Web-Based Task Management System for Improving Group Work Collaboration

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Abstract
Group work collaboration in learning, such as carrying out group assignments or group projects, is a common practice in education. It can help group members to delegate tasks, develop communication skills and manage time. However, managing working in groups can be challenging as it is hard to keep track of the team member's work progress, difficult to manage the given group tasks and tend to forget the assignment or project due dates. Thus, a new method is necessary to help students to manage and coordinate group work collaboration better. This study proposed a web-based application system with work progress, group task management and email notification features. The application was developed using the Waterfall methodology that consists of requirement gathering, analysis, design, implementation and testing. The implementation used Xampp, Php, Sublime Text and Yii2 framework. Based on the five times of functional tests conducted, the system managed to achieve the study's objectives. In conclusion, the web-based system helps students in managing work group tasks when doing collaboration work. Future work for the application includes developing mobile platforms and uploading completed tasks or files to prove the work's progress.
Keywords: Collaboration, Group Work, Web Based System, Group Work Management

Introduction
Group work collaboration at higher education is inevitable. Most coursework requires students to carry out group assignments or projects. But students may find it hard to administer and coordinate group work to complete a task.

Students manually used books, papers or sticky notes to write down each of the assigned group tasks, update the task progress, remove the sticky notes or slashed the task if it is completed. This is agreed by Norfarahhani (Personal Communication, 2021) student of UiTM Jasin, Melaka. She also stated that the task notes were easily missing, often overlooked the submission deadline and forgot about the tasks because there were many group tasks of different subjects. An unorganized sticky note will cause the desk, board, textbooks, and

notebook inundated sticky notes and will result in sticky notes to be lost, hidden, or forgotten. (Mistry & Maes, 2008).

Rivas (2005) mentioned that it is crucial to know group progress to ensure that the group remains on track and the group themselves are aware that they are not being ignored or isolated. It is important for team members to know the progress of the other team members' work to avoid last-minute work, work redundancy and easier to compile if the due date is around the corner. Indirectly, it will be well-managed team management, creating discipline and responsibility among team members.

Traditionally using books, papers or sticky notes has no reminder of important dates. Every group member should have a sense of responsibility to always remember the dateline of submission. The consequence of late submission is that the work is not acceptable and gets a penalty. Williams (2018) claimed that a reminder is necessary since our memories are incapable of retaining every detail of our daily lives. It allows people to run important tasks on schedule which prevents them from forgetting any assigned work.

The issues of conventional practice for managing group tasks as mentioned above motivates researchers to contribute solutions to the work group tasks for student collaboration. This paper aims to propose a web-based application that can manage group tasks, monitor the progress of team members' work and receive an email notification as a reminder before the deadline. The three features of the application produce a contribution towards the improvement of group work collaboration.

Literature Review
Group Work
Situmorang (2021) stated that group work is defined as a modern learning and teaching methodology. As a teaching method at schools and universities, students can improve the quality of their task and enable them to learn cooperatively and reduce the workload. Group work is having two or more individuals working together in a small group where everyone can participate in an assigned learning task (Anwar, 2016). There are many benefits of group work including breaking a complex task into parts, developing communication skills, planning and managing time.

Working together in a small group is a challenging activity either on campus where students can meet their group members face-to-face, or online learning which group members only can meet remotely (Brown, 2020). Successful group work generally depends on offering opportunities for forming a group that clearly defines the shared task and understands and can fulfill the role, duties of each member and rules of a group working (Nipp, 2017).

Collaboration and Teamwork
Hao et al (2017) mentioned that collaboration and teamwork are skills that are important for both academic and career success in the 21st century. Most of these studies focused on the disclosure of the important results of group management based on a group with a small number of members and the task that did not standardize.
The author added some of the major features for a platform collaboration through the internet:

- Real-time communication. For example, audio or text chat.
- Can manage people and teams.
- Mechanism that can control the progress of the task.
- Can manage the tasks used in group activities.

Working in a group can give a better understanding for a student and easier for them to solve problems with conditions students need frequent help from their group members. In a group also, they need to have positive interdependence where the team members believe each other that the performance of individuals in a group project gives a great performance for the whole group (Ferdous & Karim, 2019).

