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Social Media Application for FSKTM Students

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Abstract

Social media is a useful tool for discovering latest information. Students use social media for their social lives and academic purposes. However, it is noticeable that students at Faculty of Computer Science and Information Technology (FSKTM), Universiti Tun Hussein Onn Malaysia (UTHM) lack a centralized hub for convenient access to academic and campus information. Therefore, Social Media Application for FSKTM Students (FSKTMConnect) is developed to provide a common platform for students to access and exchange academic and campus information. Waterfall software deveplopment life cycle and a full-stack development tool called "MERN" are utilized to develop the application. The application is developed using web-based approach that allows students to access the application through desktop or mobile. This application will provide a common platform for student to access latest academic and campus information At the end, this application is expected to foster a stronger sense of community within UTHM.

1. Introduction

Social media is becoming increasingly popular with the introduction of the Internet and Web 2.0 technologies. The term "social media" can be defined as the comprehension of online and mobile technologies which are widely employed for communication purposes [1]. The fundamental features of social media include individual promotion through profile pages, interconnections with other users and dynamic updates of pages and content embedded [2]. The most central element in non-academic social media like Facebook is the "post". A post can be plain text that describes a user's ideas, opinions, and feelings. It can also be a user image or a video with the description. In the educational aspect, social media is crucial in facilitating access to course contents, video clips and transfer of instructional notes [3].

Students enrolled in FSKTM have access to academic resources and information through various platforms such as Student Academic Information System (SMAP) Online, UTHM Academic Online Resources (AUTHOR), Telegram, WhatsApp and UTHM official accounts on Facebook, Instagram, etc. It is time-consuming for students to traverse across multiple platforms to access the desired academic information. It is noticeable that many students wish to advertise their products, services and events in the UTHM community. It is time-consuming and tedious for the students to advertise their products, services, and events through different kinds of platforms, for example, WhatsApp, Telegram, and Instagram. One of the challenges the students face is the lack of real-time awareness of the prevailing campus conditions. The students are not aware of the campus conditions before they enter the campus. This issue brings about inconvenience for students in their daily campus life.

As a result, this study proposes the development of Social Media Application for FSKTM Students (FSKTMConnect). This application will provide a centralized hub that allows students to access academic information in a handy way by integrating all platforms into a singular, independent platform. Moreover, a

common marketplace will allow students to advertise their products, services, and events in the UTHM community. Lastly, this application provides a common platform or group to allow the students to upload and access the prevailing campus condition in real time. Given these attributes, the unity in the UTHM community is expected to be improved.

The project has three objectives, first objective is to analyse and design an object-oriented social media application, second objective is to develop a web-based social media application and third objective is to test and evaluate the social media application using user-acceptance testing. The target user for this application are regular users (FSKTM lecturers and FSKTM students) and administrators (Information Technology Club staffs). This application includes ten modules, such as user registration, user login, reporting, group management, profile customization, service, product and event advertisement, prevailing campus condition upload, post management, friend list management and early registered user reward. This application is expected to receive positive user feedback and it will then give back the value to the UTHM community.

2. Related Work

This section explains the online social networking concept, online communities' concept, digital communication concept, and the comparison of proposed application with three existing systems.

2.1 Online Social Networking Concept

Online social networking is a way where users engage in social interaction by sharing personal information on online social networking sites [4]. The popular online social networking sites nowadays including Facebook, Instagram and Twitter provide connection among people, which facilitates widespread communication [5].

The young generation, particularly adolescents and young adults, have enthusiastically adopted online social networking sites more than older generations, and they use these sites to connect with peers, share information, redefine their identity, and display aspects of their social lives [6]. However, the data from one site is accessible to others, which creates an information silo, and the users have limited control over the dissemination of their personal information on such sites, leading to potential privacy issues [7].

2.2 Online Communities Concept

An online community can be defined as "a specific reference to websites where people congregate online to discuss as subject or to introduce themselves for possible meeting in person" [8]. Online communities exist in the virtual space of the Internet. It brings people together who may stay in different countries but are connected by common affinities. Online communities offer support, both emotional and technical, creating a kind and helpful environment that empowers individuals and fosters a cycle of kindness [9]. The members of a community often share a common interest, passion or purpose that serves as the foundation of their connection. User participation is the success of online communication. Often time, there are several established guidelines and rules that govern the member behaviors to maintain a positive and inclusive environment for members.

2.3 Digital Communication Concept

Digital communication can be defined as "electronic transmission of information that has been encoded digitally (as for storage and processing by computers)" [10]. Digital communication involves various channels and media for sharing thoughts, expressions, and data. Digital communication media can be classified into two categories, which are media with high social presence, such as video and phone calls, and media with lower social presence, such as text messaging and email [11.]. In addition to common workplace communication tools like email and instant messaging, digital communication environments allow for the public sharing, editing, and storage of information within the organization and occasionally with external stakeholders [12]. Nowadays, many digital communication tools offer real-time interaction, allowing the users to engage in instant messaging, live chats, or video calls.

2.4 Comparison with the Existing Systems

Three existing systems, Facebook, Instagram, and Twitter have been reviewed, studied, and then compared with the proposed application. Table 1 shows the result of comparison of existing systems with proposed application.

Table 1 *Comparison of existing systems with proposed application*

Feature	Facebook	Instagram	Twitter	Proposed Application
Type of system	Yes	Yes	Yes	Yes
Register new user module	Yes	Yes	Yes	Yes
Login user module	Yes	Yes	Yes	Yes
Manage post module	Yes	Yes	Yes	Yes
Post interaction (Like, comment, share feature)	Yes	Yes	Yes	Yes
Profile customization module	Yes	No	No	Yes
Friend list management module	Yes	No	Yes	Yes
Group management module	Yes	No	No	Yes
Service, product, and event advertisement module	Yes	No	No	Yes
Prevailing campus condition upload module	No	No	No	Yes
Early registered user rewarding system module	No	No	No	Yes

The system's comparison table indicate that the proposed application will implement the fundamental modules found in the three existing systems. Moreover, there will be some new modules in the proposed application, such as the prevailing campus condition upload module and the early registered user rewarding system module. The early registered user rewarding system module is proposed because the three existing systems are popular worldwide. This system will attract new users to try to use the proposed application. The early registered user will receive rewards such as custom badges, avatars or colourful profile frames.

3. Methodology/Framework

This section will discuss the methodology used to develop the application. The Waterfall model and its five fundamental phases will be discussed in detail. A system development workflow will be presented for each phase with their tasks and outputs. Moreover, the system requirements will be explained with the illustration of some Unified Modelling Language (UML) diagrams such as Use case diagram, Class diagram and Activity diagram. Lastly, the User Interface (UI) design of the proposed application will be explained with illustration provided.

