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Parents and Teachers System for Sekolah Kebangsaan Parit Raja

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Abstract: This study focuses on implementing technology in managing the learning and teaching activities of Sekolah Kebangsaan Parit Raja in Batu Pahat. The current manual record management systems and paper-based document storage pose challenges to the institution's management environment. To address these issues, the study aims to develop logical and management procedures using the object-oriented approach and create a web-based system. The System Development Life Cycle (SDLC) methodology is followed to ensure systematic development and meet all system requirements. Using Flutter and Firebase technologies, a standalone online system is constructed to streamline record management processes. This system improves accessibility, accuracy, and security of records, reducing reliance on manual paperwork. The application-based system enables efficient data storage, retrieval, and management, enhancing the overall learning experience and administrative efficiency. This study provides a foundation for similar initiatives in other educational institutions, leading to improved educational management practices through the integration of technology.

Keywords: Management System, Manual Record, Parents and Teachers System, SDLC, School Management System, Flutter

1. Introduction

Nowadays, we can see that the advancement of school is slow progressing, and numerous efforts can be taken to guarantee that every student improve their performance in academic and cocurricular. A school is a place where people can gain knowledge and receive an education. There is a relationship between two parties in school, such as teachers and students. However, in the elementary and secondary school levels, the relationship between parents and teachers should be emphasized in order to monitor their children's activities and development. In Malaysia, in particular, the connection between teachers and parents is fairly restricted since they normally meet on the day of collecting student performance cards, as well as the meeting between students' parents and teachers that is conducted at least once a year. Furthermore, they will communicate using the WhatsApp application, as well as other media social applications which is very inefficient. As a result, this system is being developed to address the

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majority of the issues that arise. By using the system development life cycle and object oriented approach, the system will be developed based on web and applications.

The scope that will be developed in this project will cover all the problems faced by parents and teachers in their affairs to communicate and exchange information with each other. Furthermore, the process of collecting and storing school-related data will be more organized and secure, enabling the task of managing school data and information better.

2. Related Work

2.1 Introduction

The school's current system is said to be inefficient and time-consuming. Today's technological advancements, new network technologies that connect individuals from all over the world have enabled every user to keep in touch with one another, even at a distance. Having stated that, correct technology is required to give a more convenient and appropriate solution for a certain function. When you understand programming, you understand how to tell a computer to carry out a set of logical steps to reach a required outcome [1]. With the aid of software development skills and the technologies available today, it is feasible to develop a management system capable of meeting all requirements from stakeholders. In addition, the interface design used will be based on the principles of ui/ux design to develop this system, therefore it will appear more attractive and more user-friendly to the target users of the system.

2.2 Development Technology

There are many platforms that can be used to develop a system nowadays, including mobile platforms or web platforms. In addition, the development of technology from time to time can further simplify the process of developing a management system. For example, Flutter technology, which will be used in the development of this system, allows for the creation of a cross-platform application that can be used by teachers and parents. With Flutter, the system's user interface can be designed and built using widgets. Flutter provides a rich set of widgets and tools that make it easier to create an appealing and user-friendly interface. To enhance the visual appearance and style of the system, Flutter's built-in styling capabilities. Flutter allows for the customization of widgets and the application's overall theme, ensuring a visually cohesive and attractive design. In addition to its UI capabilities, Flutter also handles the back-end programming of the system using Dart, the programming language associated with Flutter Flutter's Dart code determines the system's processes and actions based on user input and output. By leveraging the power of Flutter, the system can be developed as a mobile application, providing a seamless experience for teachers and parents on various mobile platforms.

2.3 Study of Existing Related System

The difference between the system functions will be observed and discussed. Any righteous functions that are applicable in the project system will be taken into consideration and implemented in the project system. The interrelation between functions that are performed on the market and the current project system will be examined thoroughly as well. Any advantages that can be utilized in this project system will be applied to the developed system as a reference. Table 1 shows the system comparison between each chose system.

Table 1: System Comparison

System Features	Teacher Kit	School2me	Home School	Parent & teachers System
Login	√	√	√	√
Registration	√	X	√	√
User Profile	X	√	√	√
Notification	X	√	√	√
Document	√	√	√	√
Chat	X	√	√	√
Manage Users	X	√	X	√
Print Report	√	√	√	√
Search	X	X	√	√

Based on table 1, system comparison, all of the system can be compared through theirs different function and features offered in each system. For example, system features of login, registration, user profile, notification, chat, document, manage users, print report and search. Referring to table 1, all 4 systems have the same features in login, document, and print only while Teacher Kit lacks of user profile, notification, chat, manage users and search features. School2me does not have registration and search features only while Home School apps only lacks with manage users feature. Therefore, proposed system, Parents and Teachers System is the only application that has all of the features mentioned.

3. Methodology/Framework

A strong methodology is a set of procedures that ensures the project of the proposed system is able to be developed successfully in accordance with the steps used in methodology in keeping with the mapping of each phase [2]. The Software Development Life Cycle, SDLC, is a method choose to be used for the development of the proposed system It is suitable for creating software that is of the finest quality and least costly in the shortest amount of time and it is being implemented in the development of the proposed system. The SDLC's well-organized phases allow the development to become a system that is quickly build with high-quality software that is well-tested and ready for use in production's includes the processes of analysis, planning, design, development, and testing to actually develop the system. Figure 1 shows the System development Life Cycle.

