ViBE: A Mobile Application for Easy Venue Booking with AR and AI Recommendations

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**Abstract.** The existing venue booking system at Multimedia University (MMU) is currently outdated, inefficient and has limited accessibility. The current system is not suitable for mobile users and only academicians and administrators are allowed to make room bookings. Students, on the other hand, must make manual bookings, which are ineffective and will not be getting immediate results. The MMU Venue Booking System (ViBE) is a proposed mobile application that offers real-time availability, an intuitive user interface and role-based access for academicians, administrators and students. ViBE aims to transform the current booking system into a more convenient system that allows users to view, book and manage booking across devices. Before booking, users can use their smartphones or tablet camera to preview the room virtually, helping them to make better and more informed decisions. ViBE is developed using the SwiftUI framework which supports multiple Apple platforms with a single codebase. Augmented Reality (AR) features implemented Xcode with ARKIT integration have been used in the system to enhance user experience by providing immersive environment. Furthermore, ViBE Assist, an intelligent Large Language Model (LLM) has been included in the system to assist users based on user preferences, event requirements and contextual data. ViBE delivers a modern and efficient system which aligns with digital transformation by reducing administrative workload, streamlining the booking process, enhancing accessibility and integrating intelligent technologies. This paper outlines the limitations of the current system and proposes a new system that leverages emerging technologies.

# INTRODUCTION

In the era of digital transformation, many higher education institutions are still depending on their existing system or legacy systems which are outdated in terms of accessibility, automated notification and smart assistance. Venue booking systems are one of the digital infrastructures that should evolve in alignment with the latest operational requirements and user expectations.

The existing venue booking system at Multimedia University (MMU) has limited accessibility and lacks functionality. Academicians and administrators can use the system to book the venue, but students need to use manual procedures through faculty administrator. When the system excludes students from gaining access to the venue booking system, it increases the administrative burden and students’ dissatisfaction due to the delays in receiving the booking result. Additionally, the system does not support real-time availability checking, has a non-intuitive user interface and lacks smart assistance.

The implementation of ViBE is aligned with MMU’s strategic commitment to digital innovation and resource optimization. It aims to improve service accessibility, reduce the administrative workload and enhance overall user experience. ViBE integrates advanced features such as real-time venue availability tracking, an intuitive graphical user interface, role-based access control, AI-driven venue recommendations and AR-based room previews.

Importantly, ViBE is aligned with national digitalization efforts under Malaysia government. By leveraging AI and AR technologies, ViBE supports the goals of the National Artificial Intelligence Roadmap 2021-2025 [1] which emphasize smart, inclusive and efficient public service solutions through the adoption of Fourth Industrial Revolution (4IR) technologies. ViBE is not just a solution for MMU’s internal challenges, but a forward-looking initiative that contributes to the country’s vision of a more digitally empowered society.

# literature review

The evolution of the booking system in education and facility management has moved beyond basic digital scheduling to advanced technologies like AI and AR. These innovations are transforming user experience, operational efficiency and personalization in booking environments. Multiple studies document the transition from manual or email-based reservation processes to automated, web-based systems. A pilot was conducted using Google Calendar, emphasizing integration with existing platforms for ease of use and adoption [2]. Similarly, the focused on the technical architecture of online booking systems, underlining the importance of real-times updates, slot management and database integration for reliability and scalability [3],[4].

AI is reforming booking systems through tasks automation, user experiences personalization and resources allocation optimization. AI-powered tools such as intelligent booking agents and chatbots enable natural language interactions, allowing users to make reservations through conversational interfaces across multiple platforms (web, WhatsApp, phone) [3]. AR technology overlays digital information onto the real world, creating immersive and interactive experiences within booking platforms. In hospitality and tourism, AR enables virtual tours of rooms and venues allowing users to explore spaces in detail before making a reservation [4]. This not only builds trust but also helps customers make decisions.

The GoHoliday mobile application leverages both AI and AR to transform the boutique hotel and resort booking experience. AI-driven features such as instant multilingual responses, predictive guest insights and automated upselling allow the system to tailor recommendations, streamline bookings and boost revenue without human intervention [5].

The MMU CLiC System is web-based and restricted to academicians and administrators, excluding students from direct bookings. It lacks real-time availability, automated notification and mobile access. Manual approvals are required, contributing to booking delays and administrative overhead. The system’s outdated interface and limited functionality provide an unsatisfactory experience for the user and might affect operational efficiency especially room optimization.

