

THE CHINESE UNIVERSITY OF HONG KONG, SHENZHEN

CSC4001 PROJECT FINAL REPORT

Mindy——A Web-based Document Application

GROUP 10

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1 Introduction

1.1 Project Overview

Our group found that students, teachers, and social workers use online documents, online editing tables and online diagrams in various situations because those softwares can broadly reflect people's thinking process and logic easily online and shared with others, and sometimes they can even be expressed more accurately than people's oral or written expression. That is to say, such kind of softwares provide a structured way to capture, organize and clarify ideas and information. Our project, Mindy, meaning "map your mind", is an online website integrated by the function of online documents writing, online table editing and mind-map drawing, which aims to provide an easy-to-use platform for users to map their mind digitally. Compared with the traditional software that focuses on single function and the out-of-date way of writing thoughts on paper, the all-function electronic website will not be limited by paper size and will be easier to modify and save. With internet access, multi-person cooperation across regions can also be realized.

Mindy is the result of the collective collaboration of our group. There are four members in our group, and the workload are assigned and completed as follows:

Member	Workload
119010258 Shao Xiaowen	Frontend+Presentation+report
119010221 Luo Haoyan	Backend+Presentation+report
119010080 Ge Wentao	Backend+report
118010029 Chen Yanyu	Frontend+report

1.2 Objective

Our goal is to create an easy-to-use, efficient and convenient online collaborative editing web-based client-server system, actively accessible over the Web using a Web. This website can be used to create online documents, make Excel style tables, draw mind maps, and more. The website will provide users with comprehensive user management functionalities including but not limited to sign up, login/logout, upload profile photo, and change password. Users will be able to create, edit, save, view and share documents using their own accounts.

1.3 Highlights

For a website that can be edited online, the two most important characteristics are usability and readability.

In order to achieve good usability, we have done sufficient market research before designing system functions. We looked and tried out some of the existing competing sites, listing their pros and cons, making horizontal comparison, and we found that the advantage of these websites is that they all have rich page functions, but this also brings certain problems. Too many complex functions lead to a high starting threshold for the use of pages. Therefore, in Mindy's functional design, we decided to focus on the most common and most needed points, pursue the quality of functions rather than quantity, and fully consider the actual needs and using experience of users.

In terms of achieving readability, we put a lot of effort into the interaction design of the page. We want to keep the page beautiful, clean, and easy to understand while achieving the most complete functionality possible. Users will not be confused by the complicated operation pages, but can quickly get started and proficient in using our pages by looking at the icons and notes on the page. Our main target users are college students and Internet-related social workers. An important feature of Mindy is that it supports online collaboration of multiple people. College students often need to work together to complete group assignments. If meetings and discussions are arranged offline every time, the efficiency will be relatively low, and it will be difficult for group members from different majors to coordinate their free time. With Mindy, everyone can collaborate online in their free time. Another practical point is that with the outbreak of the COVID-19 in the past two years, online courses and working from home have become our new normal. Meeting offline is no longer an option for group members in different cities or colleges who work from home. Therefore, a good online collaboration website can play more roles in this post-epidemic era.

1.4 Project Statistics

The following shows the line of code statistic for both frontend and backend implementation.

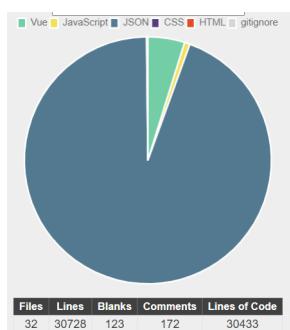


Figure 1: Project statistic: front end

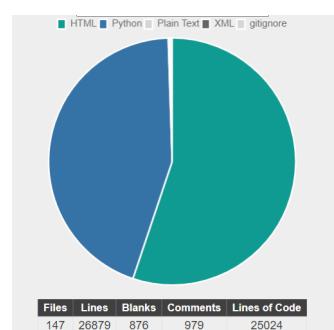


Figure 2: Project statistic: backend

2 System Architecture Design

This part describes the system architecture of our system. The architecture diagram of the whole system and UMLs of different components will be presented together with the text explanation of our design. We would also briefly discuss what platform and language we used during the development stage of our system.

2.1 System Architecture

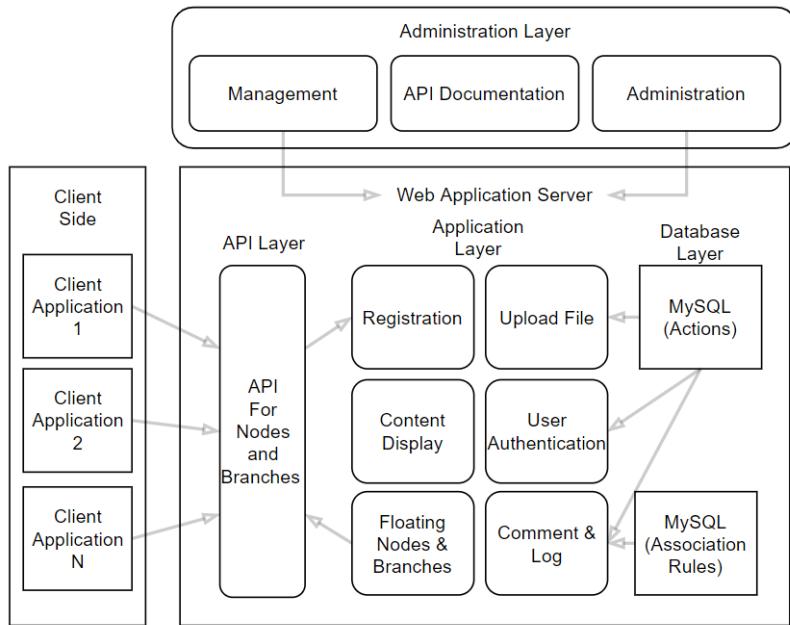


Figure 3: System architecture diagram

The overall architecture design of the system is shown in Figure 3. The implemented graphical UI helps users access their workspace by using a web browser in the front-end part. The web application server takes charge of all the functionalities in our web-based documentation application, including user registration, file upload, embedded online table/document writing, and update. On the server side, we manage multiple tables for different users (under the case that the number of a user is relatively small) to keep track of the change of the online document. In addition, we implement the administration tool (upper side of diagram) to manage the users and their information on the database.

2.2 System Specification by DFDs

- **User Login & Registration:** For the user who is the first time to use Mindy, he has to register his own account. During the sign up process, the user has to set his own user name, password and email, and he also has to type in the verification code which is randomly generated.

