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Development Of A Scalable Event Management System Using Next.Js, Tailwind Css, And Mern Architecture

SHAZIA ANJUM[1], MOUNIKA[1],DEEPALI INANI[1], AYESHA NADAF[1], LABEEQUA YUSUF[1]

[1]Department of Computer Science and Engineering, Visvesvaraya Technological University, Belgavi, India.

[1]Navodaya Institute of Technology, Raichur, India.

Abstract: The rapid growth of digital platforms has transformed the way events are planned, managed, and executed. However, traditional event management practices still rely heavily on manual coordination, disconnected communication channels, and delayed service tracking, which often leads to inefficiencies and user dissatisfaction. This paper presents the design and development of a scalable Event Management System built using the MERN architecture, enhanced with Next.js for server-side rendering and Tailwind CSS for responsive, utility-first user interface design. The proposed system provides a centralized platform for event creation, service management, attendee registration, and real-time scheduling. By leveraging Next.js API routes and MongoDB's flexible data model, the application ensures high performance, scalability, and improved search engine visibility. The system aims to simplify the complete event lifecycle while delivering a seamless experience for organizers, administrators, and attendees.

Keywords—Event Management, Next.js, Tailwind CSS, MERN Stack, Full-stack Development, Scalability.

1. INTRODUCTION

Event management involves the planning, coordination, and execution of multiple activities such as venue selection, scheduling, resource allocation, attendee handling, and post-event analysis. As events grow in scale and complexity, managing these processes manually becomes increasingly inefficient and error-prone. Conventional approaches that depend on spreadsheets, phone calls, and isolated software tools fail to provide real-time visibility and seamless coordination among stakeholders.

With the increasing adoption of web-based applications, event management systems have evolved to automate core functionalities such as registration, ticketing, and scheduling. However, many existing systems are limited in scalability, lack real-time performance optimization, and offer poor user experiences on modern devices. This creates a strong need for a robust, scalable, and performance-oriented solution capable of handling dynamic workloads during peak event periods.

This research focuses on the development of a full-stack event management application using modern web technologies. Unlike traditional React-based applications that rely solely on client-side rendering, the proposed system utilizes Next.js to enable ServerSide Rendering (SSR) and Incremental Static Regeneration (ISR). These features significantly improve page load times, enhance search engine optimization, and ensure smooth user interaction even under high traffic conditions.

Additionally, Tailwind CSS is integrated to implement a utility-first design approach, enabling rapid UI development while maintaining consistency and responsiveness across devices. The backend infrastructure, powered by Node.js and MongoDB, efficiently handles event data, user roles, and concurrent registrations.

Together, these technologies form a scalable and user-centric platform that manages the complete event lifecycle from planning to post-event insights.

2. LITERATURE SURVEY

The rapid advancement of web technologies has led to the emergence of various digital platforms aimed at automating event planning and management processes. Early event management systems primarily focused on basic functionalities such as event listings and manual registrations. However, these systems lacked real-time coordination, intelligent service recommendations, and scalable architectures required for handling large-scale and multi-vendor events.

Sharma et al. (2023) studied traditional web-based event booking systems and highlighted that most platforms rely heavily on static content delivery and client-side rendering, which results in slower page loads and poor search engine visibility. Their study emphasized the need for server-side rendering to improve performance and accessibility, especially for event platforms with high user traffic.

Kumar and Singh (2024) analyzed the effectiveness of Next.js in comparison with conventional React-based Single Page Applications. Their findings demonstrated that server-side rendering and incremental static regeneration significantly reduce time-tofirst-byte and enhance SEO performance. These features are critical for event management applications where fast discovery of services and packages directly impacts user engagement.

The role of responsive and scalable user interface design was examined by Miller (2024), who evaluated utility-first CSS frameworks in large web applications. The study concluded that Tailwind CSS enables consistent UI development, reduces unused styles through purging mechanisms, and improves maintainability. Such benefits are particularly relevant for event management platforms that must support multiple user roles, including customers, vendors, and administrators, across different devices.

Database scalability and flexibility have also been extensively studied in recent literature. Zhao (2023) discussed the advantages of NoSQL databases in handling heterogeneous and dynamic data structures. Event management systems often deal with variable data such as service types, vendor details, venue locations, and custom user requirements. MongoDB's document-oriented approach allows seamless schema evolution, making it suitable for complex event-based applications.

Recent research by Patel et al. (2025) focused on real-time communication in service-oriented platforms. The study emphasized the importance of WebSocket-based technologies for enabling live updates, tracking, and notifications. Real-time tracking systems significantly improve transparency and trust among users, vendors, and administrators, which is essential in time-sensitive event operations.

Additionally, studies on AI-driven recommendation systems indicate their growing importance in service marketplaces. AIbased personalization helps users discover relevant services, assists vendors in optimizing pricing, and enables administrators to identify trends and performance gaps. However, existing event management platforms rarely integrate AI-driven decision support in a unified system.

From the reviewed literature, it is evident that while individual technologies such as SSR frameworks, utility-first CSS, NoSQL databases, real-time communication, and AI systems have been explored independently, there is limited research on integrating these technologies into a single, scalable event management platform. The proposed system addresses this gap by combining modern web architecture, real-time tracking, AI-powered recommendations, and secure payment workflows within a unified platform.

3. SYSTEM ARCHITECTURE

The system architecture of the proposed EVENT WE – Complete Event Management Platform is designed to support a scalable, real-time, and multi-role event coordination environment. The architecture follows a layered and modular approach that clearly separates presentation logic, business logic, data management, and external service integration. This design ensures high performance, flexibility, and ease of maintenance. At a high level, the platform consists of three primary layers: the Frontend Layer, Backend Layer, and Database Layer, along with integrations for AI services, payment gateways, and location-based services. Each layer is independently scalable and communicates through well-defined interfaces.

3.1. Frontend Layer

The frontend of the system is developed using Next.js with React and TypeScript, providing server-side rendering and optimized performance. Tailwind CSS is used to design a responsive and modern user interface that adapts seamlessly to different screen sizes and devices.

This layer provides role-specific dashboards for Users, Vendors, and Admins. Users can browse services, book events, track assigned personnel in real time, and initiate secure payments. Vendors can manage their service listings, accept assignments, and update service progress. Admins are provided with comprehensive tools for platform management, vendor coordination, analytics, and service quality monitoring.

Interactive components such as booking forms, dashboards, real-time maps, and QR-based payment interfaces are handled entirely within this layer, ensuring a smooth and intuitive user experience.

3.2. Backend Layer

The backend layer is implemented using Node.js and Express.js and serves as the core business logic of the system. It exposes RESTful APIs responsible for user authentication, event and service management, booking workflows, vendor assignments, payment processing, and AI-based recommendations.

Secure communication is ensured using JSON Web Token (JWT) based authentication. Middleware components validate tokens and enforce role-based access control across the platform. Real-time functionality is achieved through WebSocket communication using Socket.IO, enabling instant status updates and live location tracking between users, vendors, and administrators.

The backend also acts as a secure intermediary for third-party integrations such as AI recommendation engines, Google Maps services, and payment gateways, ensuring controlled and reliable data exchange.

3.3. Database Layer

The data persistence layer utilizes MongoDB, a NoSQL database that is well-suited for managing dynamic and nested data structures. Separate collections are maintained for users, services, events, bookings, vendor assignments, and tracking information.

Geospatial indexing is employed to efficiently handle location-based queries, enabling accurate distance calculations and estimated arrival time (ETA) predictions. The flexible schema design allows the system to accommodate varying service attributes and scale effectively as the platform grows.

3.4. External Services Integration

The platform integrates multiple external services to enhance functionality and system intelligence. These include AI services for personalized recommendations, analytics, and pricing optimization, the Google Maps API for real-time tracking and routing, a secure payment gateway for transaction handling, and QR code systems for service verification and payment confirmation.

Overall, this architecture ensures seamless coordination among all stakeholders while maintaining security, scalability, and real-time performance.

