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iSmashON: A Mobile Application for Social Networking and Badminton Court Booking

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ABSTRACT

Badminton is a thrilling and competitive sport that has gained popularity across the world, attracting players of all ages. The sport fosters social interaction among players which helps create friendships and engagement within a community. Although many local sport centres provide badminton courts, some facilities lack a systematic way to handle bookings. The booking process can be frustrating and time-consuming. This may result in delayed replies, miscommunication and conflicting booking information. In this paper, we present iSmashON, a mobile application developed to simplify the booking process by providing systematic way of booking badminton courts, chat with other players and manage bookings. It features real-time availability updates and personalized notifications. The development encompasses four phases which are requirement analysis, design and development, testing and refinement. The evaluation of the developed mobile application is done using Technology Acceptance Model (TAM) that considers four components which are Perceived Ease of Use (PEU), Perceived Usefulness (PU), Attitude (ATT) and Behavioural Intention (BI). Questionnaire with 13 questions is prepared and distributed over 30 respondents with at least one-year experience of playing badminton. Results from the TAM evaluation shows a favourable attitude among respondents towards using the mobile application as a medium for booking badminton courts. This is drawn by the highest mean score obtained from ATT component. It is believed that the iSmashON application is expected to enhance the booking experience, providing more efficient and user-friendly process that will be benefited by badminton community.

1. INTRODUCTION

Badminton is a fast-paced and thrilling sport that can be enjoyed by people of all ages. It requires a combination of speed, agility, power and precision. It also played at both amateur and professional levels

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worldwide. It is a great social sport that can be enjoyed with friends and family. The sport also offers a significant physical and mental health benefits such as improves cardiovascular health, increases muscle strength and flexibility also enhances hand-eye coordination and reflexes.

Maintaining a healthy lifestyle is essential for anyone who want to excel in their life and carrier. Numerous lifestyle illnesses can be prevented and treated by engaging in physical exercise (Bueno et al., 2018). The benefits of a healthy lifestyle extend beyond physical health well-being, leading to reduced diseases and improved body fitness. Physical activity has a significant impact on both physical and mental health, particularly for older people living in highly developed countries (Zubir et al., 2022). Regular participation in racquet sports like badminton has the lowest risk of cardiovascular diseases and the lowest all-cause mortality (Chao et al., 2021).

Access to a proper space and facility for playing badminton can provide a convenient way to enjoy the sport and prevent unexpected injuries. Various facilities with badminton courts provided by local sports centres, private clubs and community organizations. Players can book to ensure they have a reserved spot for their games. However, booking badminton courts can be time-consuming and inconvenient especially the facilities that require players to make phone calls or visit in person to check availability and book a court. Most badminton players find the manual booking process can be highly time-consuming and frustrating (Mendis & Rathnayake, 2020). Slow response times and ignored calls frequently result in booking cancellations and reduced participation in this sport. Additionally, many existing systems lack comprehensive features within a single application to assist users in booking badminton court. This situation may discourage players from participating in badminton and maintaining a healthy and active lifestyle.

Therefore, in this paper, we present a mobile application to assists users in the process of booking badminton courts. The mobile application, named iSmashON aims to provide a convenient and efficient way for users to book courts, communicate with other players and manage their bookings. It also features checking for court availability from various facilities, review past and upcoming bookings history and QR-code for court check-in at the facility.

2. LITERATURE REVIEW

2.1 Challenges Faced by Badminton Enthusiasts

Badminton is a sport that has been relished for many years by people of all ages and backgrounds. It also provides numerous physical and mental benefits and is valued by people all over the globe. Badminton enthusiasts are peoples who have interest in playing badminton. They share a passion for the sport and regularly engage in relate activities such as local leagues or tournaments. As badminton's popularity rises, an increasing number of players are renting badminton courts and play the sport more frequently (Lauddipa & Suryawinata, 2021).