3.1 Waterfall Model

Waterfall model was introduced to be the first Process Model that consists of phases such as analysis, design, implementation, testing and maintenance [13]. The model is named "waterfall" because it is a sequential development process where the flows are like a waterfall through all the phases [14]. The client requirements must be gathered and analyzed clearly at the beginning of the development [15]. The system development is not flexible because all user requirements are decided during analysis phase and not allowed to be changed [16].

During the planning phase, a brainstorming session was carried out to figure out the project title, problem statement, project objectives and the system scopes. A Gantt Chart will be scheduled.

During the requirement gathering and analysis phase, a brainstorming session was first carried out to determine the potential system and user requirements. Besides, a meeting with the stakeholder was conducted to gather more detailed system requirements. A student survey was conducted using a questionnaire technique (Google Form) to gather more requirements and understand the user needs.

When all the requirements were gathered completely, the requirements were being analysed. These requirements will be categorised into system requirements, functional requirements and non-functional requirements. Next, use case diagram, sequence diagram, activity diagram, class diagram and use case specification will be created.

The design phase is crucial to illustrate the system architecture and the user interface to give an overview of how the system will be functioning. All diagrams and specifications that had been illustrated will then be revised

Applied Information Technology and Computer Science Vol. 6 No. 1 (2025) p. 940-958

to make sure that it does not contain any contradiction between and within the diagrams and specifications. Moreover, the schema tables and user interfaces will also be designed in detail.

The implementation phase is crucial, and it usually takes the longest time during the software development. In this project, the programming platform chosen is Visual Studio Code, which is a popular Integrated Development Environment (IDE) to develop a web-based application. The MERN Stack is the tool used to develop the frontend, backend and database of the system.

The testing phase is crucial in minimizing the errors and defects found in the system. In this project, the user-acceptance testing will be carried out. The user-acceptance testing involves the alpha testing and the beta testing.

Figure 1 shows the phases in Waterfall Model.

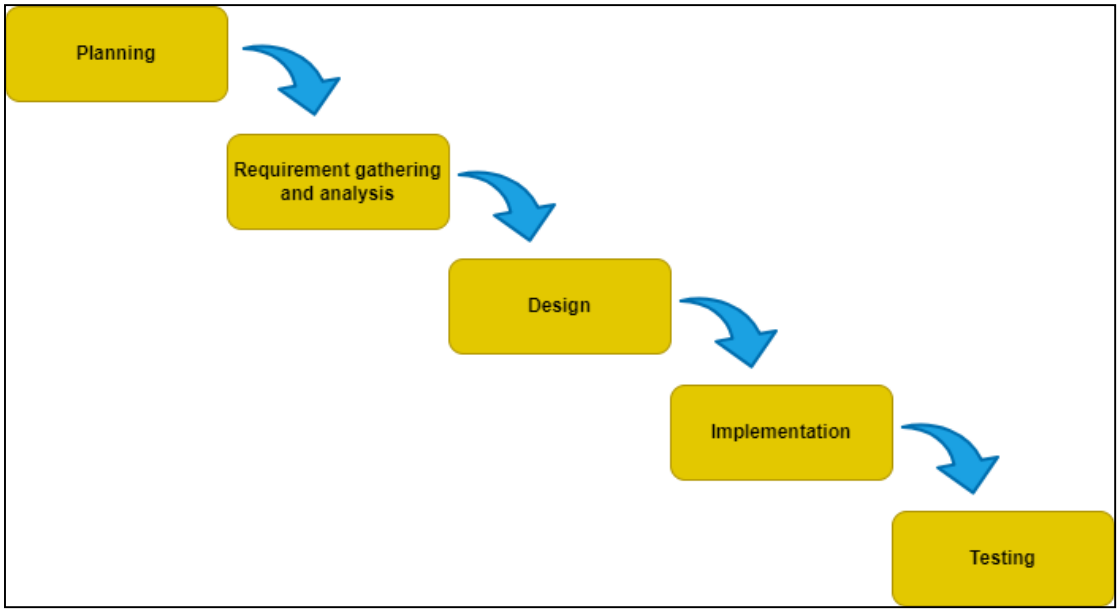


Fig. 1 *Waterfall Model*

3.2 System Development Workflow

The tasks and outputs for each phase will be in the software development workflow. Table 2 shows the software development activities and their task.

Table 2 *Software development activities and their task*

Phase	Task	Output
Planning	Determine project title and problem statement Determine project objectives and system scopes Schedule Gantt Chart	• Gained basic ideas • Project's proposal • Generate Gantt Chart
Requirement gathering and analysis	Figure out potential requirements Conduct a meeting with stakeholder Conduct a student survey Analyzed and formulated diagrams and specifications	• Meeting records and analysis • Questionnaire analysis • Formulated diagrams and specifications
Design	Illustrate system architecture and user interface Design all diagrams and specifications Revise all diagrams and specifications	• User interface design • Use case diagram • Use case specifications • Sequence diagrams • Activity diagrams • Class diagram • Schema tables

Implementation	Develop final system Implement system requirements	• System source code
Testing	Prepare test cases and test procedures Document the test results	• Test case specification • Test procedure specification

3.3 System Requirements Analysis

The system requirements analysis is a crucial phase in SDLC as it provides a clear and concise understanding of the proposed system. System requirement consist of functional requirements and non-functional requirements.

3.3.1 Functional Requirements

The functional requirements specify the fundamental system functionalities. The functional requirements are the features that a system should have to fulfil the end users' needs and fit the end users' environments. Table 3 shows the functional requirements for the proposed application.

Table 3 *Functional requirements*

No	Module	Functions
1.	Register user	• User can register new account.
2.	Login	• User can login to his account with correct email address and password.
3.	Make report	• Administrator can manage the reports for post or group made by regular users
4.	Manage group	• Regular user can manage the group, such as create new group, join, or leave group, create a post in the group, approve or reject the join group request, invite other users to join the group and remove a group member
5.	Customize profile	• Regular user can customize his profile, such as profile picture, bio, and cover photo.
6.	Advertise service, product, and event	• Regular user can advertise his product, service, or event in the provided marketplace.
7.	Upload prevailing campus condition	• Regular user can upload and view the prevailing campus condition.
8.	Manage post	• Regular user can manage his post such as create new post, edit post, and remove post.
9.	Manage friend list	• Regular user can manage his friend list such as add or remove a friend and approve or reject a friend request.

3.3.2 Non-functional Requirements

Non-functional requirements are the quality attributes of the systems. Non-functional requirements are crucial to developing a user-friendly system. Table 4 shows the non-functional requirements for the proposed application.

Table 4 *Non-functional requirements*

No	Aspects	Functions
1.	Performance	• The system shall allow the user to perform any task smoothly, and the waiting time for performing a task should be minimum.
2.	Usability	• The system learning curve should be gradual, and the system should be easy to use.
3.	Reliability	• The system should be exceptionless and never crash.
4.	Security	• The system should only allow authenticated user to login to the system.