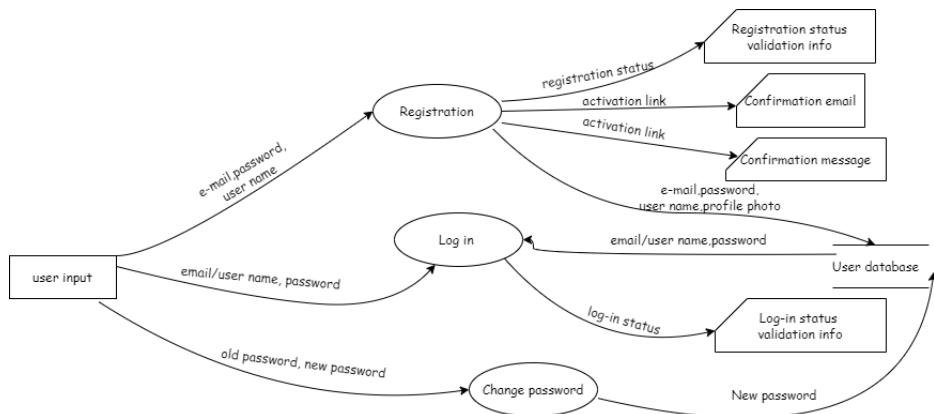


Figure 4: Data Flow Diagram of User Login and Registration

- **Uploading profile photos:** Users can upload their profile photos in their user center. In the user center, the user can manage all the projects, documents, pictures and other attachment files created by himself. The user can then choose the image he wants to upload. The photos can be used for different purposes.

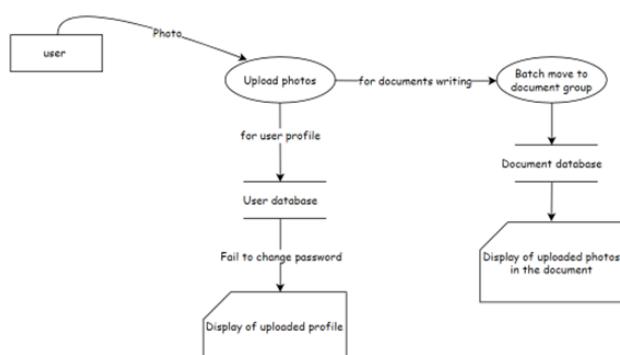


Figure 5: Data Flow Diagram of uploading profile photo

- **Changing Password:** Users can also change their password. When the user wants to change the password, he has to type in both the old password and the new password. The old password is used to make sure that the operation of changing password is done by the account user himself, instead of hacking by someone else. And after the user successfully change the password, the user will be forced to logout and use the new password to login again.
- **Administrator Management:** For Mindy, there exists a super administrator, who can manage the whole application systems that include user information, user projects, user documents, user authority and so on. The user can step into the user/project/document/table/picture management center where he can create/remove/edit all the content included.

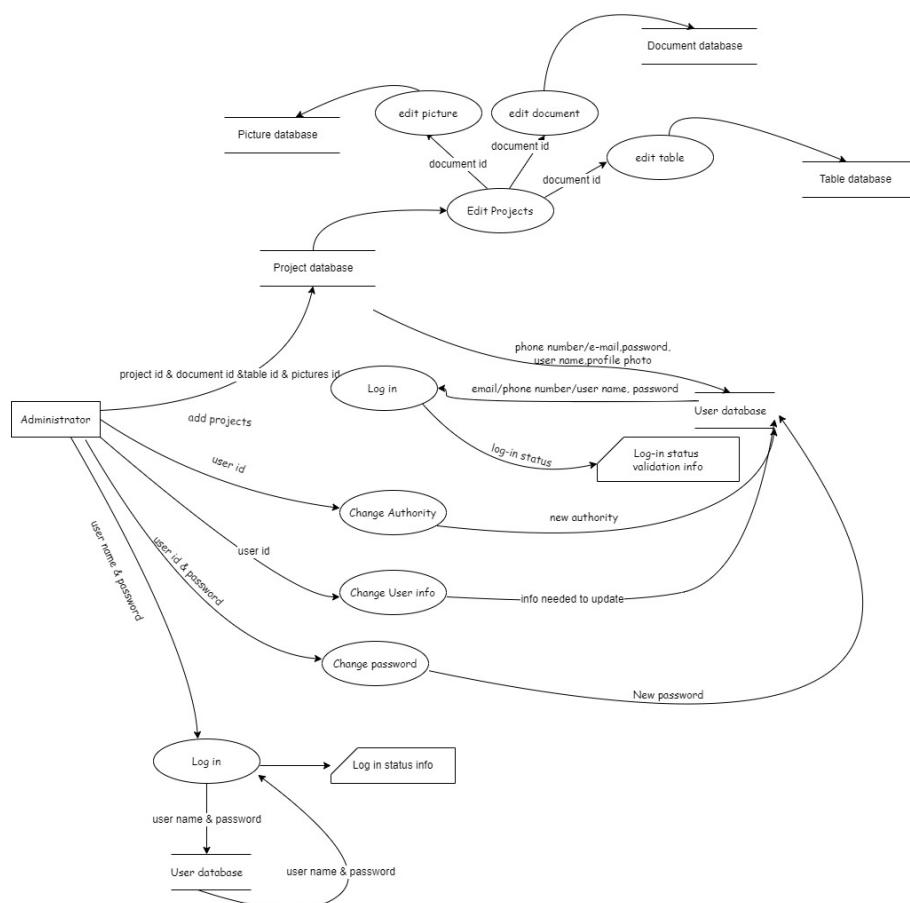


Figure 6: Data Flow Diagram of Administrator

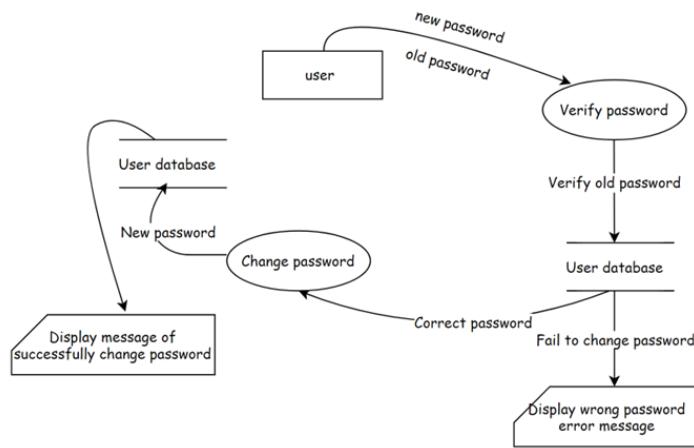


Figure 7: Data Flow Diagram of changing password

3 Detailed Description of Components by UML

3.1 Basic Functionality

3.1.1 User Login/Logout and Registration

This part implements the basic function of user account management. The detailed operations will be introduced later.

- **Functionality:** User login and registration system implements the function of:
 - **Sign Up:** Users need to sign up for an account in our website before they can use our website. Users are required to input their email address and password to create an account. If the email address is available(not registered before) and the password is valid, a verification link will be sent to user's email account. User needs to click the "Confirm" button to activate the account and then he/she will be directed to the homepage of our web application.
 - **Login:** Users who have already registered can log into our website using the registered email or username (as account number) and password.
 - **Logout:** Users can log out of our web. After each logout, users need to log in again to use our website.
 - **Change Password:** Users can change their password within our website. The original password and new password are needed for changing the password.