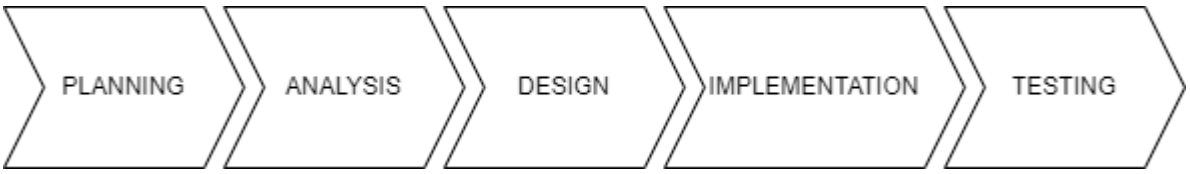

Figure 1: System Development Life Cycle

All data and information related to development of the system which are collected during the early phase of SDLC which is planning phase. All of the requirements needed for the system's development are also collected from the stakeholders, then all the requirements will be analyzed during requirement analysis phase [3]. The software, hardware, and other elements such as functional and non-functional requirements of the system will also be analyzed. As part of the initial analysis, system requirements are assessed to determine system fundamental problems and requirements [4]. Then the interface of the system will be developed during the design phase. The design of the interface will be more focus to fulfill the users need and easy to use. The implementation phase is critical because all of the

requirements' functions must be implemented in the system and perform properly. The testing process will be carried out to ensure that the system functions as intended and that all requirements are met. In this phase, functional testing and user acceptance testing will be used. Table 2 shows software development activities and its task.

Table 2: Software development activities and its task

Phase	Activities	Deliverables
Planning phase	• Brainstorming Ideas. • Proposal preparation. • Produce Gantt Chart.	Able to illustrate the overview of the system, Gantt chart and submit the proposal.
Analysis phase	• Meeting with client • Gather and analyze the requirements. • Analyze existing system.	Able to documented the problems in Software Requirement Specification and completing report chapter 2.
Design phase	• Design the use case diagram, sequence diagram and activity diagram. • Design class diagram. • Design the User Interface (UI) of the system. • Design the table scheme.	Able to obtained the system's prototype through the class diagram and report chapter 3 and 4 is completed.
Implementation phase	• Start the coding development for the system. • Connect the system with database. • Run the application system.	Able to develop the source code of the system and connect the data of the system with the selected database.
Testing phase	• Create the test case specification. • Document the test result.	Able to develop the source code of the system and connect the data of the system with the selected database.

3.1 Functional Requirements

The functional requirement are the characteristics that the end user directly requests as a fundamental system facility. As a part of the contract, all of these features or module must be implemented into the system. How the system should be used and how it functions might serve as a definition of a functional requirement [5]. Table 3 shows functional requirements.

Table 3: Functional Requirements

Modules	Functionalities
Login	To log into their respective accounts. Error message for wrong username or password. Update password for first time user, and if forgot old password.
Register	To offer a secure and reliable environment for communication and interaction with all system users. Each user must register their account first before gaining full access to every system function.
Notification	Teachers able to upload and display information. Available to be seen by all users which are parents and teachers.
Chat	Able to develop the source code of the system and connect the data of the system with the selected database.

Modules	Functionalities
Document	Able to develop the source code of the system and connect the data of the system with the selected database.
User Profile	Teachers are able to create a group chat. All users are able to search for existing groups and join the groups to have a conversation with other users.
Manage Users	The admin has the ability to add, update or delete the users in the system from the database.
Print Reports	The admin has the ability to print out related document saved in the database.

3.2 Non-Functional Requirements

Non-functional requirements are generally quality requirements that the system must meet in accordance with the project contract [6]. The significance or amount to which these aspects are incorporated differs each project. Table 4 shows non-functional requirements.

Table 4: Non-Functional Requirements

Modules	Functionalities
Usability	The usability of a system determines how difficult it will be for a user to understand and use it. How user with lack of technology skills can perform tasks in one page, how quickly they can carry out any task and how the design is appealing to the user.
Performance	Security requirements guarantee that illegal access to the system and its stored data is restricted. It takes into account various degrees of authorization and authentication across different user roles.
Security	Teachers able to upload and display information. Available to be seen by all users which are parents and teachers.
Scalability	How the system must develop without sacrificing its performance. This involves more users, and more data processing. Scalability affects both hardware and software.
Availability	The duration of time that the system's functionality and services are available for usage with all operations is used to calculate availability. As a result, scheduled maintenance periods have a direct impact on this parameter. It is also critical to identify how the impact of maintenance might be reduced.

3.3 Use Case Diagram

Use cases the main representation of system requirements for an unfinished new proposed system. It aids in system design from the viewpoint of the end user. By describing all externally observable system activity, it is a useful tool for explaining system behavior to users. The actors included in the use case of the system are admin, teachers and parents who will perform different task of the module provided.