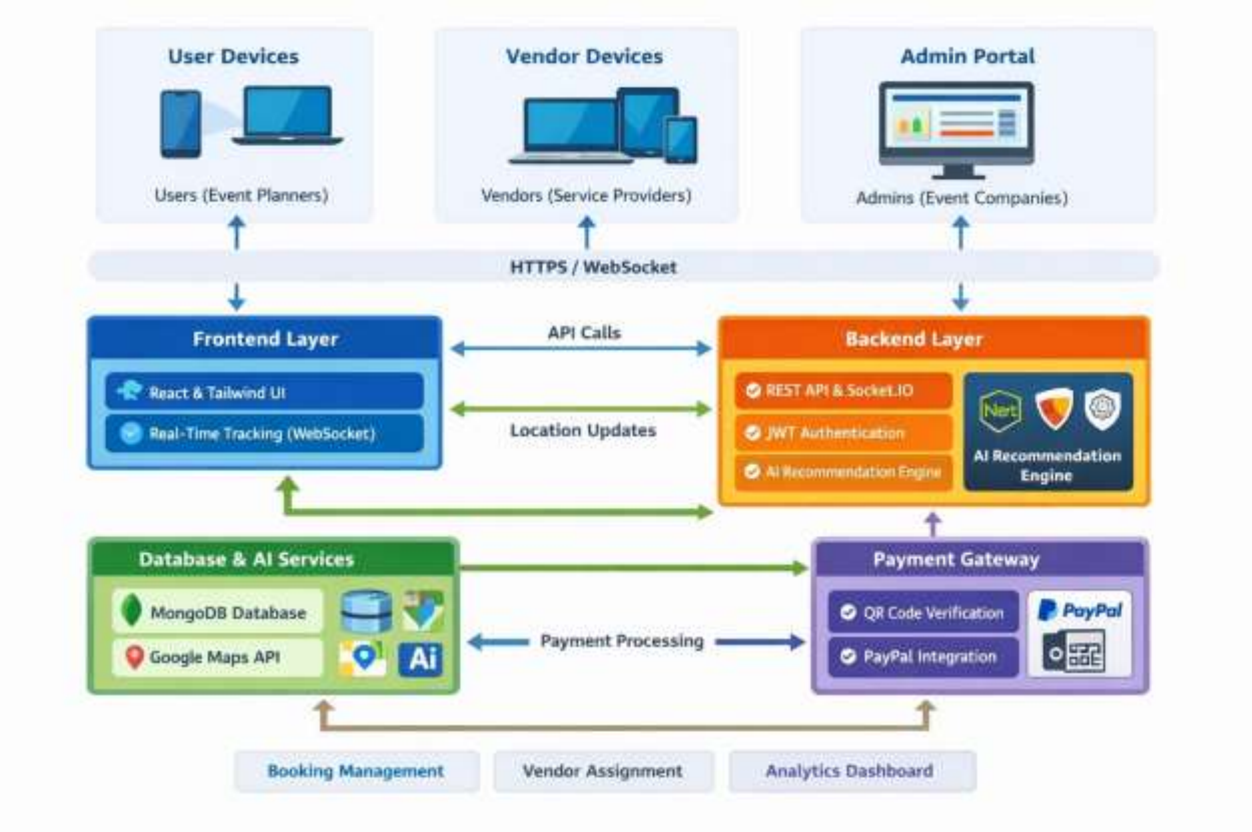


Figure 1: System Architecture of the EVENT WE Event Management Platform

4. METHODOLOGY

The development of the proposed Event Management System follows a structured and modular methodology aimed at ensuring scalability, usability, and real-time performance. The methodology is designed to support multiple user roles, dynamic event workflows, and secure transaction processing.

- User Registration and Role Management: The system begins with a secure authentication process where users register and log in based on predefined roles such as User, Vendor, and Admin. JSON Web Tokens (JWT) are used to manage secure sessions and enforce role-based access control throughout the platform.

- Event and Service Configuration: Administrators create event packages and define service categories, while vendors can list and manage their own services. These services are stored in a MongoDB database with flexible schemas to accommodate varying service attributes, pricing models, and availability.

- Booking and Assignment Workflow: Users browse event packages and initiate bookings by providing event-specific details such as date, venue, and guest count. Bookings are created with a pending status and reviewed by administrators. Vendors are assigned to specific services, and assignment status transitions are managed through the system dashboard.

- Real-Time Location Tracking: Once a service is confirmed, real-time tracking is enabled using WebSocket communication. Vendors transmit live location updates, which are visualized on interactive maps for admins and users. Distance and estimated arrival time are calculated using geospatial algorithms and mapping APIs.

- AI-Based Recommendation and Analytics: The system integrates AI-based modules to provide personalized service recommendations to users, pricing optimization suggestions for vendors, and performance analytics for administrators. A fallback logic ensures consistent functionality even when external AI services are unavailable.

- Payment and Verification Process: After service completion, a QR-based verification mechanism is generated to ensure secure payment initiation. Payments are processed through an integrated payment gateway, and transaction status is updated in real time. Admin oversight ensures controlled fund release to vendors.

- Testing and Validation: The system undergoes iterative testing to validate authentication workflows, booking logic, realtime tracking accuracy, and payment security. Performance testing ensures the platform remains responsive during peak usage scenarios.