5.	Availability	• The system should be available anytime in anywhere with the presence of Internet connection.

3.3.3 Use Case Diagram

Use case diagram is used to visualize the user behavior in the system. The main components included in the use case diagram are the actor (user) and the use cases (functional requirements). The solid lines that connect the actor and the use cases denoted that the actor is allowed to perform those specific actions. Figure 2 shows the use case diagram for the proposed application.

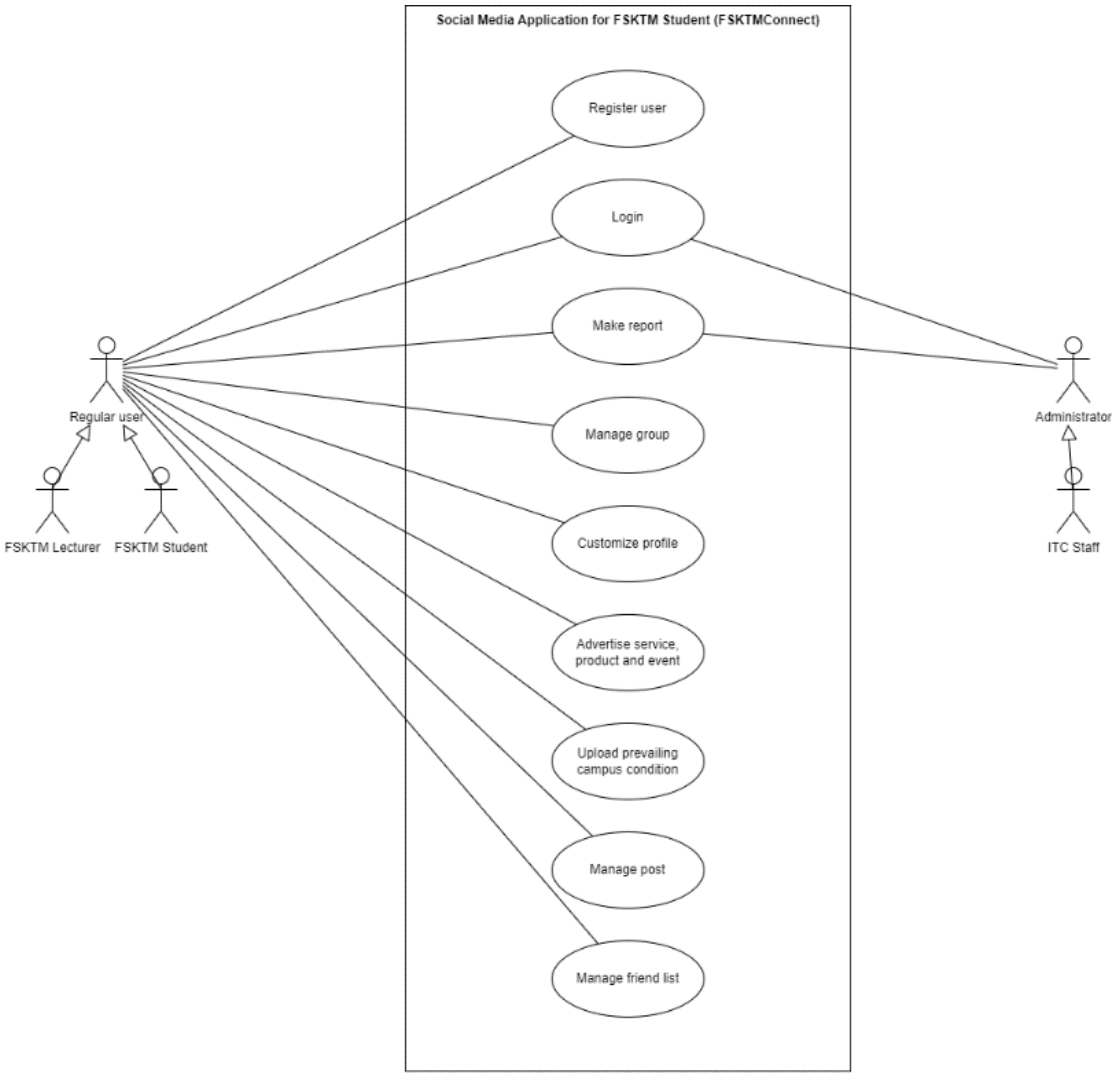


Fig. 2 *Use case diagram*

3.3.4 Class Diagram

A class diagram is a UML diagram that provides a clear visual representation of the system structure. There are three main components in a class diagram, they are classes, relationships, and multiplicities. Each class contains the attributes and the methods. Attributes are the data contained in the class, whereas methods are the behaviors that can be performed by the class. Figure 3 shows the class diagram for the proposed diagram.