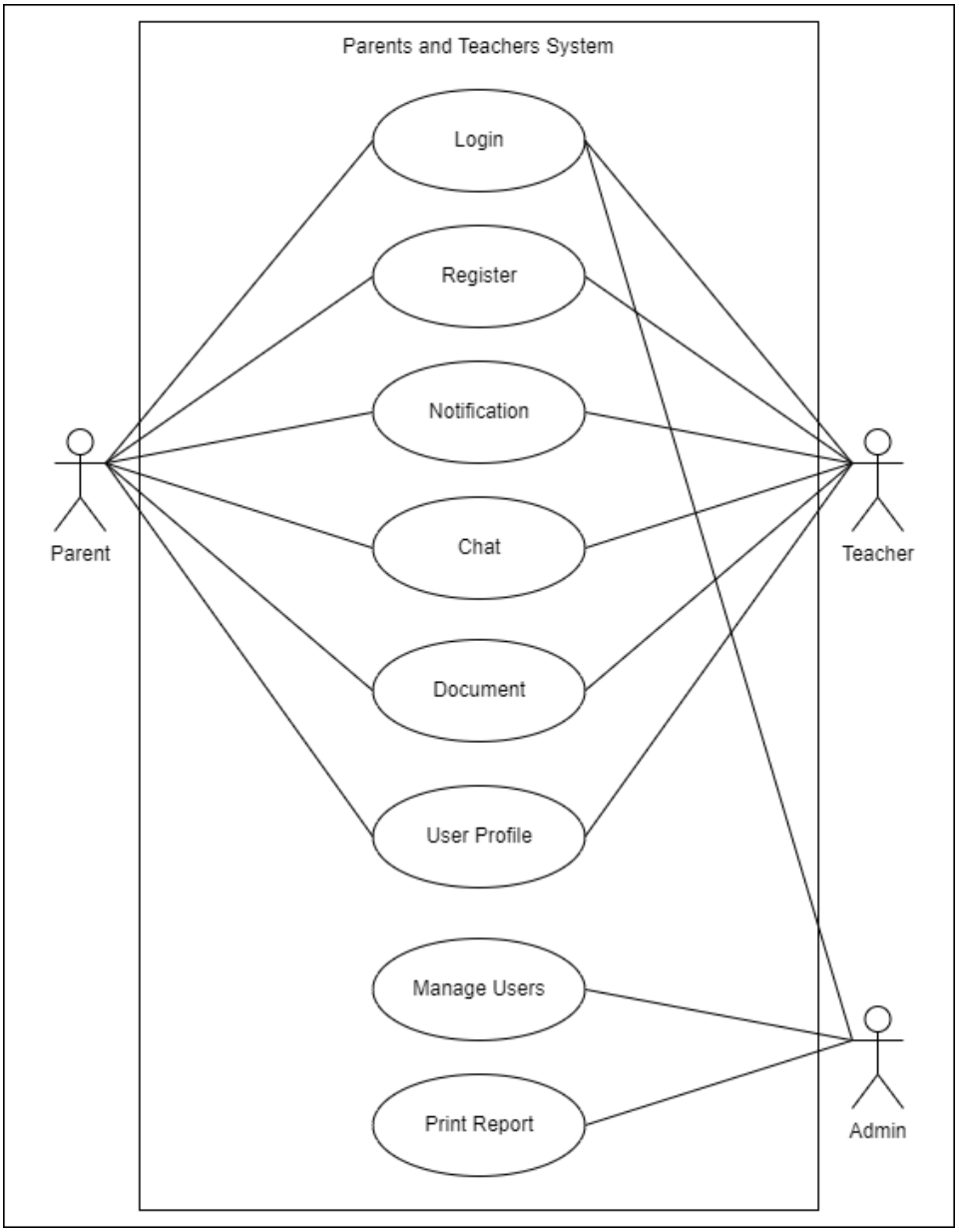

Figure 2: Use Case Diagram

Based on figure 2, there is at least 8 use case which is necessary to develop the system. First is login use case where in this use case, all users including teachers, parents and admin need to login to authenticate their privilege and have access to the system. Next is register use case where the teachers and parents need to fill all required details in order to have access to the system. Notification use case is where the teacher can add, edit and delete the notification or announcement to be shared with the parents or other users. In this use case, all the users will have ability to view the notifications. After notification, the system will also have chat use case where all the users can have the ability to communicate with each other's in a particular chat group. The use case will also give the teachers specific function which is to create chat group. Then is document use case, the users will have access to upload, download and remove file in a particular document section. The teachers will also have special privilege to create new document section and view list of student submissions. User profile use case is where teachers and parents view update their profile in the system. Manage users use case is a use case develop specifically for admin where they can manage all users that have access in the system according to their desired action. Lastly is print report use case is when admin want to print a particular report related to the data saved in the system's database.

