TSE2102 Software Engineering Fundamental

Final Report

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1. Scenario / Problem Statements:

Today, universities use *post graduate management system (PG-MS)* to manage data of their student. However, most of the system used by these institutions are outdated as they are inconvenient to be used and view in mobile devices as the systems are built on obsolete technologies. Moreover, the system used by some of these universities are not integrated as different components are hosted on multiple domains, making it hard to be used as users have to navigate through different website for different functions.

1.1. Objective:

To tackle the problems above, we decided to:

- Create an integrated PG-MS, with all functionalities all bundle in a centralized platform.
- Make a PG-MS with responsive web pages that is suitable for browsing on both computers and mobile devices of different size.

1.1.1. Scope:

1. Profile Management
    - Login function
    - Logout function
    - View and edit profile information
2. Item Management
    - Add Item
    - Edit Item
    - Delete Item
    - Search Item
    - Item check in/check out process
3. Transaction/Process Management
    - Alert or notification process
    - Payment transaction
    - Report generation

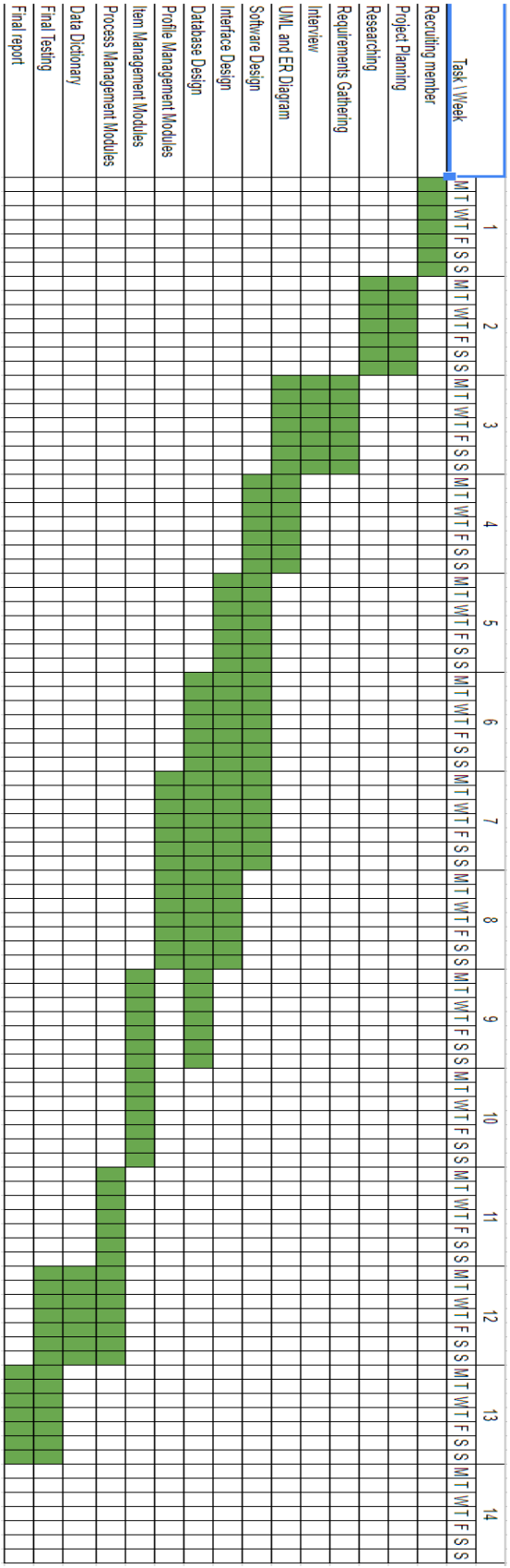
1.2. Functional Requirements

No.	Module	Requirements	Actor Involved
1	Login	• **Login function** Users will be able to login by entering the correct user id and password combination through the login page, and will be redirected to the user's and admin home page respectively. • **Logout function** After logging in, users are able to log out at will by clicking at the logo button and they will be redirected to the website's homepage.	Student, Supervisor, Admin
2	Profile Management	• **View and edit profile information** Users are able to edit their information such as changing password, username and profile picture and also view their master's progress.	Student, Supervisor, Admin
		• **Profile search** Students are able to search for supervisor profile and vice versa.	Student, Supervisor
		• **Update progress** ○ Supervisors are able to update the progress of the master by research students they're supervising. ○ Supervisors are able to update master by coursework student's academic report.	Supervisor
3	Application	• **Application function**	Applicant

	Management	Applicant that apply for a post-graduate studies, an account will be created for the applicant only if they're qualified and approved by admin. Student will need to provide all required information. For research student, they need to submit their research proposal.	
		● **Application approval function** Admin can review the applications and create a student account for the applicants if all the requirements are met.	Admin
4	File Management	● **Add File** Student and supervisor are able to submit their documents such as journal, and thesis by uploading the pdf files to the server.	Student, Supervisor
		● **Delete File** Students and supervisors are able to delete the files they uploaded.	
		● **Download File** Students and supervisors are able to download the files that they or their students/supervisors have uploaded to the system.	
		● **Search File** Students and supervisors will be able to search for the documents they have uploaded in the system.	
5	Appointment Management	● **Appointment Booking** ○ Student will be able to make appointment with supervisor.	Student
		● **Appointment Approval**	Supervisor

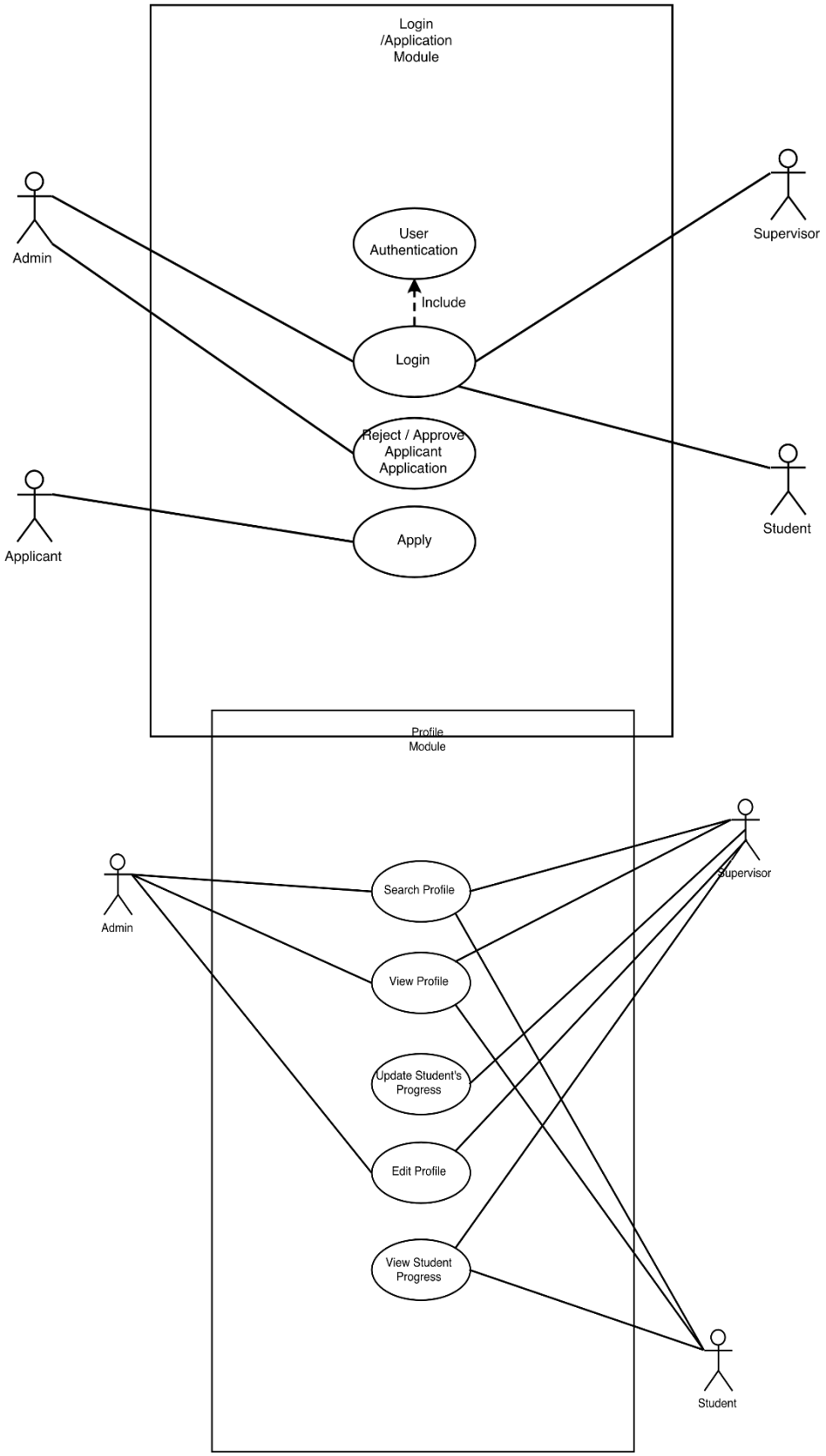
		○ Supervisor are able to approve appointment date booked by the student.	
6	Subject Management	● **Enroll Subject** Student is able to enroll subject	Student
		● **Add Subject** Admin is able to add subject and assign supervisor to that subject.	Admin
7	Transaction/ Process Management	● **Payment transaction** ○ Student may make a payment through the system.	Student
		● **Report generation** ○ Generating report payment and result for student taking master by coursework.	
8	User Management	● **Add user** Admin are able to add students and supervisors user.	Admin
		● **Delete user** Admin are able to delete any user.	
		● **Edit user status** Admin are able to determine the status of students and supervisors. For students, there are 3 type of status, active, terminated and graduated. For supervisors, the statuses are active and retired.	
		● **Search user** Admin are able to search any user by their user id and username.	