Monitoring Group Progress

According to Ferdous and Karim (2019), hard work is required to make a team successful. Therefore, to make the team successful, all the team member contributions must be assured, and equal participation is highly needed to ensure the team success. But to ensure equal participation is difficult. Thus, the progress of the group members must be implemented to ensure that group work is successful.

From the article by Burke (2011) mentioned that monitoring the group progress can help the group work succeed. In group work, each of the team members should have a role and responsibility. She also stated that usually, for the group progress, each of the team members needs to submit their weekly report to the leader to monitor the group's progress. Even though it seems difficult because they need to make a manual weekly report for the progress, they still need to submit their progress to the leader so that the leader can monitor their work.

Email Notification

In today's digital world, e-mail is widespread as a means of communication as well as a task management tool (Dinneen, 2020). Because of their advantages, email messages can be used to provide learning opportunities. Email is a simple method of delivering messages through nonverbal communication; it allows for a wide range of communication styles to be used; and it does not necessitate a real-time connection between the parties involved (Parte, 2021).

When compared to one-on-one chat, email is faster. It can be used as both an informative and a serious business presentation. In terms of speed, email works in both directions. It comes into focus more frequently, implying that we can contact the person at any time of day. It allows the email to respect the recipient's time and avoid sending unneeded messages (Pedamkar, 2021).

Task Management System

According to Techopedia (2021), task management is an activity where each team member or team leader tracks a task or group tasks throughout its life cycle and decides according to the progress of the work task. By using a task management software tool, we can track the team member's task. It can help the team well organize and the task will be managed by using the features in the software. For example, task creation, time schedule, tracking, communication between group members, notification, and reporting on team projects and the required task.

Based on the article by Taimer (2019) mentioned that task management is important for running the project because task management is created to capture, organize, and assign all

the important tasks or work that need to be done to complete a project that is run by a group or individual. By keeping all the tasks in one location, it will help users to reduce the load on the brain and give users more focus on what needs to be done first on priority. It also stated that task management should provide anyone viewing the task information so that each of them can know which task is the priority, the due date, the owner, and the next steps to do.

Web Based Application

Based on the Techopedia (2021), a web-based application can be defined as any program that has accessed the network over HTTP. There is no web-based application in the memory of a device. The application is frequently run within a web browser. Web Based applications can be defined in which users can access, read, and write, and users can make a collaboration with other users (Alsadoon, 2018). The example of Web Based application is Facebook, Twitter, Blog, YouTube, Google documentation, google meet and others.

Methodology

The application was built by adapting the Waterfall methodology which utilized four phases: requirement gathering, analysis, design and implementation. Only functionality testing was carried out and the maintenance phase was excluded. The following subsections show the general flow in developing the application: requirement gathering and analysis, design, implementation and functionality testing.

A. Requirement Gathering and Analysis

To get feedback from stakeholders, an open-ended interview was carried out to UiTM students from the faculty of Agrotechnology and faculty of Computer and Mathematical Sciences. 10 questions were constructed using Google form. The interview session was conducted through WhatsApp for three respondents. A survey was also conducted. 10 questions were created in order to obtain a large number of responses about the students' grouping task process. The survey using google form for 50 respondents.

