

Design and Integration of IJTutors Tuition Center Management System

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Abstract: In recent years, managing the tuition centres using a traditional approach has become inefficient. It has also become inconvenient for both parents and students. This project recognises the competitive education landscape in Malaysia. It also acknowledges the growing demand for online tuition. Therefore, we suggest creating a web-based Tuition Centre Management System (TCMS) for the Iltizam Jaya Tuition Center. The current process for managing tuition is done manually, including tasks like registering new students, keeping track of their information, assessing them by subject and class, and organising study materials. This project aimed to streamline the processes, offering an accessible online platform for registration procedures, static timetable management, payment tracking, homework and lesson posting, subject management, and performance reporting, contributing to a more efficient and effective educational environment. The Iterative Waterfall Model methodology for Tuition Centre Management Development was used in this study. It covered the feasibility study phases, requirement analysis and specification, design, coding and unit testing, and maintenance. The results and discussion of the IJTutors TCMS explore the feedback from 30 respondents through assessments of the user interface and in-depth system testing using the System Usability Scale.

Keywords: Iterative waterfall, Tuition center, TCMS

1 Introduction

A tuition centre is an educational institution that provides students with extra academic support [1-2] and tutoring outside school hours. Tuition centres in Malaysia have become increasingly popular due to the competitive school system and the pressure on students to excel academically. In the past, tuition centres relied on manual processes to perform various tasks, including storing student information and managing student homework data. However, this manual approach introduced risks to the data, including the potential for duplication or redundant information. The COVID-19 pandemic has changed the way of the learning process in the global educational field. Teaching and learning activities that are usually carried out with face-to-face meetings have turned into virtual meetings in various online learning applications [3]. This indicates that the teaching sector is very competitive. Nevertheless, most tuition centres, such as Iltizam Jaya tuition centre, are still run traditionally.

The education system in most countries is becoming very competitive and challenging for students [4]. This situation makes it increasingly difficult for students to keep up, especially with the pressures of tuition-based learning. The study by Byrd et al. [5] found that online programs offer students greater flexibility and greater student choice not only in where they can attend but also when they can attend. This is due to increased accessibility, allowing students to access educational resources remotely. In the past, tuition was limited to in-person tutoring sessions, which restricted access to education. However, the rise of online platforms and innovative tools has transformed tuition systems,



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making them more accessible and inclusive than ever before. The rapid advancement of technology has led to the swift development of tuition systems. People believe that tuition can enhance students' understanding of some specific subjects, improve students' academic performance, and help them cope with school examinations [6]. Another study by Ireson and Rushforth [7] stated that the increasing importance of educational achievement for future careers, together with increased pressure on schools to raise standards, may lead parents to perceive private tuition as a worthwhile investment. The implementation of a web-based system is crucial for enhancing management systems. Work by Aida et al. [8] showed that the number of student records and documents is growing rapidly each year, due to the increasing number of student enrolments, academic performance reports, and school test papers. The Iltizam Jaya Tuition Centre's manual approach to managing student registration, assessments, and study material delivery is inefficient and inconvenient for both parents and students. Working parents struggle with the manual registration process due to limited visiting hours, and administrators face time-consuming tasks in recording student data and tracking payments. Students are also disadvantaged by manual evaluation methods and difficulty in accessing or reviewing study materials. Additionally, delivering printed materials is cumbersome, especially when updates are needed. Overall, the manual system is burdensome, and a proposed automated system would benefit all parties involved. Therefore, the proposed web-based system, which is IJTutors TCMS, will overcome the issue that occurred in the traditional method previously.

2 Literature Review

A Existing System in Iltizam Jaya Tuition Centre

At Iltizam Jaya Tuition Centre, the student registration process is conducted manually. Typically, when parents want to enrol their children in a tuition class, they must either visit the centre in person [9] or complete a form through WhatsApp. This registration method can pose challenges for working parents. Additionally, student data is recorded using traditional methods, such as pen and paper and physical files. Currently, the tuition centre relies on Microsoft Excel to manage student records. As a result, the administrator often spends considerable time entering student data, registering subjects, and tracking payment statuses. When there are changes to the timetable or tuition fees, the administration must post announcements on the information board or message each parent individually via WhatsApp. Furthermore, the previous paper-based system made it challenging to reach all students or parents, making it difficult to keep them updated on schedules and payment information. Moreover, the tuition centre employs a manual approach to student assessments, requiring students to answer questions using pen and paper. This method is unsuitable for students whose parents are too busy to bring them to the centre, often resulting in poor exam performance at school. Besides, the centre relies on paper modules for student materials, necessitating the printing and distribution of all notes. This approach is inconvenient, as the modules can be easily lost or damaged due to unforeseen circumstances like flooding.

