

Cyber Tuition Saujana Utama Management System

**Muhammad Azri Ishraf Harun¹, Norhanim Selamat^{1*},
Afiqah Batrisya Jalil²**

¹Fakulti Sains Komputer dan Teknologi Maklumat,
Universiti Tun Hussein Onn Malaysia, Parit Raja, Batu Pahat, 86400, MALAYSIA

²01-02, Level 2, Jalan Bidara 6/2, Saujana Utama, 47000 Sungai Buloh, Selangor

DOI: <https://doi.org/10.30880/aitcs.2023.04.02.082>

Received 23 June 2023; Accepted 09 November 2023; Available online 30 November 2023

Abstract: Cyber Tuition Saujana Utama Management System is as system designed to efficiently manage all information related to tuition centers. Cyber Tuition Saujana Utama is a tuition center that provides education to form four and form five students. Currently, the system relies on manual processes involving Microsoft Word software, where data is printed and stored in separate files. However, there is a lack of a dedicated system to manage important data specific to the tuition center. Therefore, this system is built to facilitate the online registration process for new students. To streamline attendance tracking, QR code scanning is implemented, eliminating the need for manual attendance forms. Additionally, the system incorporates payment gateway technology, enabling students to make tuition fee payments directly. The chosen methodology for system development is the prototype model. The system being developed is web-based and uses HTML, CSS and JavaScript programming languages to create a user-friendly interface. It aims to streamline the administrative processes for all users. Moreover, this system able to expedite the registration and management procedures of the tuition center.

Keywords: Tuition Management System, Web-Based System, Prototyping Model, Object-Oriented Programming, QR Code Scanning, Payment Gateway, ToyiybPay.

1. Introduction

Cyber Tuition Saujana Utama is a tuition centre in Sungai Buloh, Selangor that has been in operation since 2015. The centre has been providing quality education to Form 4 and Form 5 students for many years. The centre aims to provide students with the knowledge and skills they need to excel in their academic pursuits by offering a diverse range of subjects such as Science, Mathematics, and English. The administrative tasks at the centre are handled by a clerk, who currently manages all related information using Microsoft Word and Microsoft Excel software. Student and teacher details are recorded in Microsoft Word, printed out, and stored in physical files.

Several issues can be identified with the current manual management system. Firstly, there is a risk of data loss if the physical files stored at the center are misplaced or damaged. Additionally, the method used to take attendance through manual forms is inefficient. It requires teachers to call out each student's name before the class begins to determine their attendance. Furthermore, the lack of data protection when uploading tuition fee payment evidence through WhatsApp poses a security concern. The development of this system is expected to help manage information in a more systematic manner.

The main objective of this project is to analyze and design the Cyber Tuition Saujana Utama Management System using an object-oriented approach, develop the web-based system, and conduct alpha testing on the developed system. The project scope focuses on students, teachers, and the clerk. The system consists of several modules, including module of register, module of login, module of manage students and teachers, module of manage class, module of taking attendance, and module of tuition fee payment.

2. Related Work

2.1 Tuition Management System

A tuition center is an educational institution that provides additional instruction and guidance to students beyond what is taught in formal school settings. Typically managed by private entities or associations, these centers are often located in shop lots or residential areas, conveniently situated near the students' homes. They offer specialized subject teaching and academic support regarding various grade levels and subjects. The tuition centers play a crucial role in helping students improve their academic performance and achieve their educational goals.

A Tuition Management System is a software application designed specifically to automate the administrative tasks associated with running a tuition center. This system serves as a centralized platform that manages and organizes the various aspects of a tuition center's operations. It includes features such as student registration, class scheduling, fee management, attendance tracking and reporting capabilities. By leveraging technology and automation, a Tuition Management System simplifies and enhances the management of a tuition center, enabling administrators to focus more on providing quality education and ensuring student success.

2.2 Web-Based system

A web-based system, commonly known as the World Wide Web (WWW), refers to the presentation of web pages that users can access through an internet connection [1]. This system is accessed via networks using the HyperText Transfer Protocol (HTTP), which facilitates the transmission of various content, including text and graphics, within the WWW. Users can access these web pages through popular web browsers such as Google Chrome, Microsoft Edge, and Mozilla Firefox. At its core, a web-based system relies on programming languages such as HTML, CSS, and JavaScript to create a visually appealing and interactive user interface, ensuring a seamless and engaging user experience.

2.3 QR Code

QR code technology was developed in 1994 by Denso, a major group company of Toyota, and was later approved as an international standard by ISO (ISO/IEC18004) [2]. Initially, QR codes were created for use in the automotive industry as a means of production control. With the advent of smartphones equipped with cameras, QR codes can now be scanned using these devices to automatically access internet addresses by simply reading the URL encoded within the QR code.

The use of QR codes has expanded beyond the automotive industry and has become prevalent in various applications. QR codes are widely used for marketing purposes, allowing users to quickly access websites, product information, promotions, or special offers by scanning the code with their

smartphones. The widespread adoption of QR codes is attributed to their efficiency, versatility, and ease of use, making them an integral part of modern-day digital interactions and information retrieval.

2.4 Payment Gateway

A Payment Gateway is deemed essential to ensure the security of customer information, such as bank accounts and passwords [3]. The primary advantage of utilizing Payment Gateway technology is to enhance the safety and integrity of payments. ToyyibPay is one of the payment processors that offers FPX (Financial Process Exchange) payments. It supports payments from various banks in Malaysia. Payments made through ToyyibPay are highly secure as it implements industry-standard encryption protocols to safeguard the transmission of sensitive data such as credit card information or personal details [4].