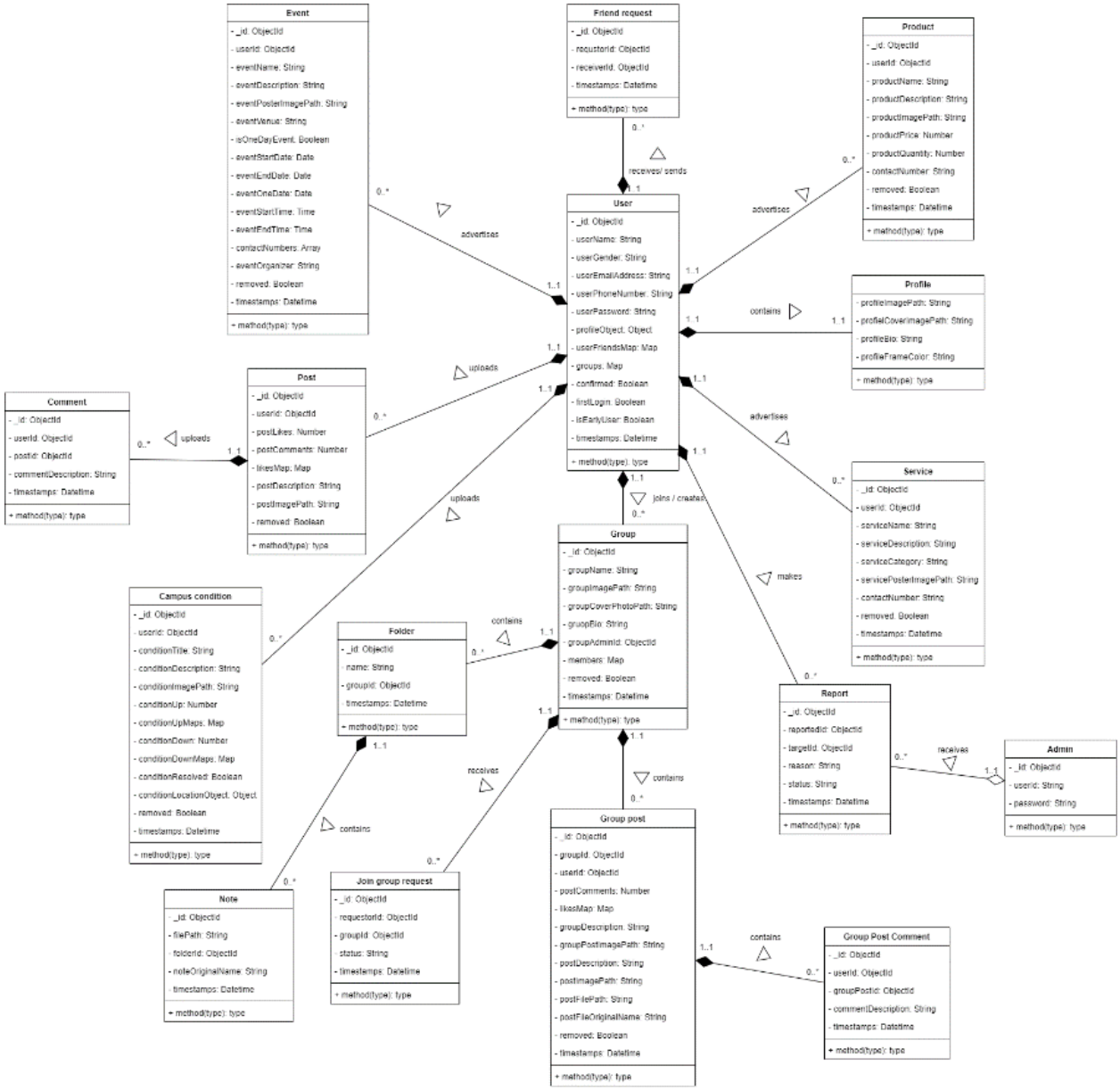


Fig. 3 *Class diagram*

3.3.5 Activity Diagram

An activity diagram visually represents the flow and sequencing of activities and actions within a system, process, or workflow. There are some key components in an activity diagram such as start node, end node, activities, decision points, transitions and forks and joins. Start node is represented by a black circle. It indicates where the activity diagram begins. End node is represented by a black circle with red line surrounding it. It indicates where the activity diagram ends. Activities are represented by rounded rectangles. They represent specific actions or steps within a process. Decision points are represented by diamonds. They represent a condition that determines which path the process will take. Transitions are represented by arrows. They indicate the sequence in which activities are performed. Forks and joins are represented by black bars. Forks indicate the point at which the flow splits into multiple concurrent paths, allowing several activities to happen simultaneously. Joins represent the merging of multiple paths back into a single flow. Figure 4 shows the overall activity diagram for the proposed application.

Applied Information Technology and Computer Science Vol. 6 No. 1 (2025) p. 940-958

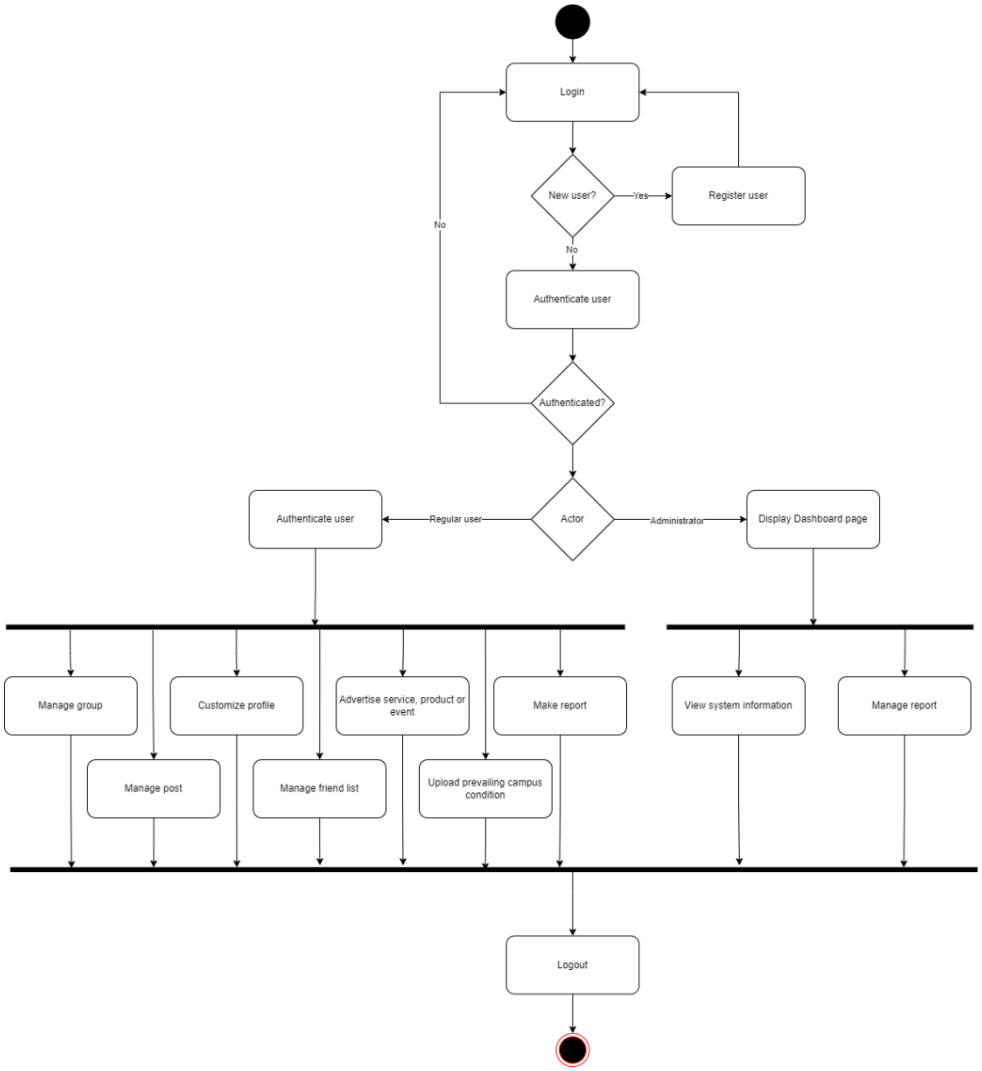
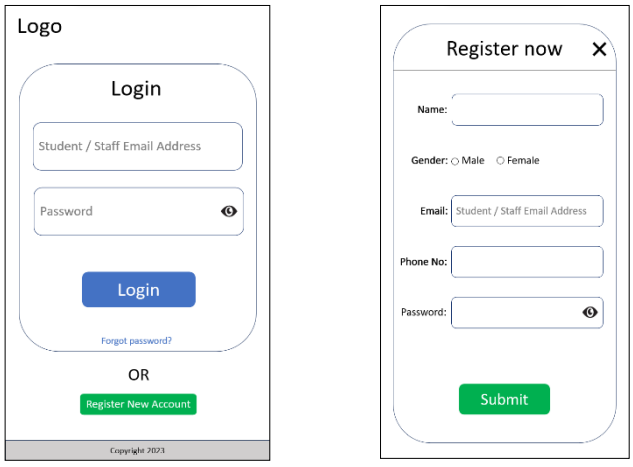