Similarly, UMPOINT at University Malaya (UM) only allows academicians and administrators to do online bookings while students need to make manual bookings. Manual booking can lead to double bookings, lack resources optimization and does not provide instant updates or feedback . The manual approval workflows always end with user dissatisfaction. The absence of student access and a mobile-friendly interface restrict its effectiveness as a modern reservation tool [6].

The USMbiz Space Rental System is designed primarily for commercial events rather than academic events. It features a complex interface, multi-stage manual approval and payments process that requires physical visits to the finance department. The system excludes students from initiating bookings and is not optimized for mobile platforms which further reduces accessibility and convenience [7].

The outdated user interface, limited accessibility, manual workflows and the absence of automation and intelligent features are the recurring issues across all three systems that have been observed. None of the systems offer a mobile-centric experience or real-time booking capabilities [6],[7]. These gaps underline the need for a more inclusive, efficient and intelligent solution. The proposed MMU Venue Booking System (ViBE) introduces a mobile application with role-based access for academicians, administrators and students. It integrates real-time availability, automated notifications and intelligent recommendations through AI, while enhancing via features like AR previews. ViBE aims to modernize the booking experience, reduce the administrative burden and support MMU’s broader digital transformation goals.

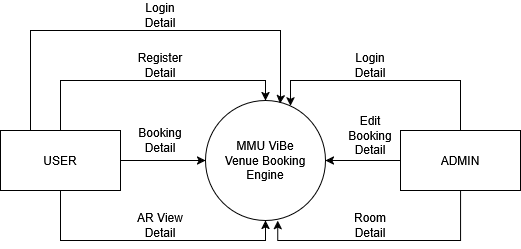
# methodology

The design of ViBE involved a systematic approach comprising user research, prototyping and iterative testing. The system is built using SwiftUI framework, ensuring compatibility across various Apple platforms and delivering a modern user interface. Role-based access is central to the design which allowing different functionalities for academicians, administrators and students. This study adopts a qualitative, design-based research methodology to develop ViBE which is aims to resolve the limitations of existing MMU CLiC System. The project began with comparative analysis and user feedback on existing systems at MMU to identify issues such as limited user access, manual approval process and outdated interfaces. Data was collected through observation, informal interview and reviews of similar system, then analysed thematically to define key system requirements. The development was guided by user-centred design principles and modelled using context diagrams, data flows diagrams and entity relationship diagrams. SwiftUI framework with a single codebase and Xcode with ARKIT integration were used to build the system which was tested on iOS devices to ensure usability and performance. Ethical considerations included informed feedback participation, secure handling of booking data and the use of MMU credentials to maintain confidentiality and role-based access. The methodology was chosen for its flexibility and practical focus, ensuring the final product aligns with user needs, enhances operational efficiency and modernizes MMU’s venue booking experience.

# system design

## Context Diagram

The context diagram illustrates the high-level interaction between the entities of the ViBE and the system itself. The ViBE processes information related to user authentication, venue bookings, augmented reality view and room management. Figure 1 shows the connection between the system and its external entities, namely users and admin. It shows two main entities interacting with the core systems represented by a circle. For system access, Login Details are sent to the system to authenticate the user or admin. For new users, Register Details are sent to the system for account creation. After successful login, the user will receive the AR View Detail, an augmented reality depiction of the available venue and can proceed with the Booking Details to book a venue. On the other hand, the admin can enter Room Detail, contain venue information and availability. Moreover, the admin may manage and receive editing details, implying administrative control and modification to current bookings. User bookings and administrative actions within the ViBE venue booking system are shown from this high-level perspective outlining the necessary data transfers.