B. Design

A use case diagram shows possible interactions of the users with the application system. For this application, a use case diagram was constructed based on the identified requirements in the previous phase. There were three actors: the admin, the leader and the members. The most encountered roles are for the leader and the members. A total of 18 use cases had been identified as depicted in Fig. 1.
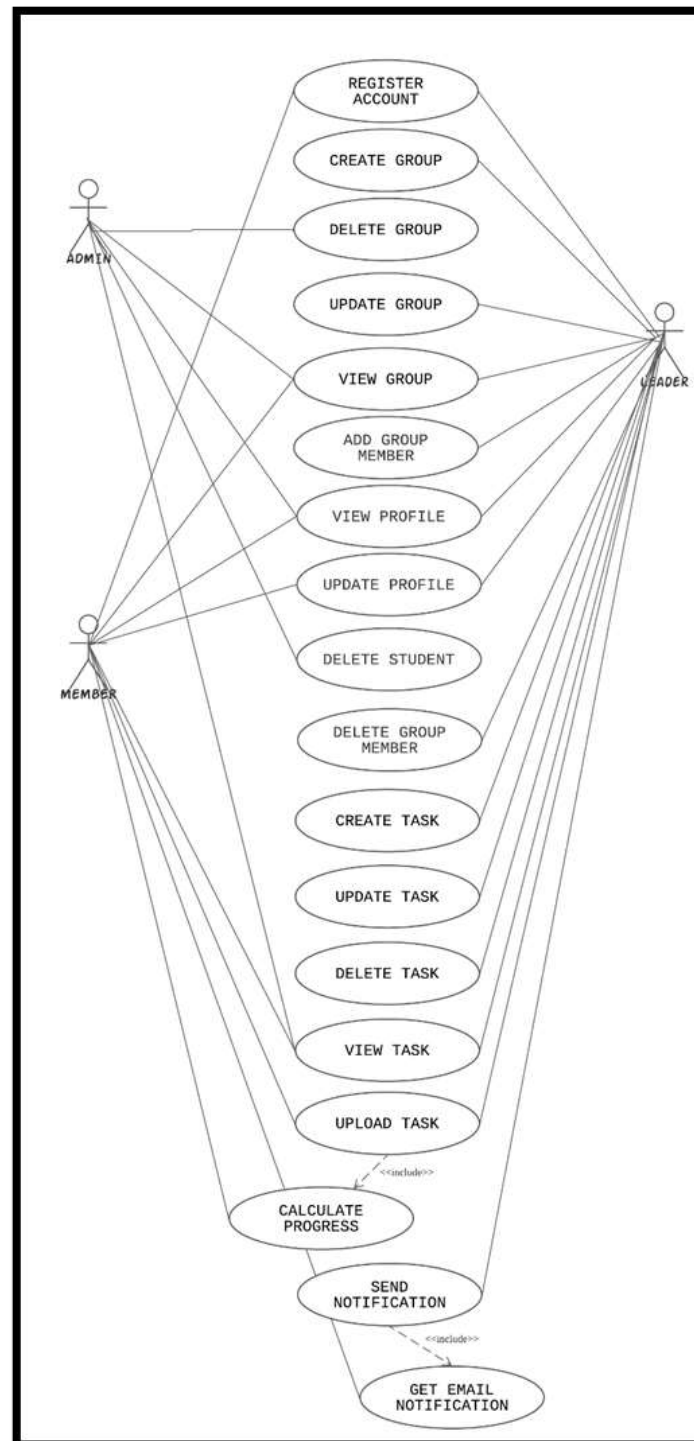
Fig. 1 Use Case Diagram for Web Based Application