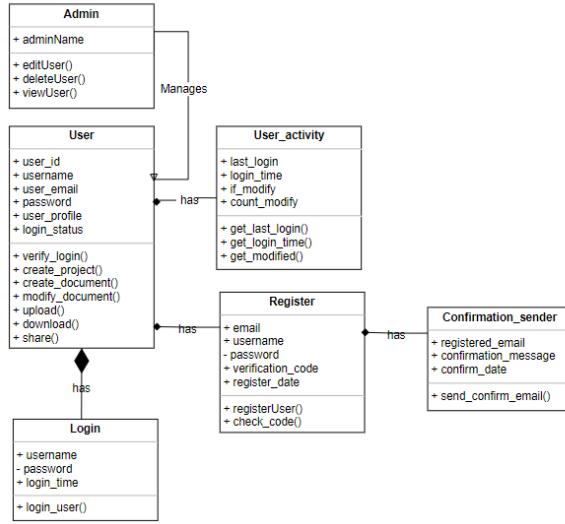


Figure 8: UML class diagram of User Login & Registration

3.1.2 Upload Profile

For the basic requirements part, we implement the function for the user to upload their profile photo. The specific operations will be introduced in the later section.

- **Functionality:** The functionality of the uploading profile function is for user to upload their profile photos and also update their profile photos anytime.

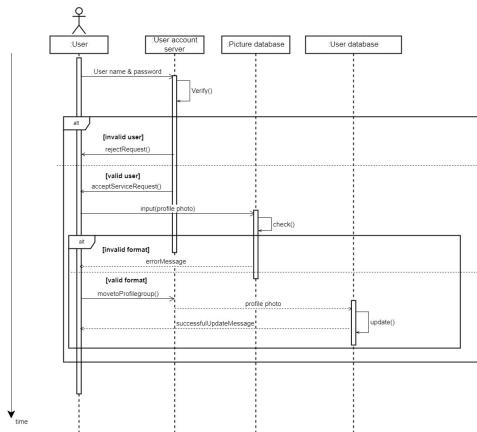


Figure 9: Sequence diagram of uploading user profile photo

3.1.3 Administration Management

For Mindy, there exists a super administrator who can manage all the application databases, including projects, documents, tables and users. For the project management, the administrator can remove and modify all the projects created by the users, including the images imported and attachment files. For the user management, the administrator can change the password and profile photo, and also the role of the users. The detailed operations will be introduced later.

- **Functionality** The functionality of our administration management includes the following:
 - **Project Management:** Administrator can create/modify/delete the Mindy project with no limits. Administrator can also assign/change the type of users' project (public, private, or semi-public) and give/change descriptions of their project. The meanings of public, private, and semi-public will be introduced later.
 - **Document Management:** Administrator can create/modify/delete users' files as they want.
 - **Image/Attachment Management:** Administrator can upload/delete/modify images or attachments in users' projects. Also, he/she can change the image group of the image that it belongs to.
 - **User Management:** Administrator can change all the information of the user, which includes: password, profile photos and their authorities, and he/she can also delete the user.

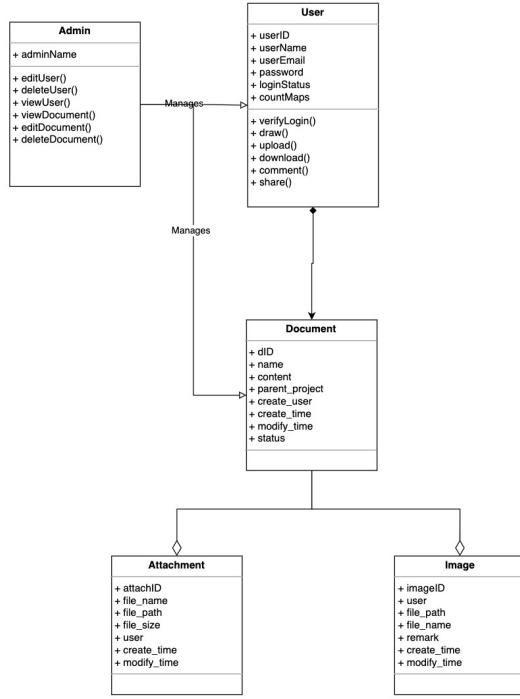


Figure 10: UML class diagram of administrator's function

3.2 Document Writing System

In Mindy, the document writing system is the core component of the overall system. We implement the writing system using a markdown editor. After one creates a document, he/she can modify the content of the document.

3.2.1 Functionality

Our document writing system implements several functions including:

- **Change Document Type:** The document writing system supports two kinds of text editors: Markdown Editor and Rich Text Editor. Users can choose and switch the editor type to write the document.
- **Modify Content:** Users can modify the content of the document using different editors. With markdown editor, users write content in markdown syntax. With rich text editor, users modify content directly. Both of these two editors support the basic functions of: Change Font Size, Change Font Style, Bold, Italic, and Underline .

- **Add Embedded Table:** Our document writing system also supports editing tables. Users can create tables by choosing the "Table" editor type and then they can edit the table like using Excel.
- **Add Mind Map:** In the markdown editor, we provide a special function of adding mind map. Users can create and modify mind maps within the markdown editor using markdown syntax.
- **Import Attachment and Picture:** Users can import attachments and pictures into the document.

3.2.2 Use Case Diagram

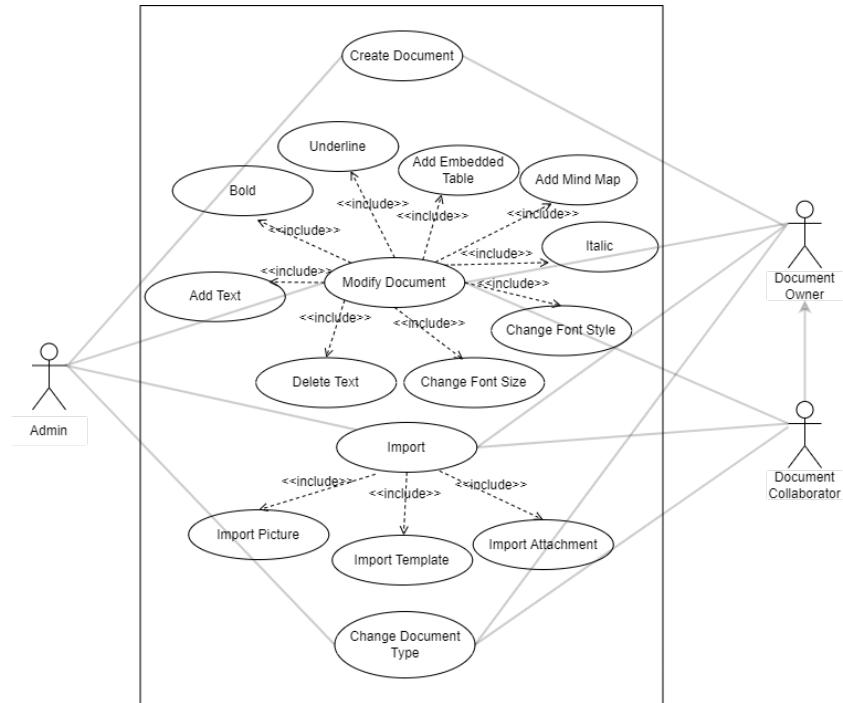


Figure 11: Use case diagram of Document Writing System

In the use case diagram shown in Figure 11 most of the functions based on actors and actions are displayed in a global view. The admin user can manipulate management operation on all created documents, including creating document, modifying document, importing attachments into documents, and changing document type. More detailed operations are introduced in the previous section. The owner of the document has the same level of authority on manipulating his own documents as the admin user. Document owners can also choose someone to be their collabora-

tor. These document collaborators can modify the document that owners share with them.

