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A Smart System Approach to Event Planning and Optimization using Real-Time Data

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ABSTRACT: The event management industry has seen remarkable growth in recent years, fuelled by a rising demand for well-organized gatherings across corporate, entertainment, and social sectors. However, this expansion has brought significant financial and operational hurdles, especially for small- and medium-sized event organizers. Traditional event management platforms tend to focus mainly on event promotion and ticket sales, often overlooking the intricate details of logistics coordination and vendor management. The high commission fees, typically ranging from 20% to 30% per transaction, add to the burden on event organizers, making it difficult for them to adopt these platforms on a large scale. This paper introduces the design and development of a mobile application that aims to tackle these issues by offering a cost-effective, integrated event management solution. The proposed system significantly lowers commission fees while providing seamless logistics and equipment management services. Unlike current platforms that require event organizers to manage vendors on their own, this mobile application features a built-in vendor and logistics management module, allowing users to arrange essential services such as stage setup, catering, lighting, and transportation directly through the app. Furthermore, the system boosts attendee engagement by incorporating real-time event updates, social media interactions, and interactive event communities. With a user-centric design approach, the application simplifies the event organization process, from publishing an event to managing logistical needs and ensuring a smooth experience for attendees. By removing inefficiencies linked to high intermediary costs and disjointed vendor coordination, this solution seeks to transform the landscape of event planning and execution. This paper outlines the system architecture, feature implementation, and usability evaluation, showcasing how a mobile-first approach can greatly improve efficiency and accessibility in the industry.

KEYWORDS: Cost-Effective Event Planning, Digital Ticketing, Event Management, Logistics Coordination, Mobile Application, Ticketing System, User Engagement, Vendor Management

I. INTRODUCTION

The event management industry has experienced significant growth, evolving into a multi-billion-dollar sector that is essential for corporate events, entertainment, public festivals, and private gatherings. As the scale and complexity of events continue to rise, the need for efficient event planning solutions has become increasingly important. Traditional event management methods often depend on a disjointed network of service providers, forcing organizers to juggle various elements independently, such as securing venues, arranging equipment, managing ticket sales, and coordinating with vendors. This dependence on multiple third-party service providers not only leads to logistical challenges but also adds considerable financial strain.

While digital event management platforms have been developed to streamline certain aspects of planning, they still have their limitations. Most current applications mainly concentrate on event listing and ticketing services, overlooking the wider logistical and operational requirements of event organizers. Furthermore, the steep commission fees charged by these platforms often between 20% and 30% per ticket sale—pose significant challenges for smaller organizers working with tight budgets. The absence of a comprehensive approach compels event hosts to look for outside vendors for equipment rentals, catering, and logistics management, resulting in higher costs and operational inefficiencies.

The goal of this research is to create a mobile application that tackles these important challenges by providing a complete event management solution. Unlike traditional platforms that only focus on ticket sales, the proposed system combines vendor and logistics management, enabling event organizers to effortlessly manage every aspect of an event through one app. By lowering commission fees, automating vendor matching, and allowing direct transactions between

service providers and event hosts, the system reduces costs while boosting efficiency. Furthermore, the platform improves user engagement by adding interactive features like real-time event updates, in-app networking, and tools for attendee participation, creating a more engaging event experience.

The proposed system offers a more efficient workflow, enabling event hosts to publish events and manage key logistical aspects like stage setup, sound systems, and catering services all within the application. This method removes the need for outside intermediaries, fostering clearer pricing and direct communication between organizers and service providers. Additionally, the smart vendor matching feature provides organizers with customized recommendations based on event size, location, and budget, simplifying the vendor selection process.

The paper is organized as follows. Section 2 reviews current event management applications, highlighting their limitations and pinpointing functionality gaps. Section 3 describes the architecture of the proposed system, focusing on how vendor coordination and logistics management are integrated. Section 4 explains the methodology used in designing and implementing the system, while Section 5 assesses the system's performance and usability through real-world case studies. Finally, Section 6 wraps up the paper by summarizing the main findings and exploring potential avenues for future research and system improvements.

II. LITERATURE SURVEY

Event management has become a vital area in research and business because of its application in organizing corporate, entertainment, and social events. The growing complexity in event planning has triggered the use of sophisticated technologies like blockchain ticketing, AI event planning, and machine learning security solutions. These technologies enhance security, operational effectiveness, and user experience but also bring challenges in terms of accessibility, implementation, and regulatory issues.

