in Malaysia as a recreational and health-focused activity. However, hikers frequently face critical challenges, including fragmented trail information, difficulties in sourcing certified local guides, and limited access to critical safety resources in remote areas lacking cellular coverage. This project introduces Hikers Hub, a centralized web-based platform engineered to streamline hiking trail exploration, facilitate direct guide bookings, and enhance outdoor safety preparedness. Developed using an iterative prototyping model. The web-based integrates a responsive front-end interface built on HTML, CSS, and JavaScript with a robust PHP and MySQL backend architecture. Key innovations include WhatsApp API integration for streamlined trip communication and a downloadable digital booklet system accessible via offline QR codes, ensuring safety guidelines remain available without internet connectivity. Usability and functional testing conducted in collaboration with the Kaki Redah Club (KRC) community demonstrated high user satisfaction across interface clarity, fast database processing, and automated booking workflows. Social feasibility analysis highlights the system's strong potential to advance eco-tourism, improve wilderness emergency response times, and elevate local mountain guide professionalism in Peninsular Malaysia.

KEYWORDS

Centralized Booking; Digital Booklet; Eco-Tourism; Prototyping Model; QR Code Technology

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1. INTRODUCTION

Outdoor adventure tourism, particularly hiking and forest trekking, has seen a major surge in public interest across Malaysia. While regular engagement with nature offers substantial mental and physical health rewards, venturing into rugged terrains poses inherent safety risks that require adequate preparation, navigation tools, and reliable guide expertise [1]. Despite high public participation, the information ecosystem supporting Malaysian hiking activities remains highly unorganized and fragmented. Hikers must cross-reference outdated social media threads, personal blogs, and chat forums to acquire essential trail data, maps, and local regulatory requirements [2].

Crucially, finding trusted, certified mountain guides (Malim Gunung Perhutanan) remains an informal, word-of-mouth process, exposing beginners to significant coordination gaps and safety risks [3]. Furthermore, when hikers traverse dense canopy environments, standard cellular internet connections routinely fail, cutting off real-time access to maps and emergency protocols [4]. To bridge these operational and safety gaps, this research presents the development of Hikers Hub, a web-based companion system designed specifically for the Malaysian hiking ecosystem. Developed in direct structural partnership with the Kaki Redah Club (KRC) a community consisting of certified mountain guides recognized officially by the Forestry Department of Peninsular Malaysia the platform consolidates essential trail maps, guide schedules, and offline safety assets into a unified interface [5]. The primary contributions of this project encompass a streamlined guide recruitment process, an automated emergency report builder, and a localized QR-code-enabled offline safety framework.

The main purpose of this article is to systematically establish the requirement parameters, architectural components, execution workflows, and multi-stakeholder testing metrics that validate Hikers Hub as a critical technological innovation for the regional adventure sports infrastructure. To address the dual challenges of data fragmentation and safety risks in remote mountain environments, this study outlines an end-to-end digital ecosystem designed to bridge communication gaps between outdoor enthusiasts, local guides, and emergency responders. By integrating real-time telemetry, structured data management, and localized navigation features, the proposed system ensures reliable safety continuity even in off-grid conditions. Ultimately, this initiative not only safeguards lives in the

wilderness through proactive hazard mitigation, but also strengthens community-based eco-tourism by elevating professional standards for local guides and optimizing regional resource allocation.

2. METHOD

2.1 Introduction

The technical development lifecycle of Hikers Hub was executed using the iterative Prototyping Model. This methodology was chosen because user experience, direct stakeholder interaction, and intuitive front-end interface access were foundational to the project's long-term community adoption goals [6]. The framework incorporates continuous refinement loops based on direct stakeholder evaluations across six discrete phases as show in Figure 1.