Many badminton enthusiasts struggle to find available courts at a convenient time due to high demand and limited availability. These difficulties may result in ineffective utilisation of resources, confusion and frustration among those attempting to reserve spots (Singh & Shah, 2020). Another difficulty is the time and effort required to secure a spot for their badminton match. Making reservations manually might be time-consuming and challenging since customers would need to contact person in charge at the facility (Mendis & Rathnayake, 2020). Poorly specified systems frequently result in delayed replies, conflicts, inefficiency, breakdowns in communication and improper handling of requests (Singh & Shah, 2020).

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2.2 Online Court Booking

The online booking system is a digital platform that allows sports enthusiasts to book facilities via online (Alkhaldi et al., 2018). The system is intended to simplify the process of booking a court by providing a convenient and assists customers who are unable to physically visit the badminton facility (Lauddipa & Suryawinata, 2021). It also should provide a user-friendly interface where players can check available courts, view their availability and select time slots that meet their preferences.

Before booking can be made, users are required to register an account by providing personal information such as name, address and contact information (Kassim et al., 2019). Next, commonly on most system, after registration users are allowed to select court where they wish to book by selecting location, date and time, then proceed with payment. Upon completion with the payment, users may receive a confirmation email or text message with the booking details.

Among advantages of court booking systems include, it can be used at any time and from any location with an internet connection. Players also have option to choose the available time slots, preferred court and make a quick court booking. The system also provides a transparent record of transactions, including the accurate information about the amount paid, date and time of payment and any fees or charges associated (Naeem et al., 2020). This can help prevent miscommunications and disputes about payment amounts and due dates.

Paperless invoicing and online payments can reduce the costs associated with printing, mailing and paper bills (Swathi et al., 2020). Online payment systems can include security features to safeguard sensitive data, such as encryption and two-factor authentication (Dangol & Kautish, 2019). Overall, a secure and efficient online payment system can increase consumer trust in a business or service provider (Widiyanti et al., 2020).

2.3 Related Works

Several mobile applications and computerized platforms have been introduced to facilitate courts booking. This section reviews the existing solutions and explores their features and functionalities. GotCourts is a social network and online service for booking courts and coaches for participants in racket sports that includes tennis, padel, squash and badminton. It was founded in 2012 and is comprised of thousands of players within their system (Jovanovic, 2024). Users can locate and reserve tennis courts via computer or mobile device, meet potential partners and post an invitation to play. “Smart Court Badminton-Book” is another related mobile application available on software store that enables user to effortlessly book and manage badminton courts (Simya Solutions Ltd, 2024). The application allows users to avoid the hassle of contacting the facility and reserving their preferred court.

Courtsite.my is a web application that enables users to digitally reserve sports facilities for 27 different sports across eight states in Malaysia (Ignatius, 2023). The platform features real-time availability information for sports facilities, and users can make online reservations and payments. It enables users to search for and reserve spaces for multiple sports, including badminton. Other than that, it also enables owners of sports facilities to sign up to be listed on the platform (Courtsite for Business, 2024).

GoPlay is a sports facility reservation application designed to provide benefits to both users and venue owners through a unique feature that is an automated reservation system. The application developed using Flutter and Google API uses data mining to obtain recommendations of previous booking routines, closest venues based on preference, business intelligence to obtain user analytics through graphs and augmented reality to display a graphical view of the venue (Mendis & Rathnayake, 2020).

BOOKiilT mobile application is a venue booking system designed to address the booking management challenges faced by academic institutions (Singh & Shah, 2020). The development is based on design thinking and the PACT framework to ensure user-friendly and effective in various contexts of

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use. The main objective is to provide an efficient and user-friendly space management system that address the difficulties faced in administering bookings.

Table 1 shows a comparison of features offered from related works and applications discussed above. Based on five applications reviewed, all of them provides real time court availability checks and court booking feature. These features are compulsory for any application related to booking system. Most applications feature an online payment and manage user's booking. These features are essential for transparent record of transactions information about their bookings. In addition, features such as an instant messaging system and booking statistics are exclusive to GotCourts, making this application more usable for users to view their bookings and connect with others.

Many existing badminton booking applications cover basic functionalities where most of them are lacking comprehensive features within a single application. iSmashON mobile application intends to integrate a wider range of functionalities with comprehensive features and social networking among its users.