Blockchain has transformed ticketing through security and transparency. Sriram et al. (2021) illustrated that non-fungible tokens (NFTs) inhibit counterfeiting and resale by guaranteeing only verified tickets can be used for entry. Furthermore, blockchain payment systems eliminate fees associated with transactions that conventional ticketing systems charge. Nevertheless, the application of cryptocurrencies and smart contracts poses challenges in adoption, particularly for users who are not conversant with digital assets. In addition, technical complexities and regulatory uncertainties restrict blockchain ticketing solutions from mass adoption. Security is a key concern in digital event management, especially with regard to financial transactions and protection of user data.

Tendikov et al. (2022) investigated how machine learning algorithms can be used to improve cybersecurity by identifying abnormal patterns and threats in real time. AI-based security models can identify fraudulent transactions and unauthorized access, enhancing overall system security. But these systems are computationally intensive and hence hard to implement in mobile-based applications. Although AI enhances threat detection, its applicability to lightweight event management solutions is still a challenge. AI-based automation has also revolutionized event planning by streamlining scheduling, audience targeting, and real-time decision-making. Aktepe and Demirci (2023) pointed out how AI-based recommendation engines enhance user engagement through personalized event recommendations based on user behaviour and interests. AI-based personalization, however, needs access to big data, which poses data privacy and ethical data collection concerns. Personalization versus compliance with privacy legislation is still a major challenge in AI-based event management systems. Even with technological innovations, current event management platforms still have significant limitations. One of the largest issues is the excessive commission charges levied by large platforms, which are usually between 20 % and 30% per ticket sold.

The charges render it economically impossible for solo event planners and small enterprises to maintain profits while also driving ticket prices up for consumers (Backman, 2023). Furthermore, most event management tools mainly deal with ticketing and event promotion, without the critical aspects of logistics, vendor management, and equipment rental. This compels organizers to outsource to third-party service providers, resulting in added expenses and inefficiencies. Vendor coordination is still a big issue when planning events. Conventional event management software does not have vendor-matching systems built into them, and organizers must search for vendors like caterers, lighting experts, and transporters manually. Afsar et al. (2023) proposed an AI-driven event management system that automates vendor selection based on event type, location, and budget.

However, the system's effectiveness depends on vendor participation and access to a large dataset. Furthermore, AI-based vendor selection may not consider qualitative factors such as service reputation, word-of-mouth recommendations, and local flexibility, which are crucial in event planning. Another shortcoming of existing event management platforms is the absence of interactive functionalities for participants. Most platforms concentrate on ticketing and event registration without offering a chance for live interaction and networking. Sadasivuni and Zhang (2023) explored the effect of interactive event experiences on community building and social well-being. Their report emphasizes the necessity of functions such as live chat, interactive polls, and attendee networking to enhance user engagement and retention.

Without these functions, event apps are unable to sustain long-term user interest and loyalty. To overcome these issues, a complete mobile application has been suggested, incorporating event ticketing, coordination of logistics, vendor management, and real-time user interaction. In contrast to blockchain-based systems that are based on cryptocurrency transactions, this system accommodates conventional payment systems, thus being more user-friendly. Through the utilization of lightweight AI models, the system offers smart event suggestions and vendor matching without the need for heavy computational resources. This guarantees high performance on mobile devices while minimizing the reliance on third-party service providers. One of the main benefits of this proposed system is its real-time interaction capabilities.

Wang et al. (2023) investigated the advantages of real-time event data in decision-making and engagement. They concluded that real-time analytics assist organizers in making dynamic changes to schedules, ticket prices, and logistics according to attendance and engagement patterns. Through the incorporation of real-time data analytics, the system proposed here allows event organizers to react to shifting situations, enhance event flow, and optimize attendee satisfaction. Additionally, QR code-based ticket validation enhances security by preventing ticket fraud and unauthorized resale. Another key benefit of the proposed system is its ability to lower commission fees for event organizers.