3.2.3 UML Class Diagram

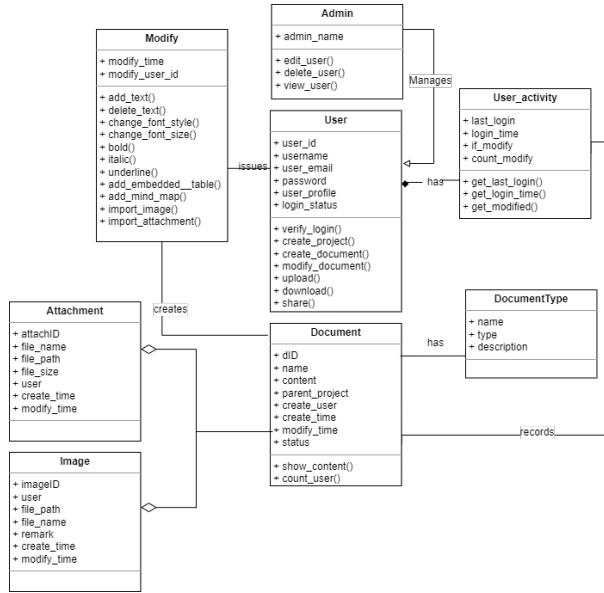


Figure 12: UML class diagram of Document Writing System

The UML class diagram of the document writing system is shown above (Figure ??). The "Document" class corresponds to the document that users create. There are two sub-classes belonging to the "Document" class: "Attachment" and "Image", which correspond to the imported attachments and pictures. The "Modify" class represents all manipulations on documents, i.e. users modify documents by calling functions in this class.

3.3 Personal File Management

In our Mindy project, the personal file management system is one of the most essential parts. We design a multi-layer (project and document) and collaborative file management system which includes the following components:

- **Project**: Each 'Project' object in our system represents a 'Folder'. There can be many (or empty) document objects inside a project. Meanwhile, we design a collaboration pattern that enables users to set the project either public or private:

- If public, all the users of Mindy can see the project on the panel and access the project. However, they cannot modify the documents inside the project.
 - If private, only the creator of the project can access the project. However, project creator can assign specific user to role 'collaborator', which allows them to access the project and modify the documents inside.
- **Document:** We provide two modes/types of online document: online Markdown document and online table. User can create many documents and assign to the projects they own.
 - **Image/Attachment:** We implement a concentrated image management control for our project. All the images and attachments upload in the documents and user profiles will be gathered into different image groups

More detailed descriptions are provided below.

3.3.1 Structural Diagram

Figure 13 shows an example structure of the file management system. For example, there are three registered users Clarence, Seline, and Owen. Clarence and Seline created a public project and private project, respectively, which both contains several documents/files. For a visitor of Mindy, he/she can only access (cannot modify) the content of Clarence's public project and cannot access Seline's private project. Nevertheless, the project collaborator of Clarence and Seline, Owen, can access the contents and modify them in both projects. Similar structure can be inferred from this structure diagram.

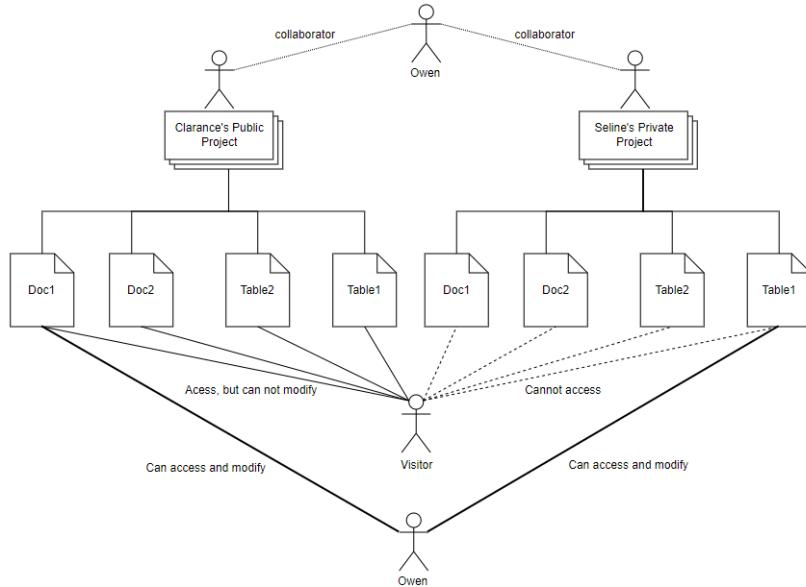


Figure 13: Structure diagram of personal file management system

3.3.2 Class Diagram

The class diagram of personal file management system is shown below (Figure 14). The 'Project' class corresponds to the project that user creates. 'role' is a notable attribute in this class. The class 'ProjectCollaborator' allows each project could have multiple collaborators. In our implementation, different roles represented in the 'role' attribute have the following meanings:

Attribute Value	0	1	2
Meaning	A private project	A public project	A semi-public project that only specific users can access

Table 1: Meaning of 'role'

Another notable value is the 'type' attribute in the 'DocumentType' object. The 'type' corresponds to the two embedded functions: Markdown document or Online table. Each time a new file (either document or table), the type information will be added.

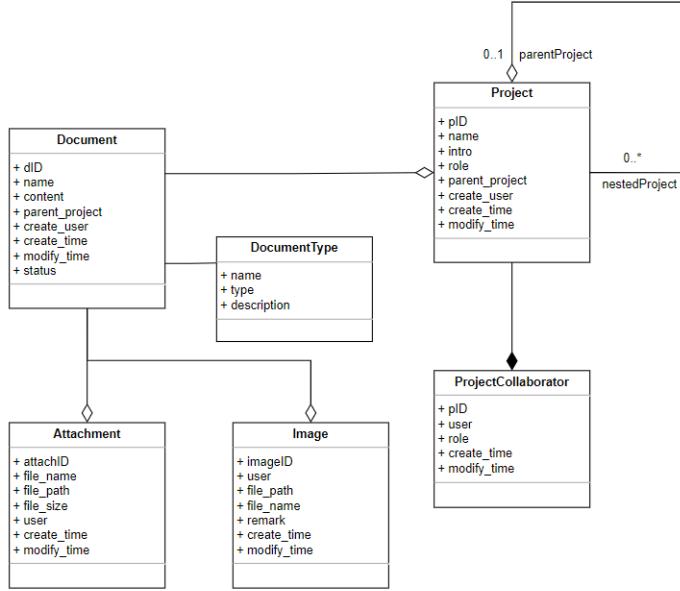


Figure 14: Class diagram of personal file management system

3.3.3 Functionality

The functionality of our file management system includes the following:

1. **Create/Modify/Delete Project:** Users can create/modify/delete the Mindy project with no number limits. Users can also assign the type of their project (public, private, or semi-public) and give descriptions of their project. The meanings of public, private, and semi-public are shown below:
 - If public, all the users of Mindy can see the project on the panel and access the project. However, they cannot modify the documents inside the project.
 - If private, only the creator of the project can access the project.
 - If semi-public, project creator can assign specific user to role 'collaborator', which allows them to access the project and modify the documents inside.
2. **Create/Modify/Delete File:** Users can create/modify/delete their files as they want, as long as he/she has the permission of that project. We provide two modes/types of online document: online Markdown document and online table. Users can create many documents and assign to the projects they own.