By implementing a Payment Gateway, Cyber Tuition Saujana Utama can ensure the secure handling of customer payment information, safeguarding sensitive data such as bank account details and passwords. The integration of ToyyibPay into the system enhances the overall security and integrity of the payment process. With ToyyibPay's support for multiple banks in Malaysia, the tuition center can accommodate a wide range of customers and provide them with a convenient and secure payment experience. Adherence to strict security standards ensures transactions are protected and helps build trust and confidence among customers.

2.5 Comparison between different systems

The study was conducted based on the existing systems that have been developed. In this study, three systems were selected as references for the development of the Cyber Tuition Saujana Utama Management System to enhance its quality. Among the three chosen management systems are MCPlus Online Tuition Malaysia [5], Bright Kids Tuition Centre Management Information System [6], and TrackCC Class Management [7]. Table 1 below illustrates the comparison between the proposed systems and the existing system.

Table 1: Comparison between different systems

Features	MCPlus Online Tuition Malaysia	Bright Kids Tuition Centre Management Information System	TrackCC Class Management	Cyber Tuition Saujana Utama Management System
Platform	Web, Android and iOS	Web	Android, iOS & macOS	Web
User	Student and Admin	Student, Staff, Teacher, Manager and Parents	Student, Teacher, Parents and Clerk	Student, Teacher and Clerk
Register and login	Yes	Yes	Yes	Yes
Manage profile	Yes	Yes	Yes	Yes

Features	MCPlus Online Tuition Malaysia	Bright Kids Tuition Centre Management Information System	TrackCC Class Management	Cyber Tuition Saujana Utama Management System
Manage students and teachers	Yes	Yes	Yes	Yes
Manage subject	Yes	Yes	Yes	Yes
Manage attendance	No	No	Yes	Yes
View report	Yes	Yes	Yes	Yes
QR Code Scanning	No	No	No	Yes
Payment Gateway	Yes	No	No	Yes

Cyber Tuition Saujana Utama Management System offers a comprehensive set of features for managing tuition center operations. Unlike MCPlus Online Tuition Malaysia, it provides functionalities for managing students, teachers, subjects, attendance, and integrating a payment gateway. In comparison to Bright Kids Tuition Centre Management Information System, Cyber Tuition Saujana Utama Management System supports more user roles and includes attendance management with QR code scanning. Additionally, it surpasses TrackCC Class Management by using the ability to use qr code scanning and payment gateway technology. Overall, Cyber Tuition Saujana Utama Management System stands out as a robust system that covers a wide range of functionalities required for effective tuition center administration.

3. Methodology

This section describes all the necessary information about the methodology used to obtain the results of the project.

3.1 Prototype Model

Cyber Tuition Saujana Utama Management System adopts the prototype model as development methodology. The prototype model is a software process approach that involves creating a prototype to gather initial feedback from stakeholders, followed by iterative testing and refinement until the prototype meets the required acceptance criteria [8]. The development process encompasses distinct phases, including planning, analysis, design, prototyping, and implementation. This methodology allows for a systematic and iterative approach, ensuring that the system aligns with stakeholder expectations and effectively addresses the needs of the tuition center. Through continuous feedback and refinement, the system aims to deliver a robust and user-friendly solution that streamlines tuition management.

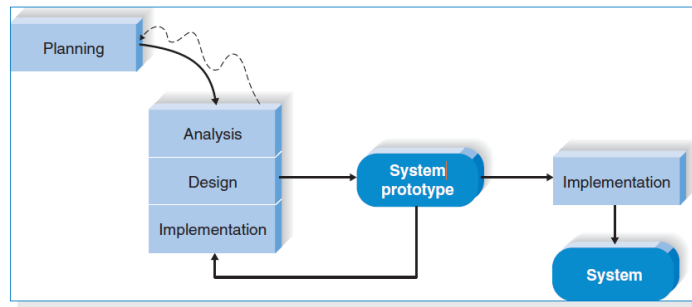


Figure 1: Prototype Model [8]

Table 2 outlines the tasks associated with each phase, including two iterations of prototyping, during the development of the Cyber Tuition Saujana Utama Management System. These phases include planning, analysis, design, prototyping, and implementation to ensuring the successful creation of an efficient and comprehensive system for managing the tuition center's operations. Each phase contributes to the systematic progression and refinement of the system throughout its development lifecycle.

Table 2: Software Development Activities and Deliverable for Phases in Prototyping Model

Phase	Tasks			
Planning	<ul style="list-style-type: none"> Proposing the project title. Identifying stakeholders. Conducting stakeholder interviews. Preparing Gantt chart. Preparing interview questions. Preparing proposal paper. 			
	Prototype 1			
	Analysis	<ul style="list-style-type: none"> Conducting interview sessions. Recording interview session responses. Analyzing system requirements. Analyzing provided documents. Reviewing existing systems. Creating UML diagrams based on user requirements. 		
		Design	<ul style="list-style-type: none"> Determining database schema. Sketching wireframes. Designing system interface. 	
			Prototype	<ul style="list-style-type: none"> Developing the first prototype.
			Implementation	<ul style="list-style-type: none"> Obtaining feedback from stakeholders for the first prototype.
Prototype 2				
Analysis	<ul style="list-style-type: none"> Analyzing feedback and comments from stakeholders. Identifying improvements to be made from the prototype. 			

Design	Enhancing system interface.
Prototype Implementation	<ul style="list-style-type: none"> • Developing the second prototype. • Obtaining feedback from stakeholders for the second prototype. • Validating the final prototype with stakeholders.
Final Implementation and Testing	<ul style="list-style-type: none"> • Developing system code. • Implementing database schema. • Building REST API code. • Testing each module. • Fixing errors. • Conducting alpha testing.

3.2 System Requirements

Functional requirements are system functions that need to be implemented by the system. Each functional requirement is determined by the stakeholders. Table 3 describes the functional requirements of the system according to each module.