3.4 Class Diagram

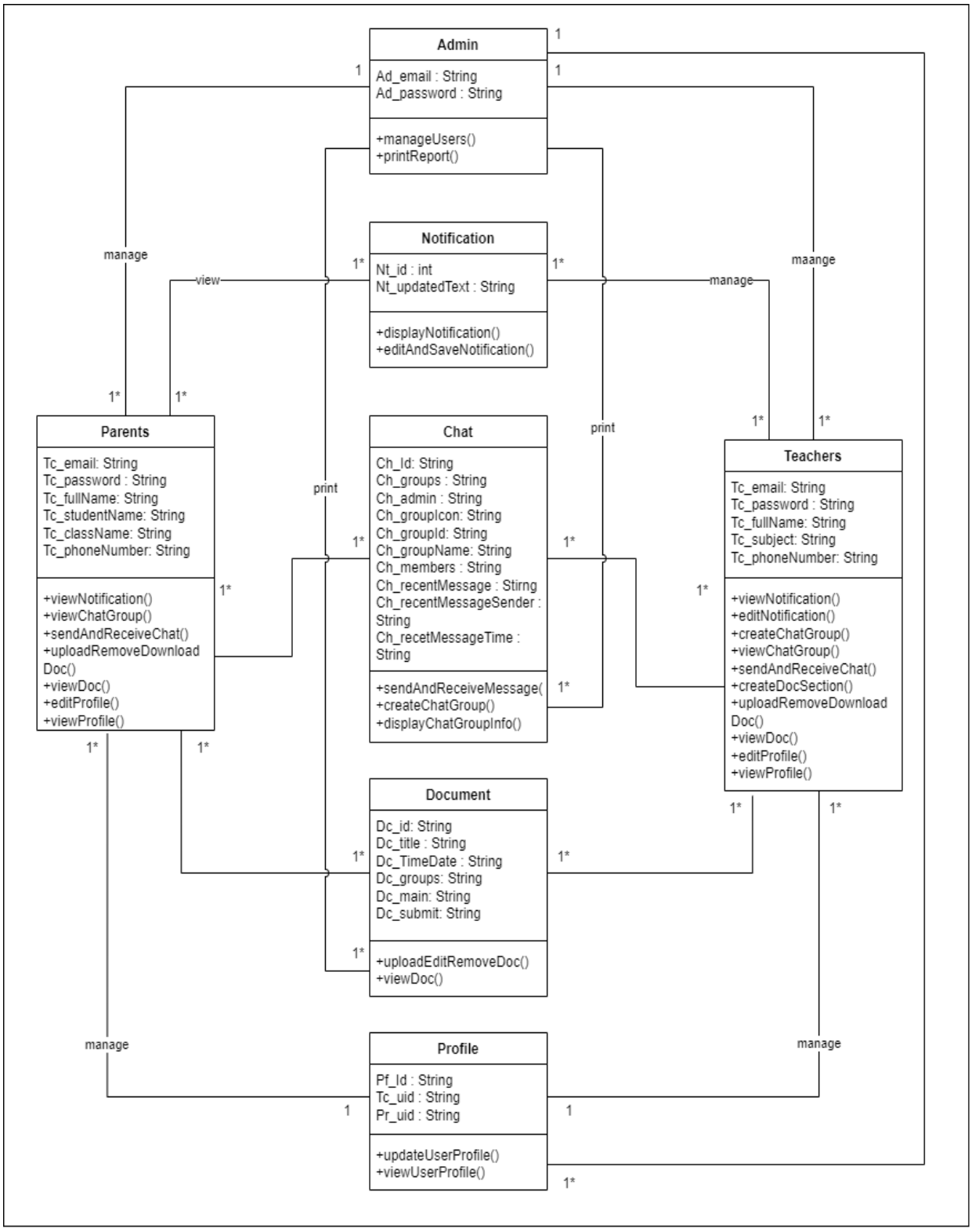

Figure 3: Class Diagram

Based class diagram in figure 3 show that there is 7Class Diagram define Class used to manage the data in the system. Class Diagram define Class included is Admin, Parents, Teachers, Notification, Chat, Document, and Profile.

3.5 Database Scheme

A database schema is a structure or layout that defines a set of data. A schema table also is a database architecture that contains entity and attribute information. Firebase is used to create the database for the proposed system. Databases are dynamic environments that undergo frequent changes, with design elements being regularly added, removed, or updated [7].

I. `Admin (Ad_email, Ad_password)`

II. `Teacher (Tc_uid, Tc_email, Tc_fullName ,Tc_password, Tc_subject, Tc_phoneNumber, Tc_profilePic, Tc_uid, Tc_groups)`

III. `Parent (Pr_uid, Pr_email, Pr_fullName, Pr_password, Pr_studentName, Pr_className, Pr_phoneNumber, Pr_profilePic, Pr_uid, Pr_groups)`

IV. `Notification (Nt_Id, Nt_updatedText).`

V. `Document (Dc_id, Dc_title, Dc_TimeDate, Dc_groups, Dc_main, Dc_submit)`

VI. `Chat (Ch_Id, Ch_groups, Ch_admin, Ch_groupIcon, Ch_groupId, Ch_groupName, Ch_members, Ch_recentMessage, Ch_recentMessageSender, Ch_recentMessageTime)`

VII. `Profile (Pf_Id, Tc_Id, Pr_Id)`

3.6 Implementation phase

The design of the interface for each module in the development of the proposed system. The design will follow the vital principal of ui/ux design to develop such user-friendly system.

i. Login Interface

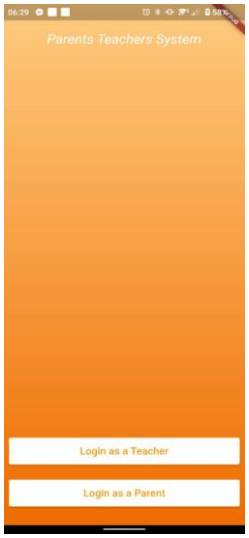

Figure 4(a): Welcome Page

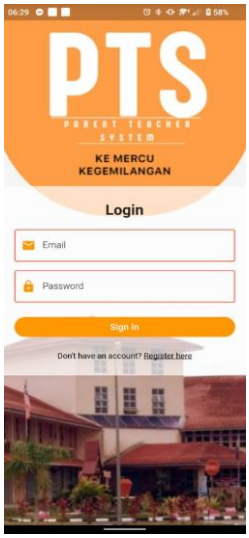

Figure 4(b): Login Page

Figure 4(a) shows welcome page where the users will choose their role before login to the system and figure 4(b) shows login page which the users need to login first in order to has access to the system. There is also validator which will shows pop up alert message if the users enter wrong credentials.