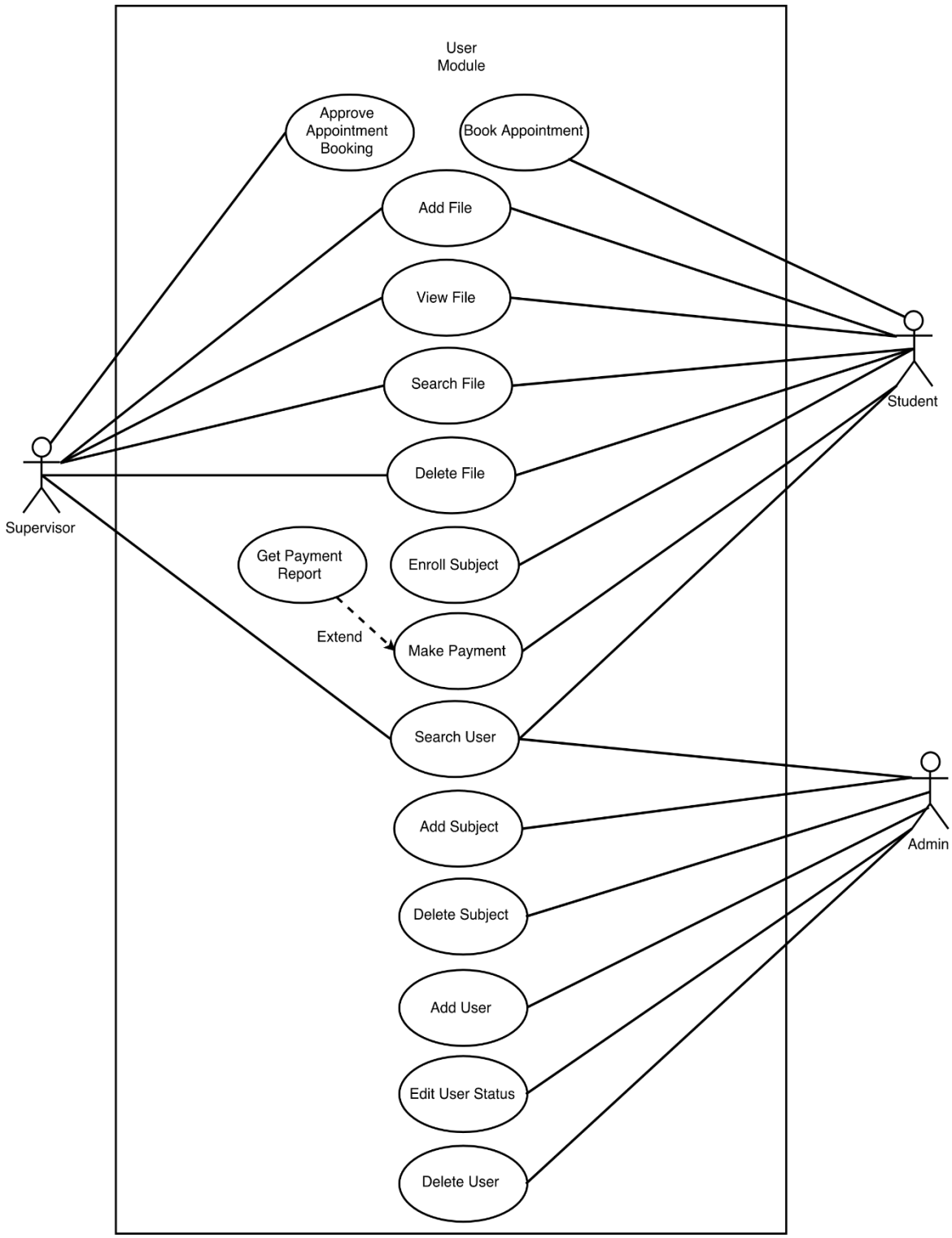
1.3. Gantt Chart



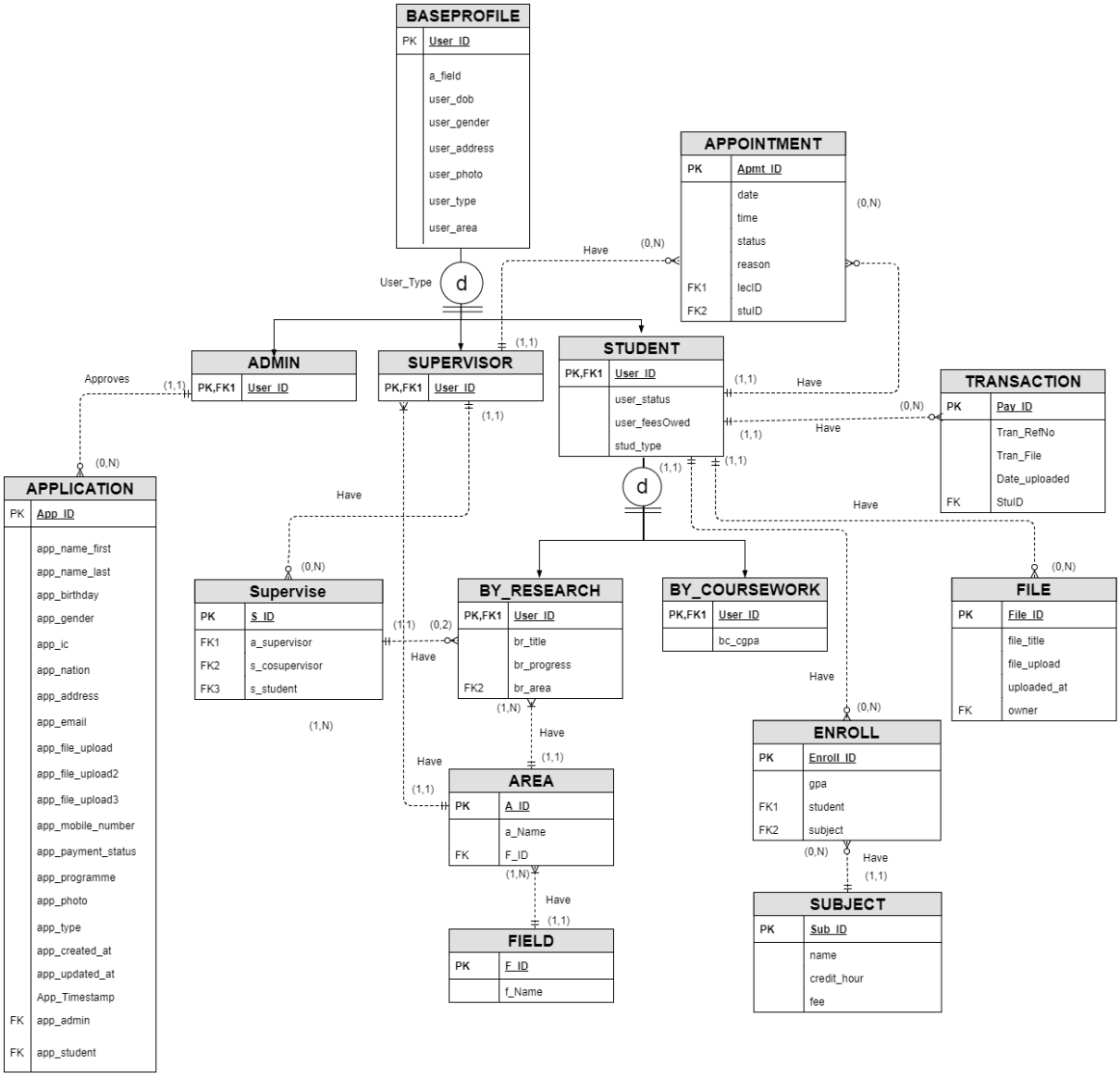
2. System Overview

2.1. Use Case Diagram




User
Module
Approve
Appointment
Booking
Book Appointment
Add File
View File
Search File
Delete File
Get Payment
Report
Enroll Subject
Extend
Make Payment
Search User
Add Subject
Delete Subject
Add User
Edit User Status
Delete User
Supervisor
Student
Admin

2.2. ERD Diagram



2.3. Quality Requirement

No.	Quality Requirement	Description / Metric	Member
1	Responsive Design	• **Description** Our web system layout scale will be adjusted automatically with the screen size. Certain element will be hide and display according to the screen size of the device where the application is accessed. The arrangement of elements will be adjusted by this 3 screen size: - 768px - 992px - 1200px	Goh Kun Shun
		• **Metric** Make sure all elements display properly in all 3 screen size	
2	Data Integrity	• **Description** Accessibility is constrained by the user type.	James
		• **Metric** User can only access to specific function that is allow by their user type. For example, admin cannot access or view document uploaded by the student or supervisor.	
3	Security	• **Description** All users password will be not be saved in raw text, but will be hashed and salted. Each user will be given a different salt.	Eric
		• **Metric** User password are encrypted and can't be access by even the admin. Different salt for different user are given and the first few character of the salt are shown as the proof that each user have different salt even though they	

		have the same password, resulting in different hash.	
4	Portability	● **Description** Our system will be accessible by laptops, desktop and mobile devices through website domain.	Ong Koon Hua
		● **Metric** System testing will be done on a few different computer and phone to make sure that they display the correct output.	
5	Functionality Testing	● **Description** Our website will include exception handling and error checking to ensure that the user will receive correct response from our system when requested.	Christopher
		● **Metric** Wrong input will be put to test the system error handling and ensure that the system give the correct response.	
No.	Quality Requirement	Description / Metric	Member
1	Responsive Design	● **Description** Our web system layout scale will be adjusted automatically with the screen size. Certain element will be hide and display according to the screen size of the device where the application is accessed. The arrangement of elements will be adjusted by this 3 screen size: - 768px - 992px - 1200px	Goh Kun Shun
		● **Metric** Make sure all elements display properly in all 3 screen size	

2	Data Integrity	● **Description** Accessibility is constrained by the user type.	James
		● **Metric** User can only access to specific function that is allow by their user type. For example, admin cannot access or view document uploaded by the student or supervisor.	
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		● **Metric** User password are encrypted and can't be access by even the admin. Different salt for different user are given and the first few character of the salt are shown as the proof that each user have different salt even though they have the same password, resulting in different hash.	