C. System Flowchart

One output for design is a flowchart. A flowchart is a diagram that shows the flow of a process from the beginning to the end. It helps users to understand the process flow easier. Used for the project, Fig. 2 depicts the overall general flow of steps for the application.
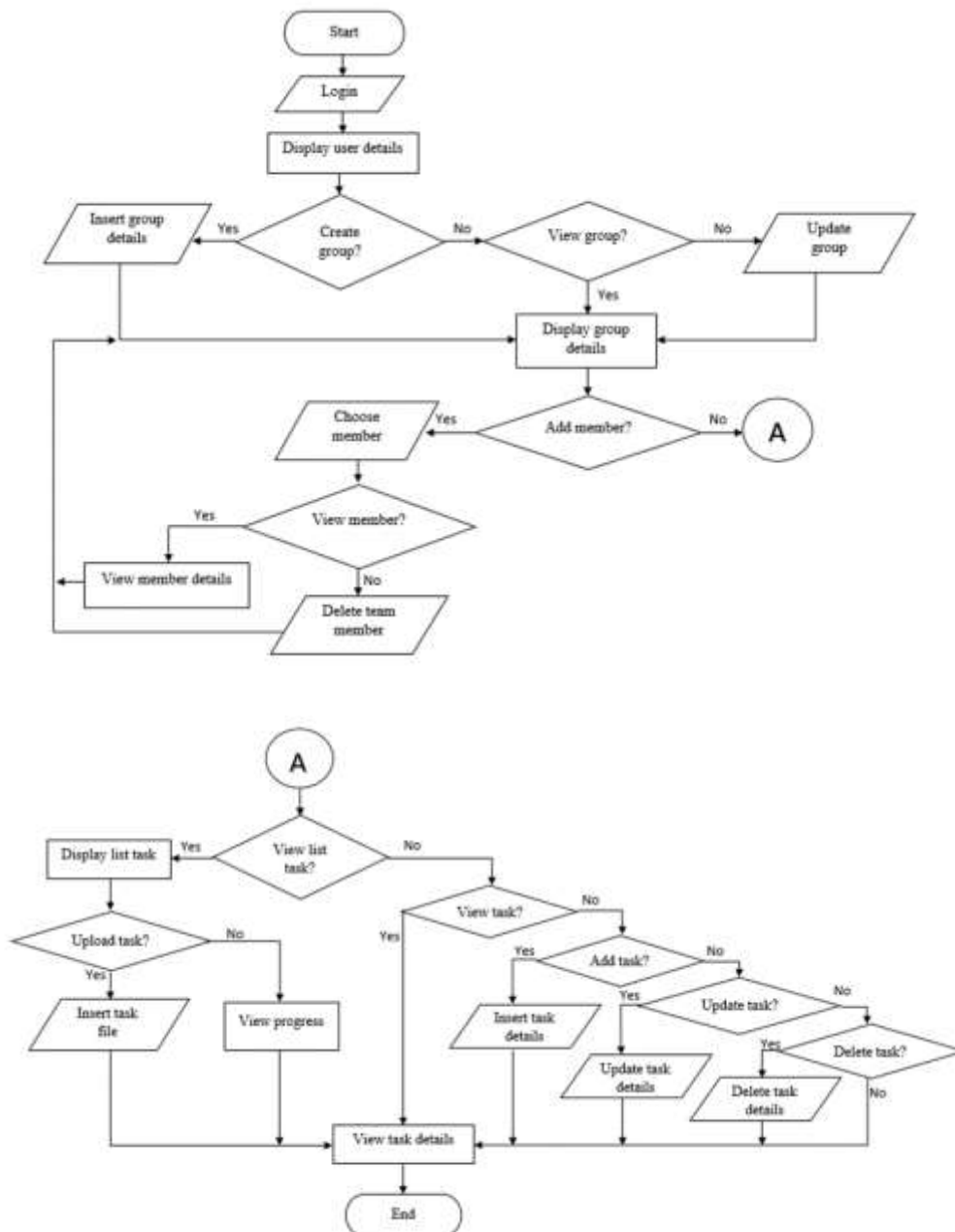
Fig. 2. Flow of The System

D. Implementation

This phase involved converting all the design products such as the use cases into the actual application. This process utilized softwares Sublime Text, Xampp, and MySQL. The system was written in the PHP programming language, and Sublime Text was the coding platform. Additionally, Xampp was used as a cross-platform web server to build and test code on a local web server, and MySQL was used to keep the data and to get the data.

This web based application's features are to allow group task management, work progress update and sending email notification. Group task management includes create, view, update and delete groups. It also includes adding group members and deleting group members. It includes create, view, update, delete and upload tasks. For work progress, users can view the work in progress in percentage which will be calculated automatically by the system. For email

notification, the group leader can send email to notify the group members when the submission date is near.

This section will show several user interfaces to highlight features for group task management, work progress and email notification.

a) Create group
    All students can create a group and the student who creates the group will be assigned as the leader for the group. Fig 3 below shows the form to create group.

Fig. 3 Create Group Interface

b) View Group
    For the user, they can view the list of groups that they joined and can view the group details if the button view is clicked. For the admin, the system will show all the lists of the group that have been created. Fig. 4 shows the form to view the group.

Fig. 4 View Group Interface

c) Update Group
    Only the leader of the group can update the group information. Fig.5 shows the user interface to update groups.

