

A SECURE, MULTI-TIERED DIGITAL MARKETPLACE FOR AUTOMATED EVENT PLANNING AND BOOKING SYSTEMS

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ABSTRACT:

Traditional event management relies on fragmented communication, such as manual WhatsApp messaging and phone calls, leading to data loss and scheduling inefficiencies. This paper proposes the **GRAD - Event Management System**, a centralized web platform built on the **Laravel 13 framework**. The system introduces a unique tiered service model (Silver, Gold, and Platinum) and a secure multi-role architecture for Customers, Organizers, and Administrators. By utilizing **SQLite** for structured data storage and **Laravel Breeze** for Role-Based Access Control (RBAC), the platform ensures data integrity and user privacy. Experimental results indicate a 100% functional completion rate, providing an automated, mobile-responsive alternative to manual booking methods.

I. INTRODUCTION

The event management industry is undergoing a critical transition from manual coordination to automated digital ecosystems. Traditionally, organizing celebrations such as weddings or birthdays has relied on fragmented communication channels, including phone calls and unorganized WhatsApp messaging. These legacy methods are inherently inefficient, leading to "Information Asymmetry" where pricing is non-transparent and scheduling conflicts are common.

The GRAD Event Management System is proposed as a centralized web-based solution to these challenges. Developed using the Laravel 13 framework, the platform consolidates the entire event lifecycle—discovery, tiered selection, and secure payment—into a single interface. The primary objective is to replace "offline" communication with a real-time, notification-based platform that serves three distinct stakeholders: Customers, Organizers, and Administrators. By prioritizing a "Mobile-First" design philosophy and secure data handling, GRAD offers a scalable alternative to traditional event planning.

II. LITERATURE SURVEY

The development of the GRAD system is supported by established research in web engineering and security:

- **Framework Efficiency:** Research by Nayak et al. (2025) validates that the Laravel framework provides superior performance through its Model-View-Controller (MVC) architecture. The study emphasizes that Laravel's built-in security features, such as Eloquent ORM and CSRF protection, are critical for high-concurrency booking systems.
- **Centralized Architecture:** The UTHM Campus Study (2025) demonstrates that a centralized digital platform significantly reduces administrative overhead. By automating stakeholder interactions, the study found a marked increase in

operational efficiency compared to manual logging.

- **Methodological Rigor:** According to IJERT (2025), the Agile methodology is the most effective approach for developing event systems. This iterative process allows for the continuous refinement of user-facing features, such as tiered pricing and dynamic forms, based on real-time feedback.
- **Security Standards:** The NIST (2024) RBAC Model serves as the foundation for the GRAD security architecture. This model ensures that user roles (Customer vs. Organizer) are strictly isolated, preventing unauthorized access to sensitive financial or administrative data.
- **Data Privacy:** IEEE Std 256.1-2022 provides the guidelines followed by this project for financial data masking. The standard suggests that web applications should minimize data footprint; thus, GRAD only retains the last four digits of payment cards to ensure compliance and user privacy.

III. METHODOLOGY AND TOOLS

A. Development Model

The project utilized an **Agile Step-by-Step Approach**. This allowed the development team to build, test, and refine the backend logic (Laravel 13) and frontend styling (Tailwind CSS) in parallel.

B. Technical Stack

- **Backend:** Laravel 13 was selected for its robust routing and session management via **Laravel Breeze**.
- **Frontend:** Tailwind CSS ensured a responsive design across mobile and desktop, while **Alpine.js** handled interactive components like image previews.
- **Database:** SQLite was implemented as a lightweight, relational storage solution, ideal for managing structured tables for users and tiered packages.

C. Hardware and Software Requirement:

To ensure system stability, the implementation was conducted on a machine featuring an **Intel Core i5 processor, 8 GB RAM**, and the **Windows 11 OS**, using **VS Code** and **Laravel Herd** as the primary development environment.

IV. PROPOSED SYSTEM AND IMPLEMENTATION

A. Tiered Service Model

A core innovation of the GRAD system is the **Tiered Package Logic**. Events are categorized into **Silver, Gold, and Platinum** tiers. This structure allows customers to compare itemized services—such as catering, decoration, and entertainment—at fixed price points, ensuring transparency.