B Tuition Centre Management System

TCMS is a user-friendly software solution designed to simplify and improve the way a tuition centre operates. This system serves as the backbone for efficient management, ensuring seamless coordination of various tasks and resources. The core of the management system is an integrated platform that oversees the entire spectrum of activities within a tuition centre, ranging from student enrolment, scheduling, payment, homework, lessons, and performance monitoring. One of the key features of the TCMS is the unified inventory, which consolidates all educational materials, teaching aids, and resources in a centralised database. This makes it easy for educators to track and manage tuition materials, homework, and other teaching tools. With the unified inventory, teachers have real-time access to everything they need, making it easier to create effective and engaging learning experiences for their students. Another study by Dhak et al. [9] suggested nine modules suitable for TCMS, which are registration, setting, subject, course, batch, student, account, enquiry, and report module.

Study by Azri et al. [10] mentioned that TCMS is a software application designed specifically to automate the administrative tasks associated with running a tuition centre. This system serves as a centralised platform that manages and organises the various aspects of a tuition centre's operations. It includes features such as student registration, class scheduling, fee management [11], attendance tracking, and reporting capabilities. By leveraging technology and automation, a TCMS simplifies and enhances the management of a tuition centre, enabling administrators to focus more on providing quality education and ensuring student success.

Asset monitoring is another essential aspect of the TCMS. This feature allows tuition centre administrators to keep a close eye on physical assets such as computers, projectors, and other equipment. By implementing asset monitoring, the system can provide insights into asset utilisation, maintenance schedules, and the overall condition of resources, optimising their lifecycle and ensuring that they contribute efficiently to the educational process. Several existing systems can be compared when creating the proposed system. Three selected existing tuition centres that were used for comparison were Misi Jaya Tuition Centre, Ai Tuition Centre, and Ilman Tuition Centre. The comparison results are shown in Table 1.

Table 1: Comparison of the existing system

Features of system	Misi Jaya Tuition Centre	Ai Tuition Centre	Ilman Tuition Centre	Iltizam Jaya Tuition Centre Management System (proposed system)
Parent login	x	✓	x	✓
Parent logout	x	✓	x	✓
Admin login	x	✓	x	✓
Admin logout	x	✓	x	✓
New registration	✓	✓	✓	✓
Static Timetable management	✓	✓	x	✓
Student management	x	✓	x	✓
Teacher management	x	✓	x	✓
Teacher login & logout	x	x	x	✓
Homework/ lesson management	x	x	x	✓
Subject management	✓	✓	✓	✓
Report performance	x	✓	x	✓
Record payment	x	x	x	✓

3 Methodology

Since methodologies play a crucial role in project management, choosing the right one is essential for success [11]. Therefore, this research focuses on exploring iterative Waterfall methodologies in project management in detail to help determine which is the most suitable for a given project. A project methodology typically includes phases such as collecting ideas, tools, and strategies for planning, executing, and managing projects. The Iterative Waterfall Model is a hybrid approach that integrates elements of the traditional Waterfall model with iterative development [12]. It aims to address some limitations of the purely sequential Waterfall method by incorporating iterative and feedback-driven processes. Experts reported that the iterative development approach had a positive effect in terms of project execution control [13]. In this model, the project advances through multiple iterations, using feedback from later stages to improve and refine earlier phases of development. The system is divided into six phases: feasibility study, requirement analysis and specification, design, coding and unit testing, integration and system testing, and maintenance.