Table 3: Functional Requirements

No.	Module	Description
1.	Register Student Module	<ul style="list-style-type: none"> • The system allows new students to register by providing personal information and selecting the subjects they are interested in studying. • The system displays an error message if any information is not entered. • The system allows the clerk to approve or cancel new student registration applications.
2.	Login Module	<ul style="list-style-type: none"> • The system allows all users to log into the system using their email and password. • The system shall display an error message if the login fails due to an incorrect email or password entered. • The system shall allow users to log out from the system.
3.	Manage Profile Module	<ul style="list-style-type: none"> • The system allows student and teacher to update their personal information. • The system displays an error message if any information is not entered.
4.	Manage Students And Teachers Module	<ul style="list-style-type: none"> • The system allows the clerk to update student and teacher information. • The system allows the clerk to add or remove a student's subject.

No.	Module	Description
5.	Manage Subject Module	<ul style="list-style-type: none"> • The system allows students to view information about their subjects. • The system allows teachers to view information about the subjects they are teaching and the list of students in each subject. • The system allows the clerk to manage subjects by updating subject information and choose teacher.
6.	Taking Attendance Module	<ul style="list-style-type: none"> • The system allows teachers to choose the subject name, date, and time to display the attendance QR code. • The system allows the teacher to manually select the attendance status of a student either attend or not. • The system allows students to scan QR code using the camera. • The system changes the attendance status to “attend” if the student successfully scans the QR code. • The system displays an error message if the scanned QR code is not the QR code for student attendance. • The system allows the clerk to view attendance information of a student by subject.
7.	Manage Tuition Fee Payment	<ul style="list-style-type: none"> • The system allows students to make tuition fee payments using a payment gateway service through online banking or by uploading bank transfer receipts. • The system shows a success interface if the payment gateway transaction is successful, then changes the payment status to “paid”. • The system shows an unsuccessful interface if the payment gateway transaction is unsuccessful. • The system allows the clerk to check the payment status of each student, whether it has been paid, waiting for approval, or unpaid. • The system allows the clerk to approve bank receipts uploaded by students, then changes the payment status to “paid”. • The system allows the clerk to use cash as a payment method if a student wants to pay in cash.
8.	View Report Module	<ul style="list-style-type: none"> • The system allows students to view monthly reports. • The system allows clerks to view monthly statistical reports on students, teachers, subjects, attendance and tuition fees.

Non-functional requirements are quality characteristics that are necessary to develop a system. Table 4 explains the non-functional requirements of the system along with their functions.

Table 4: Non-Functional Requirements

No.	Module	Description
1.	Operation	The system is a web-based system and can be used by any web browser such as Google Chrome, Mozilla Firefox, and others except for Internet Explorer.
2.	Performance	<ul style="list-style-type: none"> The system's response time will be monitored at an acceptable level. Generating QR codes takes less than 10 seconds.
3.	Security	<ul style="list-style-type: none"> User information including students and teachers will be securely stored. User passwords must be at least 8 characters long and include uppercase letters, lowercase letters, numbers and special character. Payment information is handled entirely by ToyyibPay as the payment gateway. The system does not directly handle or store any transaction payment data.
4.	Usability	The user interface is user-friendly and aims to simplify user transactions. The main goal is to provide a seamless user experience.

User requirements refer to detailed explanations of the needs and requirements of users. Table 5 below outlines each user requirement in system development.

Table 5: User Requirements

No.	User Requirements
1.	Students, teachers, and clerks should be able to enter email and password to log into the system.
2.	New student should be able to enter their personal information and select subjects to register.
3.	Clerk should be able to approve or reject new student registration applications.
4.	Student and teacher should be able to view and update their own information.
5.	Clerk should be able to manage and update student and teacher information.
6.	Student should be able to view information about the classes they are attending.
7.	Teacher should be able to view information about the classes they are teaching and the list of students in each class.
8.	Clerk should be able to manage class information and view the names of teachers and the list of students enrolled in each class.
9.	Teacher should be able to display QR codes for taking attendance.
10.	Student should be able to scan QR codes using the camera to mark their attendance.
11.	Teacher should be able to mark student attendance as present or absent.

No.	User Requirements
12.	The clerk should be able to view student attendance by month.
13.	Student should be able to use a payment gateway to pay tuition fees.
14.	Student should be able to upload bank transfer receipts to pay tuition fees.
15.	Clerk should be able to verify or cancel bank transfer receipts uploaded by students.
16.	Clerk should be able to view the payment status of each student, whether it has been paid, unpaid or waiting verification
17.	Clerk should be able to manage cash payment made by students.

3.3 System Analysis

The use case diagram describe the relationship between users and use cases within the system. It is used to identify structured system function requirements and to model the interaction between the system and its users. As shown in Figure 2, the users involved in this system are students, teachers, and clerks.