4	Portability	● **Description** Our system will be accessible by laptops, desktop and mobile devices through website domain.	Ong Koon Hua
		● **Metric** System testing will be done on a few different computer and phone to make sure that they display the correct output.	
5	Correctness	● **Description** Our website will include exception handling and error checking to ensure that the user will receive correct response from our system when requested.	Christopher
		● **Metric**	

		Wrong input will be put to test the system error handling and ensure that the system give the correct response.	

2.4. Pseudocode

2.4.1. Login module

```
Start
    if loginBtn is pressed:
        get username
        get password
        if authenticate(username, password) is success:
            Redirect to home_page
        else
            Print error_message
        end if
    end if
End
```

2.4.2. AddUser Module

```
Start
    if loginBtn is pressed:
        get username
        get password
        get usertype
        get email
        get dob
        get gender
        get address
        if info is valid:
            addUser(username, password, usertype, email, dob, gender, address)
        end if
    end if
End
```

2.4.3. DeleteUser Module

```
Start
    if deleteBtn is pressed
        deleteUser(username)
    end if
End
```

2.4.4. EditUserStatus

```
Start
    if editBtn is pressed:
        editStatus(username)
        get Status
        updateStatus(username, status)
    end if
End
```

2.4.5. Application Module

2.4.5.1. Applicant

Start
    If applyBtn pressed:
        get name
        get dob
        get gender
        get ic
        get nationality
        get address
        get qualification
        get document
        get paymentstatus
        get programme
        get photo
        get type
        get timestamp
        If application form is full fill:
            print success_message
        else
            Print error_message
        end else
End

2.4.5.2. Admin

Start
    display application list
    If approvalBtn pressed:
        process to **AddUser Module**
    end if
End

2.4.6. Transaction Module

Start
    if (verified payment is selected)
        get photoFile
        get receiptRefNo
        while (photoFile format is not PNG, PDF, GIF, JPEG or receiptRefNo is empty)
            print error message
            get photoFile
            get receiptRefNo
        end while
    else
        Break
    end else

End

2.4.7. Appointment Module

2.4.7.1. Student

Start

get userSearch
print all lecture names
get selectedUser
User is directed to lecture profile page
if (make appointment is selected)
get time
get date
While (time is less than 1 hour or date is before current date)
get time
get date
end while
else
Break
end if
Database is updated with time, date, studentID and LecID
// LecID and studentID will be autofilled

2.4.7.2. Lecture

Start

if (approve is selected)
Update status of appointment in database to approve
else if (reject is selected)
Update status of appointment in database to reject
else
Break
end if