Table 1. Table of comparisons of features availability by different booking applications.

Features / App	GotCourts	Smart Court Badminton - Book	Courtsite.my	GoPlay	BOOKiilT
Live Court Availability	✓	✓	✓	✓	✓
Court Booking	✓	✓	✓	✓	✓
Upcoming Events			✓		✓
Manage Bookings	✓	✓	✓		✓
Online Payment	✓	✓	✓	✓	
Instant Messaging System	✓				
Booking Statistics	✓				

Source: Author's review of literature.

3. METHODOLOGY

There are three phases involved for the development of iSmashON mobile application which includes requirement analysis, design and development, testing and refinement. The phases and activities involved are depicted in Fig. 1. Generally, the first phase is carried out to determine the feasibility of the mobile application development through reviewing literatures and related works. Second phase involves design on user interfaces, database and development of booking and chatting module. While the third phase is to test the developed mobile application using Technology Acceptance Model (TAM) and the result is analysed and discussed in the following section.

3.1 Phase 1: Requirement Analysis

This phase begins with analysing requirements of the proposed development. Review of literatures and examining related works are carried out to understand the potential challenges, risks, and opportunities related to the project. Reviews of past and existing works are done based on online database, articles, journals and software stores such as Android Google Play and Apple AppStore. The focus is on mobile applications, Flutter mobile application development, databases, booking system, instant messaging system

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and quick response code (QR code). The information gained helps in setting realistic requirements and refining the project scope to ensure its successful implementation.

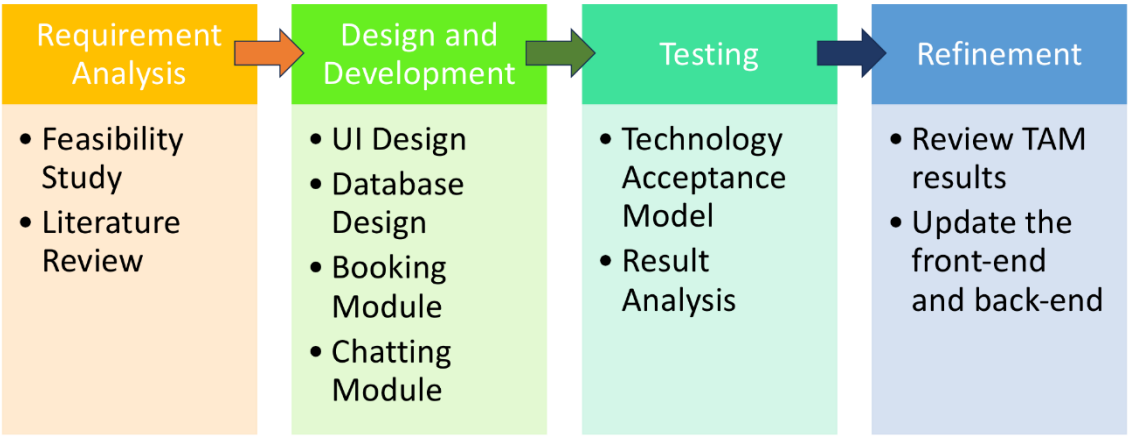

Fig. 1: Four phases involved for the development of iSmashON Mobile Application

Source: Author's research methodology.

3.2 Phase 2: Design and Development

In second phase, two major activities include design and the development of the mobile application. Design activity encompasses drafting user interfaces (UI) using Figma and database designs using Draw.io. User interfaces for iSmashON mobile application is carefully constructed to provide user interactivity and engaging experience through a consistent and visually appealing design. The user interfaces include home screen design that provide quick access to real-time court availability, upcoming bookings and chat functionality. The database design considers MySQL and Firebase as data storage for the mobile application. Entity Relation Diagram (ERD) includes table users, user details, facility, booking, booking details and courts while the hierarchical data structure for Firebase includes object user's account and chat.