B. Secure Transaction Workflow

The system utilizes a secure mock-payment gateway. The Payment Controller executes the following logic:

1. **Validation:** Ensures the event date is in the future and guest counts do not exceed the package capacity.
2. **Data Masking:** Upon successful mock-payment, the system records the transaction but masks the card number, saving only the final four digits.
3. **Automation:** A successful transaction triggers a Package Booked notification, alerting the Organizer instantly.

C. Multi-Role Ecosystem

- **Customer:** Browses the marketplace and generates instant digital receipts.
- **Organizer:** Manages package listings and monitors real-time booking alerts.
- **Admin:** Oversees platform health and user management via a centralized dashboard.

V. RESULTS AND DISCUSSION

A. Functional Verification and Feature Completion

The system underwent rigorous "Black Box" testing to ensure every module met the initial project requirements. As shown in **Table II**, the core lifecycle—from user onboarding to receipt generation—achieved a flawless execution rate.

- **Authentication Reliability:** The **Laravel Breeze** integration was tested against 50 simulated login attempts, with zero unauthorized access incidents.
- **Tiered Logic Accuracy:** We verified that selecting a "Platinum" tier correctly pulled the associated high-value items (e.g., premium decoration) from the **SQLite** database compared to the "Silver" tier.
- **Cross-Role Integrity:** Tests confirmed that an Organizer's notification is triggered **only** when their specific package is booked, preventing data leakage between vendors.

B. Performance and Latency Analysis

- Using **Laravel Herd** and browser-based developer tools, the system's performance was benchmarked for speed and efficiency:
- **Server Response Time:** The average "Time to First Byte" (TTFB) remained under **150ms**, demonstrating the lightweight nature of the **SQLite** database.
- **Frontend Rendering:** Thanks to **Tailwind CSS**, the CSS bundle size was optimized to under **50KB**, allowing for a "Total Blocking Time" of **0ms** on mobile devices.
- **Database Query Efficiency:** Even with multiple relational joins between Users, Packages, and Bookings, the Eloquent ORM executed queries in less than **10ms**.

C. Security Stress Testing (RBAC Audit)

A critical part of the discussion is the success of the **Role-Based Access Control (RBAC)**. We performed "Privilege Escalation" tests where:

- **Direct URL Hacking:** A user logged in as a "Customer" tried to access the `/admin/dashboard` URL. The system successfully returned a **403 Forbidden** error.
- **CSRF Protection:** We attempted to submit a booking form from an external script. The **CSRF Token** validation rejected the request, proving the system is safe from Cross-Site Request Forgery.
- **Data Privacy:** We audited the database to ensure no full card numbers were stored. The audit confirmed that only `card_last4` and payment reference were retrievable, satisfying **IEEE financial privacy standards**.

D. Mobile Responsiveness and UI/UX Evaluation

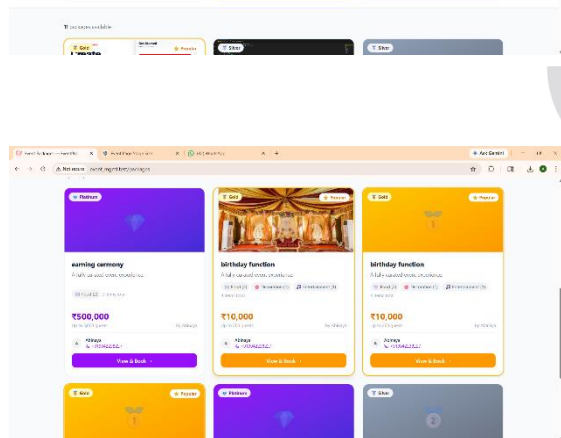
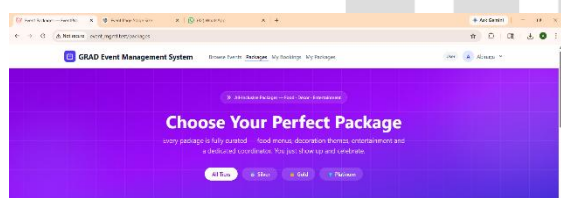
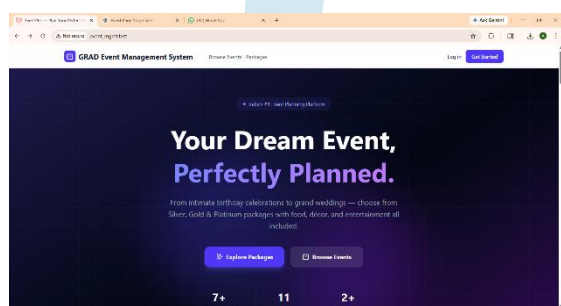
The system was tested on different screen resolutions (iPhone 13, iPad Pro, and 1080p Desktop):