Fig. 4 *Activity diagram*

3.4 User Interface Design

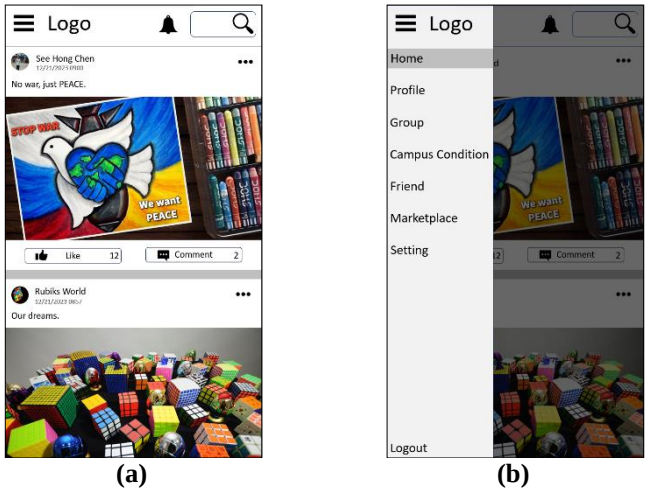
User can register a new account if he is a new user. He can enter his student or staff email address and password to login to his account. System will authenticate user credentials to ensure only authenticated user can login to the system. Figure 5 (a) and (b) show the Login page and registration form user interface.



(a) **(b)**

Fig. 5 *User Login and User Registration user interfaces (a) Login page (b) Registration form*

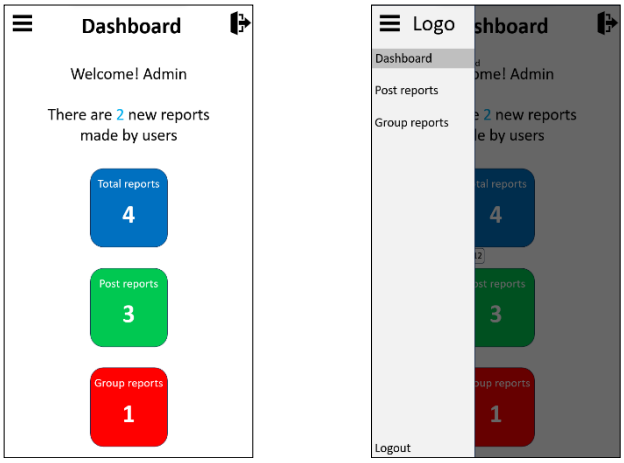
Once the regular user login to the system, system will redirect user to Homepage. User can click the hamburger icon at the top left corner of the Homepage to expand the sidebar. User can navigate to other pages, such as Profile page, Group page, Prevailing Campus Condition page, Friend page, Marketplace page or Setting page by clicking the navigation links in the sidebar. User can logout the system by clicking "Logout" navigation link. Figure 6 (a) and (b) show the Homepage and the Sidebar user interfaces.



(a) (b)

Fig. 6 *Regular user Homepage user interfaces (a) Homepage (b) Sidebar*

Once the administrator login to the system, system will redirect user to Dashboard page. Administrator can click the hamburger icon at the top left corner of the Dashboard page to expand the sidebar. Administrator can navigate to other pages, such as Post reports page or Group reports page by clicking the navigation links. Administrator can also navigate to these pages by clicking the boxes shown in the middle of the Dashboard page. Administrator can logout the system by clicking "Logout" navigation link or the logout icon at the top right corner of the page. Figure 7 (a) and (b) show the Dashboard and Sidebar user interfaces.



(a) (b)

Fig. 7 *Administrator Dashboard user interfaces (a) Dashboard page (b) Sidebar*

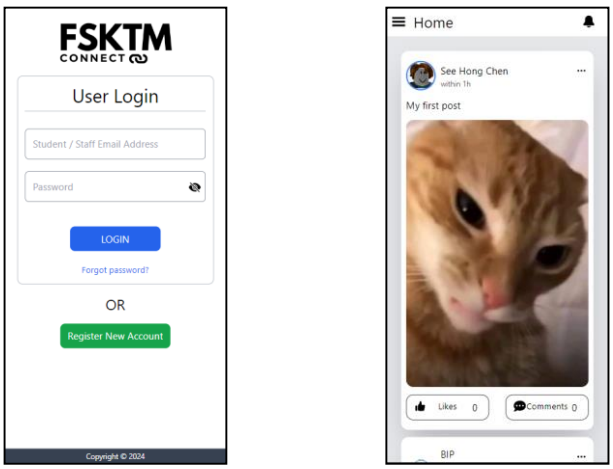
4. Result and Discussion

This section will discuss the implementation and testing phases of FSKTMConnect. The module interfaces will be displayed and discussed in detail. Moreover, a list of the test cases for User Acceptance Testing (UAT) will be provided along with their results.

4.1 Module interfaces

The user should provide his student or staff email address and password to login to the system. If the user has not registered yet, he can click the "Register New Account" button to register for a new account. If the user forgot his password, he could click the "Forgot Password?" text and follow the instructions to recover his password. For

successful login, the user will be redirected to the Homepage. Figure 8 (a) and (b) shows the Login page and Homepage user interfaces.



(a) **(b)**

Fig. 8 *(a) Login page (b) Homepage*

The user should provide his name, gender, student or staff email address, phone number and password. The system will only accept UTHM student email address (@student.uthm.edu.my) and UTHM staff email address (@uthm.edu.my). The user cannot register a new account using an existing email address and phone number in the database. The password should be at least 8 characters. For any invalid input, the system will display the specific error message after the user clicks SUBMIT button and allow the user to re-enter the input. If all inputs are valid, the system will send an activation link to the provided student or staff email address. Figure 9 shows the registration form.

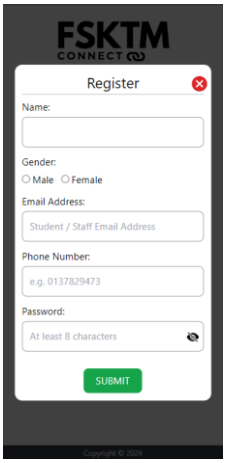


Fig. 9 *Registration form*

If the user finds any inappropriate content uploaded in the system, he can click the three dots in the top right corner of the post and click “Report” option. The report form will be displayed, and the user can select the reason to make the report to the post. The user can then click the submit button. The system administrator will receive the report and he can view and handle the report. Figure 10 shows the report form.