Fig. 5 Update Group Interface

d)   Delete Group

The admin is able to remove the group that is not used for a long time. Fig. 6 shows the user interface to delete groups.
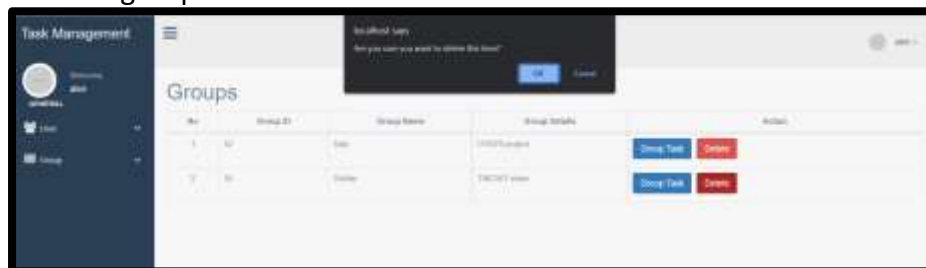

Fig. 6 Delete Group Interface

e)   Upload Task

All students can upload their task or can upload for their team member task and the task percentage will be calculated. Fig. 7 shows the user interface to upload tasks.
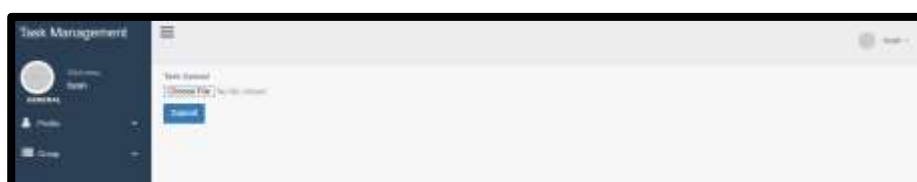

Fig. 7 Upload Task Interface

After the task is uploaded, the calculated percentage will be displayed in the task page and the status of the task will be changed to 'Done'. Fig. 8 below shows the percentage of the group assignment task.
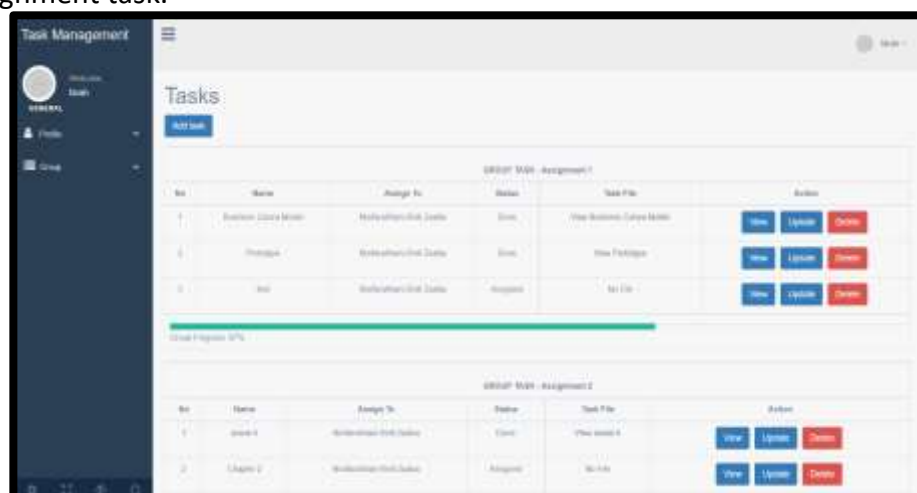

Fig. 8 View Progress Task Interface

f)   Send Email Notification

The group leader is able to send email notification for the team member if the submission day is near. The button to send email only will appear if the time left of the task submission is three days and below. Fig. 9 shows the user interface to send email notifications.