The development activity in this phase includes building the main modules which are badminton court booking, instant messaging functionality and QR code implementation for attendance monitoring by the court provider. The mobile application is developed using Android Studio IDE by utilizing the Flutter framework with Dart programming and supported by Express and Flask frameworks. The Flutter framework is utilized for creating front-end application and its user interactions while back-end processing includes data processing, instant messaging and back-end communication is implemented using Express and Flask.

3.3 Phase 3: Testing

In this phase, the developed mobile application is evaluated using Technology Acceptance Model (TAM). TAM assists in the identification of usability defects, functional gaps and areas where the prototype does not meet user expectations. A set of questionnaires with 13 questions are prepared to evaluate four components of TAM which are Perceived Ease of Use (PEU), Perceived Usefulness (PU), Attitude (ATT) and Behavioural Intention (BI). These questions are distributed over 30 respondents with at least one-year experience of playing badminton. Respondents should directly interact with the developed mobile application and experience completing available tasks in the application, beginning with user's registrations, court booking and court attendance with QR-code. The feedback gathered through TAM may

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guide the process of refinement, ensuring that the prototype meets user expectations and achieves the desired level of usability and functionality.

3.4 Phase 4: Refinement

The last phase involved refining the developed mobile application based on evaluation and feedback from TAM. The activity in this phase begins with reviewing the results from TAM, update and enhance the developed mobile application based on feedback from respondents. The focus will be on front- end, back-end and its functionality. These activities ensure the mobile application is constantly updated, meets the user's expectation and provides an enhanced user experience.

3.5 User Interfaces

In this section, user interfaces for various functionalities of the mobile application are presented and discussed. Fig. 2 (left) shows home screen of iSmashON mobile application which is a main screen where users can easily access key features such as court booking, search facility, upcoming courts, famous facility and navigation buttons. It also features the main entry point of the mobile application for the task of court booking. In this user interface, search facility allows user to discover badminton courts based on their keywords or locations and the input fields also prompted with clear query "Where are you looking to play?" and a button named as "Find Facility". This followed by upcoming courts section that displays the list of all upcoming badminton courts they have booked. It features horizontal scrolling for users to see the entire list. The list displays essential details such as date, location, state of the facility, total bookings, start time, duration, and end time. Famous facility section provides list of popular badminton courts and is also presented in a horizontally scrollable format. The bottom section of the interface displays a navigation bar with icons and clear labels for home, booking and chats.

The results from the search functionality can be illustrated in Fig. 2 (centre). The screen shows the results of badminton facilities found based on keywords and locations given and allows user to explore. At the top of the interface displays the results count and label for pricing for each badminton court. Each facility with image, facility name, location, price and action buttons from the search list is placed within a border to easily distinguish between different facilities. Action buttons features "Centre Details" that invites users to explore more detailed information about a specific facility and "Book Now" button encourages users to proceed with the booking process. The Book Now button, when tapped by user will make the mobile application to display add to cart interface as in Fig. 2 (right). The interface features the booking details data entry of the selected badminton facility that includes date, time, duration (in hours) and the court selection. Tapping "Find Court" button allows the mobile application to list the available courts for user to choose. The results are displayed together with court number, pricing and a button named "Add to Cart". Upon clicking the "Add to Cart" button, it transitions to "Added to Cart" with a white background. "My Cart" section at the bottom of the screen dynamically displays the total price of the courts currently in the cart, keeping users informed about their selections and the "Next" button, positioned at the bottom right, to allow users to proceed to the next step in the booking process.