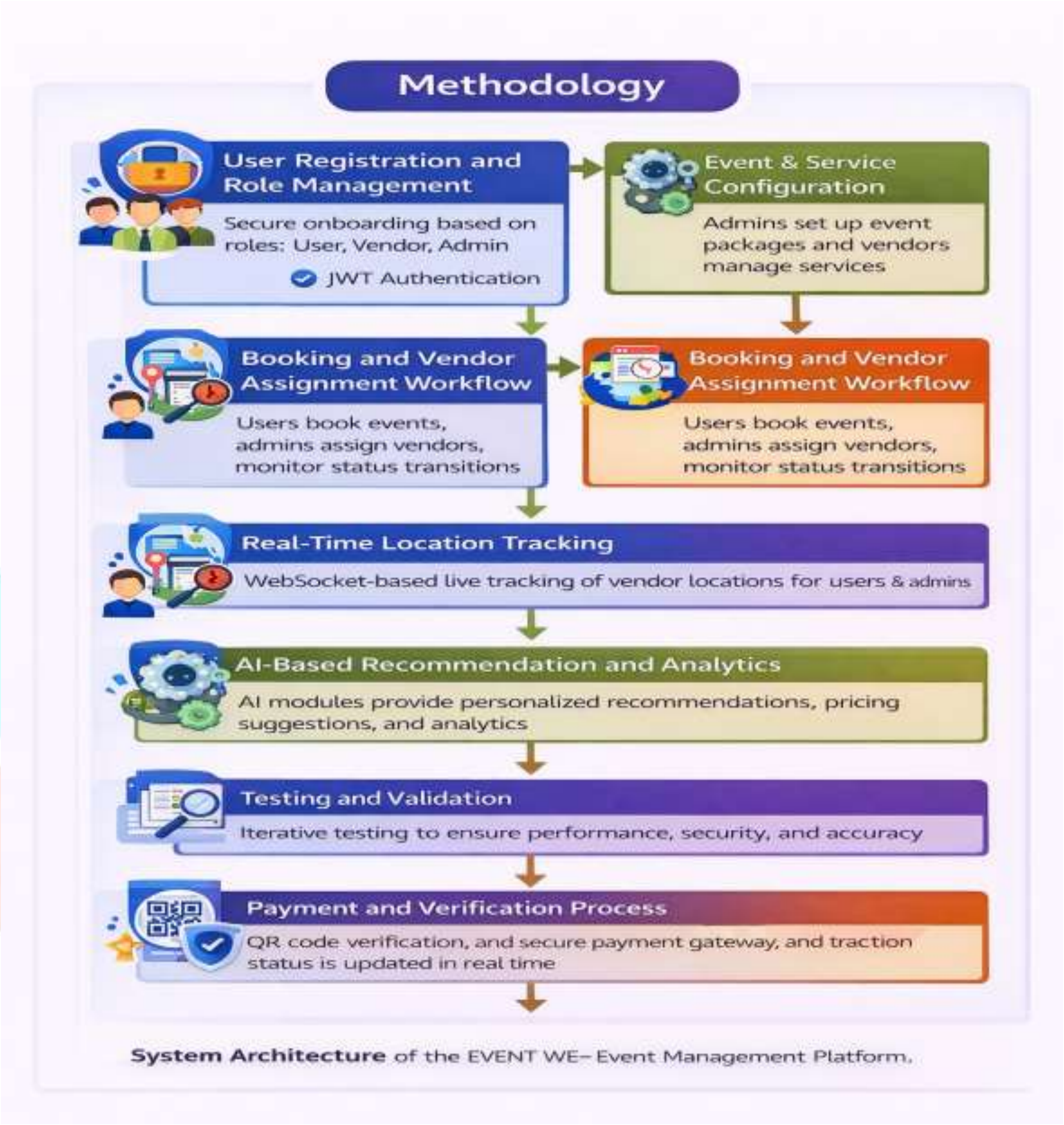

Methodology
User Registration and Role Management
Secure onboarding based on roles: User, Vendor, Admin
JWT Authentication
Event & Service Configuration
Admins set up event packages and vendors manage services
Booking and Vendor Assignment Workflow
Users book events, admins assign vendors, monitor status transitions
Booking and Vendor Assignment Workflow
Users book events, admins assign vendors, monitor status transitions
Real-Time Location Tracking
WebSocket-based live tracking of vendor locations for users & admins
AI-Based Recommendation and Analytics
AI modules provide personalized recommendations, pricing suggestions, and analytics
Testing and Validation
Iterative testing to ensure performance, security, and accuracy
Payment and Verification Process
QR code verification, and secure payment gateway, and traction status is updated in real time
System Architecture of the EVENT WE– Event Management Platform.

Figure 2: Methodology of the EVENT WE Event Management Platform

5. RESULTS AND DISCUSSION

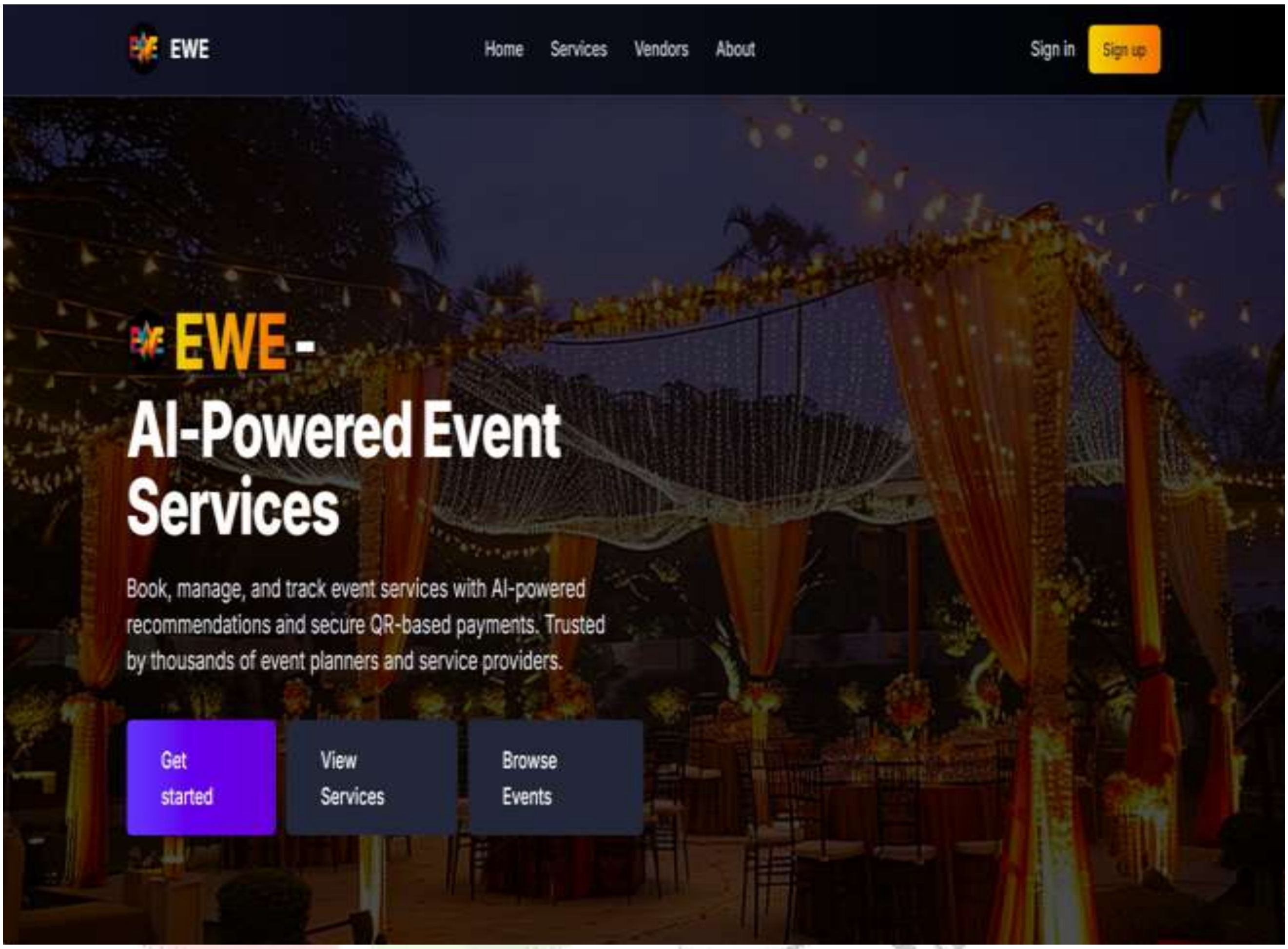
The proposed EVENT WE Event Management Platform was successfully designed, implemented, and evaluated to support end-to-end event planning, vendor coordination, real-time tracking, and secure transaction processing. The system was tested across all defined user roles, namely Users, Vendors, and Administrators, to assess functionality, usability, and performance.

The platform demonstrated efficient execution of core operations such as secure user authentication, service browsing, event booking, vendor assignment, and booking status updates. The role-based access mechanism ensured that each user interacted only with relevant features, improving system security and usability.

Real-time communication using WebSocket and Socket.IO enabled instant updates of booking progress and live vendor location tracking. This significantly enhanced transparency and coordination, especially during live event execution. Integration with Google Maps API provided accurate route visualization and estimated arrival time (ETA), improving operational planning.