3. **Upload/Delete Image/Attachment:** Users can upload or delete images or attachments when they are editing their documents and tables. Also, they can upload their profile images as mentioned before. We implement a concentrated image management control for our project. All the images and attachments upload in the documents and user profiles will be gathered into different image groups.
4. **Project collaboration:** As mentioned above, the project collaboration function allows different users to work on the same project(has the permission of both read and write). This can be achieved by the role assignment operation(change role, see Table 1). The project owner can add/delete the project collaborator on its personal management panel.

3.4 User Collaboration System

User collaboration system is one of the advanced features achieved in our project. Mindy supports multi-user online collaboration, which means that different users can cooperate working on one specific document.

3.4.1 Functionality

The functionalities achieved in this part is mainly sharing documents between users. This is achieved by sharing the whole project that the document belongs to. When one user creates a project, he/she can choose the project to be private or public. With public project, all users can view and modify the documents in it. With private project, no one but the owner and the selected collaborators can view and modify the documents in it. The owner of the project can collaborate with other users by choosing the collaborators. When choosing the collaborators, the project owner can also decide the access level of the collaborator. High-level access allows collaborator to create documents and modify all documents in the project, while low-level access allows collaborator to create documents and modify only his/her own documents. Details will be introduced below.

3.4.2 Structural Diagram

Figure 15 shows an example structure of the user collaboration system. For example, Clarence creates two projects, one public project and one private project. Clarence choose Owen to be his collaborator on his private project, so Owen can access and modify all files in the private project 1. There is another user called Seline, who is not chosen to be the collaborator of Clarence's private project 1, so she can only access and modify documents in Clarence's public project and cannot view and modify documents in Clarence's private project 1.

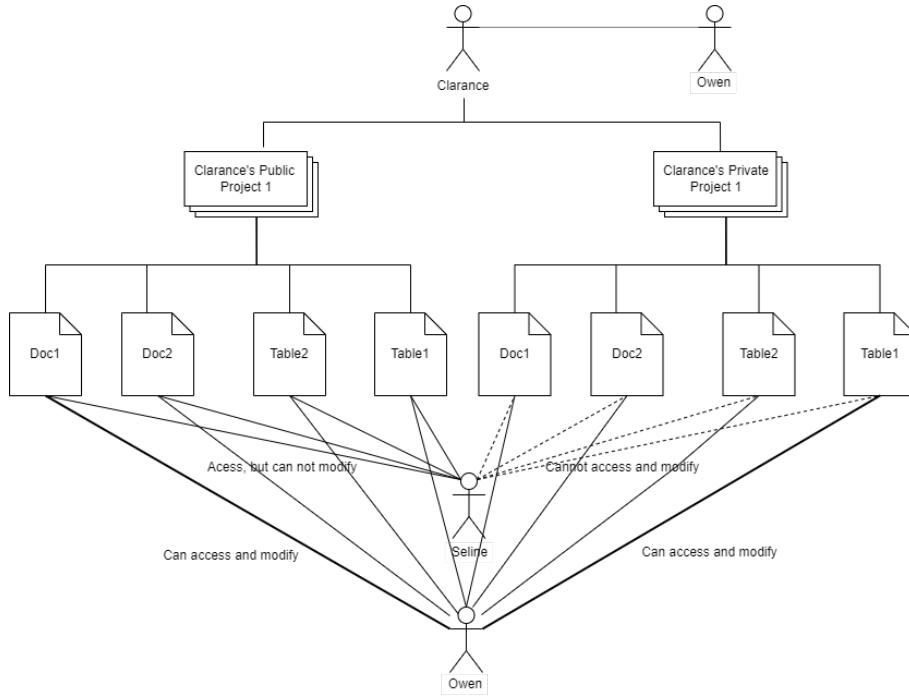


Figure 15: Structure diagram of User Collaboration System

4 User Interface Design

4.1 Description of the User Interface

We implemented the user interface by Vue.js. For the UI framework, we mainly adopted Element.js. For the implementation of mind map, we utilize the elements in Butterfy.js. All of these are open resources.

If the user has not log in, it will be automatically routed to login page. The user can choose to sign up a new account or directly login with an existed account in this web page. In the sign-up page, the user is requested to provide his email address and cellphone number for signing up a new account. Also, the user can initiate his username and password for Mindy in this page.

For a regular user, after successfully sign-up and log-in, the user will see the welcome page. This page provides shortcuts for creating new mind map. In the sidebar, there are several functions provided for the user including creating new file, checking out for created files, shared files and deleted files.

For the administrators of Mindy, after successfully login, it will direct to the administrating page. An administrator can manage all the mind maps and user information recorded in the database. Similarly, the welcome page provides shortcuts for man-

agement of mind maps and users.

4.2 Screen Images

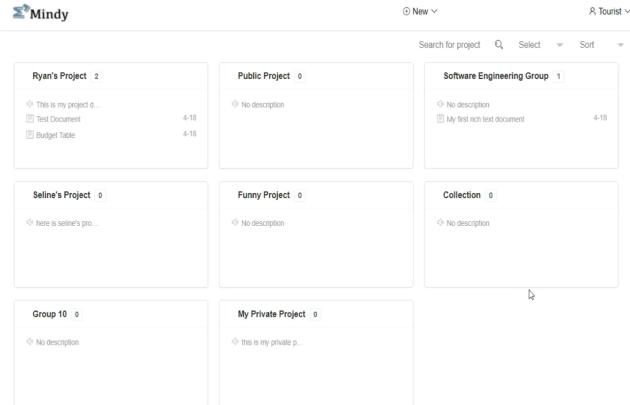


Figure 16: Screen image of the home page before Login.

Figure 16 the home page of our product. For tourists who haven't get the account of Mindy, they can view the public projects created by other users.

Figure 17 is the sign up page where users can create their own accounts by setting their usernames and passwords, input the verification code and also click the activation link sent to their emails.

After the user clicks the activation link, it will automatically jump to this page, which shows the message of successfully sign up.

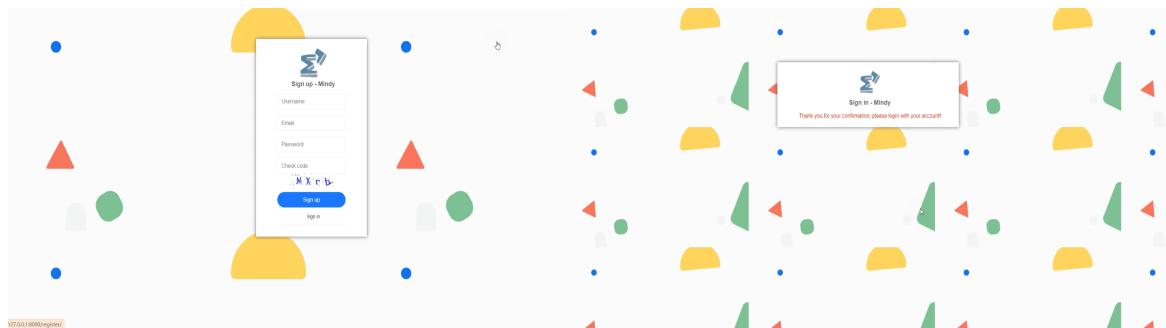


Figure 17: Screen image of the Sign Up page. **Figure 18:** Screen image of the Verified message.