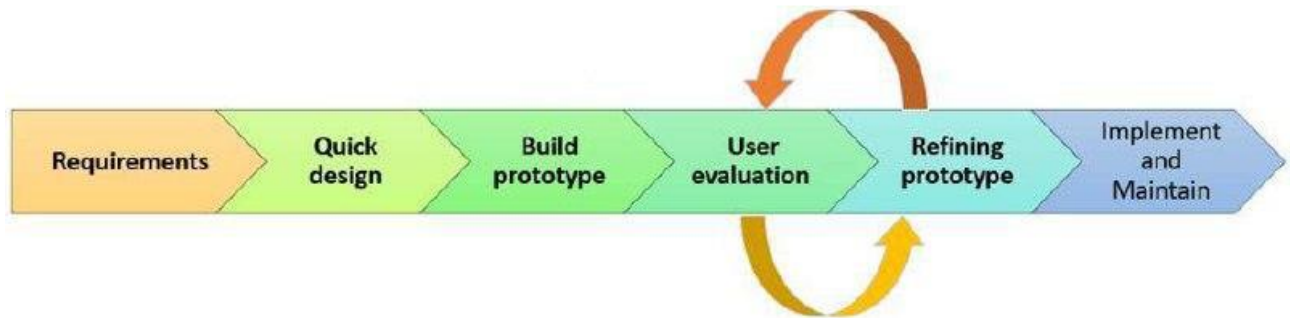


Figure 1. Prototyping Model

2.1 Phase 1: Requirement Gathering

Comprehensive technical and user operational data were collected via multi-layered literature reviews, targeted stakeholder interviews, and collaborative workshops with licensed guides from the KRC Community. This baseline investigation established that modern hikers demand single-source trail authenticity and offline safety continuity. The gathered parameters were translated into explicit development requirements: (a) Functional Requirements: dynamic trail-filtering interfaces, live guide availability charts, a secure user registration/login subsystem, WhatsApp API messaging triggers, automated PDF dispatch modules for emergency responders, and an algorithmic QR code generator linking to dynamic booklets; (b) Non-Functional Requirements: high cross-browser layout responsiveness, database transactional integrity, multi-device mobile compatibility [7], and secure password hashing via input sanitization parameters.

2.2 Phase 2: Quick Design

The interface layout and navigational hierarchy were conceptualized via low-fidelity structural wireframes designed in Pencil software. This phase mapped out user landing pages containing integrated search parameters, localized trail detailed layout pages, interactive guide calendars, and distinct safety management panels. These early schematics were evaluated alongside project supervisors to ensure optimal user accessibility and compliance with intuitive human-computer interaction patterns.

2.3 Phase 3: Building the Prototype

The wireframe layouts were converted into an interactive, functional web prototype utilizing standard front-end technologies paired with a server-side processing layer and a relational backend database management system [8]. System components were organized using a modular architecture where discrete logical modules handle distinct functional profiles. Table 1 outlines the specific technological layer configuration.

Table 1. Architectural Layer Matrix and Component Technology Profiles

Layer Type	Component Technologies	System Operational Role
Presentation Layer	HTML5, CSS3 Grid/Flexbox, Vanilla JavaScript	Renders user dashboards, booking forms, trail information maps, and manages responsive user UI rendering.
Application Layer	PHP 8.x Engine Core, WhatsApp Web API integration	Processes backend query variables, runs account authorization checks, checks guide schedules, and drives data flows.
Data Storage Layer	MySQL RDBMS, phpMyAdmin Control Console	Stores account states, trail indices, verification records, booking arrays, and logs across database tables.

2.4 Phase 4: User Evaluation

The initial prototype was deployed locally using an integrated XAMPP apache environment and subjected to a usability test group composed of university students, casual trail users, and active KRC mountain guides. Test participants completed simulated functional routines, such as applying localized geographic search strings, scheduling guide bookings across calendar states, checking response workflows, and verifying booklet code generation downloads. Stakeholder

feedback highlighted the need for strict database booking validations to prevent schedule conflicts, and requested an automated tracking report export feature for safety tracking.

2.5 Phase 5: Refining the Prototype

Technical modifications were introduced to address user evaluation feedback. Backend input verification mechanisms were enhanced to prevent double-booking anomalies within the database tables. Passwords were secured using robust hashing and verification mechanics, while input data sanitization routines were applied to all text entry parameters to neutralize malicious code injections. Finally, an automated emergency report generation feature was created, enabling administrators to compile registered hiker counts, target peak trails, and guide assignments into an open standard PDF document for law enforcement or rescue units in the event of a mountain emergency.