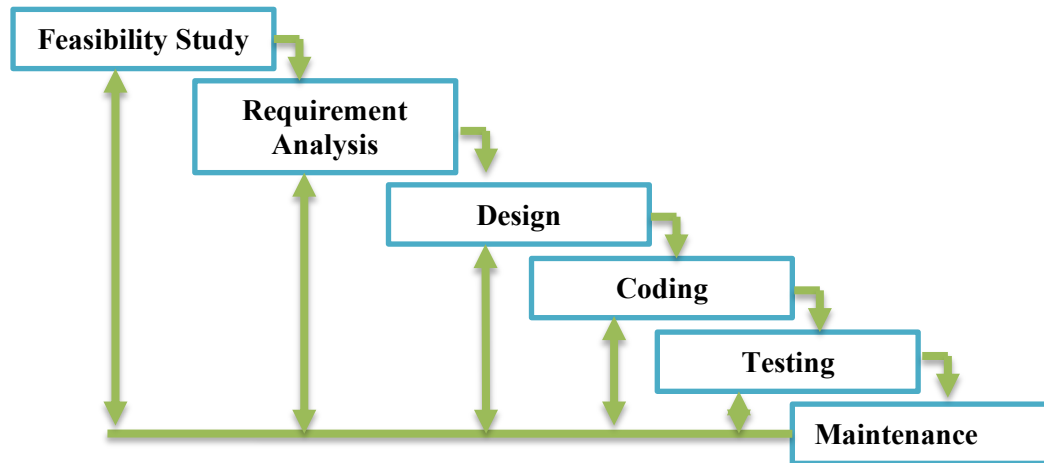


Figure 1: Iterative Waterfall Model [14]

A Feasibility Study

The feasibility study phase is a key part of project planning because it investigates whether a software project can be designed to fulfil all of the users' requirements or not [15]. This step involves looking into various aspects, such as whether the technology is suitable, if the project is financially viable, how it fits into daily operations, and whether it meets legal and regulatory requirements, as well as the timeline for completion. For the IJTutors TCMS project, this study was essential in giving Iltizam Jaya Tuition Centre a clear picture of the technical needs, financial considerations, operational fit, legal compliance, and time limitations involved in developing the system. The study's findings and recommendations have been gathered into a detailed report, providing a solid foundation for making informed decisions about the project's execution. By identifying key challenges and risks, this phase allows Iltizam Jaya Tuition Centre to carefully consider whether to move forward with the TCMS as originally planned, modify its scope, or even rethink the project entirely. By tackling potential concerns early in the feasibility study, the goal was to ensure a thorough examination of the project, ultimately increasing the chances of success for the IJTutors TCMS.

B Requirements Analysis and Specification

For the IJTutors TCMS, we recognised the need to gather information about parents, students, and teachers. This phase involved a careful and organised approach to collecting and categorising data, with a strong focus on understanding the specific requirements and expectations of end-users. To deepen our analysis, we sourced relevant materials, including online and offline publications and journals. Apart from that, preliminary analysis was also obtained from the management procedures of Iltizam Jaya and the findings of the survey through parents, tuition centre owners, and also tuition centre teachers. This crucial phase of information gathering was vital in identifying areas for improvement within the TCMS, ensuring that the following development stages were closely aligned with the needs and preferences of both students and teachers.

C Design

The Context Diagram (CD) for the IJTutors TCMS offered a clear, high-level overview by defining the system's boundaries and showing how it interacts with outside entities. Figure 2 emphasised the relationships between the TCMS and its users, including parents, students, teachers, administrators, other systems, and external data sources, illustrating how information flows in and out of the system. By clarifying the broader context and connections with these external elements, the CD helped everyone involved gain a better understanding of the system's scope, dependencies, and overall environment.