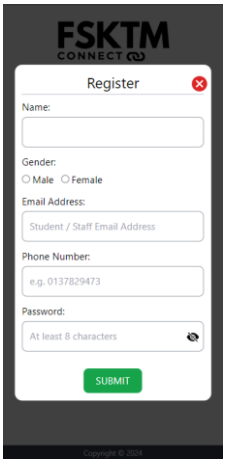
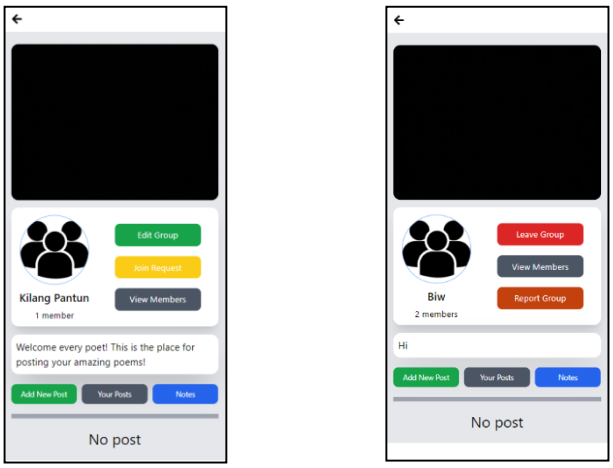


Fig. 10 *Report form*

The group admin can edit the group profile, for example the group image, cover image, group name and group bio. The group admin can handle the join group request from other users either accept or reject them. The group admin can add new notes, and the system will push a notification to all group members. The group member can leave the group by clicking the "Leave Group" button. The group member can make a report to the group if there are some inappropriate contents posted in the group. The group member can view the notes uploaded by the group admin and download them. Figure 11 (a) and (b) shows the group profile interfaces for group administrator and for group member.



(a) **(b)**

Fig. 11 *(a) Group profile interface for group administrator (b) Group profile interface for group member*

The user can edit his profile picture, cover image, name, and bio. After editing the profile, the user can click the save button to update his profile information in the database. Figure 12 shows the edit profile interface.

Applied Information Technology and Computer Science Vol. 6 No. 1 (2025) p. 940-958

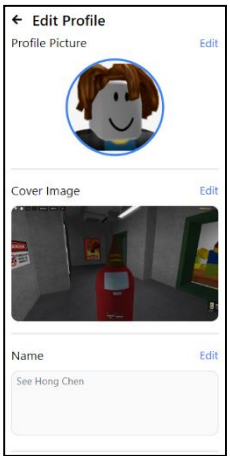
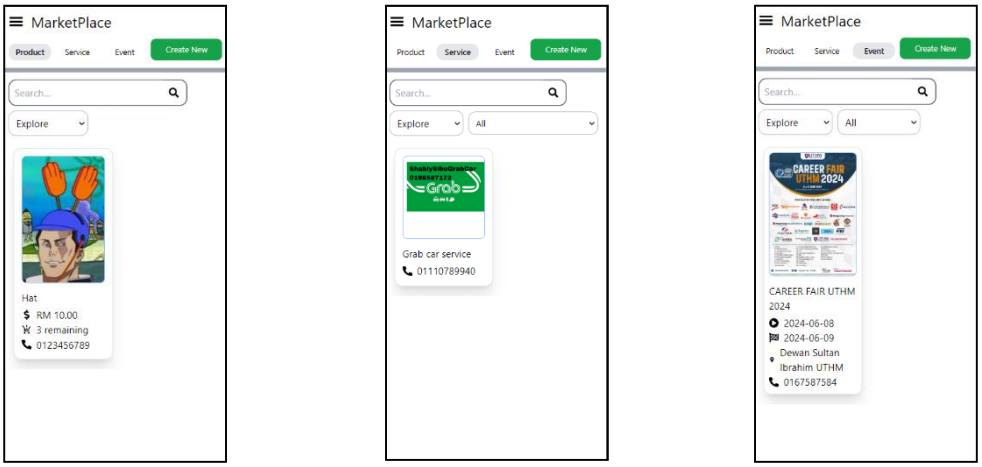


Fig. 12 *Edit profile interface*

The user can view the products, services, and events uploaded by the users. The user can also create his product, service, or event by clicking the "Create New" button and filling in all the required information. The user can click the product, service, or event to view its information. Figure 13 (a), (b) and (c) show the view product, view service, and view event interfaces.



(a) **(b)** **(c)**

Fig. 13 *(a) View product interface (b) View service interface (c) View event interface*

The user can rate the campus condition either up or down. The user can view the location of the campus condition. The user can view the top 5 most useful campus conditions (campus conditions with highest rate) in the Most Useful section. The user can upload a new campus condition by clicking the "Upload New" button and filling in all required campus condition information. Figure 14 shows the prevailing campus condition interface.

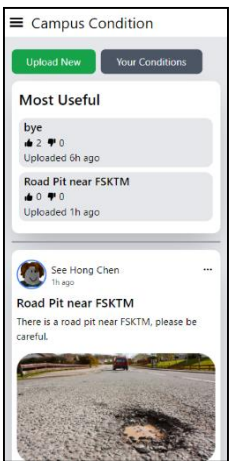
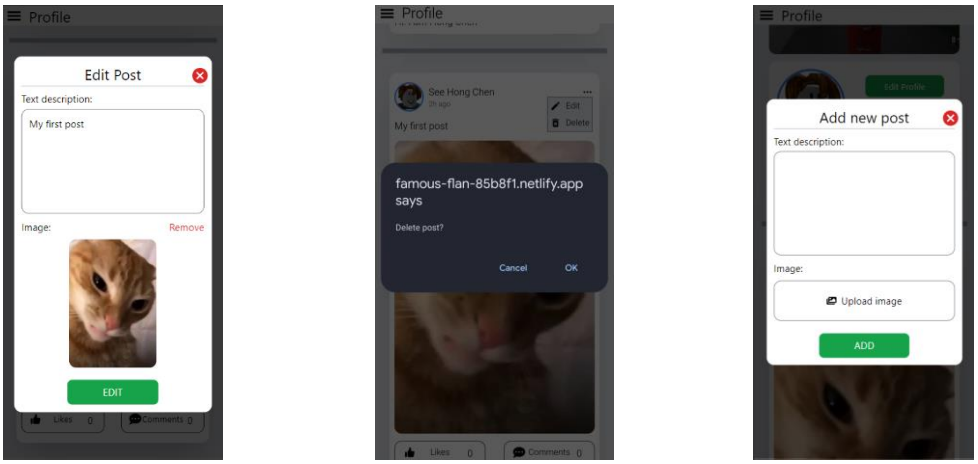


Fig. 14 *Prevailing campus condition interface*

The user can click the three dots at the top right corner of the post, select edit post and the edit post form will be displayed. The user can edit the post description and image. The user can select delete and the system will display confirmation popup to delete the post. Once the user clicks Ok, the post will be archived from the database and the image will be removed from the firebase storage. On the add new post form, the user should enter post description, with / without the image, and then click add button to add new post to the database. Figure 15 (a), (b) and (c) show the edit post form, delete post confirmation popup and add new post form.