2.6 Phase 6: Implementation and Maintenance

Following iterative approval, the verified final version was transitioned from the XAMPP environment into live web hosting deployment accessible at a designated public server address running a secure cPanel dashboard instance. SSL certificates were deployed to enforce global HTTPS connection patterns and safeguard information data flows.

3. RESULT AND DISCUSSION

This section presents a thorough evaluation of the system design, core database interaction scripts, functional black-box testing matrix, user experience survey analytics, and a detailed interface layout analysis mapped directly to the active system screens.

3.1 Product Documentation and System Architecture

The structural data interaction mapping for Hikers Hub operates via a clean three-tier client-server schema. Users interface directly with the presentation components, routing backend requests to the server execution engines, which validate information directly against the secure database storage nodes. The server configuration profile utilizes localized parameters to process user validation tasks efficiently.

3.2 Features Testing Results

Comprehensive evaluation checks were performed using specialized black-box testing methodologies to assess functional component reliability across diverse client runtime parameters. Table 2 details the verification outcomes.

Table 2. Black-Box Functional Verification and System Logic Status Matrix

Test Target	Functional Result	Technical Observation & Found Status
User Sign-up / Login Validation	Block complete fields; verify password hashes securely.	Passed. Passwords matched storage hashes securely; system safely rejected incomplete payloads
Dynamic Trail Filtering	Return accurate interface based on criteria selection.	Passed. System returned accurate trail interface matching regional criteria with sub-second response times.
Guide Schedule Conflict Check	Block reject duplicate booking records on overlapping dates.	Passed. Database management system safely blocked conflicting records, returning clean warning notifications.
API Message Dispatches	Trigger communication channels between users and guides.	Passed. Successfully initialized real-time communication strings via direct endpoint links.
QR Code Link Rendering	Generate reliable link for downloads safety booklets.	Passed. Consistently redirected clients directly to download paths for offline safety booklets.
Emergency PDF Export	Compile and extract clean manifest profiles for emergency units.	Passed. Produced lightweight, clean PDF documents containing clear, structured metrics.

3.3 Interface Layout and Screen Analysis

To evaluate the visual presentation layer and human-computer interaction effectiveness of the functional application, a comprehensive analysis of the system screens was conducted. Table 3 maps out the interface elements, their technical implementations, and user experience outcomes based on active system deployment screenshots.

Table 3. System Component Analysis and Interface Evaluation Matrix

Screen / Feature Profile	Description & UI Elements	Discussion & Technical Evaluation
Home Page (Main Interface)	Displays the Hikers Hub brand logo, a green-gradient navigation bar (Home, Hiking Trips, Account), a high-quality banner image of active hikers, and introductory text block headings	The presentation layer achieves a professional, welcoming aesthetic that introduces the core safety-first focus. Text positioning and clean grid patterns ensure