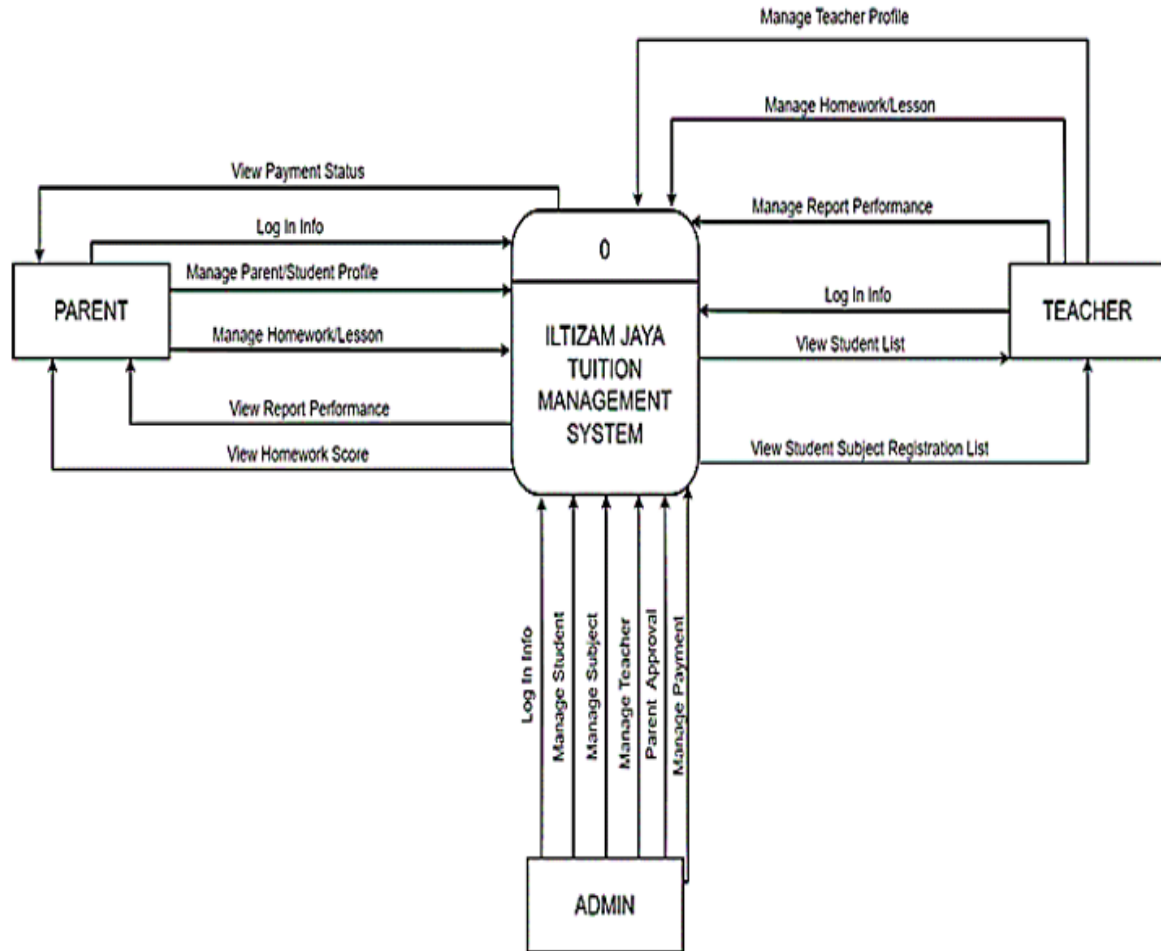


Figure 2: Context Diagram for the IJTutors TCMS

D Coding and unit testing

In the coding phase of the IJTutors TCMS development, the meticulously designed software architecture was transformed into executable source code using a combination of PHP, CSS, HTML, and JavaScript. Additionally, HTML and CSS were used to create the structure and style of the user interface, ensuring a visually appealing and responsive design. Meanwhile, JavaScript was also added to the system, enabling dynamic elements and user-friendly features. The coding process involved the integration of these languages to create a cohesive and functional web-based application. Ongoing testing and refinement helped make sure that the final product met the project's goals and fulfilled user expectations.

E Integration and system testing

During the integration and system testing phase, 10 items that become the standard System Usability Scale (SUS) in Table 2 below were used. SUS was adopted because this item is the most discriminating between the easy and difficult applications in a relatively small-sample experiment [16]. In this study, SUS was employed to evaluate user experience of 30 participants. SUS was employed as an evaluation tool for assessing software interfaces [17].

Table 2: System Usability Scale [18]

No.	Questions
1.	I think that I would like to use this system frequently.
2.	I found the system unnecessarily complex.
3.	I thought the system was easy to use.
4.	I think that I would need the support of a technical person to be able to use this system.
5.	I found the various functions in the system were well integrated.
6.	I thought there was too much inconsistency in this system.
7.	I would imagine that most people would learn to use this system very quickly.
8.	I found the system very cumbersome to use.
9.	I felt very confident using the system.
10.	I needed to learn a lot of things before I could get going with this system.