ii. Register Interface

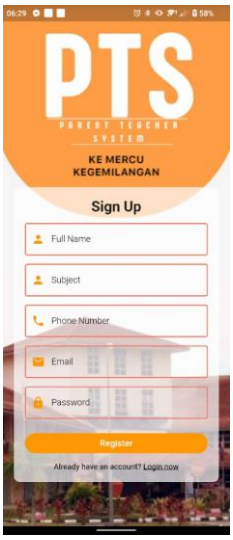

Figure 5(a): Teacher Registration Page

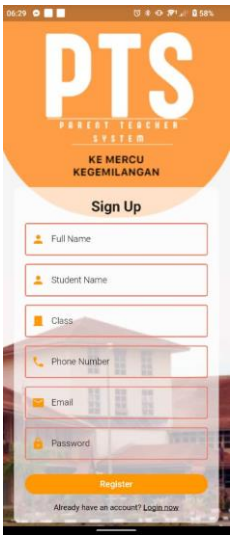

Figure 5(b): Parent Registration Page

Figure 5(a) shows registration page for teachers and figure 5(b) shows parent registration page where the users need to fill in all required details in order to an account for this system. There is also validator which will shows pop up alert message if the users enter wrong credentials.

iii. Homepage Interface

Figure 6(a): Homepage

Figure 6(b): Edit Notification at Homepage

Figure 6(a) shows the users interface while figure 6(b) shows the edit function on homepage that can only be use by the teachers.

iv. Notification Interface

Figure 7(a): Display Notification

Figure 7(b): Edit Notification

Figure 7(b): Add New Notification

Figure 7(a) shows the normal view of notification page while figure 7(b) and 7(c) shows the notification page when the teachers want to edit the notification to be displayed to all users.

v. Chat Interface

Figure 8(a): Chat Page

Figure 8(b): Chat Group Page

Figure 8(c): Teacher Chat Group Page

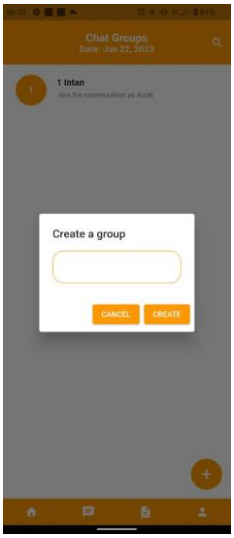

Figure 8(d): Create Chat Group

Figure 8(e): View Chat Group Information

Figure 8(a) shows the chat interface for all users and 8(b) and 8(c) is the chat page that displays chat group joined by users teacher and parent respectively. Figure 8(d) shows the interface when the teachers want to create new chat group. Lastly on image 8(e), it displays the chat group information interface for all users.

vi. Document Interface

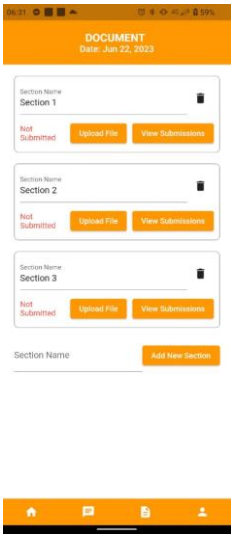

Figure 9(a): Document Page

Figure 9(b): Submission List Page

Figure 9(a) shows how the document section page looks like in the system which is actually from the point of view of teacher's account and 9(b) is the list of students who already submitted the file in a particular document section.

vii. Profile Interface

Figure 10(a): Profile Page

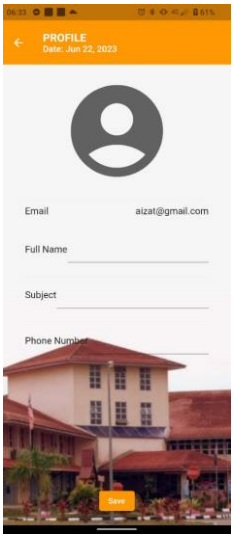

Figure 10(b): Profile Page

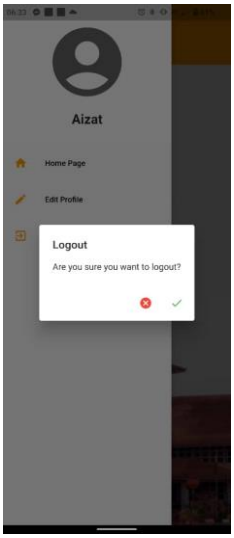

Figure 10(c): Log out at Profile Page

Figure 10(a) and 10(b) shows a typically profile page for almost every apps which is very crucial so the users can also edit and update their personal data to be saved in the system and can be used for the school management purpose. Image 10(c) shows how the user can log out from the system through profile page.

4. Result and Discussion

The implementation process of this project has been implemented by using Flutter which is dart language as the front end and logic for the system. Firebase has been used to efficiently store, retrieve, update, and manage vast amounts of data and information in the system. The teacher can register and login to the system, add and edit notification, add and edit document section, add, chat with other users and search group chat, add and edit timetable, edit profile and view all data related in the system. Parent has the ability to register and login to the system, view notification, chat with other users and search group chat, search document section, submit file, view and edit profile. Admin has the ability to manage the users in the system and generate report. Software testing is a process, or a series of processes, designed to make sure computer code does what it was designed to do and that it does not do anything unintended. The initial and crucial stage in software development is of utmost importance because customers will not approve a product that fails to meet their functional demands, even if it excels in other aspects [8].