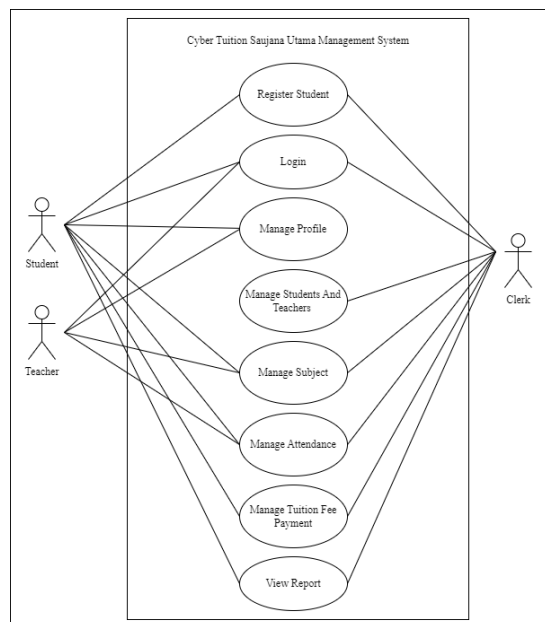


Figure 2: Use Case Diagram

From Figure 2, register student use case includes the process of registering new students and obtaining approval from the clerk. Login use case involves user authentication and authorization processes. Manage students and teachers use case involve clerks managing student and teacher information, respectively. Manage subject use case covers the management of subject-related information. Both students and teachers have the ability to view information about their respective classes. Manage attendance use case facilitates the attendance process, where students scan a QR code displayed by the teacher. Manage tuition fee payment use case handles the payment of tuition fees by students. Lastly, view reports use case allows students and teachers to access monthly reports containing relevant information about tuition.

Class Diagram is one of the UML (Unified Modeling Language) diagrams used to depict the system's structure by showing classes, attributes, and relationships between classes. Figure 3 represents the Class Diagram used for the Cyber Tuition Saujana Utama Management System. It includes classes such as Student, Teacher, Clerk, User, Subject, Student_Subject, Attendance, Student_Attendance,

Tuition Fee, Payment Gateway, and Receipt Bank. Each class has its own operations and attributes specific to this system.

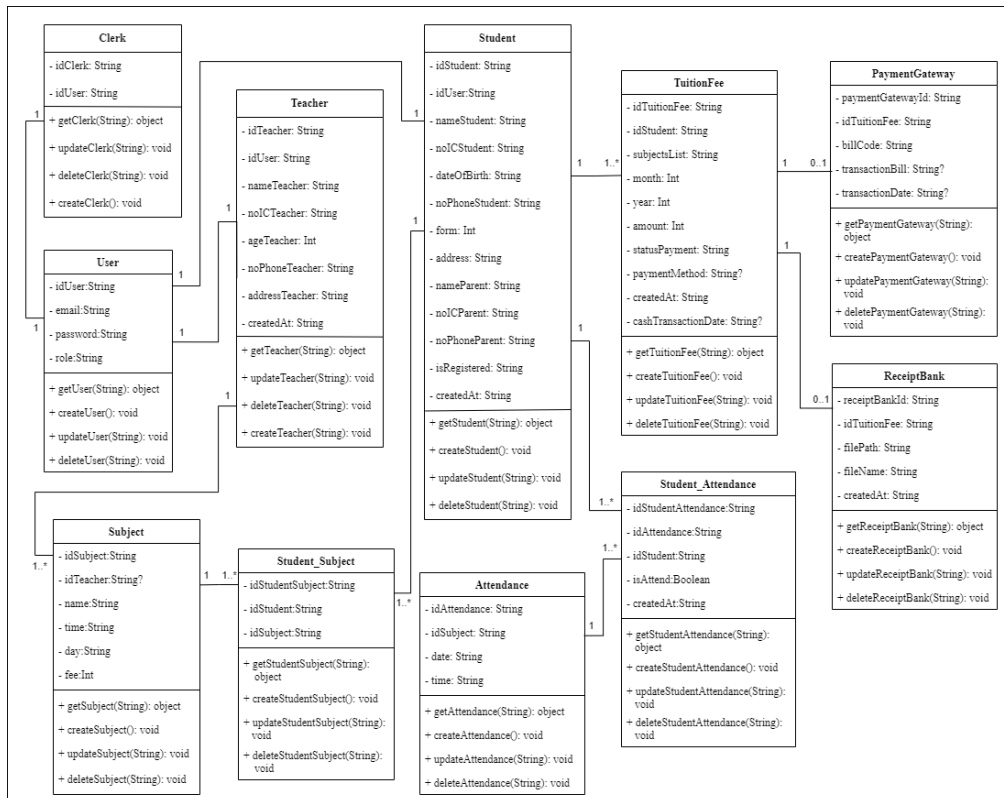


Figure 3: Class Diagram

3.4 System Design

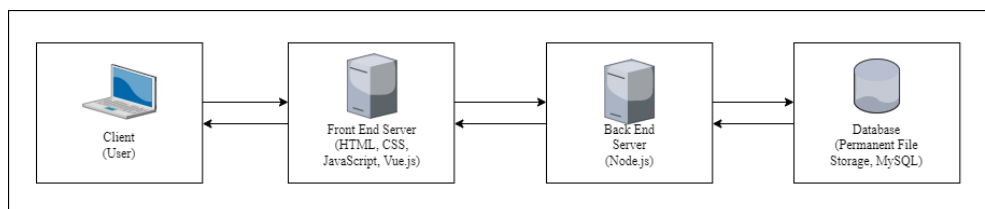


Figure 4: System Architecture

In Figure 4, it illustrates the system architecture for Saujana Utama Cyber Tuition Management System, specifically a multi-tier architecture. The diagram shows the relationship between the client, Front-End Server, Back-End Server, and the database, working together to perform specific functions. The client represents the user device, such as a web browser, that communicates with the system. The Front-End Server is responsible for displaying information and receiving input from users. The Front-End Server components used in the system development include HTML, CSS, JavaScript, and Vue.js framework. It communicates with the Back-End Server using APIs (Application Programming Interfaces). The Back-End Server, implemented using Node.js, handles the system's logic and data storage [10]. The database serves as the storage system for the system's data. MySQL is used as the database for the system. The Back-End Server connects to the database to retrieve, update, and store data. The advantage of using a multi-tier architecture is that each component is separated into different layers, allowing independent updates to specific parts of the system without disrupting others.

The purpose of the database is to store and manage the data of the system. The database structure represents the entities that hold different types of data within the database.