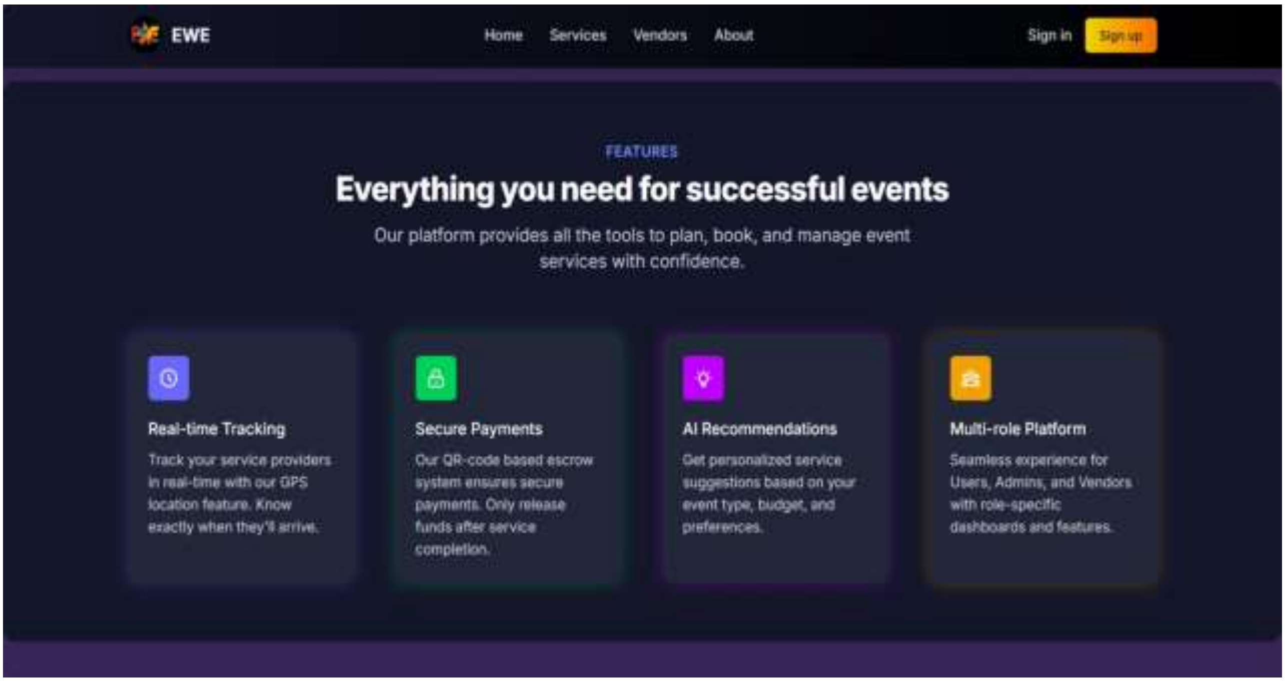
The MongoDB database efficiently managed dynamic event data, service configurations, and vendor assignments. Geospatial indexing enabled fast location-based queries without affecting system performance. Additionally, the AI-based recommendation module improved user experience by suggesting relevant services based on historical preferences and booking patterns.

Overall, the results confirm that the system meets its objectives by delivering a scalable, secure, and real-time event management solution.



Book, manage, and track event services with AI-powered recommendations and secure QR-based payments. Trusted by thousands of event planners and service providers.

Figure 3: Landing page of the EVENT WE Event Management Platform



FEATURES

Everything you need for successful events

Our platform provides all the tools to plan, book, and manage event services with confidence.

Real-time Tracking

Track your service providers in real-time with our GPS location feature. Know exactly when they'll arrive.

Secure Payments

Our QR-code based escrow system ensures secure payments. Only release funds after service completion.

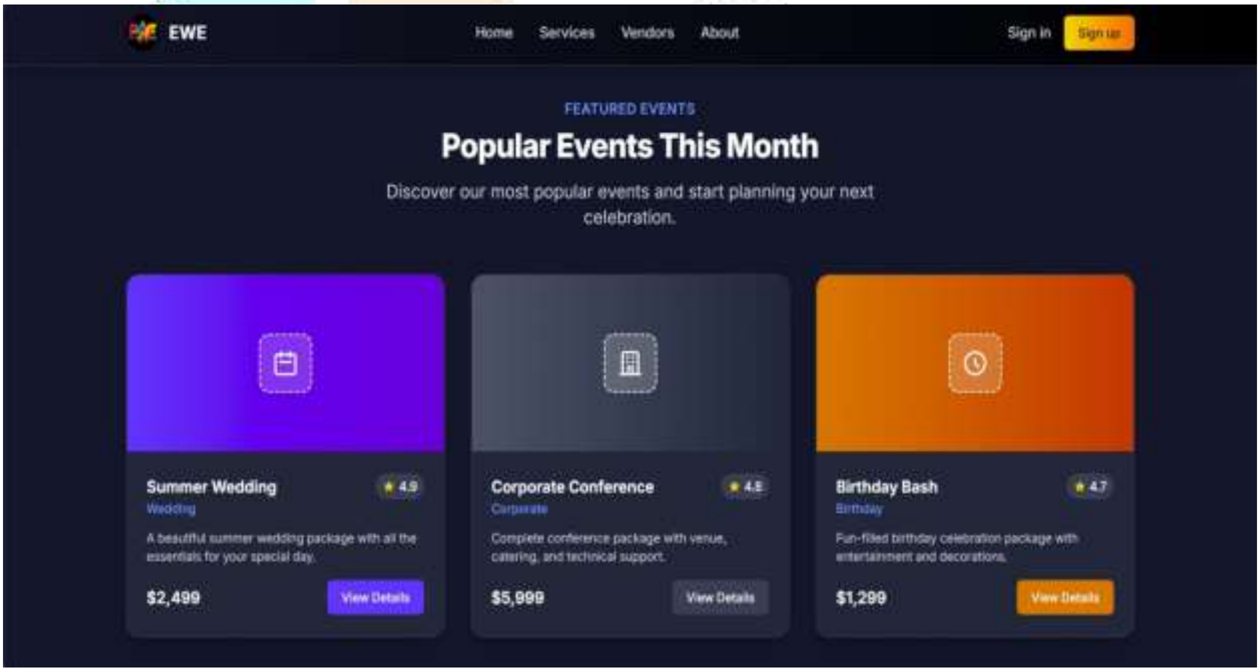
AI Recommendations

Get personalized service suggestions based on your event type, budget, and preferences.

Multi-role Platform

Seamless experience for Users, Admins, and Vendors with role-specific dashboards and features.

Figure 4: Landing page of the EVENT WE Event Management Platform



FEATURED EVENTS

Popular Events This Month

Discover our most popular events and start planning your next celebration.

Summer Wedding ★ 4.9

Wedding

A beautiful summer wedding package with all the essentials for your special day.

$2,499

Corporate Conference ★ 4.8

Corporate

Complete conference package with venue, catering, and technical support.