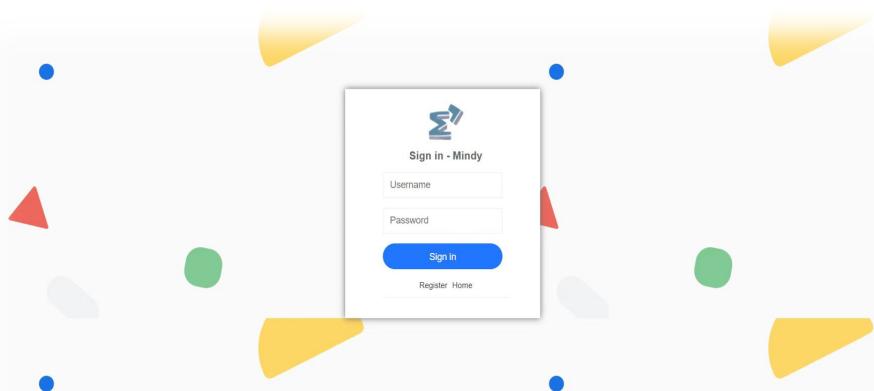


Figure 19: Screen image of the Sign In page.

After creating the account, the user can use the username and password used to sign up for login.

 A screenshot of the home page after logging in. The top navigation bar includes a 'Mindy' logo, a 'New' dropdown, a 'clearance' dropdown, a search bar ('Search for project'), and a 'Select' dropdown. Below the header is a grid of project cards. The projects listed are:

- Ryan's Project (2 items): Includes a note ('This is my project ...'), a document icon ('Test Document'), and a date ('4-18').
- Public Project (0 items): Includes a note ('No description').
- Software Engineering Group (1 item): Includes a note ('No description'), a document icon ('My first rich text document'), and a date ('4-18').
- Seline's Project (0 items): Includes a note ('here is seline's pro...').
- Funny Project (0 items): Includes a note ('No description').
- Collection (0 items): Includes a note ('No description').
- Group 10 (0 items): Includes a note ('No description').
- My Private Project (0 items): Includes a note ('this is my private p...').

Figure 20: Screen image of the home page after login.

This is the home page after login. And there are some basic functions on this page, such as creating the project/table, changing password and logout.

Figure 21 is the page of the user center. Users can change their personal information and also update their profile photos.

Figure 22 is the page of changing the password.

Figure 21: Screen image of the User Center page.

Figure 22: Screen image of the Change Password page.

Figure 23 is the page for the administrator, who can manage the whole application and also all the users' information.

Figure 24 is the page for managing the projects.

Figure 23: Screen image of the Administrator homepage.

Figure 24: Screen image of the page of project management.

Figure 25: Screen image of the page of document management.

Figure 25 is the page for managing the documents.

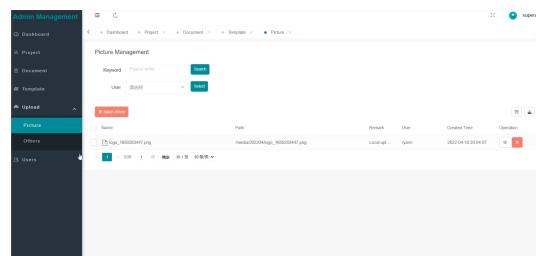


Figure 26: Screen image of the page of image management.

Figure 26 is the page for managing the images.

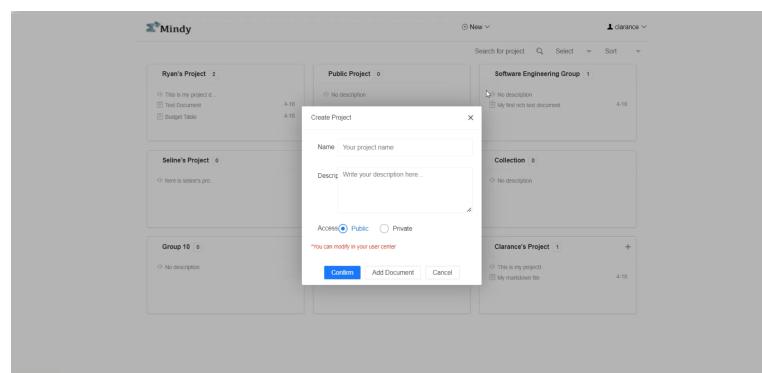


Figure 27: Screen image of the page of creating project.

Figure 27 is the page for the users to create projects.

Figure 28 is the page for the users to writing document.

Figure 29 is the page for the users to edit online table.

Figure 28: Screen image of the page of writing document. **Figure 29:** Screen image of the page of editing table.

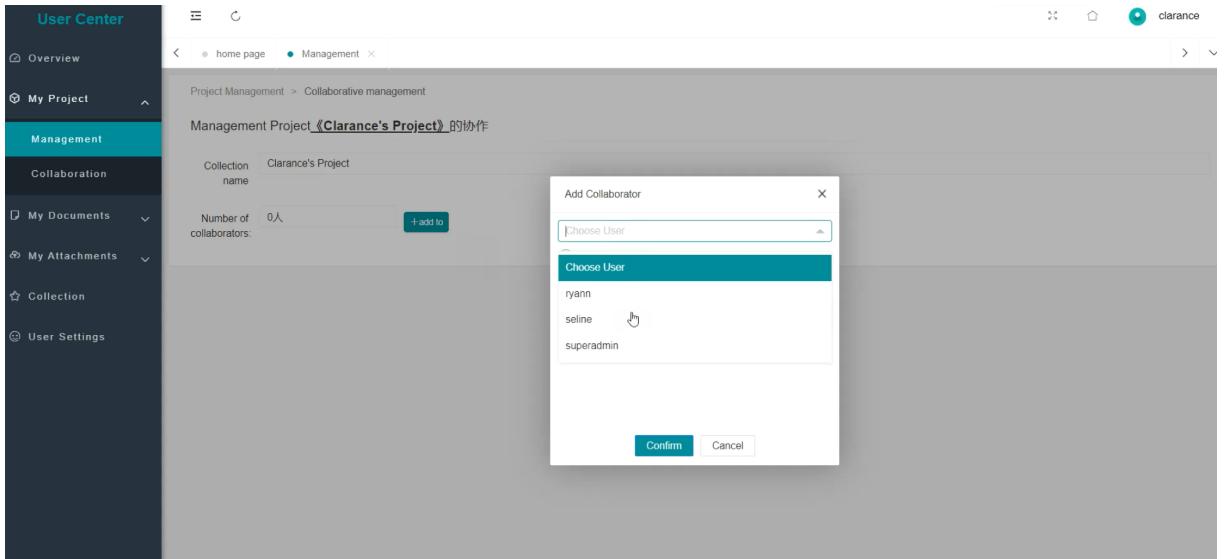


Figure 30: Screen image of the page of user collaboration.

This is the page for the users to set the collaboration relationship with other users.