4.1 Functional Testing

The test case has been created to verify the functionality of the login process. Effectiveness refers to the capability of the devised test to expose the highest possible number of errors present in the software, while economics implies that the test should utilize minimal time and resources [9]. Table 5 provides a brief overview of the test case.

Table 5: Test Cases

Test Case ID	Test Case	Expected Result	Result
Test Case login			
PTS_TEST_100_001	Click sign in button with correct details	The system will sign in the user and display the homepage.	PASS
PTS_TEST_100_002	Click sign in button with incorrect details	The system will generate validator if the input entered is wrong.	PASS
PTS_TEST_100_003	Click sign in button with correct or incorrect details on wrong login.	The system will block the user from login on the wrong login page.	PASS
Test Case Registration			
PTS_TEST_200_001	Click sign up button with correct details	The system will sign up the user and display the homepage.	PASS
PTS_TEST_200_002	Click sign up button with incorrect details	The system will generate validator if the input entered is wrong.	PASS
PTS_TEST_200_003	Click sign up button with insufficient details.	The system will block the user from login on the wrong login page.	PASS
Test Case Notification			
PTS_TEST_300_001	Teacher enters new data on notification	The system will display saved alert message and displays updated data.	PASS
PTS_TEST_300_002	Users are at homepage and notification page	The system will display all data related to notification on both pages.	PASS
Test Case Group Chat			
PTS_TEST_400_001	Teacher clicks on create group	The system will create the new chat group.	PASS
PTS_TEST_400_002	Users entered the chat group name and click on search	The system will display the correct chat group with correct name.	PASS

Test Case ID	Test Case	Expected Result	Result
PTS_TEST_400_003	Users click on the join group button	The system will displays joined status alert message and direct users to the chat group page.	PASS
PTS_TEST_400_004	Users enter text and click on send button.	The system will display the most recent message and older message in a particular chat group.	PASS
PTS_TEST_400_005	Users click on chat group information	The system will display the chat group information and members.	PASS
PTS_TEST_400_006	Users click on leave chat group icon	The system will display alert message and ask for confirmation from the users.	PASS
Test Case Document			
PTS_TEST_500_001	Teacher clicks on create document section	The system will create the new document section.	PASS
PTS_TEST_500_002	Users entered the document section name and click on search	The system will display the correct document section with correct name.	PASS
PTS_TEST_500_003	Teachers click on the view submission button	The system will display list of students who has submit their file in a particular document section.	FAIL
PTS_TEST_500_004	Users upload file	The system will save, update or delete the data of a file in database for a particular document section.	FAIL
PTS_TEST_500_005	Users click on document section information	The system will display the document section information.	FAIL
PTS_TEST_500_006	Users delete file	The system will save, update or delete the data of a file in	FAIL

Test Case ID	Test Case	Expected Result	Result
		database for a particular document section.	
PTS_TEST_500_007	Users edit file	The system will save, update or delete the data of a file in database for a particular document section.	FAIL
Test Case User Profile			
PTS_TEST_600_001	Users click the users profile button	The system will display correct data.	PASS
PTS_TEST_600_002	Users edit their profile data and click save button	The system will update the data on database and displays correct data.	PASS
PTS_TEST_600_003	Users click the log out button	The system will log out the users from the system and save their data in database.	PASS
Test Case Manage Users			
PTS_TEST_700_001	Admin click on manage users	The system will display correct users data in the system.	PASS
PTS_TEST_700_002	Admin click on action to the selected user account	The system will do action intended to the account selected and update the database.	FAIL
Test Case Print Report			
PTS_TEST_800_001	Admin clicks on report	The system will display correct report data saved in the system.	PASS
PTS_TEST_800_002	Admin click on print to the selected data report	The system will print out the selected data.	PASS

4.2 Overall Test Results

A total of 28 test cases were conducted against this system and the overall results were very positive. Out of the 28 test cases that were found, this system has passed 22 test cases successfully making it pass the testing part with a high percentage of 78.6%. The table 6 below shows the overall system testing approval at each level:

Table 6: Overall test result for Parents and Teachers System

Test Case ID	Total Test Cases	Total Passes	Total Fails
PTS_TEST_100	3	3 (100%)	0 (0%)
PTS_TEST_200	3	3 (100%)	0 (0%)
PTS_TEST_300	2	2 (100%)	0 (0%)
PTS_TEST_400	6	6 (100%)	0 (0%)
PTS_TEST_500	7	2 (28.6%)	5 (71.4%)
PTS_TEST_600	3	3 (100%)	0 (0%)
PTS_TEST_700	2	1 (50%)	1 (50%)
PTS_TEST_800	2	2 (100%)	0 (0%)

4.3 User Acceptance Testing

User Acceptance Testing is a type of testing that carried out by the client or end user in order to ensure the software system met the user requirements [10]. A total of 25 testers who held the role of teacher and parent participated in the user acceptance testing session and their data was recorded in the google form. Based on the data given in figure 11 to figure 17, the results of user acceptance testing are very positive, meaning that the system successfully provides satisfaction and fulfills the requirements of both users, teachers and parents:

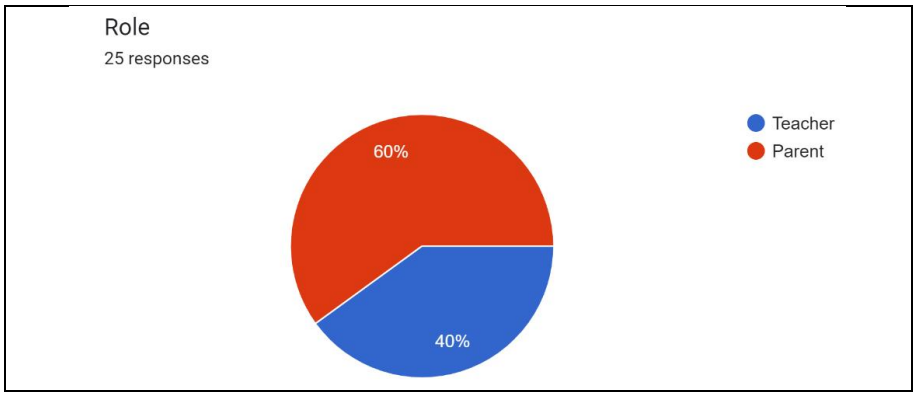

Figure 11: Roles

Figure 11 shows total numbers of users who participate in the users acceptance testing are 60% parents which equal to 15 and 40% teachers which equal to 10.

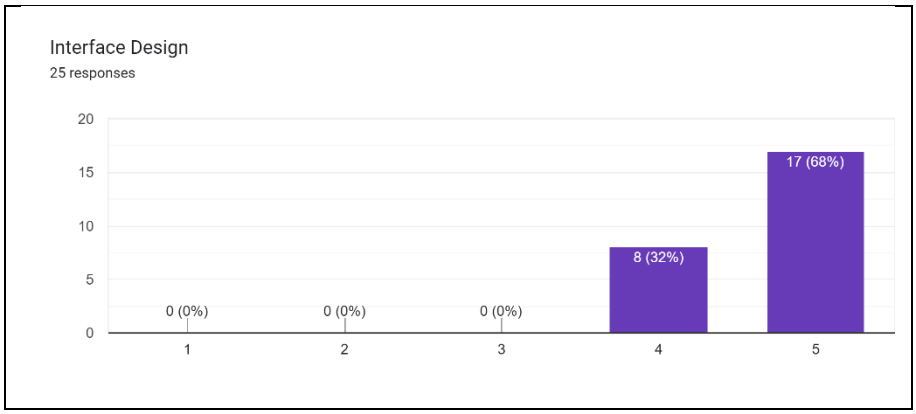

Figure 12: Interface Design Evaluation

Based on figure 12, 32% vote for 4 out of 5 marks and 68% votes for 5 out of 5 marks for the interface design evaluation which based on overall design of the User Interface (UI) of the system.

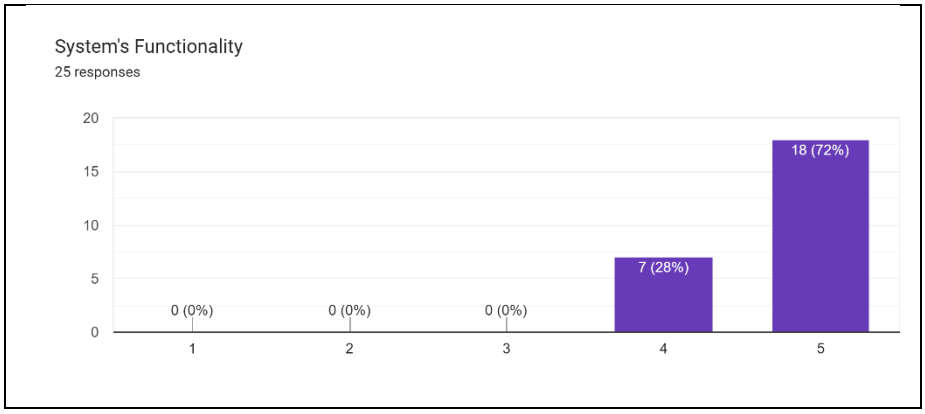

Figure 13: System's Functionality Evaluation

Based on figure 13, 28% vote for 4 out of 5 marks and 72% votes for 5 out of 5 marks for the system's functionality evaluation which based on overall functional requirement of the system.

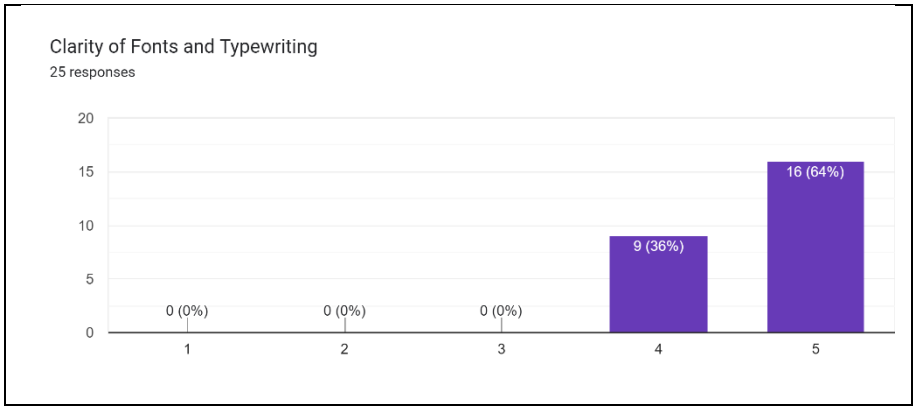

Figure 14: Clarity of Fonts and Typewriting Evaluation

Based on figure 14, 36% vote for 4 out of 5 marks and 64% votes for 5 out of 5 marks for the clarity of fonts and typewriting evaluation which based on overall fonts and text design of the system.