- i. **User**(idUser, email, password, role)
- ii. **Student**(idStudent, idUser, dateOfBirth, noPhoneStudent, form, address, nameParent, noICParent, noPhoneParent, isRegistered, createdAt)
- iii. **Teacher**(idTeacher, idUser, nameTeacher, noICTeacher, ageTeacher, noPhoneTeacher, addressTeacher, createdAt)
- iv. **Clerk**(idClerk, idUser)
- v. **Subject**(idSubject, idTeacher, name, time, day, fee)
- vi. **Student_Subject**(idStudentSubject, idStudent, idSubject)
- vii. **Attendance**(idAttendance, idSubject, date, time)
- viii. **Student_Attendance**(idStudentAttendance, idAttendance, idStudent, isAttend, createdAt)
- ix. **TuitionFee**(idTuitionFee, idStudent, subjectsList, month, year, amount, statusPayment, paymentMethod, createdAt, cashTransactionDate)
- x. **PaymentGateway**(paymentGatewayId, idTuitionFee, billCode, transactionBill, transactionDate)
- xi. **ReceiptBank**(receiptBankId, idTuitionFee, filePath, filename, createdAt)

4. Results and Discussion

4.1 Implementation

The system implementation utilizes a combination of HTML, CSS, and JavaScript for the front-end, with Vue.js framework providing a responsive and visually appealing user interface [9]. On the back-end, Node.js and Prisma are used to deliver server-side functionalities, enabling efficient server processing of HTTP requests. Prisma serves as an ORM (Object-Relational Mapping) tool to simplify communication with the database. This combination of technologies ensures an efficient and maintainable system with well-structured code.

The system provides a registration page where students interested in enrolling for the tuition can proceed with their registration. Students are required to enter their personal information, parents' information, account password, and subject choices. Once all the information entered, a successful registration confirmation will be displayed if the password and password confirmation match. If the registration is successfully approved by the clerk, the student will be contacted later via phone. Figure 5 shows the interface for register student and Figure 6 shows code segment for register student.

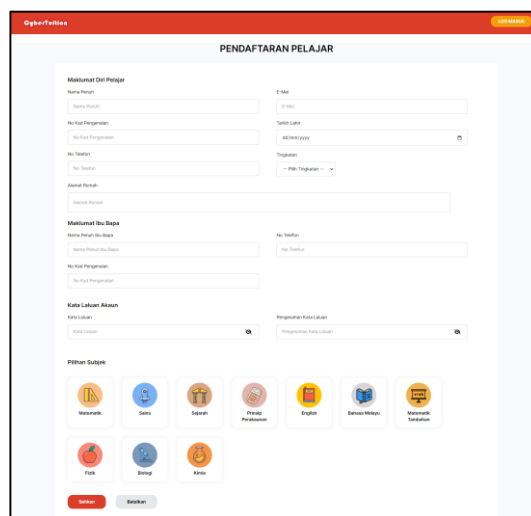


Figure 5: Register Student Interface

In Figure 9 shows the page for updating user profiles. It displays all the user data that can be modified. Users can change any input to update their information. After modifying the input, users need to press the 'Confirm' button to submit the information to the system and update the data with the latest changes.

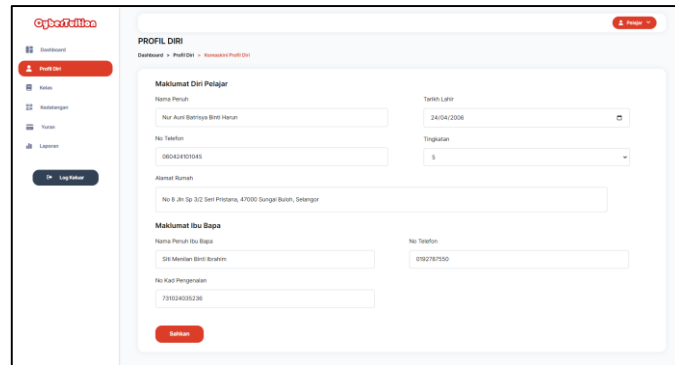


Figure 9: Manage profile interface

For the student management page, the clerk can view the list of students in the system as shown in Figure 10. The system displays the full name, email, grade level and IC number in a table. To view detailed information, the clerk can select an icon in the action column to either update student information or remove student data.

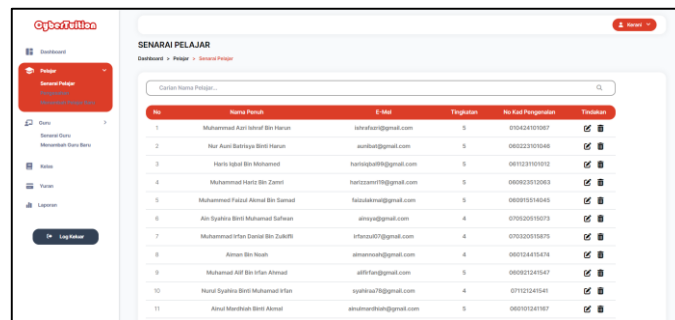


Figure 10: Manage student interface

Figure 11 below shows the interface for the subject management page. Each subject is displayed along with information such as the subject name, teacher name, day, and time. The clerk can click on the icons located in the right corner to update any subject-related information.