4.3 Objects and Actions

Home Page Design

We implement the sign up/ login and logout functions. There are many projects listed in our home page, which are different projects created by the users of Mindy. All these projects that can be seen here has a public attribute, which means that every user of Mindy can view the projects, but they cannot modify them.

Sign up& Login & Logout

For the user who is the first time to use Mindy, he has to register his own account. During the sign up process, the user has to set his own user name, password and email, and he also has to type in the verification code which is randomly generated. Then he click the submit button, and a verification email will be send to the email you used for register. He has to click the confirm message shown in the email and then the website will directly jumped to the login page.

After the user finish doing all the operations on Mindy, he can also click the user icon in the upper left and choose to log out.

Uploading Profile Photo

Users can upload their profile photos in their user center. User can manage all the projects, documents, pictures and other attachment files created by himself in the user center. He can also click the upload image button to upload photos. The user can create various groups to manage the photos for different purposes, such as profile

photos and document attachment.

Changing Password

Users can also change their password by clicking the user icon in the upper right and choose to change the password. When the user wants to change the password, he has to type in both the old password and the new password. The old password is used to make sure that the operation of changing password is done the account user himself, instead of hacking by someone else. And after the user successfully change the password, the user will be forced to logout and use the new password to login again.

Administrator Management

For Mindy, there exists a super administrator, who can manage the whole application systems that include user information, user projects, user documents, user authority and so on. The user can step into the user/project/document/table/picture management center where he can create/remove/edit all the content included.

Document Writing

For the document writing, Mindy users can write the markdown document online. On the home page, the user can create project by clicking the 'new' button. Then he need to define some attributes of the project, such as the project title, its authority and some brief description of the project. Then the user can step into the project directory to create a document, also the user has to do some initialization, such as giving the document a title and choose the project directory the document belongs to. After writing, the document will be saved automatically and the user can publish the document. After publish, the project created can be seen in the homepage.

Online Table Editing

For the online table editing, Mindy users can edit tables online. On the home page of the users' account, the user can click the 'new' button to create tables. Then he need to define some attributes of the table, such as the title and choose the project directory the table belongs to. The user can choose to edit the new table crated directly or choose to import the table from your computer, like the .xlxs file. After writing, the table will be saved automatically and the user can publish the table. After publish, the table created can be seen in the project directory it belongs to in the homepage.

User Collaboration

For the user collaboration function, the user can choose the project that he wants to collaborate with other users. In the user's personal center, the user can firstly choose the project he wants to collaborate with others, and then change the role of the user as 'Co-Editor', then the user added to the editor group can modify all the contents belongs to the project.

5 Test

5.1 Test Overview and Test Plan

In our Mindy project, since our implementation is based on both the external source (like the embedded markdown writing and function of online table), we need to implement a series of test cases to ensure the software reliability, detect potential errors and limitations or deficiencies of our project. During the software development for the test cases, we follow the software testing life cycle shown in Figure 31. We conducted several functional tests, to cover (nearly) all the requirements. The testing procedure is from unit testing for each function, to integration testing that tests a series of connected function (like function in a page), and system testing, which tests the fundamental functions of our project in a roll. The main testing strategies of our testing part is based on black-box testing. The testing coverage statistic will also be given.

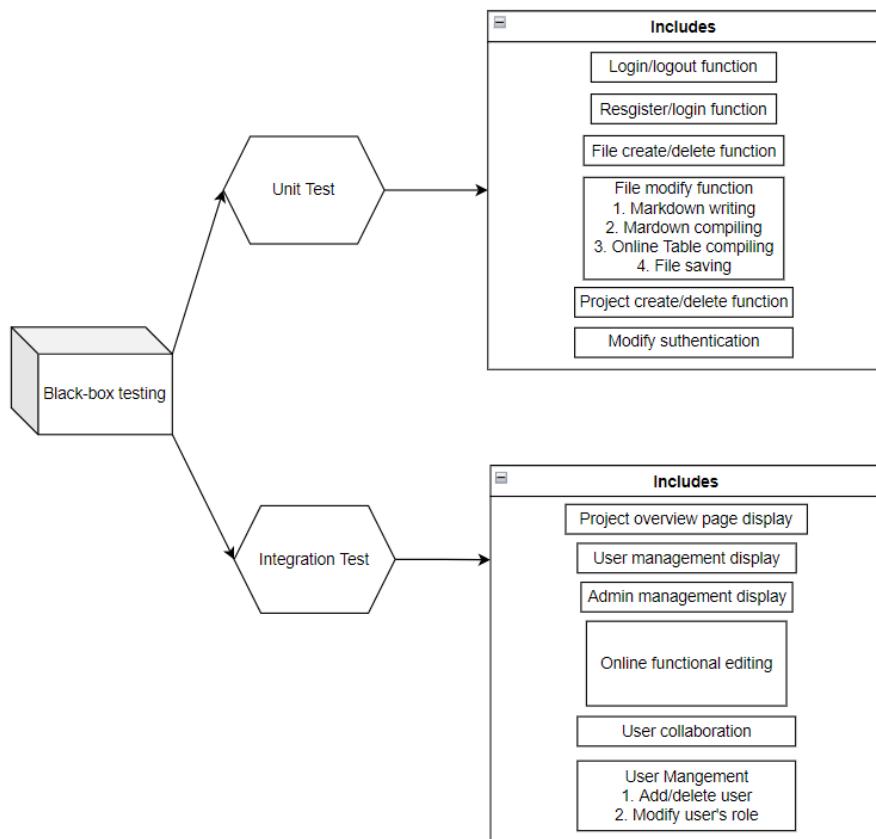
5.1.1 Software Testing Life Cycle (STLC)

The software testing life cycle of testing our Mindy project implementation is shown in Figure 31 shown below.



Figure 31: Software testing life cycle of Mindy

Test plan creation Test plan creation is the crucial phase of STLC where all the testing strategies are defined. For our project, the important functions we need to test including login/logout functions, register function, profile upload function, file create/delete/modify function (in particular, for modifying file we need to test the writing, compiling of markdown/table, saving procedure), and project create/delete/modify function (specifically we need to test the collaboration authentication of different users). The detailed testing function of our project and different test stages is listed below in Figure 32.

**Figure 32:** Test cases overview

Environment setup & Test case execution Setup of the test environment is an independent activity and can be started along with Test Case Development. The test case environment for our project is basically Windows platform and Mac OS (we perform test case in both OS).

Test case Execution takes place after the successful completion of test planning. In this phase, we started our case development and execution activity. The test cases and some required data (like the user information in the database) is collected and recorded for later testing.

Test cycle closure The test closure of our project is indicated by all the test we designed are passed.

5.2 Test Case

- **Design ideas of test cases** In this part, we will explain the corresponding functions that we use to test our product functionality and reliability through the steps shown in figure:



Figure 33: Test Steps

– Unit-test

1. **Verification Code Generation:** We tested the function of the generation of the 4-character random verification code when the user tries to sign up for Mindy. This function is expected to randomly generate a 4-character verification code. We call the test function for 1000 times and check whether the verification code will be easily repeated. If there are repeated generated codes in 1000 times, which means the randomness is not strong enough, thus the output of the test function will be “Repeated”, and then we will know that we have to design a verification code with much stronger randomness. However, in terms of the test function, our 4-character is unique without repetition, which means we can use such kind of verification code in our product.
2. **Sending Email:** For the sending email function, we also implement a test function to test this function. It includes 3 test cases to check whether the email has been successfully sent out and also the validity of the email address. For example, if someone uses the wrong format of the email address, then there will be an error message shown in the sign up page to remind the user that his/her email address format is not correct, and then the email with the activation link will not be send to the wrong email address.
3. **Activation Link:** And then we test the function of the activation

link to test whether clicking the link sent to the users' email can successfully jump to page that displays the message of successfully sign up.