End

2.4.8. File Management Module

Start

If uploadBtn pressed:
get file
get file_name
If file is valid:
upload(file, file_name)
else:
showError(“File should be in .pdf, .docx format.)
end if

```
        else If deleteBtn pressed:
                get file.id
                file.delete(pk=id)

        else if downloadBtn pressed:
                get file.id
                get file(pk = id)

        else if searchBtn pressed:
                get search
                for result in file:
                        if search == result
                                display result
                        end if
                end for

         end if
End
```

2.4.9. Subject Management Module

2.4.9.1. Admin

```
Start
        If addSubjectBtn pressed:
                get subject_name
                get subject_fee
                get subject_creditHour
                subject(subject_name, subject_fee, subject_creditHour )

End
```

2.4.9.2. Student

```
Start
        If enrollBtn pressed:
                get subject.id
                enroll(student.id, subject.id)


        else If deleteBtn pressed:
                get enroll.id
                enroll.delete(pk=id)
        end if
End
```

3. Testing

3.1. Test Data

3.1.1. Login Module

- **Point to take note**
  - **Login with ID number as credentials belong to student account**
  - **Login with Name as credentials belong to Lecturer account**
  - **Login with "admin" as credentials belong to admin account**

Input		**Expected Output**
Username	**Password**	
1151101980	pass1234	Login success. Redirect to student homepage.
1151101987	pass1234	Login fail. Error message"Account disabled"displayed.
Chris	pass1234	Login success. Redirect to supervisor homepage.
admin	pass1234	Login success. Redirect to admin page.
admin	1234	Login fail. Error message"Invalid login"displayed.

3.1.2. Profile Module

Change Password			
Input			**Expected Output**
Old Password	**New Password**	**New Password Confirmation**	
pass1234	pass1234	pass1234	Valid.
pass1234	pass5678	pass5678	Valid.
pass1234	pass1234	pass5678	Invalid. The two password fields didn't match.

pass2345	pass1234	pass1234	Invalid. Old password entered incorrectly.
pass1234	1234	1234	Invalid. New password need to be at least 8 character.
pass1234	12345678	12345678	Invalid. New password contain only numeric.
pass1234	password	password	Invalid. New password too common.
pass1234	pass1234	pass1234	Login fail. Error message“Invalid login”displayed.

Edit Profile				
Input				**Expected Output**
Profile Picture	**First Name**	**Last Name**	**Address**	
-	Kun	Shun	18, Jalan Dewasa, Batu Tiga	Valid.
me.jpg	Kun	Shun	18, Jalan Dewasa, Batu Tiga	Valid.
demo.pdf	Kun	Shun	18, Jalan Dewasa, Batu Tiga	Invalid. Invalid profile picture file.
me.jpg	-	Shun	18, Jalan Dewasa, Batu Tiga	Invalid. First name must not be empty field.
me.jpg	Kun	-	18, Jalan Dewasa, Batu Tiga	Invalid. Last name must not be empty field.
me.jpg	Kun	Shun	-	Invalid. Address must not

				be empty field.

3.1.3. Appointment Module

Points to note

- **Assuming the details at the time of booking is as follow:**
  - **Date : 10/9/2017**
  - **Time : 12:00 (using 24 hour format)**
- **Booking time slot that is clashing will not be check, it is assume that the lecturer will manage his/her own time schedule**
- **LecID will be done as drop down menu, therefore, no invalid input for lecturer is possible, unless there is none selected**
- **Reason does not have invalid input, unless there is no input.**

Add Appointment				
Input				**Expected Output**
Date	**Time**	**LecID**	**Reason**	
12/9/2017	16:00	[valid selected ID]	[Reason to consult Lec]	Valid
10/9/2017	13:59			Invalid, Booking time must be 2 hour of current time
10/9/2017	14:00			Valid
9/9/2017	16:00			Invalid, Booking date cannot be before today's date
-	16:00			Invalid, Booking date cannot be empty
10/9/2017	-			Invalid, Booking time cannot be empty
10/9/2017	16:00	-		Invalid, LecID cannot be empty
10/9/2017	16:00	[valid selected ID]	-	Invalid, Reason cannot

				be empty

3.1.4. Upload File Module

Input		Expected Output
File name	**File type**	
Research	pdf, docx	Upload success, redirect to file page.
Research	jpg, mp3	Upload fail. File type must be in .pdf or .docx.
-	pdf, docx	Upload fail. File name can't be blank.
-	jpg, mp3	Upload fail. File name can't be blank and file type must be in .pdf or .docx.

3.1.5. Add Subject Module (Admin)

Input			Expected Output
Subject Name	**Credit Hour**	**Subject Fee**	
Software Engineering Fundamental	4	1234.50	Add subject success. Redirect to subject management page.

Software Engineering Fundamental	4.0	1234.50	Add subject success. Redirect to subject management page.
Software Engineering Fundamental	4	1234	Add subject success. Redirect to subject management page.
Software Engineering Fundamental	4.1	1234.50	Add subject fail. Credit Hour must be in integer.
Software Engineering Fundamental	4	1234.500	Add subject fail. Subject Fee must be in two decimal places.
-	4	1234.50	Add subject fail. Subject name can't be blank.

3.1.6. Transaction Module

Points to take note

- **File type that are accepted are.**
  - **pdf, PNG, jpg and gif only.**
- **RefNo does not have invalid input unless there are no input.**

Make Transaction		
Input		**Expected Output**
[uploaded file type]	**RefNo**	
.pdf	[Resit Reference Number]	Valid
.gif		Valid
.mp4		Invalid, File type invalid
-		Invalid, No file is uploaded
.PNG	-	Invalid,

		RefNo cannot be empty

3.1.7. Application Module

- **Points to take note**
  - **This module is separated into 3 table to make it simpler to identify the error, however, all details in 3 table will be submitted together from a single-page view.**
  - **Number is not allow for Name input.**

Application				
Input				**Expected Output**
Name	**Nationality**	**Type**	**Programme**	
Joker	Malaysia	By Research	Master of Business	Valid,return to login page
-	Malaysia	By Research	Master of Business	Invalid,Please enter your name
123	Malaysia	By Research	Master of Business	Invalid,Name only consist of alphabet and space
Joker	-	By Research	Master of Business	Invalid, Please select your nationality
Joker	Malaysia	-	Master of Business	Invalid, Please select your type
Joker	Malaysia	By Research	-	Invalid,Please select the programme you interest

Application	
Input	**Expected Output**

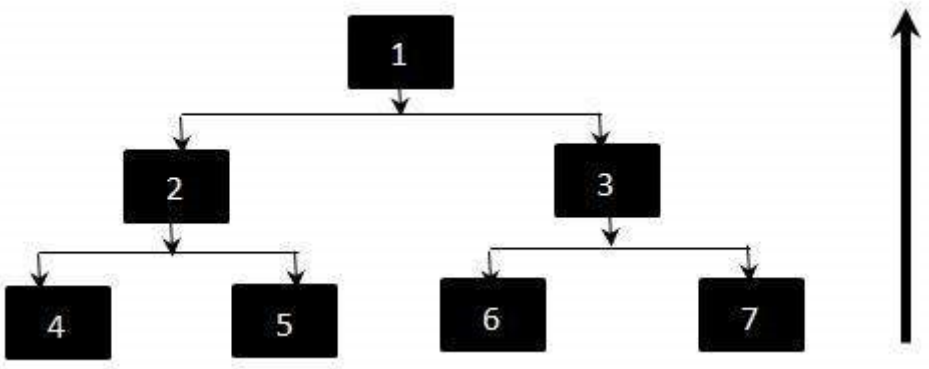
Birthday Date	Gender	IC	Qualification	
-	Male	960310105777	Qualification.pdf	Invalid,Please insert your date of birth
03/10/1996	-	960310105777	Qualification.pdf	Invalid,Please select your gender
03/10/1996	Male	-	Qualification.pdf	Invalid,Please enter your identity number and do not include -
03/10/1996	Male	dasdasdas	Qualification.pdf	Invalid,The identity number only consist number
03/10/1996	Male	3123	Qualification.pdf	Invalid,Please enter value between 12 and 12 character long
03/10/1996	Male	960310105777	-	Invalid,Please select a file and file only accept pdf file