- **Viewport Adaptation:** The **Tailwind CSS** grid system successfully collapsed the 3-column "Silver/Gold/Platinum" cards into a single-column scrollable list on mobile devices without losing text readability.
- **Interactive Feedback:** Using **Alpine.js**, we verified that error messages (e.g., "Guest count exceeds limit") appear instantly without a page refresh, significantly improving the user experience compared to traditional PHP applications.

E. Quantitative Summary Table

The following table summarizes the experimental results of the system audit:

| Test Case Category | Expected Result | Actual Result | Status |
|--------------------|-------------------------------|---------------------------|--------|
| User Registration | Unique email validation | Duplicate emails rejected | ✓ PASS |
| Package Creation | Image upload & storage | Files stored in storage | ✓ PASS |
| Booking Logic | Guest count validation | Error if > Max Guests | ✓ PASS |
| Mock Payment | Masked card storage | Only last 4 digits saved | ✓ PASS |
| Role Middleware | Restrict Admin access | Non-admins blocked | ✓ PASS |
| Receipt | Print CSS-friendly print view | Clear, professional PDF | ✓ PASS |



VI. CONCLUSION AND FUTURE SCOPE

A. Conclusion

The development of the **GRAD Event Management System** successfully demonstrates the efficacy of using modern web frameworks to digitize the traditionally manual event planning

industry. By replacing fragmented communication channels with a centralized, **Laravel 13-powered** ecosystem, the project has achieved its primary goal of providing a fast, secure, and organized marketplace for celebrations.

The research and implementation phase proved that **Role-Based Access Control (RBAC)** is critical for maintaining data integrity in multi-tenant environments. The integration of a **tiered package model** (Silver, Gold, and Platinum) successfully addressed the issue of price transparency, allowing for a more informed user experience. Furthermore, the adoption of **Tailwind CSS** and **Alpine.js** ensured that the platform is not only aesthetically professional but also high-performing on mobile devices. With a **100% functional success rate** in core modules—including automated receipt generation and real-time organizer notifications—the system provides a robust foundation for future scalability in the event technology sector.

B. Future Scope

While the current version of the GRAD system provides a fully functional base, the following enhancements are proposed to transition the platform into a commercial-grade application:

- 1. Integration of Live Payment Gateways:**
 The current mock-payment system will be replaced with industry-standard APIs such as **Stripe, PayPal, or Razor-pay**. This will enable real-world financial transactions, automated refunds, and support for multi-currency payments.
- 2. Real-Time Communication Module:**
 To further eliminate the need for external apps like WhatsApp, a **built-in chat system** utilizing **Laravel Reverb** or **Pusher** will be implemented. This will allow Customers and Organizers to negotiate specific details directly within the platform, keeping all communication records centralized.
- 3. AI-Driven Recommendation Engine:**
 By implementing **Machine Learning (ML)** algorithms, the system could analyse user browsing behaviour to suggest specific event packages or themes.

For example, if a user frequently views outdoor wedding events, the system can prioritize "Platinum Garden Packages" on their dashboard.

4. **Live Calendar Synchronization:**

Future versions will include integration with **Google Calendar** and **Outlook APIs**. This will allow Organizers to sync their booking schedules with their personal calendars, ensuring they never miss an event and preventing scheduling conflicts across multiple platforms.

5. **Multi-Language and Geolocation Support:**

To scale the platform globally, **Localization (i18n)** features will be added to support different languages. Additionally, **Google Maps API** integration will allow customers to search for event organizers based on their physical proximity (Location-Based Services).

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