4. **Login:**Then, we test the login function in our homepage.

There are 2 test cases involved in this part: 1. the case with normal valid input—username with correct password. 2. the case with an invalid input—1. username with incorrect password. 2. Username that doesn't exist and any password.

For the case tests with the normal valid input, this test function will verify the username with its password.

For the case tests the invalid input, this test function will check whether there exists a username as the input, and if there exists such a user, then check whether the password is matched with the username.

5. **Sign up:**Next we test the function of user signing-up. the test cases we user mainly considered from the perspective of username and password. The test cases tested will be introduced as follow. And for the Email,cell phone number gender, etc., the test cases should consider the character requirements.The first is the case with invalid input including the existence of invalid characters and the unexpected length of input which doesn't meet the requirement of maximum or minimum. The second case is the re-registering of existing users which is detected through the input of email address. The third is inconsistencies between the re-entered password and the initially entered password.Moreover, for the form submission, whether the tap and enter keys are supported and whether the password can be copied and pasted.

6. **Changing Password:**And we tested the function of changing password for both administrators and normal users. The test cases tested will be introduced as follow. The first is the case with unexpected no input. The second is the case with incorrect input including incorrect old password and inconsistencies between the re-entered password and the initially entered password. The third is the case with invalid input of new password including the existence of invalid characters and the length of new password doesn't meet the requirement of maximum or minimum. the fourth is the test case with consistence

between the old password and the new password. The first and the third case are expected to be detected in the frontend. And for the second case, the data will be sent to the backend and be checked. Also, for this function, since it related to the form submission, we also tested whether the tap and enter keys are supported. And we tested whether the password can be copied and pasted. Also, it is important in the function test for password that whether the password is case-sensitive. For our product, Mindy, all the function related to the password is case-sensitive.

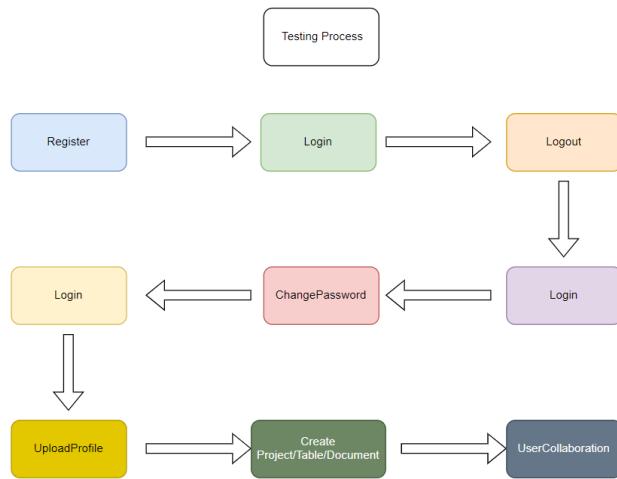


Figure 34: Test process overview

– Component-test

After explaining the design of some unit-test functions, we continue to briefly introduce the idea that we utilize to design the Component testing. There are 6 files to perform the component testing and together test the login-logout component, main page component, register component, project/table/document creating component, user information management component, and the administrator management component. For example, we test all the functions during the process of register a new account. It includes email sending, username checking, and database updating, etc. And for the main page component, we test the basic functions we expose in the main page, such as changing password, creating project and so on.

– System-test

After introducing the component testing, we link all the components together to form a whole journal of using our website. The whole process of using the website as shown below is tested:

6 Lessons Learned

- **Knowledge about frontend and backend development:** To develop our Mindy project, we divide the project into frontend part and backend part. In the frontend part, we use Vue framework, html, and CSS to develop, and we use Django framework to achieve the backend development. Through the process of project development, we gradually mastered the knowledge and skills of frontend development and backend development.
- **Teamwork:** One of the clutch factors that brings us to success is teamwork. This project is a huge project and our teammates need to work together to share the workload. Meanwhile, we need to put our separate work together to form up a whole system. The epidemic has made our work more difficult, as two of our teammates got quarantined at home, and we have to discuss all stuffs online.

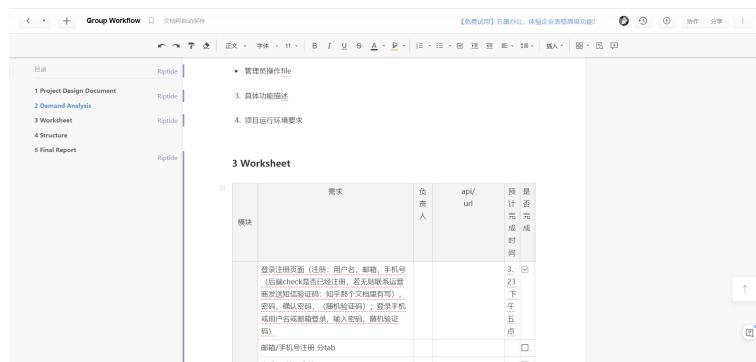


Figure 35: Snapshot of group workflow document

Throughout the whole process, we had more than 10 meetings online to divide our work, track work progress, and discuss future work. We use GitHub to update our coding materials and use Overleaf to write our report. We also wrote an online group work overflow document to keep track of the progress as well as to record the work done and future work. Although difficulties and obstacles occur during the process, we did an excellent job as a team and learned a lot about working as a team in software development.

Figure 35 shows a snapshot of our group workflow document, details can be seen in [Group Workflow Document](#).

7 Conclusion

In conclusion, to create an easy-to-use, efficient and convenient online collaborative editing web-based client-server system, we created Mindy. This website allows users who have an account in our website and logged in already to create online documents, make Excel style tables, draw mind maps, and collaborate on documents online.

To implement our project, we use CSS+HTML+Vue to achieve frontend development, use Django framework to implement the backend coding, and choose Mysql to be the database used in backend. The project implements several functions, including:

- **Basic Functionality:**

- **User Login/Logout and Registration:** Allows users to sign up, login, logout, and change password.
- **Upload Profile:** Implement the function for users to upload profile photo.
- **Administration Management:** Use super administrator to manage all information in the website, including users, projects, documents, tables, photos, and attachments.

- **Advanced Features:**

- **Document Writing:** Allow users to modify document using markdown editor and rich text editor.
- **Personal File Management:** Allow users to create/modify/delete projects, create/modify/delete files, upload/delete image/attachment, and collaborate on projects.
- **User Collaboration:** Implement the function of user collaboration by sharing projects.

Overall, Mindy is a user-friendly, efficient web-based online document application. It allows users to write document and collaborate on documents online. Mindy is still not perfect, there are many places to be improved, such as making it across all platforms and also implementing more completed mind-map drawing function like draggable, deletable operations.