Application					
Input					Expected Output
Document	Photo	Mobile number	Email Address	Address	
-	photo.png	0123456789	example@gmail.com	18, Jalan Dewasa, Batu Tiga	Invalid,Please select a file and file only accept pdf file
Document.pdf	-	0123456789	example@gmail.com	18, Jalan Dewasa, Batu Tiga	Invalid,Please select an image and image only accept png and jpg type

Document.pdf	photo.png	dsadsa	example@gmail.com	18, Jalan Dewasa, Batu Tiga	Invalid,The phone number only consist number
Document.pdf	photo.png	01123	example@gmail.com	18, Jalan Dewasa, Batu Tiga	Invalid,Please enter value between 10 and 11 character long
Document.pdf	photo.png	-	example@gmail.com	18, Jalan Dewasa, Batu Tiga	Invalid,Please insert your phone number
Document.pdf	photo.png	0123456789	-	18, Jalan Dewasa, Batu Tiga	Invalid,Email address is required and cannot be empty
Document.pdf	photo.png	0123456789	example@	18, Jalan Dewasa, Batu Tiga	Invalid,Email address is invalid
Document.pdf	photo.png	0123456789	example@gmail.com	-	Invalid,Please insert address

3.2. Testing Strategy

To fulfill our quality requirement, we will be performing two types of testing on our system: unit testing and integration testing. The overall testing strategy is **bottom up integration testing**. Following this strategy, our modules will divided into submodule and form a tree. Each modules at lower hierarchy is tested individually (unit testing) and then the modules that rely upon these modules are tested.



Following the diagram above, we will be testing 4, 5, 6 and 7 individually (unit testing). After testing all the modules at the bottom layer. We will start integration testing in pair with 4 and 2, 5 and 2 and so on. While testing 4 and 5, 2 are replaced with what is called a driver.

3.2.1. Types of Testing

In order to satisfy each of our quality requirement, we will be applying different types of testing to test our system.

3.2.1.1. Responsive Design Testing

Ensure all the elements in the user interface are displayed properly and doesn't affect the user's ability to understand and interact with it.
These elements include:

- Buttons
- Images
- Texts
- Modals
- Icons
- Forms

To test this, we will be using Chrome Developer Tools to simulate how every web page will display in 4 screen-width settings:

- Extra small devices Phones (<768px)
- Small devices Tablets (≥768px)
- Medium devices Desktops (≥992px)
- Large devices Desktops (≥1200px)

3.2.1.2. Data Integrity Testing

- Testing for accessibility of function:

    - Testing whether or not all user type can only access the functions that system allowed.
    - Eg: File management page can only accessed by students and supervisors but admin.
    - We will copy the url of the function (eg:/file/) and login as the user type that is not allowed to access the function to run the url. If the access is denied that means our testing is success.
- Testing for accessibility of data:
    - Testing whether or not user can access the data that related with them.
    - Eg: Student can view the file that upload by their supervisor or vice versa, but can't view the file uploaded by other students or supervisors.
    - To test this, we will copy the file url(eg:file/<file_id>/) of one of the user and run it using another user account. If the access is denied means our testing is success.

3.2.1.3. Security Testing

- Correct implementation of user login function
    - Username and password can login correctly
- Hashed and salted password will be checked if some users' password are same
    - Raw password is tested not to show in the user table which open the file by using SQLite
- Perspective of admin
    - No password is allow to show to anyone
- The functionality of password encryption

3.2.1.4. Functionality Testing

- Forms checking
    - Make sure that all forms are fill with correct input (e.g. file uploaded must be in a specific format only), if the forms have been input with invalid input, error message will pop up prompting user to fill the forms with the correct details.
    - Scenario : If user decided to upload/change their profile picture, user must only use file format such as PNG, JPEG and GIF. If user use other file format such as PDF, the system will notify the user to use on PNG, JPEG and GIF for their file input.
- Test all links
    - Check links to ensure user is directed to the section/page that it was intended.

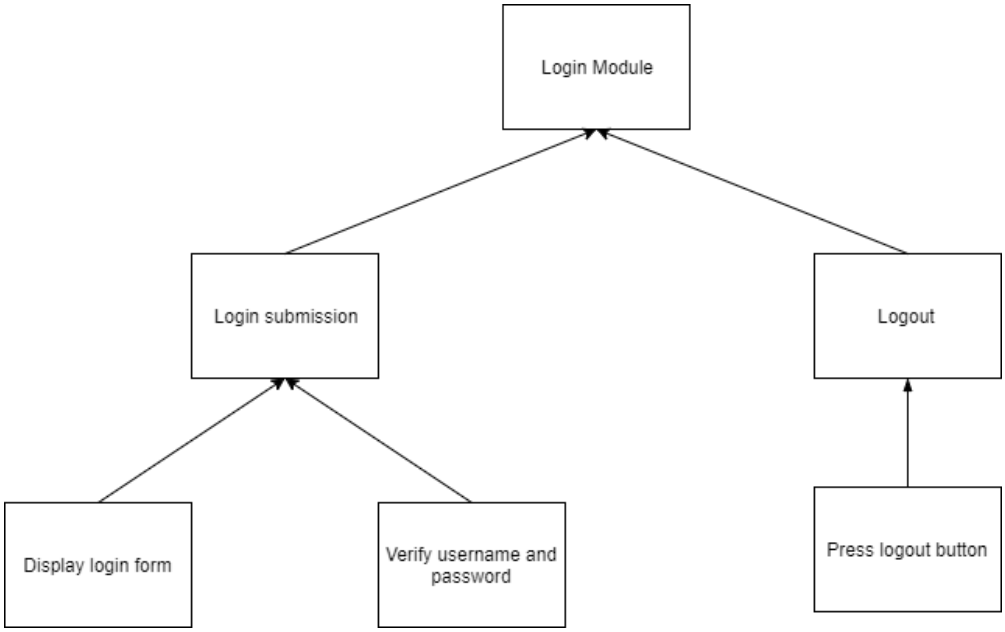
3.2.1.5. Portability Testing

- To ensure user can access by multiple type of device and different web browser through the website.
  The device included:
    - Smartphone
    - Desktop
    - Laptop
    - Tablet
- The browser that will be tested on every device (if applicable) includes:

- Google Chrome
- Mozilla Firefox
- Internet Explorer 11
- Microsoft Edge
- Safari

- To this test, we will use multiple device to access the website and ensure the output is works fine and display correctly as we expected in different type of device.

3.2.2. Example of Bottom Up Integration Testing



In our login module, the module itself is subdivided into sub-modules, namely Login Submission and Logout. So in order to test our Login Submission modules, we will have to test the sub-module's sub-modules, Display Login Form and Verify Username and Password.

We will start by testing the Display Login Form module. We will have to make sure the the labels for the form are displayed properly, and the forms work properly, eg. the username form will show everything the user types, while password form will hide the characters with '*' character.

Now to test Verify Username and Password, we could've test this module by inserting the password and username in variables and pass it to the login function to test it.

Now that both sub-modules of Login Submissions are working, we now can test Login Submission itself. To test this module we will use the form from the Display Login Form submodule and press the Login button. The input from the login form will be passed to the Verify Username and Password module and user will be logged or not logged in depending on the inputs.