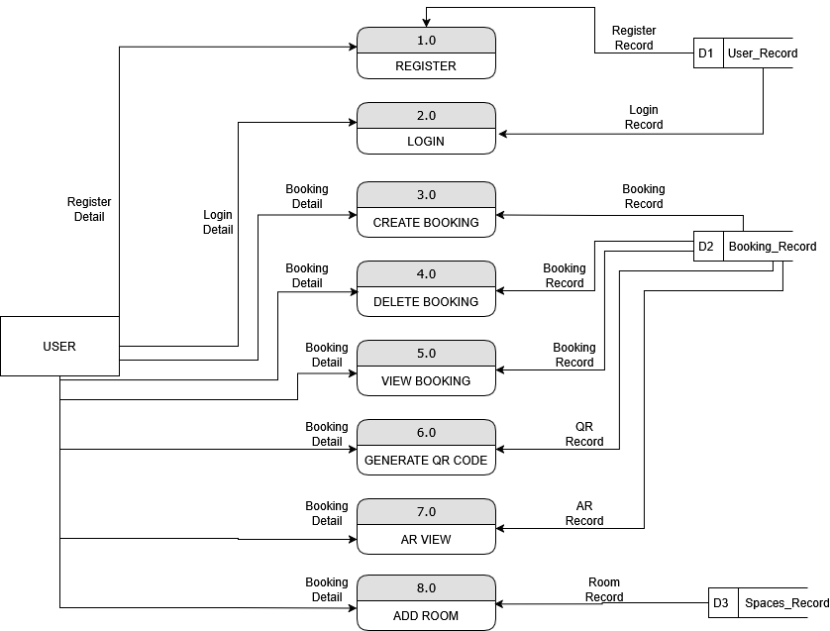
**Figure 1.** Context diagram

## Data Flow Diagram

Figure 2 represents the internal processes of ViBE highlighting the interaction between the systems and the entities as well as the flow of data between processes and data stores. This DFD provides a detailed overview of the key functions within ViBE system focusing on how data is processed and stored. It demonstrates the logical flow of data and supports system analysis, development and validation.

# proposed system

The development of ViBE is anticipated to improve user satisfaction by providing an efficient booking mechanism, thereby increasing user engagement among students, academicians and administrators. Furthermore, the systems aim to reduce reliance on manual booking processes while minimising the administrative tasks and improving operational efficiency across the university. Figure 3 shows different ViBE interfaces which is (a) registration screen used for new user registration, (b) the venue screen used for users to view venue details and (c) the verification screen used by admin to verify or cancel booking.



**Figure 2.** Data flow diagram

Screens screenshots of a phone

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1. (b) (c)

**Figure 3.** ViBE interface - (a) Registration screen (b) Venue screen (c) Verification screen

## Augmented Reality (AR) View

The AR feature allows users to preview the room virtually before booking, helping them make better and more informed decisions. For the AR View component, ARKit was utilized. ARKit is a framework available in the SwiftUI SDK specifically designed for implementing features involving AR and 3D objects. Some of the 3D models used were created manually while others were sourced from non-copyrighted repositories available online. These 3D models are stored on GitHub as a cost-effective alternative to paid server storage, which can be expensive. Storing them directly within the apps as assets would significantly increase the application’s size. Therefore, hosting the models on GitHub provides a practical balance between accessibility and storage efficiency. During the space creation process, administrators are provided with an interface within the application to upload 3D models. Once the room setup is completed, the application automatically uploads the associated 3D model to GitHub. In general, all storage related operations, particularly for 3D content, are handled via GitHub integration. Figure 4 shows how users use AR function in the system and Figure 5 is an example of AR View.

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**Figure 4.** ViBE interfaces – How to use AR function

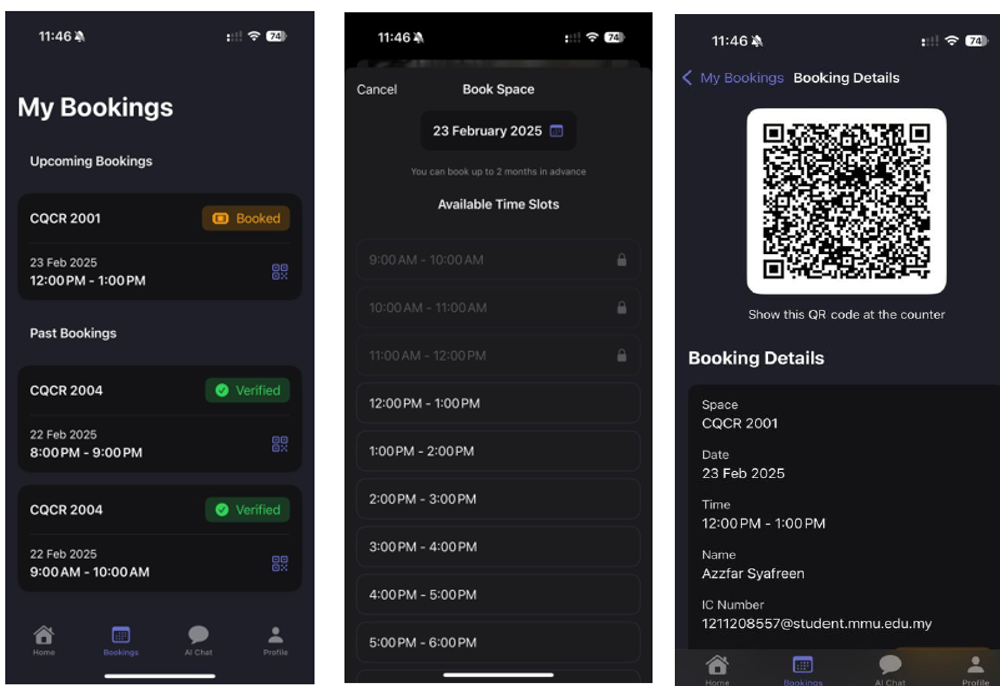
A classroom with chairs and a chalkboard