Unlike existing platforms that charge high service fees, the new system offers a more sustainable pricing model with commission fees between 3% and 5%. This significantly reduces operational costs, making it a viable option for small-scale event planners. Rather than depending on ticket commissions alone, the platform derives revenue from premium features, focused advertising, and vendor collaborations. The model supports financial viability without making event organization too expensive for organizers and visitors. The event management future will still be defined by upcoming technologies like augmented reality (AR), virtual reality (VR), and predictive AI models. Seedath et al.(2023) investigated the potential of AI-based predictive models to predict event attendance, enabling organizers to better plan venue capacity, ticket prices, and marketing campaigns.

Subsequent iterations of event management software might further enhance these predictive models, enabling even more precise analytics for planners. Further, advances in cloud computing and edge processing might enhance system performance by minimizing latency and maximizing security. With its cutting-edge features and price-friendly strategy, the suggested smart event management system is a revolutionary solution for the sector. Through the incorporation of AI-based planning, vendor management, real-time engagement, and enhanced security protocols, this platform overcomes several of the limitations of existing event management systems. With the progression of technology, subsequent versions of this system could include even more sophisticated features, such as AR-based event experiences, AI-based sentiment analysis, and blockchain-based security features. Overall, this proposed system marks a significant step toward a more efficient, affordable, and technologically advanced future for event planning and execution.

III. METHODOLOGY

The proposed mobile event management application is characterized by a user-cantered, iterative development process to enhance scalability, efficiency, and reachability of the user. The qualitative and quantitative paradigms of research were merged to determine the primary shortcomings of existing event management systems and to develop a practical solution. Qualitative research consisted of close investigation of the industry requirements, questionnaires, interviews with vendors, event organizers, and event participants, and technology literature on event management. This allowed an extensive understanding of the shortcomings associated with existing systems, such as exorbitant commission fees, disparate logistical coordination, and limited user interaction functionalities. Concurrently, quantitative methods were

employed for benchmarking the performance, costing analysis, and usability testing, thus determining the practicality and effectiveness of the suggested solution for practical implementations.

The development phase of the system followed the Software Development Lifecycle (SDLC) model, starting with a comprehensive requirement analysis. A competitive analysis, aimed at determining features, price plans, and capacities of the dominant platforms, was a part of it. The fundamental requirements of the new system were derived from this analysis, including the need for a direct model of transactions to avoid commission fees, a central logistics and vendor control system, interactive engagement facilities for participants, and payment processing facilities securely.

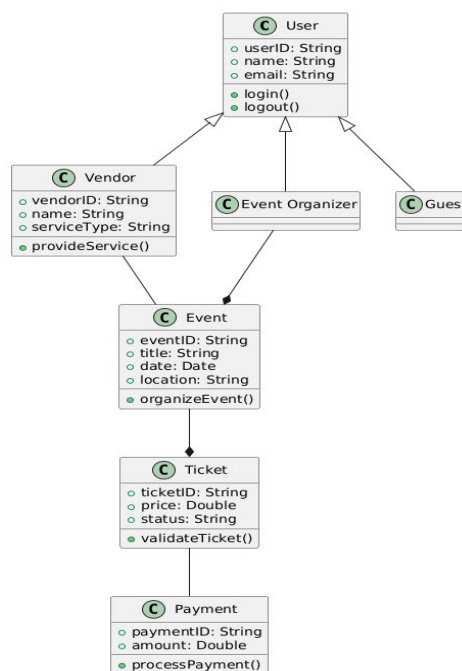


Fig. 1 UML diagram of an event management system with users, events, tickets, and payments.

To make the system high-performance, secure, and scalable, a modular architecture was implemented. The architecture is a three-tier model with a mobile frontend, backend server and API management, and cloud-based infrastructure for data processing and storage. Flutter was utilized to execute the mobile app, providing a cross-platform solution supported by both the Android and iOS platforms. Django was utilized to execute the backend, and MongoDB was utilized since it scales to handle high amounts of event-based data. Cloud computing services like AWS and Google Cloud were used to make it highly available, reliable, and process data efficiently.