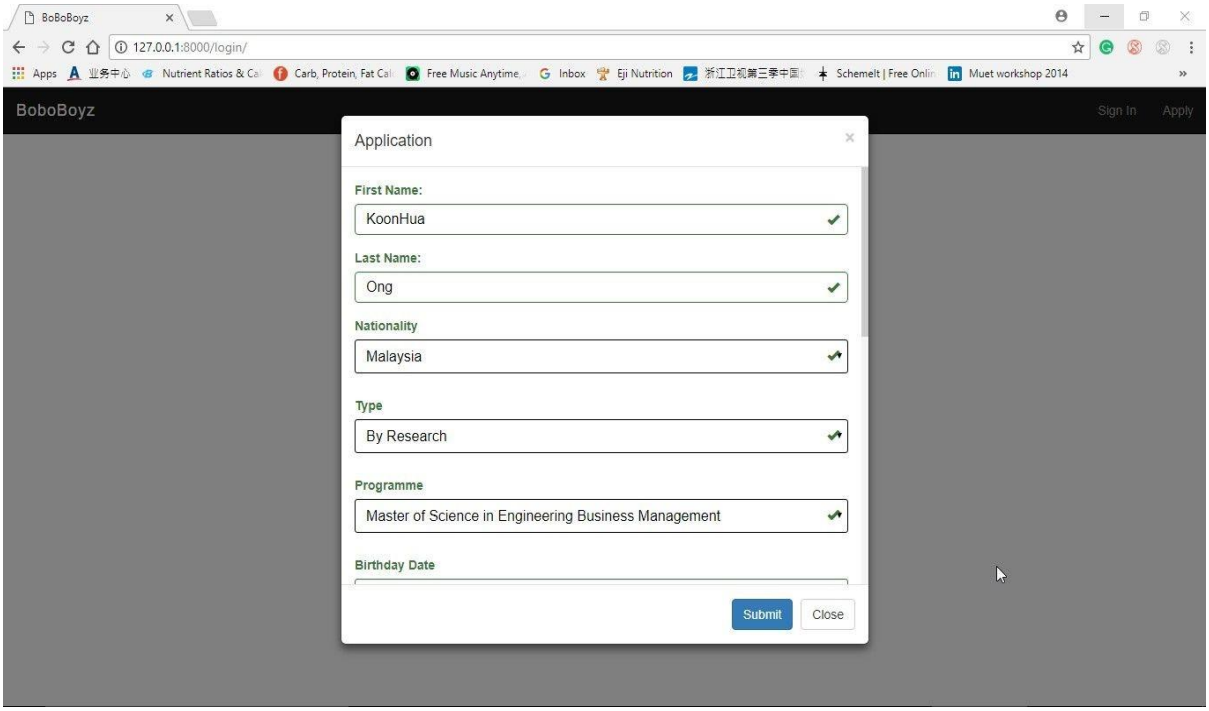
However, we still have to check the Logout sub-module before we declare the Login module tested. We have make sure the Logout button is displayed to the user. If the user clicked the Logout button and is redirect to the Login page, it's considered check. To test if the Logout truly works, we can try to access the homepage again and see if we got redirected back to login page. If it does, it means the Login sub-module is working.

With all the sub-modules tested, we now can declare the Login module tested.