$5,999

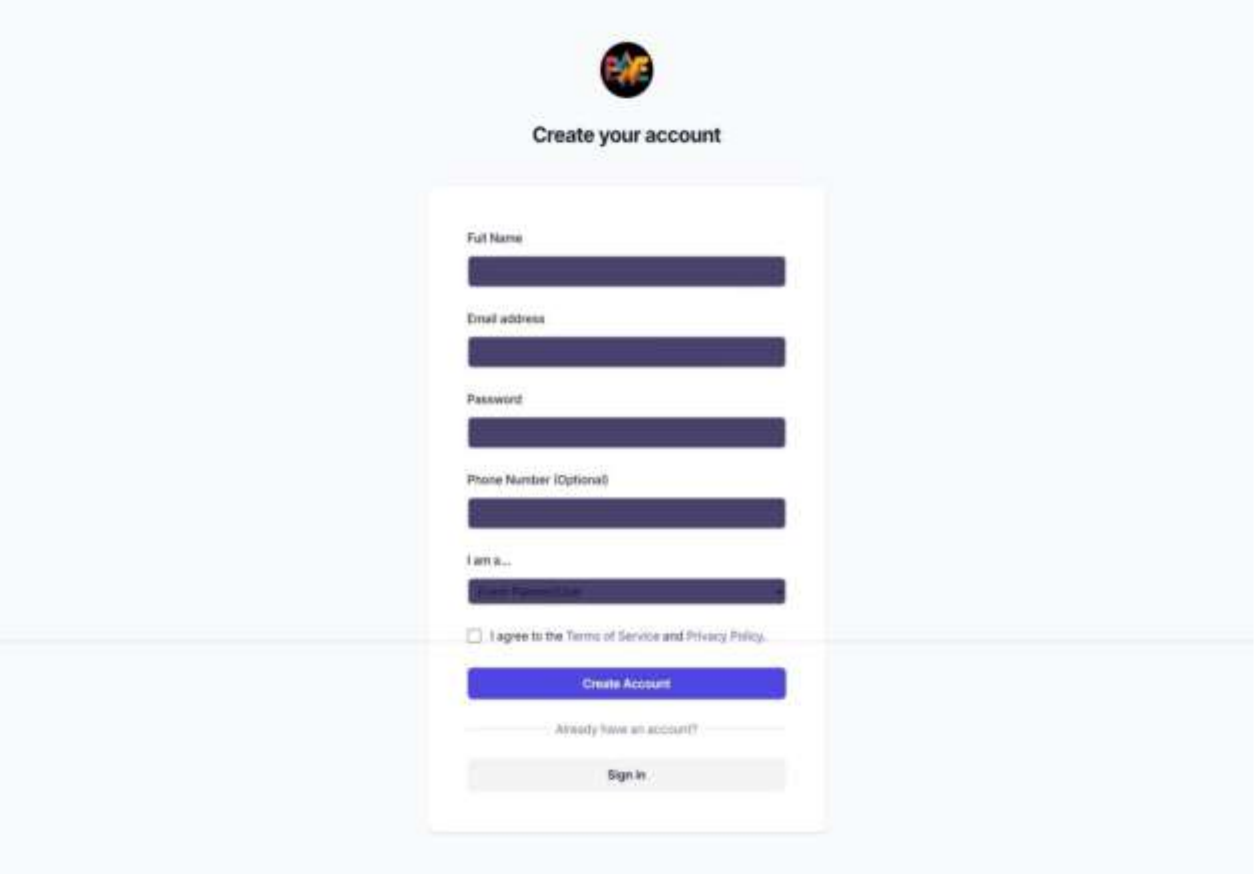
Birthday Bash ★ 4.7

Birthday

Fun-filled birthday celebration package with entertainment and decorations.

$1,299

Figure 5: Landing page of the EVENT WE Event Management Platform



Create your account

Full Name

Email address

Password

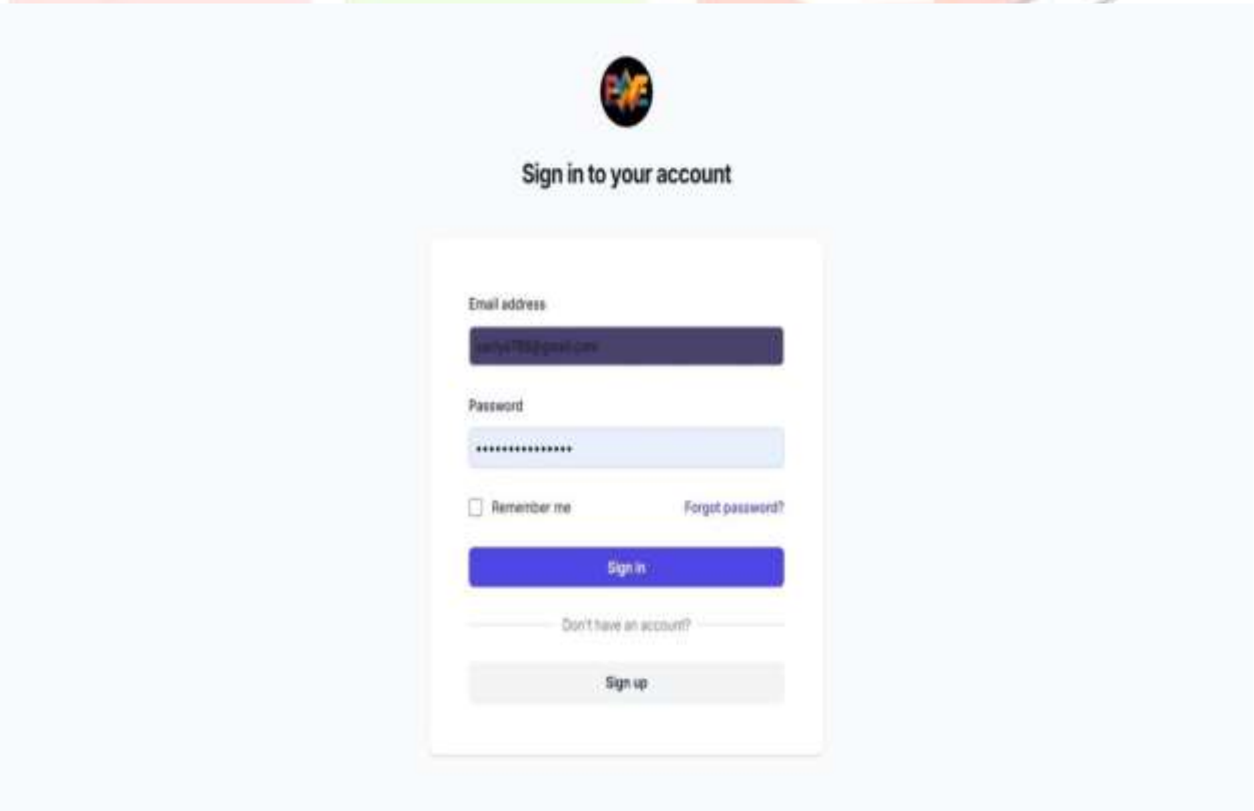
Phone Number (Optional)

I am a...

[illegible]

□ I agree to the Terms of Service and Privacy Policy.

Figure 6: Sign Up of the EVENT WE Event Management Platform



Sign in to your account

Email address

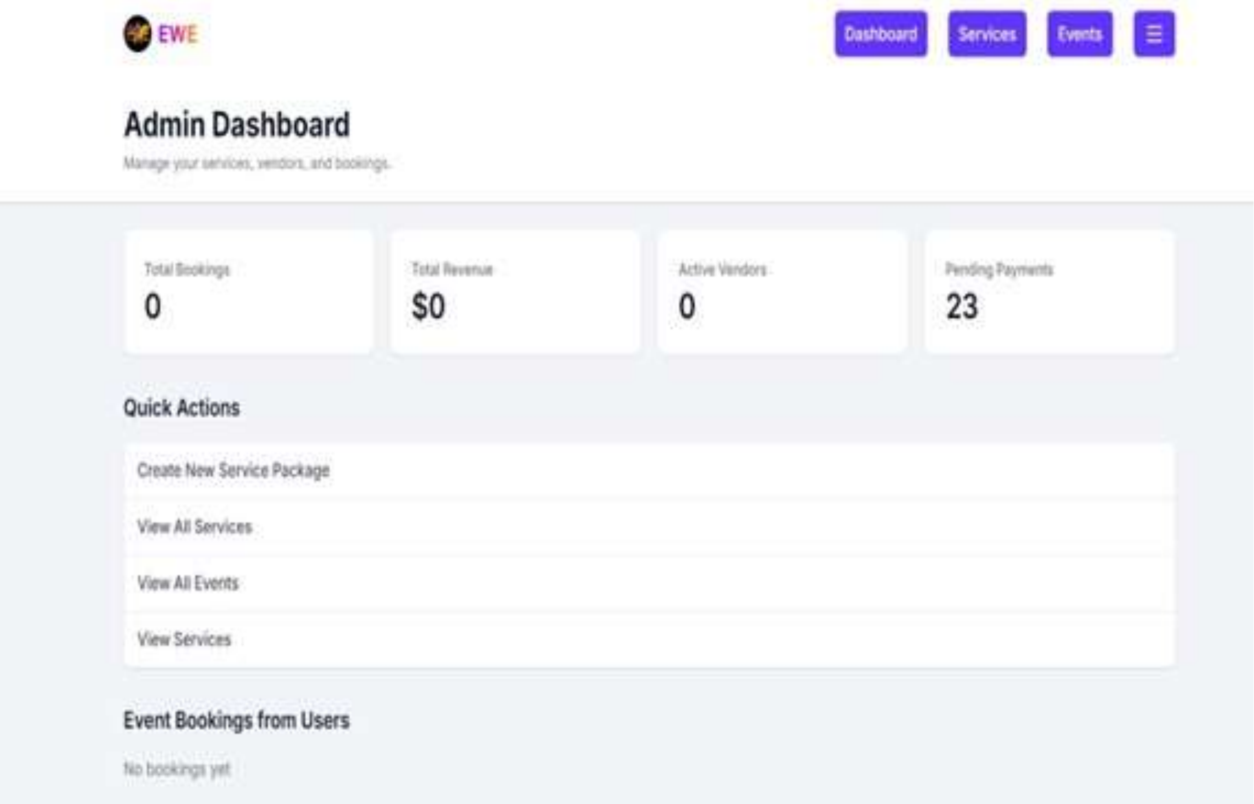
[illegible]

Password

•••••••••••••••

□ Remember me

Figure 7: Sign In of the EVENT WE Event Management Platform



Admin Dashboard

Manage your services, vendors, and bookings.