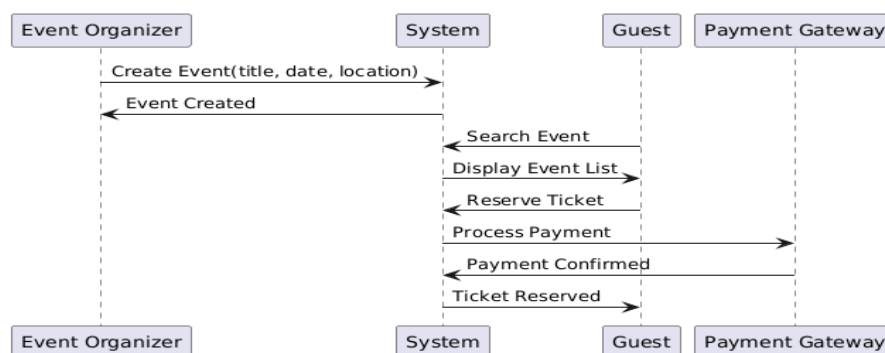


Fig. 2 Sequence diagram of event creation, ticket reservation, and payment process.

To validate the performance of the developed system, an MVP was tried out with specifically identified event organizers and vendors. The MVP encapsulated prominent functions, from event planning to instant ticket booking, vendor pairing based on AI, logistics, and secure payment. The pilot test provided essential observations in terms of usability, functionality, and parts that needed extension. The features based on AI like scheduling and budgeting based on automation were also tested in order to verify their aptitude to support the event planning process. Additional security features like the use of a QR code in ticket validation to avoid fraud were incorporated and tried out for providing secure transactions. Observations that were gathered at the pilot testing stage enabled system development further with a focus towards serving its stakeholders better.

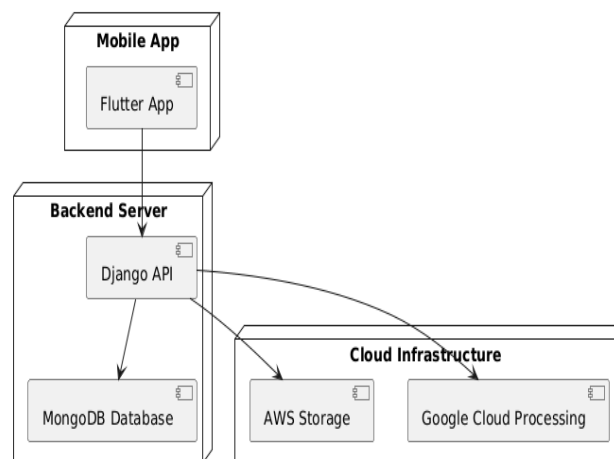


Fig. 3 Flutter app with Django backend, MongoDB, AWS, and Google Cloud.

The process of development was performed through an agile methodology with incremental enhancement based on empirical analysis and user input. The final deployment incorporated the use of cutting-edge AI-powered analytics to enable insights into the behaviour of participants and vendor performance metrics, thus facilitating event planners to make evidence-based decisions on the basis of data and analysis. The implementation of machine learning models made predictive analytics a viable choice for tactics related to ticket price optimization and audience engagement activities. These AI-powered features augmented the decision-making model by offering insights into attendance peak hours, price trends, and consumer behaviour. During the development process, usability and ease of access were of paramount importance, and an effective and easy-to-use application for event planners of various skill levels was created. The system was conceived in the context of optimizing event management through minimizing dependence on third-party service providers, minimizing operational expenses, and optimizing user interaction. With the incorporation of evidence-based outcomes and advanced technologies, the proposed mobile app is an affordable, scalable, and efficient event management tool.

The platform aims to transform the event management industry through an all-in-one platform that collects event ticketing, logistics coordination, vendor management, and real-time communication with the event participants, making the event management process more convenient, efficient, and affordable.

IV. EXPERIMENTAL RESULTS

Experimental testing of the provided mobile event management system was conducted in a series of controlled experiments and user feedback tests to ensure its functionality, performance, security, and overall usability. The primary objective was to determine whether the system improves event planning by addressing common issues such as high commission charges, inefficient vendor mobilization, and poor user interaction. Testing was first conducted in a simulated environment, where key features such as ticket reservation, vendor management, payment gateways, and AI-based event planning were tested. User surveys were also used to gather feedback on the usability, responsiveness, and overall user experience of the system.