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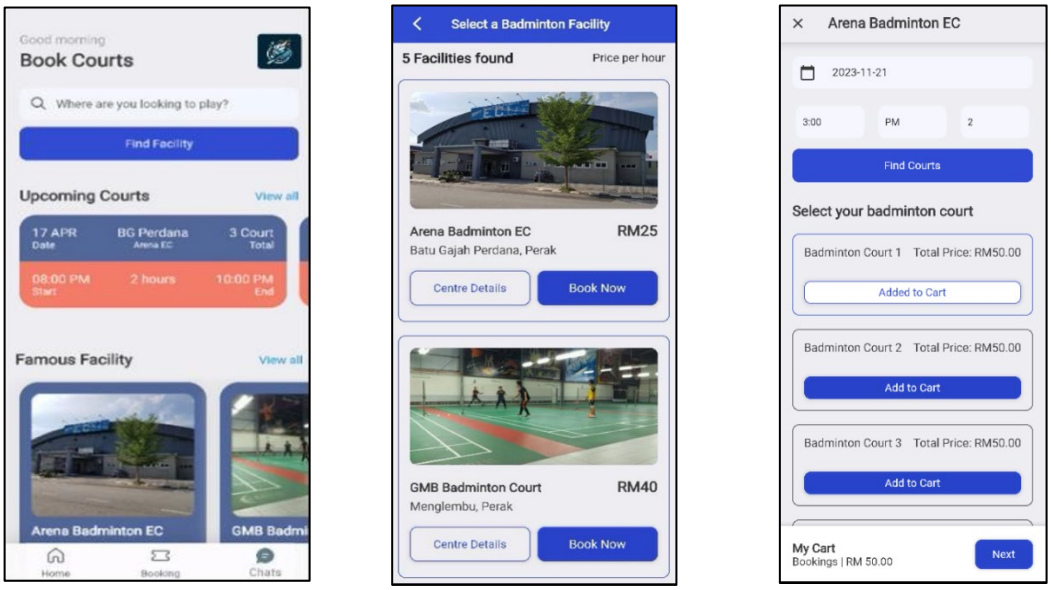

Fig. 2: (left) home screen, (centre) search results of badminton courts, (right) add to cart for court booking

Source: iSmashON mobile application screen shots.

The booking process continues with check out screen as depicted in Fig. 3 (left), which allows user to review their booking information and confirm the booking. The title for this interface is “My Cart” to maintain a consistent navigation from the previous screen. In the content area, essential details about the facility, such as its address, name, and image are displayed to confirm the facility user has selected. Below facility information, the booking details is also displayed for confirmation. It includes information such as the date, start time, and end time, as well as the court number and the respective price per court for the specified duration. A section included in the interface for total price that sum up the total price incurred. After user has confirmed with all the booking details, they can tap on the “Checkout” button for payment process.

After payment process is completed, user will be displayed with the “Booking History” screen as in Fig. 3 (centre). This screen allows user to view upcoming and previous booking history. The default screen is “Upcoming” tab, to show user with the recently completed booking. For each selected tab, features list of bookings with information such as facility name, date, start time, end time, and the total number of courts booked. There are important buttons for each booking namely “View” for user to get information about the booking and “Refund” button if user intend to cancel booking or change to the other date or time. Other than detailed information about the booking, user is able to access the entrance pass screen as in Fig. 3 (right). This screen is important for efficient check-in process upon arrival at the facility. It also provide important information such as booking code, price incurred, booked court number and QR-code. The QR-code is dynamically generated by the mobile application which contains essential booking information for easy check-in at the facility.

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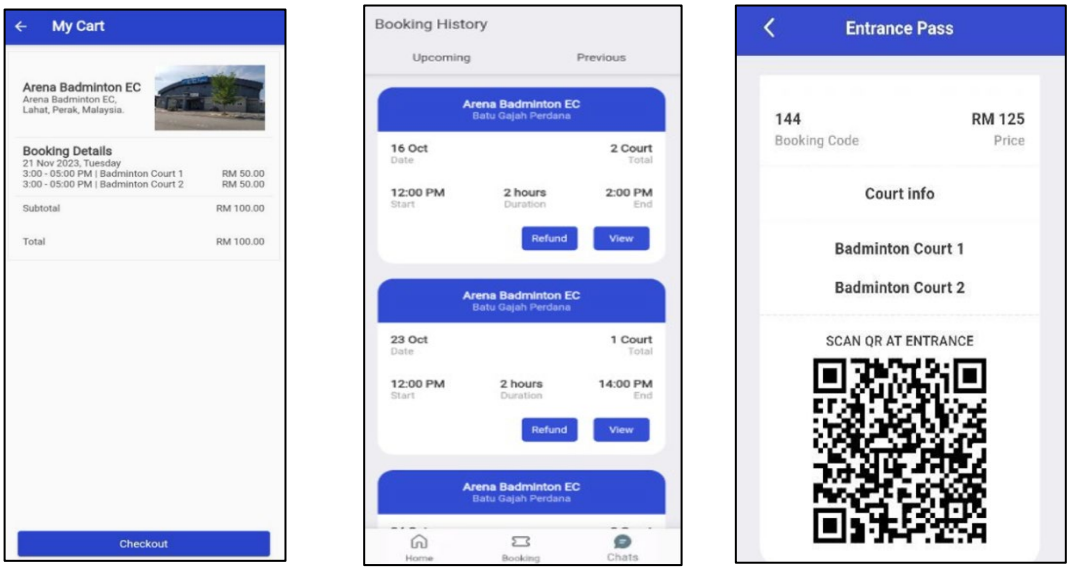