F Maintenance

Once the development cycles were completed and the IJTutors TCMS was successfully deployed, focus shifted to the maintenance phase. This stage is crucial, as it involves ensuring the system remains functional and operates smoothly over time. Maintenance is not just about keeping things running properly, but it also includes updating the system to refine its capabilities, correct any issues that may emerge, and enhance both its performance and quality.

4 Results and Discussion

A Design

The IJTutors TCMS was designed around six key features to provide an easy-to-use experience and streamline tutoring services. These features include registration, account approval, payments, homework and lesson management, subject management, and performance reporting.

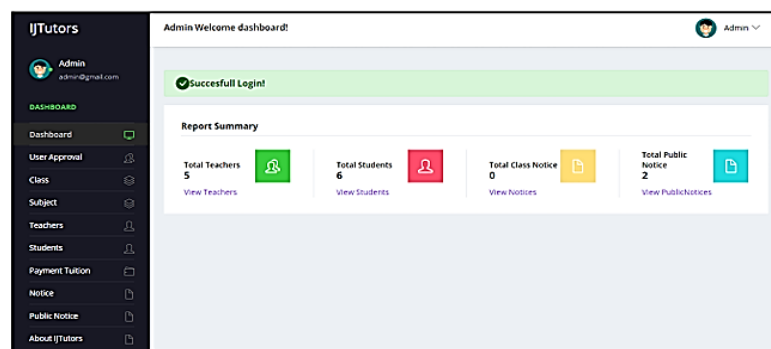


Figure 3: Dashboard for admin

Once the admin logs in successfully, they are taken to the dashboard in Figure 3, which highlights a summary of key reports. This summary includes important data such as the total number of teachers, students, class notices, and public notices. If the admin needs more detailed information, they can simply click the "View" link next to each report for further insights. Additionally, the admin has access to a full navigation menu on the left hand side of the dashboard, allowing them to easily manage different sections of the system.

i. Account Approval

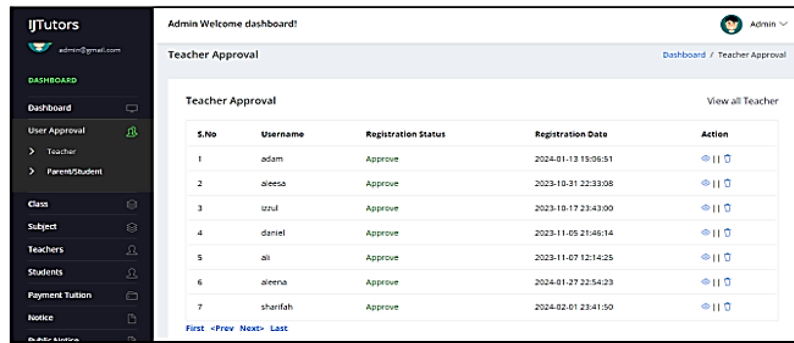


Figure 4: Teacher approval page

On the teacher approval page, key details about the teacher are displayed, including username, registration status, and the date they registered. The admin has full control over managing teacher approvals, with options to either update the approval status by clicking the edit icon or revoke it by using the delete icon in the “Action” column. Once the status is updated, it changes from “Pending” to “Approved”, indicating the teacher’s current registration status.

ii. Manage Payment

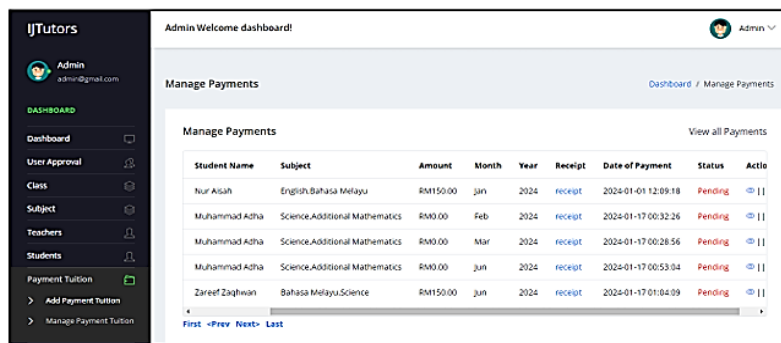


Figure 5: Manage payment

Within the “Manage Payment Tuition” page, critical information about students’ payments is displayed, including details like student name, subject, amount, month, year, receipt, status, and date of payment. Admin privileges enable the updating of students’ payment through the edit icon and the removal of students’ payment information via the delete icon in the “Action” column, and the status will change from “Pending” to “Paid”.