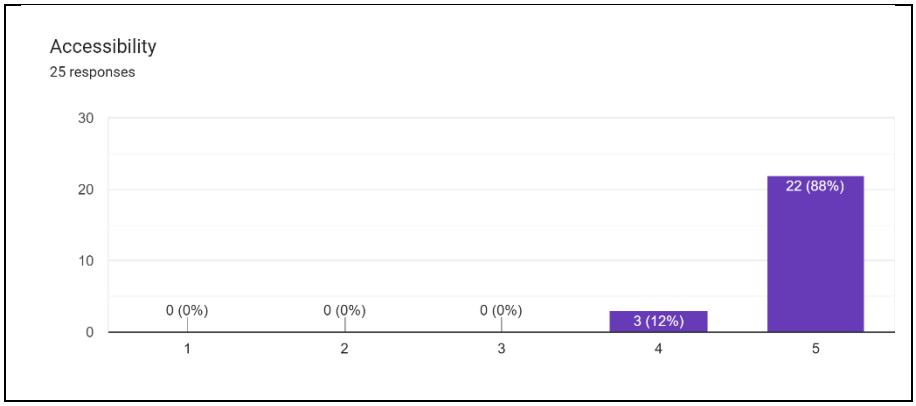

Figure 15: Accessibility Evaluation

Based on figure 15, 12% vote for 4 out of 5 marks and 88% votes for 5 out of 5 marks for the accessibility evaluation which based on overall navigation, interaction and button function of the system.

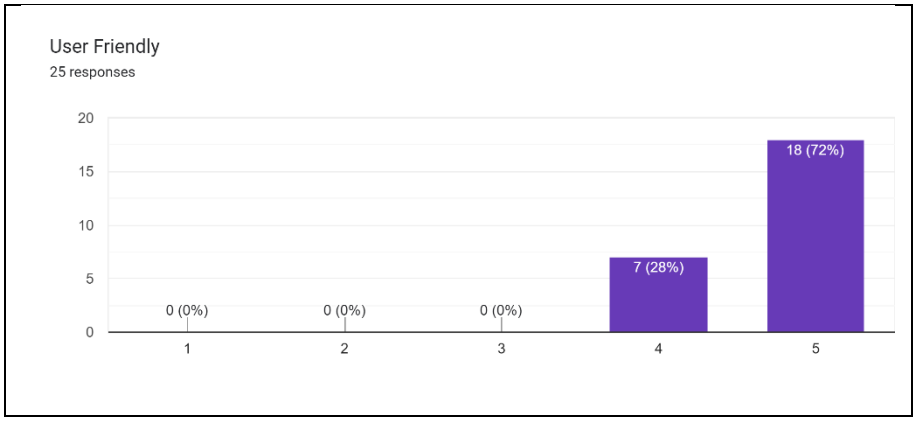

Figure 16: User Friendly Evaluation

Based on figure 16, 28% vote for 4 out of 5 marks and 72% votes for 5 out of 5 marks for the user friendly evaluation which based on overall design of how easy it is to be used by the users of the system.

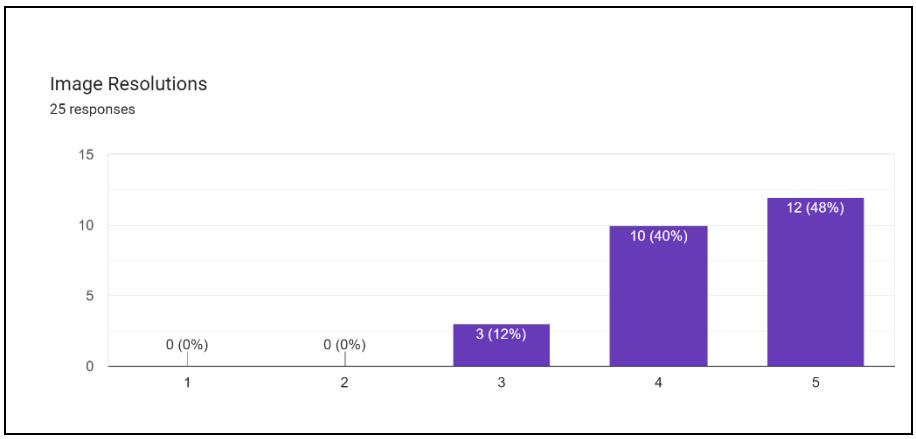

Figure 17: Image Resolutions Evaluation

Based on figure 17, 12% vote for 3 out of 5 marks, 40% vote for 4 out of 5 marks and 48% votes for 5 out of 5 marks for the image resolutions evaluation which based on overall image quality used and uploaded in the system.

5. Conclusion

In summary, Parents and Teachers System is a management system that is able to upgrade the traditional school data management and communication system to a better level. This system will help store data more securely and more easily for the school to access again. This technology may also ensure that every piece of information that teachers wish to deliver to parents is more secure and will be delivered. When both sides, parents and teachers, are able to offer a good emphasis to the growth of children at school, student progress in terms of co-curricular and academic can be monitored and improved a lot better than before.

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