Fig. 3: (left) checkout screen (centre) booking history (right) entrance pass screen

Source: iSmashON mobile application screen shots.

Chat module can be accessed by user from the bottom navigation bar with icon and label named “Chats”. This screen can be depicted in Fig. 4. It allows communication and social interaction among badminton enthusiasts within the application. The top-right of the screen features two icons: a search icon for easy access to chat search functionality and a settings icon for managing user profiles. Content area displays individual chat list that displays name of the user with whom the chat is ongoing. Positioned at the bottom right, the "Add New Friends" icon features a chat plus symbol. Clicking on this icon initiates the process of adding new friends to the chat.

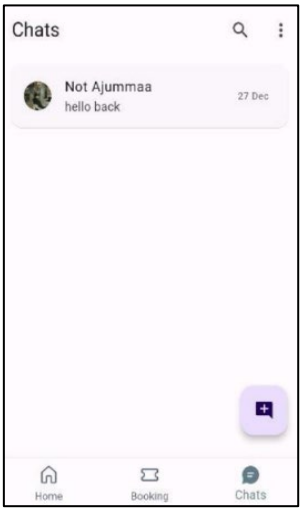

Fig. 4: Chat screen.

Source: iSmashON mobile application screen shots

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4. FINDINGS AND DISCUSSIONS

iSmashON mobile application is evaluated based on four components of TAM that includes PEU, PU, ATT and BI. These components are composed of 13 questions distributed to 30 respondents who have at least one-year experience of playing badminton to test the mobile application and answer questionnaire. Respondents are allowed to use and experience the mobile application without any assistance by the developer. They are also encouraged to complete all operations and functions available within the mobile application. After 20-25 minutes of usage, the questionnaire is given, and respondents should answer through online Google form. They are asked based on their experience of using the application. The questionnaire prepared is based on five rankings, which can be depicted in Table 2.

Table 2. Ranking provided for evaluating the mobile application.

Scale	Rank
5	Strongly agree
4	Agree
3	Neutral
2	Disagree
1	Strongly Disagree

Source: Davis (1985)

All responses submitted are stored in Google Sheets and the mean scores are calculated and analysed. The scores for each component of TAM can be summarized in Table 3. Perceived ease of use (PEU) component consists of five questions, where two questions related to independence use of the mobile application and overall ease of use in workplace and home scored highest with 4.33 means score. While, the application's information exploration about bookings and courts scored lowest with 4.06. This leads to overall performance for PEU with 4.24. Following component evaluated is perceive usefulness (PU) shows the effectiveness in completing the badminton booking process and improving networking among badminton enthusiasts scored highest with 4.36 mean score. The question about promoting the mobile application as an instrument for promoting and enhancing the badminton sport scored lowest with 4.23.

Third component involved attitude (ATT) towards the developed mobile application shows an outstanding performance where all three questions received more than 4.5 mean score where the question about the developed mobile application as a medium for badminton court booking and communication among badminton enthusiasts, scored 4.53. The last component, behavioural intention (BI) encompasses two questions. The question related to the developed mobile application as a favourite mobile application for badminton court booking scored 4.43 mean score compared to the question about the intention to use the mobile application if has access to it, scored slightly lower with 4.13. Among four components evaluated in TAM, ATT scored highest with total mean score of 4.52 while lowest mean score achieved from PEU component with 4.24.