Total Bookings 0

Total Revenue $0

Active Vendors 0

Pending Payments 23

Quick Actions

Create New Service Package

View All Services

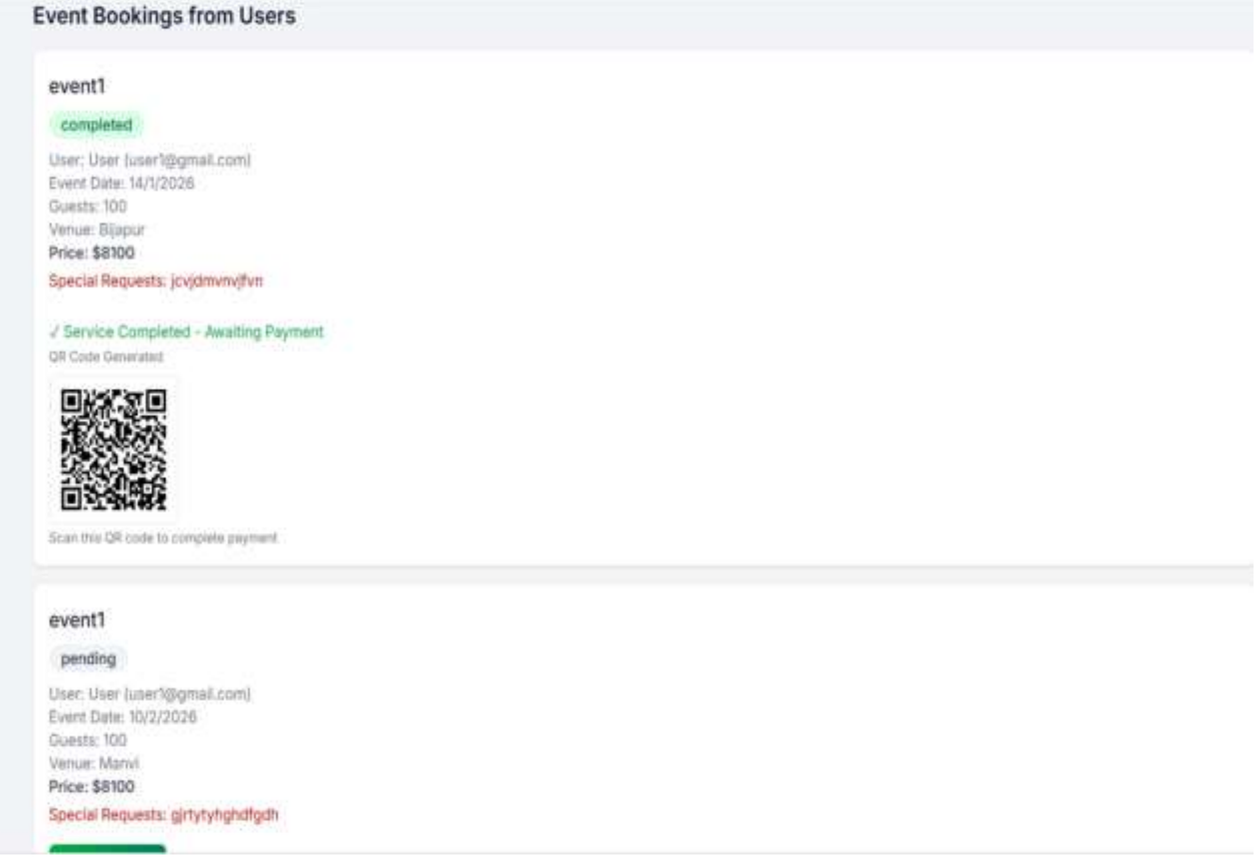
View All Events

View Services

Event Bookings from Users

No bookings yet

Figure 8: Admin dashboard of the EVENT WE Event Management Platform


Event Bookings from Users

event1

completed

User: User (user1@gmail.com)
Event Date: 14/1/2026
Guests: 100
Venue: Bijapur
Price: $8100
Special Requests: jcvjdmvnvjfvn

✓ Service Completed - Awaiting Payment
QR Code Generated

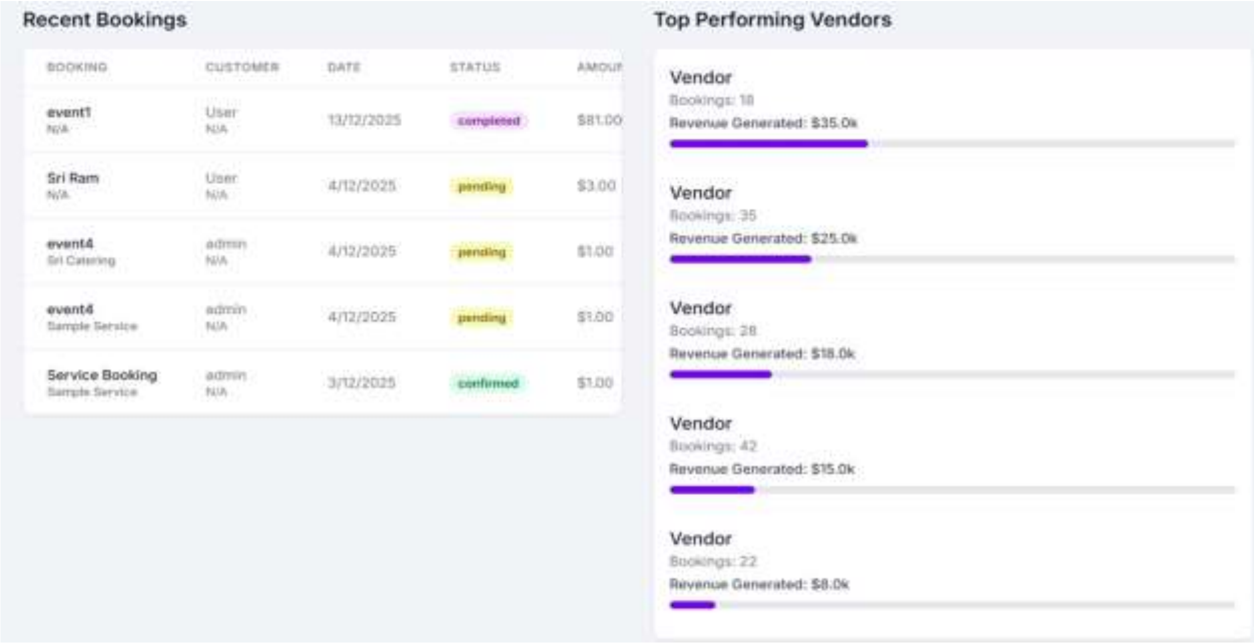
Scan this QR code to complete payment

event1

pending

User: User (user1@gmail.com)
Event Date: 10/2/2026
Guests: 100
Venue: Manvi
Price: $8100
Special Requests: gjrtytyhghdfgdh

Figure 9: Admin dashboard of the EVENT WE Event Management Platform



Recent Bookings

BOOKING	CUSTOMER	DATE	STATUS	AMOUN
event1 N/A	User N/A	13/12/2025	completed	$81.00
Sri Ram N/A	User N/A	4/12/2025	pending	$3.00
event4 Sri Catering	admin N/A	4/12/2025	pending	$1.00
event4 Sample Service	admin N/A	4/12/2025	pending	$1.00
Service Booking Sample Service	admin N/A	3/12/2025	confirmed	$1.00