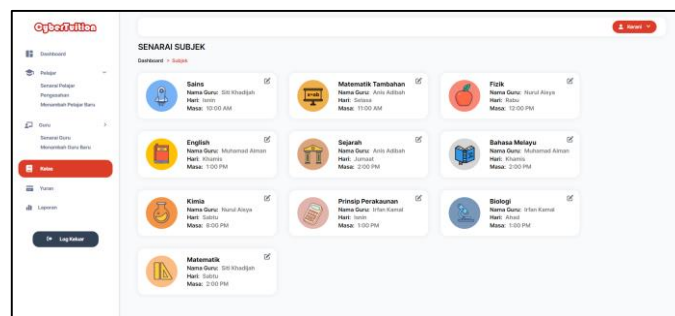


Figure 11: Manage subject interface

To take attendance, the teacher needs to select the class name, date, and time, then the system will generate a QR code for that class attendance. The system will automatically update the number of present and absent students after they scan the QR code. Figure 12 represents the interface displaying the QR code. The teacher also has the option to manually select the attendance status for each student.

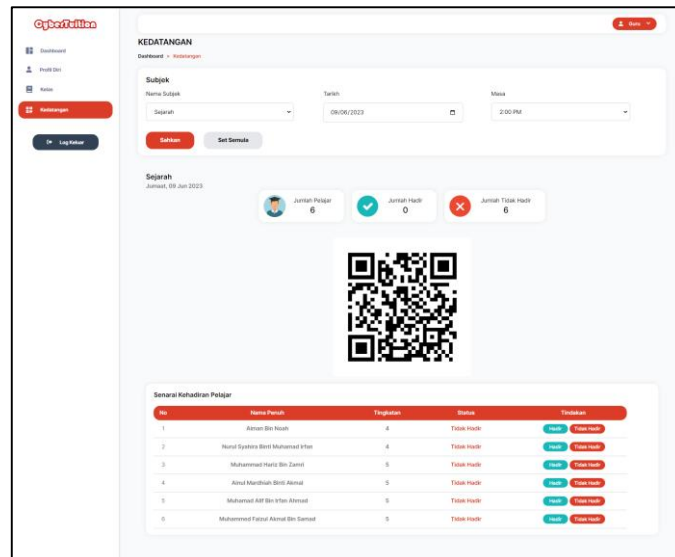


Figure 12: Display QR Code interface

Subsequently, students can scan the QR code using the camera function on their phones. Figure 13 shows the interface for students to scan the QR code. The system will prompt the user for camera permission. Once granted, students need to scan the automatically generated QR code. If the QR code scanning is successful, the student's attendance will be recorded.

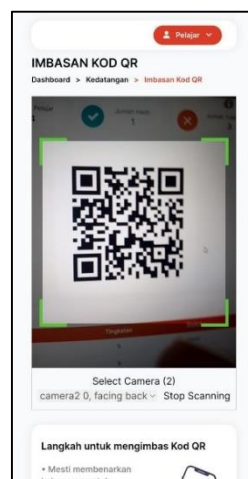


Figure 13: Scan QR Code interface

The system also allows students to make tuition fee payments, as shown in the interface depicted in Figure 14. The system displays all the subjects along with the payment amounts that need to be paid by the students. There are two payment methods available for students: using the Payment Gateway or uploading a bank receipt as proof of payment.

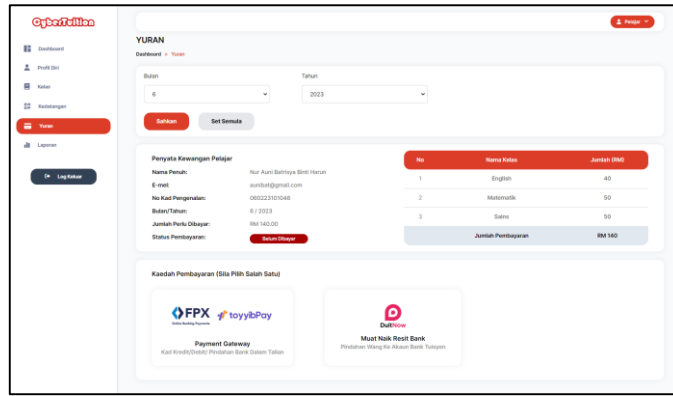


Figure 14: Pay tuition fee interface

Figure 15 illustrates the monthly report interface on the clerk's page. The clerk needs to select the month and year to generate the report according to their chosen period. The monthly report includes statistics on students, teachers, subjects, attendance, and fees.

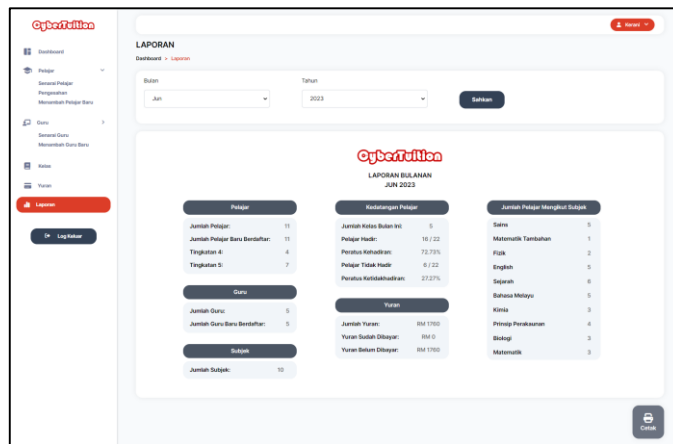


Figure 15: View report interface

4.2 Testing

After the development phase, two types of testing are carried out which are functional testing and user acceptance testing. Functional testing aims to verify the system's functionality and ensure that it meets the specified requirements. On the other hand, user acceptance testing is conducted to get user satisfaction with the developed system. In Table 6, a requirement traceability matrix has been created to track whether each test fulfills the requirements. The overall test case results are presented in Table 7.