iii. Homework and Lesson Management

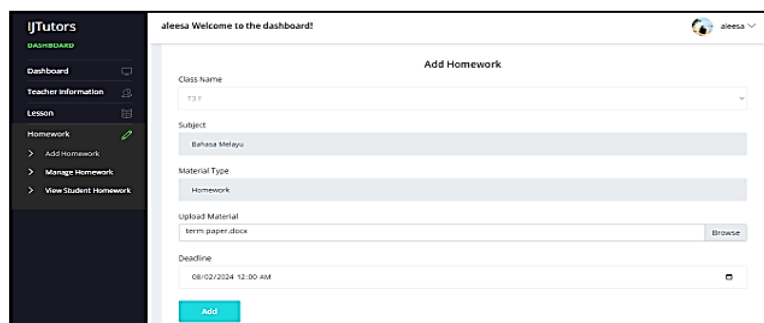


Figure 6: Add homework page

In this section, teachers can easily add some homework by entering details like the class name, material to upload, and deadline. Notably, the input fields for subject and material type are predefined and cannot be altered by the teacher. Upon completion, a simple click on the “Add” button seamlessly submits the new homework for integration into the system.

iv. Subject Management

S.No	Subject Class	Subject Code	Subject Name	Creation Date	Action
1	T2 D	BM	Bahasa Melayu	2023-12-07 22:26:05	Edit Delete
2	T2 D	BI	English	2023-12-07 22:26:24	Edit Delete
3	T2 D	SN	Science	2023-12-07 22:27:09	Edit Delete
4	T2 D	MT	Mathematics	2023-12-07 22:27:22	Edit Delete
5	T2 D	SJ	History	2023-12-07 22:27:37	Edit Delete
6	T5 B	BI	English	2023-12-07 22:27:51	Edit Delete
7	T5 B	BM	Bahasa Melayu	2023-12-07 22:27:56	Edit Delete
8	T5 B	SN	Science	2023-12-07 22:28:01	Edit Delete

Figure 7: Manage subject page

In the “Manage Subject” page, crucial subject information is provided, including details like subject class, subject code, subject name, and creation date. Admin privileges allow for efficient subject management, with the ability to update subject information through the Edit icon and delete subjects using the Delete icon located in the “Action” column. This streamlined approach empowers the admin to make necessary adjustments to subjects’ details as needed.

v. Performance Report

Subject	Mark	Grade	Teacher
Bahasa Melayu	55.00	E	Aleesa Aisy Sofea
English	89.00	B	Aaron Daniel

Grading System

- A 90 - 100
- B 80 - 89
- C 70 - 79
- D 60 - 69
- E 50 - 59
- F 40 - 49

Figure 8: Student report page

On the report performance function, parents can view the performance report for their children. By selecting the desired month and clicking the “Search” button, the system promptly generates and displays the student’s report for that specific month. This streamlined process ensures that parents can easily access and review their children’s academic performance information. Parents can also view the full performance report for their children by clicking “Download Report”.

B Integration

Next, an evaluation was conducted to determine its usability and efficiency. The evaluation was done among administrators, parents, and teachers at Iltizam Jaya Tuition Center. There were 30 respondents who have responded to the survey. According to the pie chart in Figure 9 below, 56.7% of respondents (17 users) were parents, 40% (12 users) were teachers, and 3.3% (1 user) were administrators.