Top Performing Vendors

Vendor
Bookings: 18
Revenue Generated: $35.0k

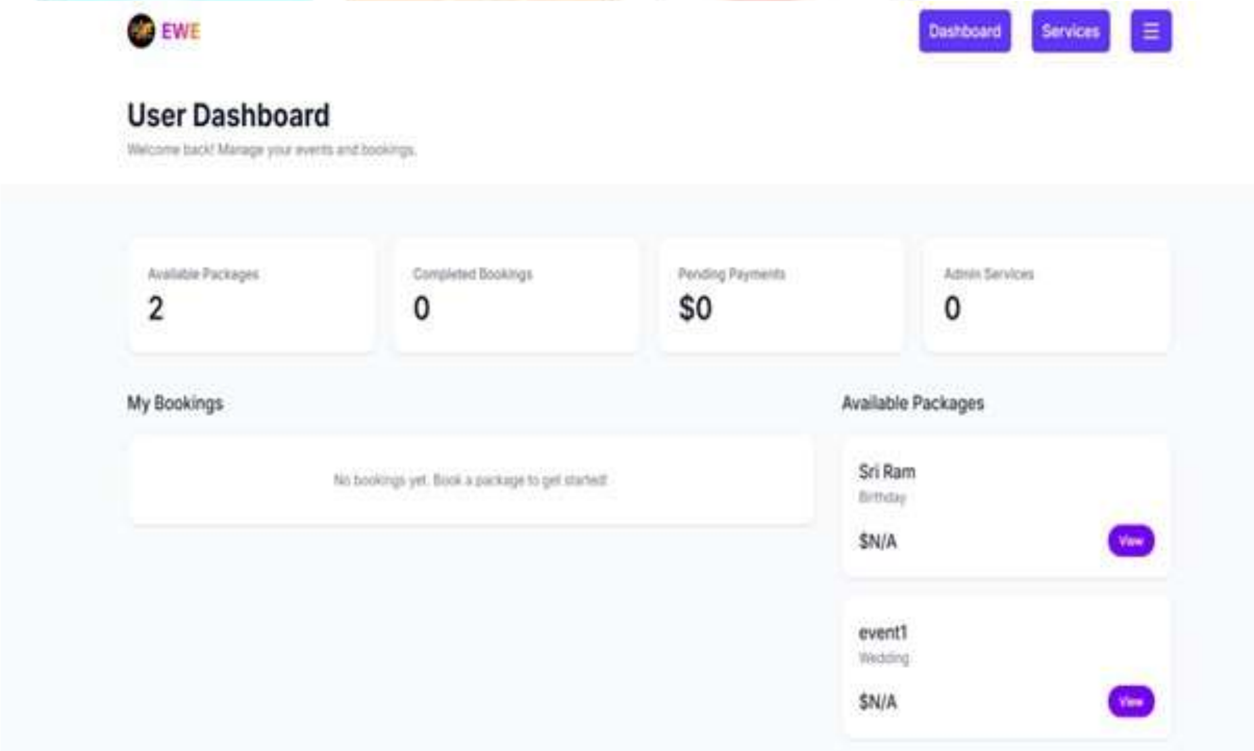
Vendor
Bookings: 35
Revenue Generated: $25.0k

Vendor
Bookings: 28
Revenue Generated: $18.0k

Vendor
Bookings: 42
Revenue Generated: $15.0k

Vendor
Bookings: 22
Revenue Generated: $8.0k

Figure 10: Admin dashboard of the EVENT WE Event Management Platform



User Dashboard

Welcome back! Manage your events and bookings.

Available Packages
2

Completed Bookings
0

Pending Payments
$0

Admin Services
0

My Bookings

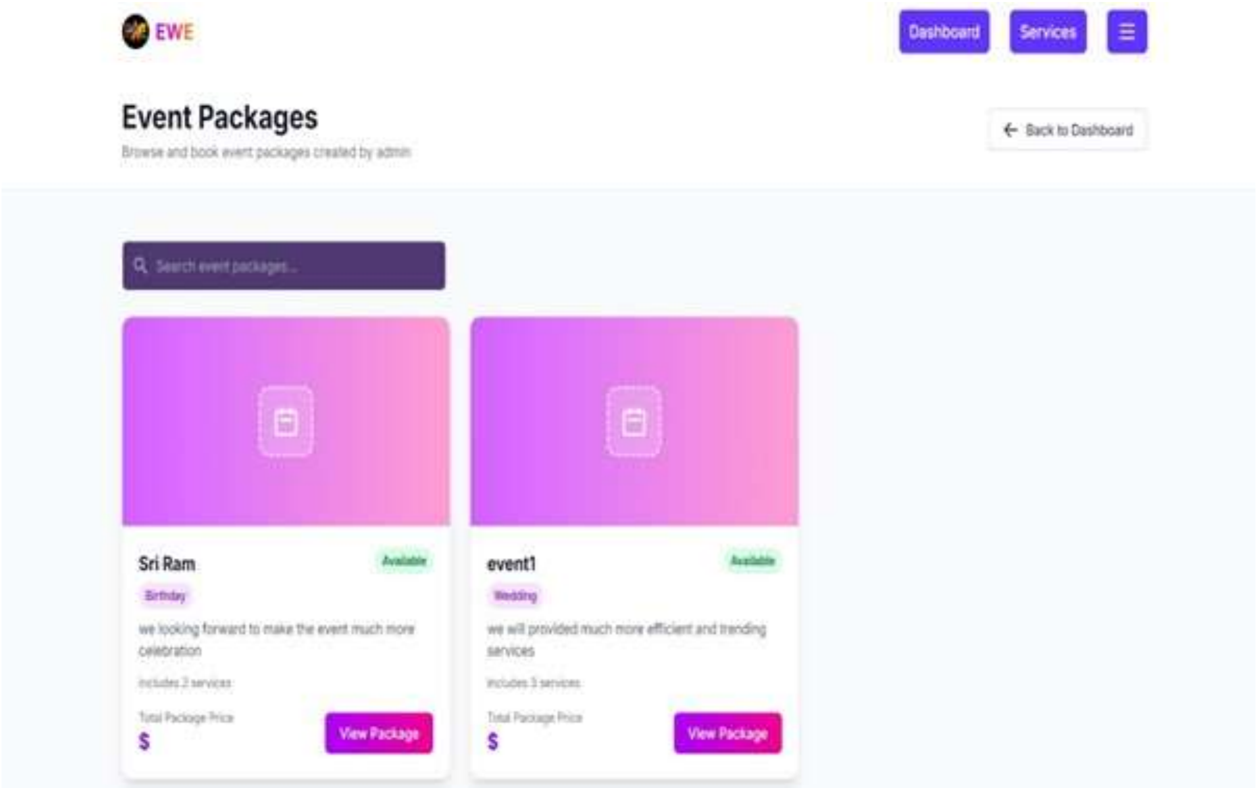
No bookings yet. Book a package to get started!

Available Packages

Sri Ram
Birthday
$N/A

event1
Wedding
$N/A

Figure 11: User Dashboard of the EVENT WE Event Management Platform



Event Packages

Browse and book event packages created by admin

Sri Ram

Birthday

we looking forward to make the event much more celebration

includes 2 services

Total Package Price

$

event1

Wedding

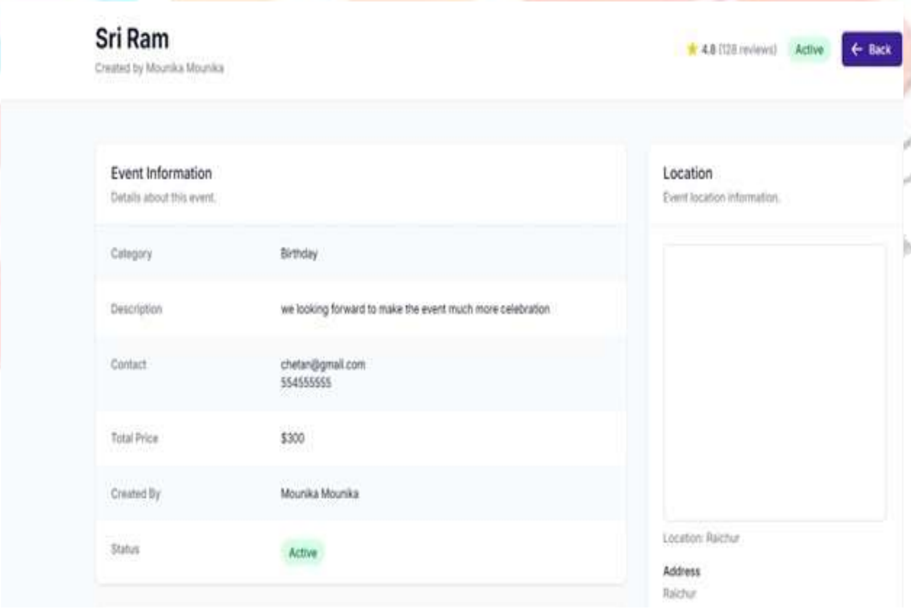
we will provided much more efficient and trending services

includes 3 services

Total Package Price

$

Figure 12: User Dashboard of the EVENT WE Event Management Platform.