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Table 3. Summary of mean score for each TAM component.

Section A: Perceived Ease of Use (PEU)	**Mean Score**
I think it is easy for the me to explore the content to obtain the badminton court booking and badminton facility info using iSmashON application.	4.06
I assume interaction with iSmashON application would be clear and understandable.	4.3
I believe interacting with iSmashON application will not require a lot of mental effort for me to use it.	4.2
I will be able to use iSmashON application independently.	4.33
Overall, I believe iSmashON application will be easy to use in workplace and at home.	4.33
Total Mean Score (PEU)	**4.24**
Section B: Perceived Usefulness (PU)	**Mean Score**
iSmashON application would improve my understanding towards the badminton court booking process and provide more detailed information about badminton facility amenities and services.	4.3
iSmashON application would enhance my effectiveness in badminton court booking process and networking with fellow enthusiasts.	4.36
iSmashON application could be instrumental in promoting and enhancing the sport of badminton, benefitting both enthusiasts and badminton facility operators.	4.23
Total Mean Score (PU)	**4.3**
Section C: Attitude (ATT)	**Mean Score**
I like the idea of using iSmashON application as badminton court booking method.	4.53
I have generally favourable attitude toward using iSmashON application.	4.5
I believe it is (would be) a good idea to use iSmashON application for booking and networking with fellow enthusiasts.	4.53
Total Mean Score (ATT)	**4.52**
Section D: Behavioural Intention (BI)	**Mean Score**
Assuming I have access to iSmashON application, I intend to use it as my booking method and networking with fellow enthusiasts.	4.13
It would be one of my favourite applications for my badminton court booking method.	4.43
Total Mean Score (BI)	**4.28**

Source: Results from TAM evaluation of iSmashON mobile application.

5. CONCLUSION AND FUTURE WORKS

In this paper, we have presented a development of mobile application for badminton courts booking and communication platforms for badminton enthusiasts. The mobile application has many features embedded such as search for badminton facilities and courts, listings of famous facilities, court bookings and chatting module. It also includes all required information for booking process such as facility name, date of booking

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and its start time and end time, as well as the court number and total price incurred. Results from TAM evaluation shows the highest mean score obtained by ATT component. This represents a favourable attitude among users towards using iSmashON mobile application as a preferred way for booking badminton courts. In comparison to PEU that scored lowest, can be influenced by practical experience during usage and how easily respondents can navigate and perform tasks within the application. Users' experience may encounter challenges while using the mobile application, especially on the home screen that features many functionalities within the same screen. Other than that, navigation thru the available screens and interfaces may have impaired overall experience.

Future works should consider improvements on enhancing the usability and user experience on iSmashON mobile application especially on the areas highlighted in evaluation. Mean score obtained by PEU component suggests improvement on ease of use such as simplifying the home screen by reducing confusion, introducing more intuitive layout and providing smooth navigation across different interfaces and features offered in the mobile application. These improvements aim to resolve the challenges identified and enhancing user satisfaction, engagement and ease of use within the iSmashON mobile application.

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7. CONFLICT OF INTEREST STATEMENT

The authors agree that this research was conducted in the absence of any self-benefits, commercial or financial conflicts and declare the absence of conflicting interests.

8. AUTHORS' CONTRIBUTIONS

Muhamad Akmal Adha Radzuan: Conceptualisation, methodology, software development, formal analysis, investigation and writing-original draft; **Muhammad Nabil Fikri Jamaluddin**: Conceptualisation, methodology, formal analysis, validation, supervision, writing-review and editing; **Iman Hazwam Abd Halim**: Conceptualisation, methodology, formal analysis, writing-review and editing; **Alif Faisal Ibrahim**: Conceptualisation, methodology, validation; **Mohd Faris Mohd Fuzi**: Conceptualisation, writing-review and editing; **Ros Syamsul Hamid**: Methodology, formal analysis, validation.

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