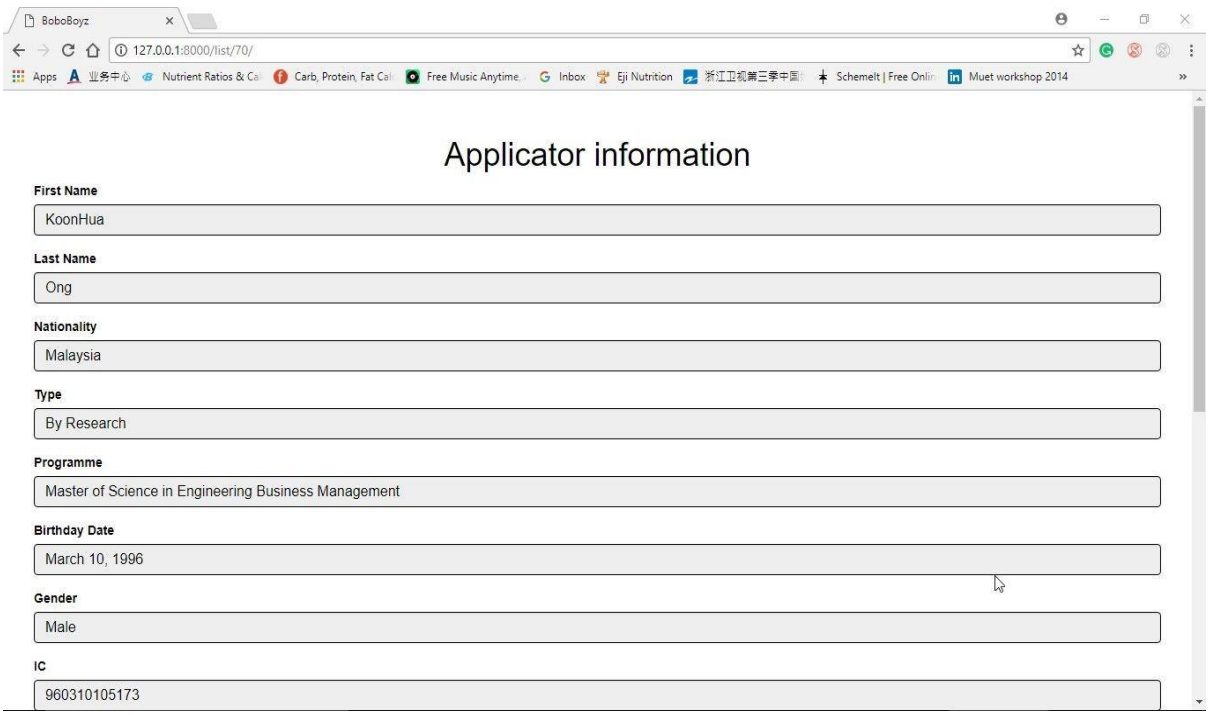
4. Final Design

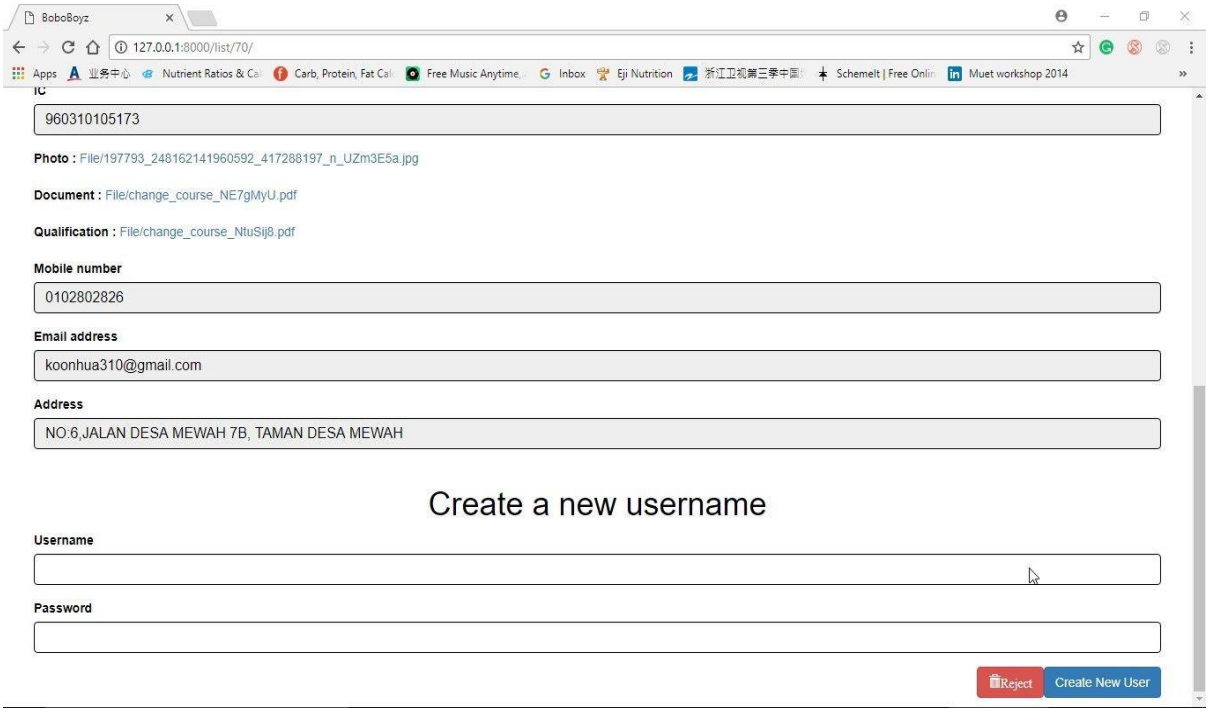
4.1. Application Module

4.1.1. Student



4.1.2. Admin (Approving students)

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Apps
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Carb, Protein, Fat Cal
Free Music Anytime
Inbox
Eji Nutrition
Schemelt | Free Onlin
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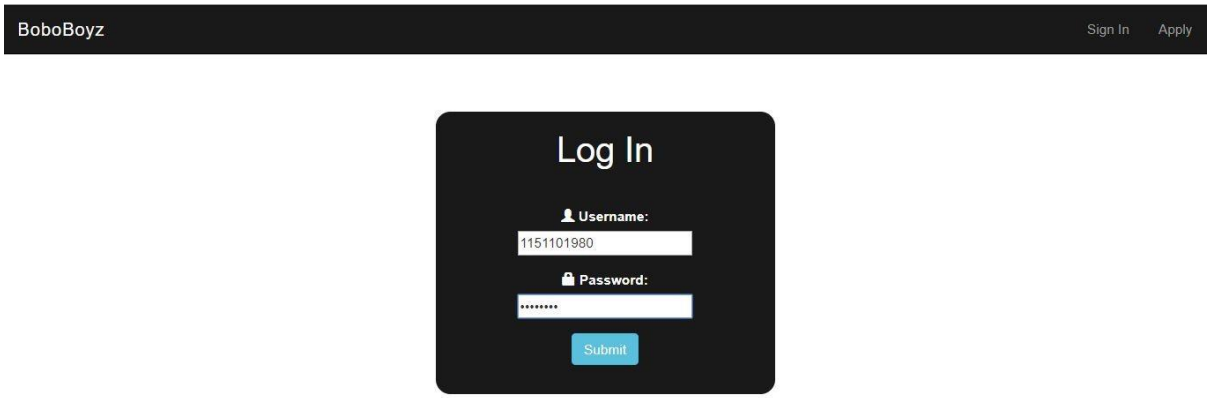
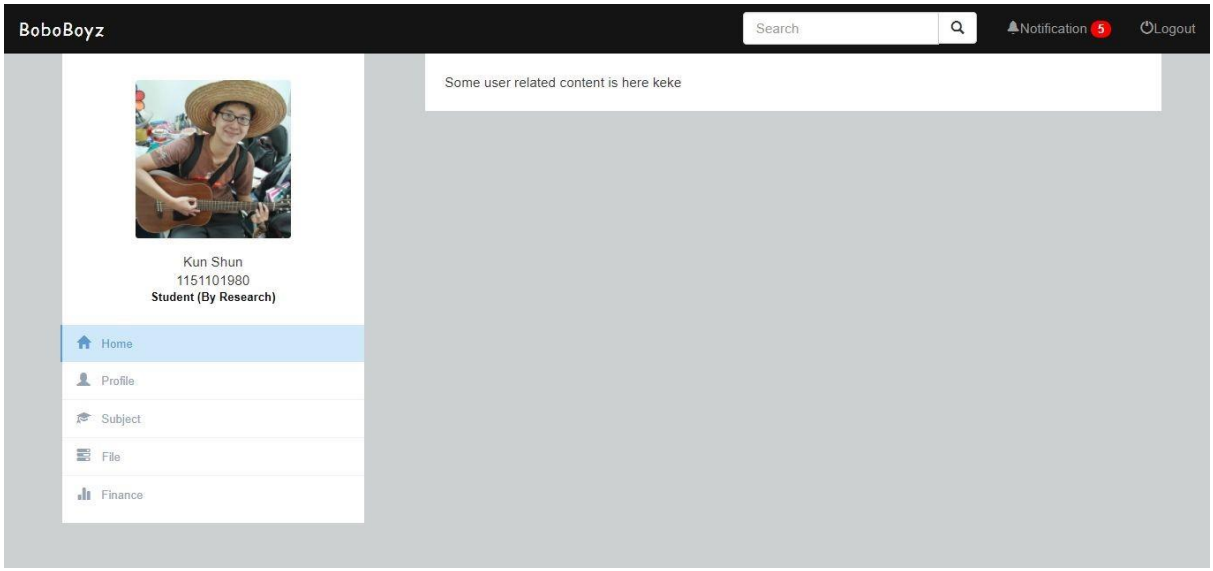
Document : File/change_course_NE7gMyU.pdf
Qualification : File/change_course_NtuSij8.pdf
Mobile number
0102802826
Email address
koonhua310@gmail.com
Address
NO:6,JALAN DESA MEWAH 7B, TAMAN DESA MEWAH
Create a new username
Username
Password
Reject
Create New User