Sri Ram

Created by Mounika Mounika

Event Information

Details about this event.

Category	Birthday
Description	we looking forward to make the event much more celebration
Contact	chetan@gmail.com 554555555
Total Price	$300
Created By	Mounika Mounika
Status	Active

Location

Event location information.

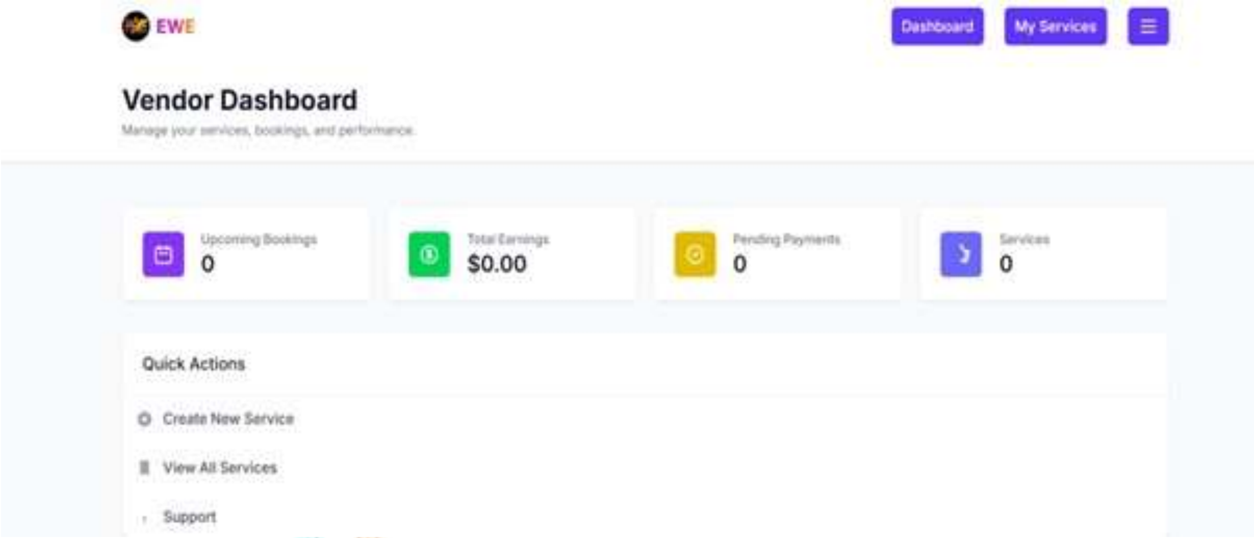
Location: Raichur

Address

Raichur

Figure 13: User Dashboard of the EVENT WE Event Management Platform

Figure 14: User Dashboard of the EVENT WE Event Management Platform



Vendor Dashboard

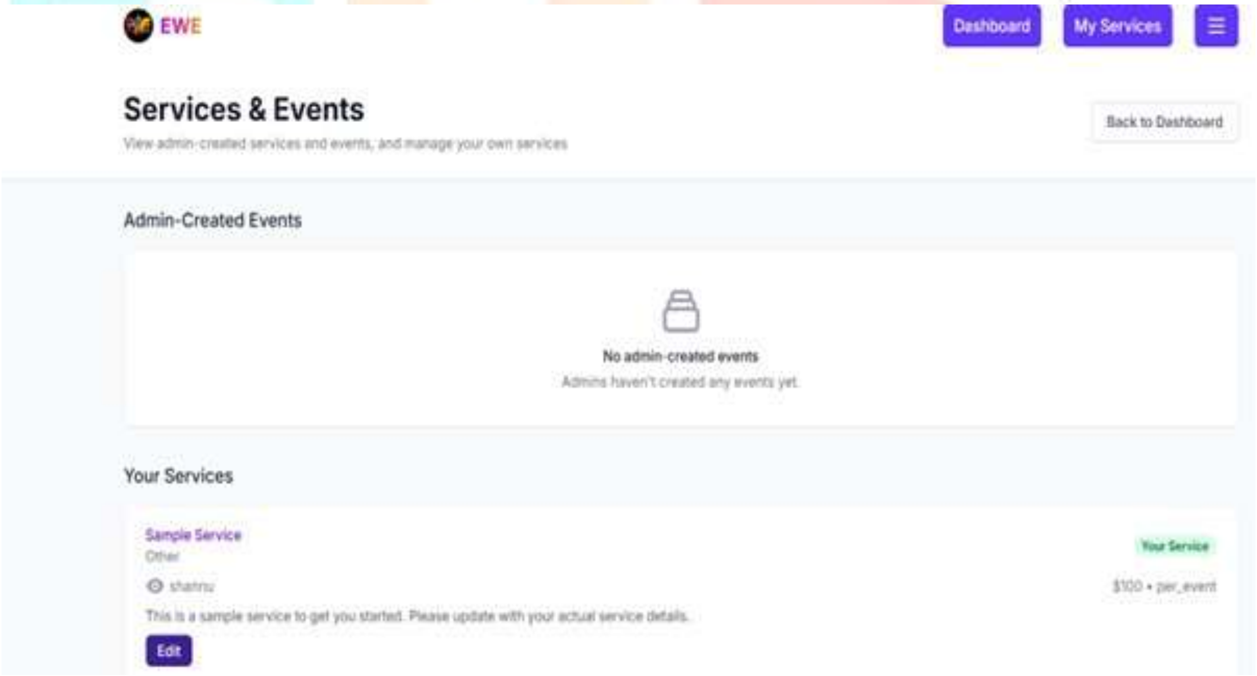
Manage your services, bookings, and performance.

Upcoming Bookings	Total Earnings	Pending Payments	Services
0	$0.00	0	0

Quick Actions

- Create New Service
- View All Services
- Support

Figure 16: Vendor services of the EVENT WE Event Management Platform



Services & Events

View admin-created services and events, and manage your own services

Admin-Created Events

No admin-created events

Admins haven't created any events yet.

Your Services

Sample Service

Other

shatru

$100 • per_event

This is a sample service to get you started. Please update with your actual service details.

6. CONCLUSION

This project successfully presents EVENT WEB Application, a complete and intelligent event management platform designed to address the challenges of modern event coordination. By integrating a modern frontend framework, a robust backend architecture, and real-time communication mechanisms, the system overcomes the limitations of traditional manual and semi-automated event management processes.

7. FUTURE SCOPE

Although the proposed system satisfies current functional requirements, several enhancements can be considered for future development: Deployment on cloud platforms for improved scalability and high availability, Advanced AI-based analytics for demand prediction and vendor performance evaluation, Development of dedicated mobile applications for users and vendors, Multi-language interface support for wider regional adoption, Automated scheduling and conflict resolution mechanisms, Enhanced security features such as multi-factor authentication. Hence, These enhancements would further improve system intelligence, usability, and global reach.

8.REFERENCES

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