Table 6: Requirement Traceability Matrix

Software Requirement Specification	Test Case ID	Test Case Description	Test Result
SRS_REQ_100	Test_100	Register Student	
SRS_REQ_101	Test_100_001	The user enters all the required information, selects subjects, and clicks the register button. Then, the system displays a success registration message.	Pass

Software Requirement Specification	Test Case ID	Test Case Description	Test Result (Pass/Fail)
SRS_REQ_102	Test_100_002	If any input fields are empty, the system should display an error message.	Pass
SRS_REQ_103	Test_100_003	The clerk approve or cancel the student registration application	Pass
SRS_REQ_200	Test_200	Login	
SRS_REQ_201	Test_200_001	The user enters a valid email and password, and then the system redirects the user to their respective dashboard based on their role.	Pass
SRS_REQ_202	Test_200_002	If the user enters the wrong credentials, the system displays an error message.	Pass
SRS_REQ_203	Test_200_003	The user click the "Log out" button to log out from the system.	Pass
SRS_REQ_300	Test_300	Manage Profile	
SRS_REQ_301	Test_300_001	The user updates profile information, and the system displays a success message if all input inserted.	Pass
SRS_REQ_302	Test_300_002	If any input fields are empty, the system should display an error message.	Pass
	Test_400	Manage students and teachers	
SRS_REQ_401	Test_400_001	The user updates the information of a student or teacher.	Pass
SRS_REQ_402		Then, the user can add or remove subjects for students.	
	Test_500	Manage subject	
SRS_REQ_501	Test_500_001	The student can view subject information.	Pass
SRS_REQ_502	Test_500_002	The teacher can view subject information and a list of students.	Pass
SRS_REQ_503	Test_500_003	The clerk can update subject information and choose a teacher.	Pass
	Test_600	Taking attendance	
SRS_REQ_601	Test_600_001	The teacher chooses the attendance details for the selected subject, and then the system displays a QR code.	Pass
SRS_REQ_602	Test_600_002	The teacher clicks "Attend" or "Not Attend" button to manually select the attendance status of a student, and the status of attendance for that student changes.	Pass

Software Requirement Specification	Test Case ID	Test Case Description	Test Result (Pass/Fail)
SRS_REQ_603 SRS_REQ_604	Test_600_003	The student scan the QR code using the camera, and then a success message is displayed, changing the attendance status to “Attend”.	Pass
SRS_REQ_605	Test_600_004	The system displays an error message if the scanned QR code is not for student attendance.	Pass
SRS_REQ_606	Test_600_005	The clerk view the attendance information of a student by subject.	Pass
	Test_700	Tuition Fee	
SRS_REQ_701	Test_700_001	The student view tuition fee information by month.	Pass
SRS_REQ_702 SRS_REQ_703 SRS_REQ_704	Test_700_002	The student choose a payment gateway, which then redirects them to the payment gateway interface. If the payment is successful, a success message is displayed, and the payment status changes to “Paid”. If the payment is unsuccessful, an unsuccessful interface message is displayed, and the payment remains “Unpaid”.	Pass
SRS_REQ_702	Test_700_003	The student uploads a bank receipt and click the submit button to send it to the clerk.	Pass
SRS_REQ_705	Test_700_004	The clerk receives the bank receipt file and can approve or reject it. If approved, the payment status changes to “Paid”.	Pass
SRS_REQ_706	Test_700_005	The clerk checks the payment status and tuition fee information of all students by month.	Pass
SRS_REQ_707	Test_700_006	The clerk clicks the “Cash Payment” button to proceed with the cash payment method, and the payment status for selected student changed to “Paid”.	Pass
	Test_800	View report	
SRS_REQ_801 SRS_REQ_802	Test_800_001	The system displays all information and statistics in the report with the correct counts.	Pass

Table 7: Overall Test Case Result

Test Case ID	Total Test Cases	Total Passed
Test_100	3	3
Test_200	3	3

Test Case ID	Total Test Cases	Total Passed
Test_300	2	2
Test_400	1	1
Test_500	3	3
Test_600	5	5
Test_700	6	6
Test_800	1	1
	24	24

Table 7 demonstrates the successful execution of all 24 test cases, indicating that the system effectively fulfills all functional requirements by performing all functionalities.

Next, user acceptance tests are conducted with 8 peoples which are clerks, tuition teachers and also students form 4 and 5. The system will be tested by several users to try all the available features. Then, they need to fill out a Google Form to find out their satisfaction while using this system. There are 8 features that need to be tested by all users and they are required to provide a rating on a scale ranging from “strongly disagree” to “strongly agree”. Out of the 8 modules or features tested, only 4 important modules will be mentioned below to represent feedback from users.

Figure 16 below shows user feedback for registering student modules. The majority of users expressed strong agreement with the new method of registering students online. Most students form 4 and form 5 are already good at filling in the information required for registration.

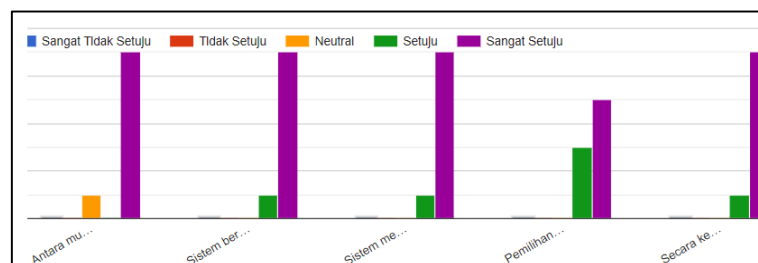


Figure 16: User Feedback for Register Student Module

Figure 17 below shows user feedback for managing students and teachers. The majority of users strongly agree with the tested system's ability to manage all information of student and teacher. It is proven to facilitate clerical work in managing all that information without using traditional paper-based anymore.