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**Figure 5.** ViBE – Example AR view

## Real-Time Availability Checks

Users will be notified instantly of any changes to their booking status such as approval, rejection or cancellation as shown in Figure 6(a). Additionally, users can view and book available venues instantly, minimizing the potential for double bookings as shown in Figure 6(b). To address the communication gaps identified in the current venue booking system at MMU, ViBE mobile application will incorporate a real-time notification module. This feature is designed to enhance user engagement, reduce booking conflicts and minimize administrative workload by automating key aspects of user communication. Figure 6(c) shows that upon successful booking, users will receive immediate confirmation through in-app notification which will include a QR code. The system will also prompt users to add the booking to their calendar, eliminating the need for manual confirmation by administrative staff. These updates will reflect in real time on both user interface and the administrative dashboard.



(a) (b) (c)

**Figure 6.** ViBE Interfaces - My booking screen (a) Booking history (b) Available slot for booking (c) QR code after booking

## AI Assistance

An AI-powered assistant is integrated to help users select the most suitable room based on their specific needs and preferences, thereby enhancing decision-making and streamlining the booking process. Initially, the AI Assist feature was designed to operate using local LLM, with the model running directly on the user’s physical device rather than relying on a server. However, this approach presented several significant limitations. Larger LLMs which typically provide better responses could not be used due to hardware constraints. This led to issues such as AI hallucinations, lack of short-term memory and limited device compatibility. As a result, the AI often gave incorrect answers especially when users asked follow-up questions. For example, it might suggest rooms that do not exist in the system. To address these problems, the system was migrated to a server-side approach using Gemini by Google. This change brought noticeable improvements, including a significant reduction in hallucinations and more accurate AI responses. In the revised architecture, AI Assist retrieves relevant data from backend database tables and supplies it to the Gemini model. This context-aware integration enables the AI to generate accurate and meaningful responses based on real system data, significantly enhancing overall performance and user satisfaction. Figure 7 shows the conversation between user and AI Assist.

# CONCLUSION

The MMU Venue Booking System (ViBE) was developed to address the limitations of the existing MMU CLiC system which was outdated, inefficient and excluded students from making direct bookings. By introducing a modern, mobile-friendly platform with real-time availability checks, role-based access control and an intuitive interface, ViBE streamlines the booking process, reduces administrative workload and enhances user engagement across academicians, administrators and students. It successfully meets its objectives by increasing system accessibility, improving the user interface for smoother experiences and reducing the need for manual in-person booking. Looking ahead, several future improvements are planned to keep ViBE aligned with emerging technologies and user needs. These include AI-powered features such as smart venue recommendations, conflict resolution, chatbot support and predictive analytics to optimize booking and user experience. Enhancements will also focus on stricter role-based access, real-time push notifications for updates and confirmations and expanded functionality to include equipment booking with inventory and check-in or check-out tracking. Additionally, integration with MMU’s Single Sign-On (SSO) will streamline authentication, improve security and ensure accurate role assignments. Together these upgrades will make ViBE a more powerful, secure and user-centric system paving the way for smarter campus resources management.

A screenshot of a phone

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**Figure 7.** ViBE interfaces - AI Assist

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