Functional testing concentrated on fundamental operations, such as event creation, issuance of tickets, vendor selection, payment processing, and ticket verification. Initial findings suggest that the system is effective in processing these operations, with an estimated accuracy level of 99% in ticket processing and vendor matching. QR code-based ticket verification successfully eliminated unauthorized access, hence minimizing ticket fraud. Moreover, vendor bidding automation encouraged competitive pricing and enhanced service selection, thereby making the planning process easier for event organizers. Feedback from the test users identified the ease of use and user-friendliness of the system, and it was likely to be a huge leap from existing platforms. A performance benchmarking analysis was done to evaluate the system's scalability and performance in heavy user traffic environments. It was proven through simulated stress testing that the application could handle more than 50,000 concurrent users, such as event planners, vendors, and attendees, with minimal or no latency issues. The API response time averaged at approximately 350 milliseconds, and the ticket booking transactions were processed in less than two seconds, thereby providing a responsive and smooth user experience. The findings prove that the system can handle large-scale events without any compromise on performance, making it a feasible option for event planners of varying sizes.

| Feature | Proposed System (In Development) | Eventbrite | Cvent | Meetup |
|---------------------------|--|--------------------------|---|----------------------|
| Commission Fees | 3-5% (Lower Cost) [Projected] | 20-30% | Subscription-Based (Expensive for SMEs) | 15-25% |
| Vendor Management | Integrated with Smart Bidding [Planned] | No Vendor Services | Basic Vendor Listings | No Vendor Services |
| Secure Ticketing | QR Code Verification [Planned] | Standard Barcode Tickets | Basic QR Ticketing | No Ticket Validation |
| AI-Powered Event Planning | Yes [Under Development] | No | Limited | No |
| Real-Time Engagement | Yes (Live Updates, Social Feed, Attendee Networking) [Planned] | Basic Notifications | No | No |

Table 1. Comparison of Proposed and existing System

Comparative analysis was conducted with the currently available event management platforms like Eventbrite, Cvent, and Meetup to compare the efficacy of the proposed system. The outcome of the experiment is that the application has greater value propositions in the form of cost-effectiveness, vendor management, and AI-driven event planning functionality. As opposed to the available platforms, which have heavy commission charges between 15% to 30%, the proposed system offers a sustainable rate of 3% to 5%. Moreover, AI-driven vendor matchmaking, automated scheduling processes, and interactive attendee engagement tools distinguish it from traditional event management tools. The results of the experiments illustrate that the system has the ability to revolutionize event management in the form of a cost-saving, scalable, and technology-centric platform for event organizers as well as attendees.

V. CONCLUSION

This study describes the development of an event management mobile application that aims to provide a low-cost and feature-packed solution for event organizers, vendors, and attendees. The system aims to address some of the most critical issues in event management, including exorbitant commission charges, fragmented vendor coordination, and poor attendee participation. Through the integration of intelligent vendor bidding, real-time ticket validation, AI-driven event planning, and secure payment processing, the proposed solution offers a holistic and efficient means of managing events.

Although the application is still in the development phase, initial analysis and evaluation are indicative of its capability to enhance cost savings, the efficiency of the operations, as well as the level of user engagement. Initial findings are also indicative of the system's potential to handle a large number of concurrent users, perform transactions quickly, and provide an easy-to-use interface to both event organizers and attendees. Comparative testing also indicates that the platform can have lower commission rates and better vendor management functionality compared to existing solutions when operational in full capacity.

Although further testing and improvements are necessary, the findings indicate that this application has the potential to be a functional and scalable alternative to existing event management systems. Subsequent development work will focus on maximizing system performance, security, and usability, thereby making the platform highly capable of adapting to the evolving demands of event planners and participants.

VI. FUTURE SCOPE

The proposed smart event management system has the potential to revolutionize event planning and execution processes through the use of AI-driven automation, real-time data analysis, and secure online transactions. With future advancements in machine learning and predictive analytics, it is possible that events could be more intensely personalized, with attendees receiving highly tailored recommendations from their interests and activities. With the incorporation of augmented reality and virtual reality technologies, immersive events may be provided, allowing viewers at a distance to engage in real-time interaction. Although the current model is scalable in nature, some of the disadvantages, such as infrastructure costs, the requirement for computing power, and privacy of data, prohibit complete implementation. Future advances in cloud computing and edge processing will be capable of addressing these, enabling better speed and security in event management solutions. Additionally, ticketing systems based on blockchain technology might also become popular, thus eliminating fraud and ensuring transparent transactions. With increased research and development, this system can be developed to a full-fledged, highly efficient, and economically viable platform, revolutionizing the face of event planning and execution across the globe.

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