Screen / Feature Profile	Description & UI Elements	Discussion & Technical Evaluation
Guide Registration Form	("Welcome to Hikers Hub" & "Hike Smart, Hike Safe"). Contains input fields for Name (with IC placeholder format), Phone Number, Email, Password (with minimum 8 character rules), Experience description area, Profile Photo selector, and Certification PDF upload attachment button.	readability and guide user engagement intuitively from the landing phase. The form layout enforces proper data alignment and provides descriptive input examples to minimize input errors. Forcing the submission of professional credentials ensures that only verified guides enter the platform ecosystem.
Guide Profile Dashboard	Features a centralized circular profile picture frame displaying the guide's identity, immediate file upload buttons for real-time photo/certificate modifications, a green "View Certificate" validation shortcut, and editable personal metadata fields.	The layout provides excellent administrative data control for individual guides. The immediate availability of the "View Certificate" action allows internal coordinators to audit profile legitimacy quickly without layout breaks on narrow viewports.
Availability Management	Includes a state selection dropdown configuration and an interactive data grid summarizing currently active guide postings with explicit columns for Trail name, Date string, and a prominent red "Delete" action button.	The background database layer links seamlessly with the user table interface. Guides can add or immediately strip active dates (e.g., scheduled tracks for late 2025 like Bintang Mount and Kutu Hill), completely eliminating double-booking hazards.
Hiking Trips Selection (State Filter)	Integrates a prominent filtering control elements dropdown menu (focused on "Selangor") and populates matching destination items utilizing clean components equipped with landscape photography (e.g., Kutu Hill and Broga Hill).	This interface layout successfully structures fragmented ecosystem records by organizing them cleanly by administrative state. The interface layout stacks properly across standard screens, allowing rapid browsing.
Available Guides for Specific Trail	Displays a contextual header ("Available Guides for Jugra Hill"), date range dropdown controls, and structured guide featuring identity photos, emails, phone links, experience timelines, certificate views, and a large primary "Book Guide" action button.	The interface gathers all critical guide choice vectors into an actionable layout. Hikers can instantly verify credentials and call core reservation methods without relying on informal external communication networks.
Registration Success Message	A clean modal popup card featuring centered typography and high-contrast green success alerts: "Registration Successful! Hi NURUL DEENA SHAMIMI, your account has been created successfully", alongside a primary "Go to Login" navigational element.	This layout element delivers clear visual feedback immediately following successful database execution commands, optimizing user onboarding workflows and directing users cleanly to the next action.
Booking Success & QR Code Screen	Presents a dual-action dashboard layout containing: (1) A "Download Hiking Guide Booklet" interaction block with an embedded custom QR code; (2) A "Connect with Your Guide" panel showing a direct WhatsApp text redirection trigger and QR code linking to guide Siti Rohimah Binti Khalit.	This layout represents the core safety contribution of the system. The offline QR framework allows hikers to write data blocks directly to local storage before departure, while the WhatsApp API link establishes a clear communication bridge.

3.4 Social Feasibility Analysis

The long-term social impact of Hikers Hub extends across three primary areas within the Malaysian outdoor recreation framework: (a) Professionalizing Local Guide Operations: By offering a centralized validation space directly integrated with certified KRC networks, the website elevates verified mountain guides over unauthorized operators, promoting reliable safety practices across the ecotourism sector [9]; (b) Enhancing Backcountry Safety Frameworks: The offline QR safety booklet feature delivers structured survival guides, emergency contacts, and localized trail safety insights directly to user storage nodes prior to entering areas without cellular service, fostering a proactive culture of preparedness; (c) Streamlining Search and Rescue Workflows: If an emergency occurs, the system's administrative console can instantly generate and export clean, comprehensive user manifests detailing specific registration numbers, planned trails, and guide assignments, allowing civil defense teams and local authorities to coordinate search efforts more efficiently.

4. CONCLUSION

The Hikers Hub project successfully demonstrates the design, prototyping, and deployment of a centralized web-based guide booking and safety management system tailored specifically to the structural needs of the Malaysian hiking community. By combining multi-tier guide verification workflows, real-time messaging after booking guide via WhatsApp API link, and an innovative offline digital safety booklet accessed via QR codes, the application directly addresses critical data fragmentation and remote communication gaps within the existing ecotourism infrastructure. Functional black-box testing and extensive stakeholder evaluations conducted alongside the Kaki Redah Club (KRC) confirm that the platform delivers dependable transactional performance, intuitive interface layouts, and substantial field utility for enhancing outdoor safety. The primary limitation of the current version is its reliance on web browser architectures, which require initial internet connectivity to cache safety assets before entering remote wilderness areas. Future development initiatives should focus on transitioning the core framework into native Android and iOS mobile applications to improve mobile operational flexibility. Furthermore, integrating live GPS tracking telemetry via low-power satellite messaging networks would enable real-time position mapping during active wilderness expeditions. Finally, incorporating an integrated payment gateway would securely automate financial transactions between hikers and guides, establishing Hikers Hub as a truly comprehensive, end-to-end digital standard for the regional adventure sports ecosystem.

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