(a) **(b)** **(c)**

Fig. 15 *(a) Edit post form (b) Delete post confirmation popup (c) Add new post form*

The user can view his friend list in this page. He can view the friend's profile or unfriend a user. The user can find more users in the Explore Friend page. In Friend Request page, the user can manage the friend requests sent by other users, either accept or reject them. In the Pending page, the user can cancel his friend requests that have been sent to other users. Figure 16 shows the Friend page.

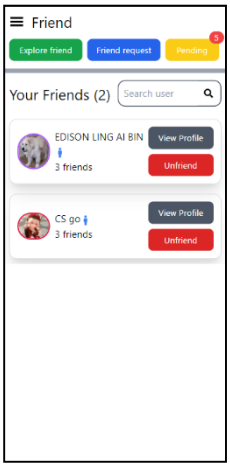


Fig. 16 Friend page

4.2 Testing

In this section, the testing of FSKTMConnect will be described and explained in detail. The test cases will be constructed based on the requirement traceability matrix. The overall test cases result will be displayed on a table. The summary for four sections in user acceptance testing will be presented in tables.

4.2.1 Test Cases

The test cases are crucial before the start of the testing process as it ensures that all requirements are tested and documented well for future reference. The list of test cases includes the test case Ids, related requirement Ids and the test case description. Table 5 presents the test cases and the test cases result.

Applied Information Technology and Computer Science Vol. 6 No. 1 (2025) p. 940-958

Table 5 *Test cases and test cases result*

Test Case Id	Requirement Id	Description	Expected outcome	Actual outcome	Passed / Failed
TC_100_001	REQ_101	System should register new user account if all inputs are valid.	A new account is registered.	A new account is registered.	Passed
TC_100_002	REQ_102	System should display error message for invalid inputs.	Error message is displayed	Error message is displayed	Passed
TC_200_001	REQ_201	System should redirect user to Homepage for successful login.	User is redirected to Homepage.	User is redirected to Homepage.	Passed
TC_200_002	REQ_202	System should send verification code to user email address for valid registered email address.	Verification is sent to user email address.	Verification is sent to user email address.	Passed
TC_200_003	REQ_203	System should validate verification code after clicking “Next” button.	Verification code is validated.	Verification code is validated.	Passed
TC_200_004	REQ_204	System should validate user inputs after clicking “Reset” button on reset password form.	User inputs are validated.	User inputs are validated.	Passed
TC_200_005	REQ_205	System should update user data in database for successful password reset.	User data is updated in database.	User data is updated in database.	Passed
TC_200_006	REQ_206	System should display error message for invalid inputs.	Error message is displayed.	Error message is displayed.	Passed
TC_300_001	REQ_301	System should add report data in database for successful report making process.	Report data is added in database.	Report data is added in database.	Passed
TC_300_002	REQ_302	System should display list of reports to administrator after retrieving report data from database.	List of reports is displayed.	List of reports is displayed.	Passed
TC_300_003	REQ_303	System should update report status in database after archiving reported target.	Report status is updated in database.	Report status is updated in database.	Passed
TC_300_004	REQ_304	System should update report status in database after dismissing report.	Report status is updated in database.	Report status is updated in database.	Passed
TC_400_001	REQ_401	System should add group data in database after user successfully created a new group.	Group data is added in database.	Group data is added in database.	Passed
TC_400_002	REQ_402	System should send join group request to group administrator after user clicked the “Join Group” button.	Join group request is sent to group administrator.	Join group request is sent to group administrator.	Passed
TC_400_003	REQ_403	System should update user and group in database after group administrator clicked the “Approve” button.	User and group data are updated in database.	User and group data are updated in database.	Passed
TC_400_004	REQ_404	System should remove join group request data in database after group administrator clicked the “Reject” button.	Join group request data is removed from database.	Join group request data is removed from database.	Passed

TC_400_005	REQ_405	System should update user and group data in database after user leave the group.	User and group data are updated in database.	User and group data are updated in database.	Passed
TC_400_006	REQ_406	System should add group post data in database after user successfully created new post in a group.	Group post data is added in database.	Group post data is added in database.	Passed
TC_400_007	REQ_407	System should update user and group data in database after group administrator removed member.	User and group data are updated in database.	User and group data are updated in database.	Passed
TC_400_008	REQ_408	System should update note data in database after group administrator added new note in the group.	Error message is displayed.	Error message is displayed.	Passed
TC_400_009	REQ_409	System should display error message for invalid inputs.	Group data is added in database.	Group data is added in database.	Passed
TC_500_001	REQ_501	System should update user data in database after successful profile customization.	User data is updated in database.	User data is updated in database.	Passed
TC_500_002	REQ_502	System should display error message for invalid inputs.	Error message is displayed.	Error message is displayed.	Passed
TC_600_001	REQ_601	System should add advertisement data in database for successful adding the advertisement.	Advertisement data is added in database.	Advertisement data is added in database.	Passed
TC_600_002	REQ_602	System should display error message for invalid inputs.	Error message is displayed.	Error message is displayed.	Passed
TC_700_001	REQ_701	System should add campus condition data in database after successfully uploading the campus condition.	Campus condition data is added in database.	Campus condition data is added in database.	Passed
TC_700_002	REQ_702	System should display error message for invalid inputs.	Error message is displayed.	Error message is displayed.	Passed
TC_700_003	REQ_703	System should update campus condition data in database after rating the campus condition.	Campus condition data is updated in database.	Campus condition data is updated in database.	Passed
TC_800_001	REQ_801	System should add post data in database after successfully creating new post.	Post data is added in database.	Post data is added in database.	Passed
TC_800_002	REQ_802	System should display error message for invalid inputs.	Error message is displayed.	Error message is displayed.	Passed
TC_800_003	REQ_803	System should update post data in database after successfully editing post.	Post data is updated in database.	Post data is updated in database.	Passed
TC_800_004	REQ_804	System should archive post data from database after successfully removing post.	Post data is archived from database.	Post data is archived from database.	Passed
TC_900_001	REQ_901	System should send friend request to receiver after user	Friend request is	Friend request is	Passed

		clicked the "Add friend" button under the friend card.	sent to receiver.	sent to receiver.	
TC_900_002	REQ_902	System should add friend data in the database and send notification to the requestor after receiver accepted the friend request.	Friend data is added in database and notification is sent to requestor.	Friend data is added in database and notification is sent to requestor.	Passed
TC_900_003	REQ_903	System should update friend request data in database after user rejected the friend request.	Friend request data is updated in database.	Friend request data is updated in database.	Passed
TC_900_004	REQ_904	System should update user data in database after user successfully removed a friend from friend list.	User data is updated in database.	User data is updated in database.	Passed

Table 6 shows the overall test cases result for each module.