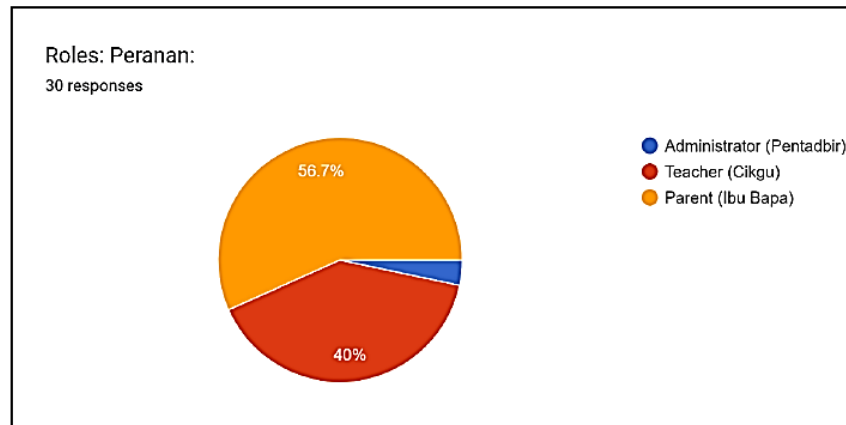


Figure 9: Role of respondents for IJTutors TCMS

The ratings range from “strongly disagree” to “strongly agree”. Table 3 below presents the results from a SUS questionnaire, which assessed users’ perceptions of the system’s usability based on 10 key statements. The findings reveal a mix of positive, negative, and neutral responses. On the positive side, 76.7% of respondents expressed a desire to use the system frequently (Item 1), while 70% believed that most people would be able to learn it quickly (Item 7). Furthermore, 66.7% felt confident in their ability to use the system (Item 9). However, there were also notable negative perceptions: 66.7% of users found the system cumbersome (Item 8), and the same percentage felt they needed to learn a lot before becoming proficient (Item 10). Additionally, 60% of respondents believed they would need technical support (Item 4), and 46.7% thought the system was overly complex (Item 2). In terms of neutral or mixed feedback, 66.7% agreed that the system’s functions were well integrated (Item 5), and 63.3% found it somewhat easy to use (Item 3). However, users were divided in their opinions about the system’s overall complexity and consistency (Items 2 and 6). The IJTutors TCMS has several strengths in terms of usability; users still experience significant challenges, particularly related to its complexity and the learning curve.

Table 3: User feedback for IJTutors TCMS

No.	Questions	1	2	3	4	5
1.	I think that I would like to use this system frequently.			6.7	16.7	76.7
2.	I found the system unnecessarily complex.	46.7	33.3	13.3	6.7	
3.	I thought the system was easy to use.			6.7	30	63.3
4.	I think that I would need the support of a technical person to be able to use this system.	60	33.3	3.3	3.3	
5.	I found the various functions in the system were well integrated.			3.3	30	66.7
6.	I thought there was too much inconsistency in this system.	53.3	40	3.3	3.3	
7.	I would imagine that most people would learn to use this system very quickly.			3.3	26.7	70
8.	I found the system very cumbersome to use.	66.7	23.3	3.3	6.7	
9.	I felt very confident using the system.			3.3	30	66.7
10.	I needed to learn a lot of things before I could get going with this system.	66.7	26.7	3.3	3.3	

Overall, the responses show that users find the system easy to use, well-organised, and simple to navigate. High scores on items 3, 5, and 9 indicate a positive experience, showing that users feel comfortable and confident. Few users agreed that the system is complex or difficult (questions 2, 6, and 8), supporting its user-friendly design that requires little technical support or training.

5 Conclusion

In conclusion, IJTutors TCMS offers computerised solutions for parents/students, teachers, and administrators. Using the system, it effectively manages all tuition centre administration by replacing

outdated systems. Furthermore, the traditional approach of IJTutors TCMS is paper-based, and the security is low and exposed to data loss and a long management process. At the same time, the system is able to manage large volumes of data involved in tuition centre operations. Other than that, the performance report feature rounds out the system, providing a reliable reporting system that delivers comprehensive performance report for each student, incorporating factors such as homework assignments and scores. For future work, the system should prioritise dynamic timetables for improved adaptability and a user-friendly experience and enhance data security by introducing CAPTCHA technology.

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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 with the funders.