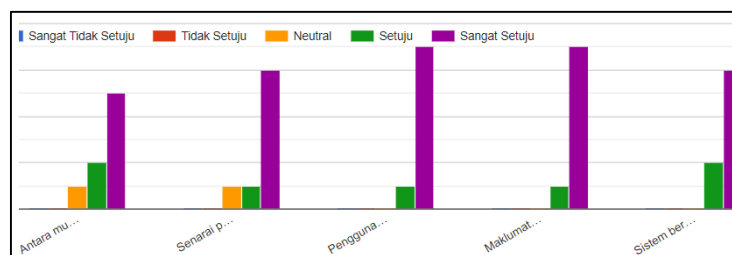


Figure 17: User Feedback for Manage Students and Teachers Module

The feedback given by users in Figure 18 shows a very positive acceptance of attendance technology that uses QR code scanners on mobile phones. Although there is a slight learning curve

associated with understanding the implementation of QR code technology, users enthusiastically accept its benefits and acknowledge its potential to simplify the attendance process.

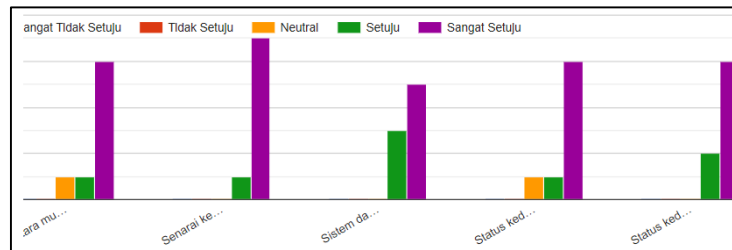


Figure 18: User Feedback for Taking Attendance Module

Based on the user feedback presented in Figure 19 regarding the management of the tuition fee module, three payment methods were tested which are payment gateway, bank receipt upload, and cash payment. All three methods received feedback with the majority of users expressing strong agreement. These results indicate a high level of user satisfaction with the module's functionality and effectiveness.

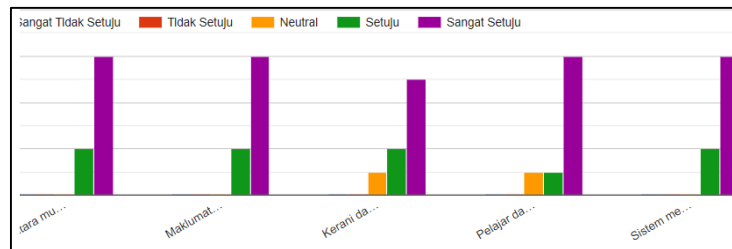


Figure 19: User Feedback for Manage Tuition Fee Module

Based on all the figures presented above, it is clear that the majority of users expressed strongly agree in the ability of the tested system to meet their needs and satisfaction with all the features provided. These results clearly show a high level of user satisfaction and indicating that the system effectively fulfills all user requirements and provides a positive user experience.

5. Conclusion

In conclusion, Cyber Tuition Saujana Utama Management System serves as an advanced computerized solution that greatly simplifies operations for students, clerks and teachers. It effectively manages all aspects of tuition centre administration by replacing outdated systems. The system optimises clerk tasks by handling student, teacher, and class information efficiently, resulting in increased efficiency and accuracy. Furthermore, when compared to traditional paper-based methods, this system ensures the security of stored data, lowering the risk of data loss. The system's ability to manage large volumes of data at the same time provides enhanced data management capabilities that benefit all users involved in tuition centre operations. Other than that, during user acceptance tests, the system received positive feedback show its ability to meet user expectations effectively. Certain additional features can be considered for implementation to further improve the system. Implementing a password reset feature, for example, during login would provide users with a secure way to gain access to their accounts if they forgot their password. Adding a feature to add subjects and modify subject images would also provide more flexibility in managing subject information. It can ensure more comprehensive user experience by continuously improving system functionality based on user feedback.

Acknowledgement

The author would like to thank the Faculty of Computer Science and Information Technology at Universiti Tun Hussein Onn Malaysia for the support and encouragement throughout the process of conducting this study.

References

- [1] Connolly, R., & Hoar, R. (2018). Fundamentals of web development (Second edition.). Pearson Education, Inc.
- [2] Bhargava, N., Bhargava, R., Mathuria, M., & Mantri, K. (2013). The Effective QR Code Development using VB .NET. International Journal of Computer Applications Technology and Research, 2(3), 306-310.
- [3] Oo, K. Z. (2019). Design and implementation of electronic payment gateway for secure online payment system. Int. J. Trend Sci. Res. Dev, 3, 1329-1334.
- [4] toyyibPay - Quick & easiest online payment solution. Retrieved at June 18, 2023, from <https://toyyibpay.com/main/>
- [5] (2023). MCPLUS (Version 2.0.0) [Mobile app]. Retrieved from Google Play Store. <https://play.google.com/store/apps/details?id=com.simitgroup.mathclinic&hl=en&gl=US>
- [6] Chai, W. C., & Mostafa, S. A. (2021). Bright Kids Tuition Centre Management Information System. Applied Information Technology And Computer Science, 2(2), 937-957.
- [7] (2023). TrackCC Class management (Version 5.8,1) [Mobile app]. Retrieved from Google Play Store. <https://play.google.com/store/apps/details?id=org.trackcc.trackccforandroid&hl=en&gl=US>
- [8] Dennis, A., Roth, R. M., & Wixom, B. H. (2019). System Analysis and Design, 7th Edition. John Wiley & Sons.
- [9] Uzayr, S., Cloud, N., & Ambler, T. (2019). Vue. js. JavaScript Frameworks for Modern Web Development: The Essential Frameworks, Libraries, and Tools to Learn Right Now, 523-539.
- [10] Supardi, I. Y. (2021). Semua bisa menjadi programmer JavaScript & Node. js. Elex Media Komputindo.