Table 6 *Overall test cases result for each module*

Test case	Module	Number of test cases	Total passed test cases	Total failed test cases
TC_100	Register user	2	2 (100%)	0
TC_200	Login	6	6 (100%)	0
TC_300	Make report	4	4 (100%)	0
TC_400	Manage group	8	8 (100%)	0
TC_500	Customize profile	2	2 (100%)	0
TC_600	Advertise service, product, and event	2	2 (100%)	0
TC_700	Upload prevailing campus condition	3	3(100%)	0
TC_800	Manage post	4	4 (100%)	0
TC_900	Manage friend list	4	4 (100%)	0

4.2.2 User Acceptance Testing

The user acceptance testing is conducted with 30 respondents who are FSKTM lecturers and students. The user acceptance testing is aimed at getting feedback and response from the target user towards the system satisfaction. Therefore, a questionnaire has been created with Google Form. The questionnaire includes 4 sections: ease of use, ease of learning, satisfaction, and functionality. Ease of use section contains 4 questions, ease of learning and satisfaction sections contain 3 questions, and functionality section contains 21 questions. Ease of use, ease of learning and satisfaction sections contain the rate range from 1 to 5, from disagree to agree. The average rate is calculated based on the formula: (total score / number of respondents). The system administrator, which is ITC staff, is requested to conduct the user acceptance testing. The administrator is asked to test the system and fill in the user acceptance testing form that contains the acceptance criteria for each module. Table 7 shows the summaries for section ease of use, ease of learning and satisfaction in user acceptance testing for regular user.

Table 7 *Summaries of user acceptance testing for regular user*

Scenarios	Number of respondents	Count					Average rate
		1	2	3	4	5	
The system is easy to use and user friendly.	30	0	0	0	12 (40%)	18 (60%)	4.6
The system is flexible and consistent.	30	0	0	1 (3.3%)	15 (50%)	14 (46.7%)	4.43
I can recover from mistake quickly and easily.	30	0	0	1 (3.3%)	10 (33.3%)	19 (63.3%)	4.6
I can use the system effortless.	30	0	0	1 (3.3%)	11 (36.7%)	18 (60%)	4.57
I learned to use the system quickly	30	0	0	0	11 (36.7%)	19 (63.3%)	4.63
I can easily remember how to use the system.	30	0	0	2 (6.6%)	8 (26.7%)	20 (66.7%)	4.6

I quickly became skillful with the system	30	0	0	1 (3.3%)	12 (40%)	17 (56.7%)	4.53
I am satisfied with the system.	30	0	0	0	16 (53.3%)	14 (46.7%)	4.47
It is pleasant to use the system.	30	0	0	1 (3.3%)	10 (33.3%)	19 (63.3%)	4.6
The system is designed to facilitate connections for FSKTM students and lecturers.	30	0	0	1 (3.3%)	12 (40%)	17 (56.7%)	4.53

Table 8 shows the response regarding the functionality of FSKTMConnect as a regular user.

Table 8 *Response regarding the functionality of FSKTMConnect as a regular user*

Scenarios	Total of answers Yes	Total of answers No
I can register a new account.	30 (100%)	0
I can login into the system with valid credentials.	30 (100%)	0
I can logout from the system.	30 (100%)	0
I can make a report to any inappropriate content.	30 (100%)	0
I can create a new group.	30 (100%)	0
I can join or leave a group.	30 (100%)	0
As a group admin, I can edit group profile, handle join group request, and add new notes.	30 (100%)	0
As a group member, I can add new post, view my posts, view notes and view posts uploaded by other group members.	30 (100%)	0
I can edit my user profile.	30 (100%)	0
I can make advertisement for my product, service, or event.	30 (100%)	0
I can view product, service, and event uploaded by other users.	30 (100%)	0
I can upload new campus condition.	30 (100%)	0
I can view my campus conditions, most useful campus conditions, and campus conditions uploaded by other users.	30 (100%)	0
I can rate campus condition and view its location.	30 (100%)	0
As an uploader, I can mark or cancel resolved for my campus condition.	30 (100%)	0
I can add, view, edit and delete my post.	30 (100%)	0
I can explore new friends.	30 (100%)	0
I can send friend request to other users or cancel the friend request.	30 (100%)	0
I can accept or reject the friend requests sent by other users.	30 (100%)	0
I can view my friend list.	30 (100%)	0
I can remove a user from my friend list.	30 (100%)	0

Table 9 shows the response regarding the functionality of FSKTMConnect as an administrator.

Table 9 *Response regarding the functionality of FSKTMConnect as an administrator*

Scenarios	Passed	Failed
I can login into the system with valid credentials.	/	
I can logout from the system.	/	
I can view the system data overview in Dashboard page.	/	
I can view the list of users in User page.	/	
I can view the list of groups in Group page.	/	
I can view the list of campus conditions in Campus Condition page.	/	
I can mark resolved for certain campus condition.	/	
I can view the list of products in Product page.	/	
I can view the list of Service in Service page.	/	
I can view the list of Event in Event page.	/	
I can view the list of reports in Report page.	/	
I can dismiss user report.	/	
I can remove the reported target from the system.	/	

5. Conclusion

In conclusion, all project preparations were completed before initiating the implementation phase. The thorough requirements analysis and design facilitate a smooth transition to this phase. The project is anticipated to meet its scheduled completion time as outlined in the Gantt chart.

All modules have been successfully implemented, making the system usable, efficient, and robust. With Firebase Database, the real-time notification feature is effectively implemented and functions well. Images are stored in Firebase Cloud Storage, enabling the system to handle large amounts of data typical of a social media application. Through alpha and beta testing in the user acceptance phase, the system has been determined to be secure, satisfying, and capable of meeting user requirements.

FSKTMConnect has successfully achieved the objectives outlined in this project. Notable accomplishments include the implementation of real-time notifications, role-based access, and access control. FSKTMConnect offers three key advantages as a web-based social media application:

i. It provides FSKTM lecturers and students with a common platform to interact and connect, facilitating the sharing of the latest academic information on campus.
ii. It enables students to upload current campus conditions to notify others of potential issues they might face.
iii. It allows students to advertise their services, products, and events on a common platform, thereby increasing their business visibility.

Despite all requirements are implemented successfully into the system, the system still has some deficiencies:

i. The system lacks real-time chatting features, which are common in most social media applications.
ii. The system only allows users to upload one image per post, group post, campus condition, product, service, or event and does not support video uploads.
iii. The image upload time is too long, requiring users to wait until the image is uploaded to Firebase Cloud Storage before they can proceed with their actions.

There are some recommendations for future work to improve the system:

i. Implement a real-time database for the entire system to ensure real-time updates, thereby enhancing the user experience.
ii. Introduce a direct messaging feature that allows users to contact product sellers, service providers, and event organizers in the marketplace.
iii. Integrate artificial intelligence to better understand user needs and recommend content that best suits each user.

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