References

- [1] P. Ezzalee Kamaroszaman, M. Zainuri Saringat, and F. Sains Komputer dan Teknologi Maklumat, "Pembangunan Sistem Pengurusan Pusat Tuisyen Menggunakan Aplikasi Mudah Alih Development of Tuition Centre Management System via Mobile App," *Appl. Inf. Technol. Comput. Sci.*, vol. 3, no. 1, pp. 1137–1155, 2022.
- [2] U. Azmat, Y. Muhammad, and M. Jamil, "Private Tuition Academies and the Development of Students' Creative and Critical Skills: Perspectives of Academy Managers Including Disability as diversity View project Exploring doctoral students' perception of supervisors' expertise View project," *Int. Rev. Soc. Sci.*, vol. 9, no. 4, pp. 277–288, 2021.
- [3] S. Wickramasekara, "E-Tuition Class System," *Master Thesis*, University of Colombo School of Computing, Colombo, Sri Lanka, 2021.
- [4] Z. Sahito, M. Khawaja, A. Siddiqui, A. Shaheen, and H. Saeed, "Role of Tuition Centers in the Performance and Achievement of Students: A Case of Hyderabad District, Sindh, Pakistan," *J. Educ. Train. Stud.*, vol. 5, no. 4, pp. 90-95, 2017.
- [5] J. Byrd, J. Roufagalas, and P. Mixon, "Tuition sensitivity in online education," *J. Econ. Econ. Educ. Res.*, vol. 16, no. 3, pp. 25–42, 2015.
- [6] C. Wei Chun and S. A. Mostafa, "Bright Kids Tuition Centre Management Information System," *Appl. Inf. Technol. Comput. Sci.*, vol. 2, no. 2, pp. 937–957, 2021.
- [7] J. Ireson and K. Rushforth, "Mapping and evaluating shadow education End of Award Report," 2005.
- [8] R. Aida, Y. Mohd, and A. A. Ramli, "Student Management System Development of Damya Deena Tuition Center (SPP Damya Deena)," *Appl. Inf. Technol. Comput. Sci.*, vol. 3, no. 1, pp. 889–901, 2022.
- [9] B. Dhak, P. P. Paunekar, S. S. Khan, S. S. Ramteke, Y. R. Jais, and P. R. Gupta, "Tuition Plus + For Managing Tuition Class Data," in *International Journal of Scientific Research in Computer Science, Engineering and Information Technology*, vol. 5, no. 1, pp. 357–362, 2019.
- [10] M. Azri, I. Harun, N. Selamat, and A. B. Jalil, "Cyber Tuition Saujana Utama Management System," *Appl. Inf. Technol. Comput. Sci.*, vol. 4, no. 2, pp. 1451–1470, 2023.
- [11] J. Wiratama, M. E. Johan, S. Sobiyanto, M. C. Wijaya, and V. I. Sugara, "Development of Web-based Application for Private School Tuition Fee Management with Prototyping Model," *J. Inf. Syst. Informatics*, vol. 5, no. 4, pp. 1402–1415, 2023.
- [12] M. H. Mustapha, S. Kamal, and A. Khalid, "Adami Tuition Centre Management System Using AES Encryption and CAPTCHA," *Appl. Inf. Technol. Comput. Sci.*, vol. 3, no. 2, pp. 118–133, 2022.

- [13] J. A. Osorio, M. R. V. Chaudron, and W. Heijstek, "Moving from waterfall to iterative development: An empirical evaluation of advantages, disadvantages and risks of RUP," in *Proc. 37th Euromicro Conf. Softw. Eng. Adv. Appl. (SEAA)*, 2011, pp. 453–460.
- [14] A. A. Ruslan, S. M. Salleh, S. F. W. M. Hatta, and A. A. B. Sajak, "IoT Soil Monitoring based on LoRa Module for Oil Palm Plantation," *Int. J. Adv. Comput. Sci. Appl.*, vol. 12, no. 5, pp. 215–220, 2021.
- [15] M. Samadi, "Waterative Model: An Integration of The Waterfall and Iterative Software Development Paradigms," *Database Syst. J.*, vol. X, no. 15, pp. 75–81, 2019.
- [16] J. R. Lewis, "The System Usability Scale: Past, Present, and Future," *Int. J. Hum. Comput. Interact.*, vol. 34, no. 7, pp. 577–590, 2018.
- [17] W. S. Husain, S. Hasrinafasya, and C. Hassan, "Evaluating the usability of interactive infographics for raising tuberculosis awareness among UiTMCK students," *J. Math. Comput. Sci.*, vol. 9, no. 2, pp. 48–55, 2023.
- [18] V. Saldaño, A. Martin, G. Gaetán, and D. Vilte, "Focusing on Older Web Users: An Experience in Patagonia Argentina," *Int. J. Adv. Internet Technol.*, vol. 7, no. 3, pp. 172–182, 2014,