Fig. 9. Send Email Notification Interface

Fig. 10 below shows the email that will be received if the leader sends email notification to their team members.
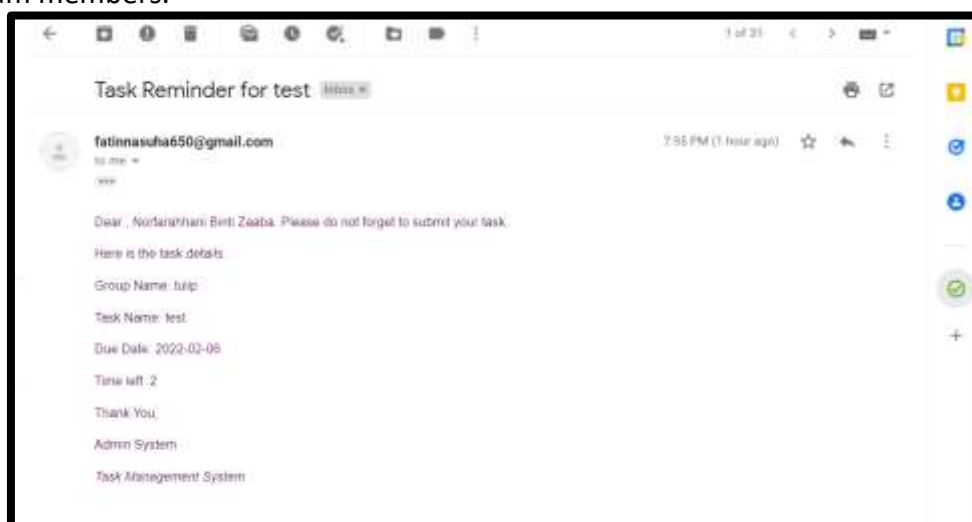

Fig. 10 Received Email Notification Interface

Results and Discussions

The result will be discussed on functionality testing of every use case before deploying to the user. It is necessary to test each use case function that has been applied in the system to make sure that it works successfully. This test evaluates each of the use cases of the system which include the registration, view and update profile, create, update, view, delete group and task and upload and email reminder.

Table 1
Functionality Test Results

Component	Test1	Test2	Test3	Test4	Test5
Register account	Ok	Ok	Ok	Ok	Ok
Create group	Ok	Ok	Ok	Ok	Ok
Delete group	Ok	Ok	Ok	Ok	Ok
Update group	Ok	Ok	Ok	Ok	Ok
View group	Ok	Ok	Ok	Ok	Ok
Add group member	Ok	Ok	Ok	Ok	Ok
View profile	Ok	Ok	Ok	Ok	Ok
Update profile	Ok	Ok	Ok	Ok	Ok
Delete student	Ok	Ok	Ok	Ok	Ok
Delete group member	Ok	Ok	Ok	Ok	Ok
Create task	Ok	Ok	Ok	Ok	Ok
Update task	Ok	Ok	Ok	Ok	Ok
Delete task	Ok	Ok	Ok	Ok	Ok
View task	Ok	Ok	Ok	Ok	Ok
Upload task	Ok	Ok	Ok	Ok	Ok
Calculate progress	Ok	Ok	Ok	Ok	Ok
Send notification	Ok	Ok	Ok	Ok	Ok
Get email notification	Ok	Ok	Ok	Ok	Ok

Based on the result of functional testing, all use cases have been tested successfully. It showed that the system meets all functionalities. The functionalities can be grouped into three main features as the solutions to constraints that have been identified earlier.

The system is able to manage group tasks that provide a proper web-based platform to create group, update group, delete group, add group member, delete group member and a few more as mentioned in Table 3. It is more organized and systematic compared to the previous method using book, paper and sticky notes to write down information related to group tasks.

The system supports a feature to display group work progress. The progress is shown in percentage to let all group members clearly know the status of completion. This has become a solution to the previous method that just relies on communication among group members.

The system provides email notification to alert group members with the deadline. This is a clarification to the problem of forgetting about deadlines.

Conclusion
Improvement of group task management is essential for higher education students to produce more quality, efficient and effective group work results. Hence, the study proposed the web based task management system and introduced the functionality of the application. The improvement has been successfully designed and developed by way of the web based application to assist students managing their group tasks, monitoring the progress of group members' work and reminder through email notification before the deadline. Thus, the application is seen as a contribution to help student collaboration much better than that of the conventional way. The application is developed for a web-based platform, with limitations to create work tasks and users can only upload one file at one time as evidence for task completion. As a future work, it is highly recommended for enhancement to mobile platforms, capable of creating many tasks and uploading many files.

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