4.2. Login Module

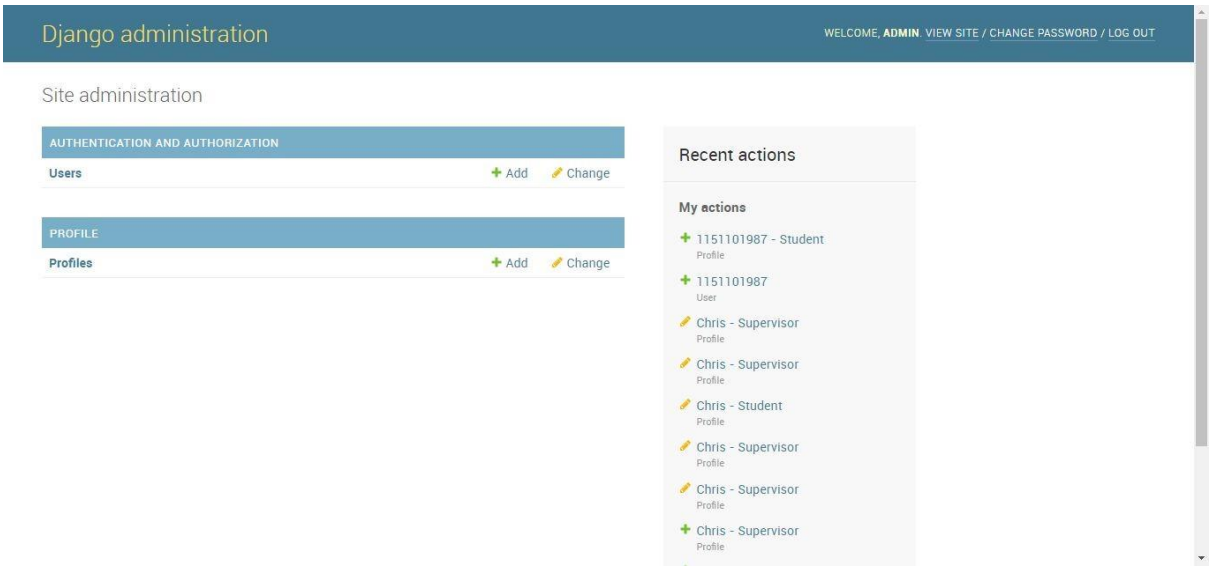
4.2.1. Login Page



4.2.2. Home Page (Student/Supervisor)

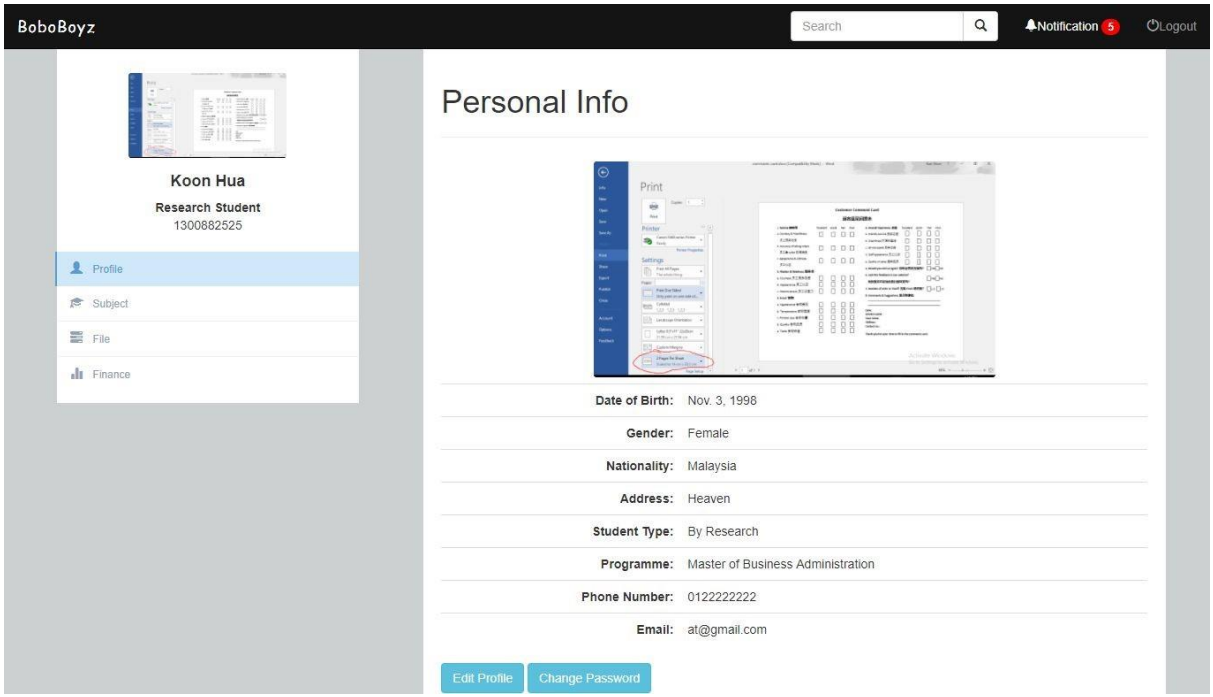


4.2.3. Home Page (Admin)

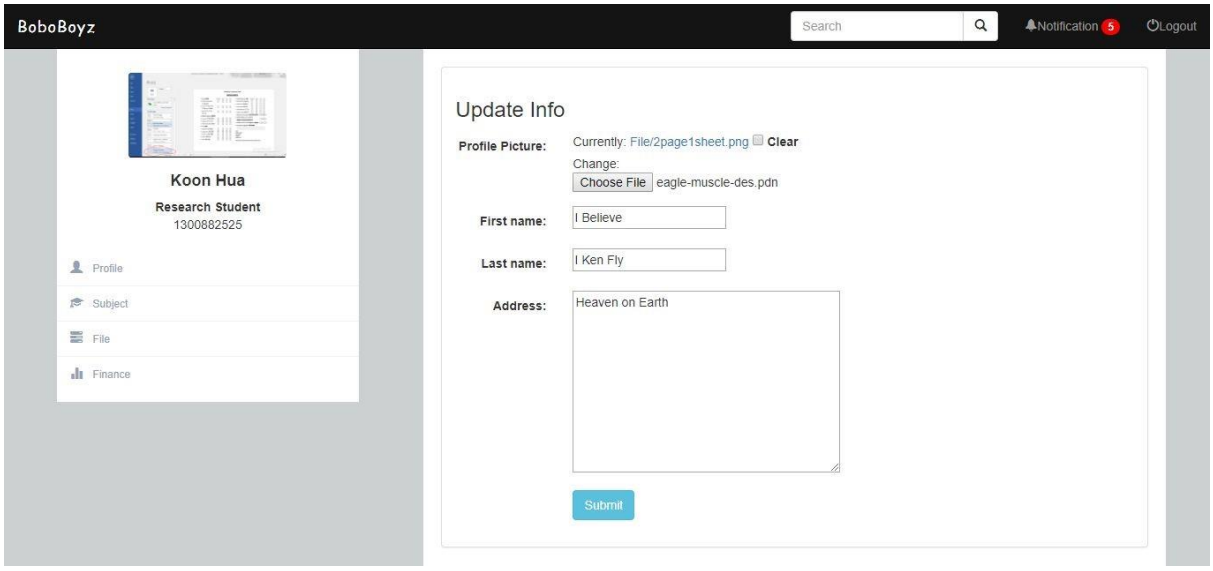


4.3. Profile Module

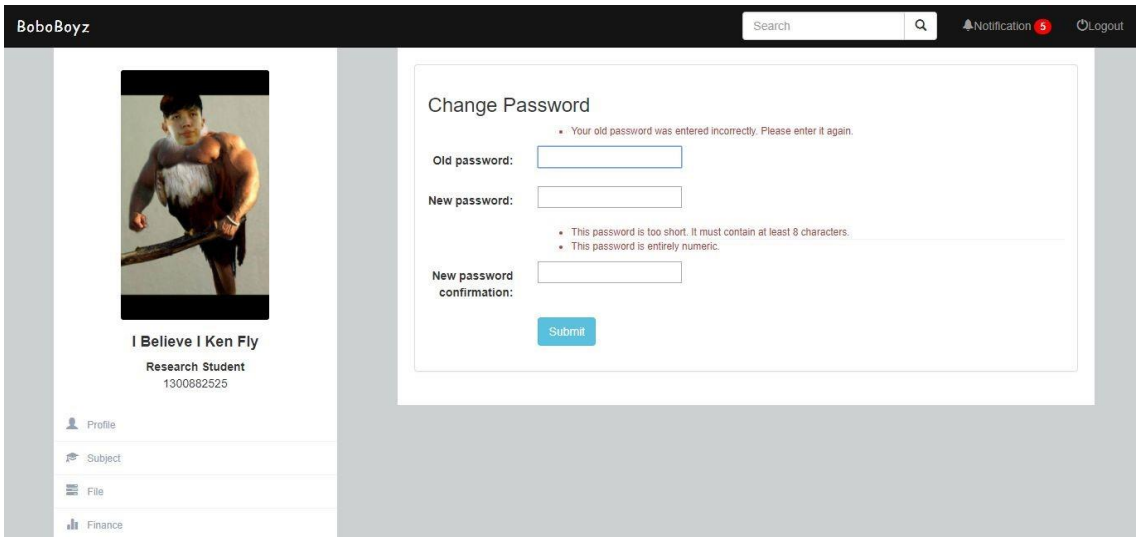
4.3.1. Main Page



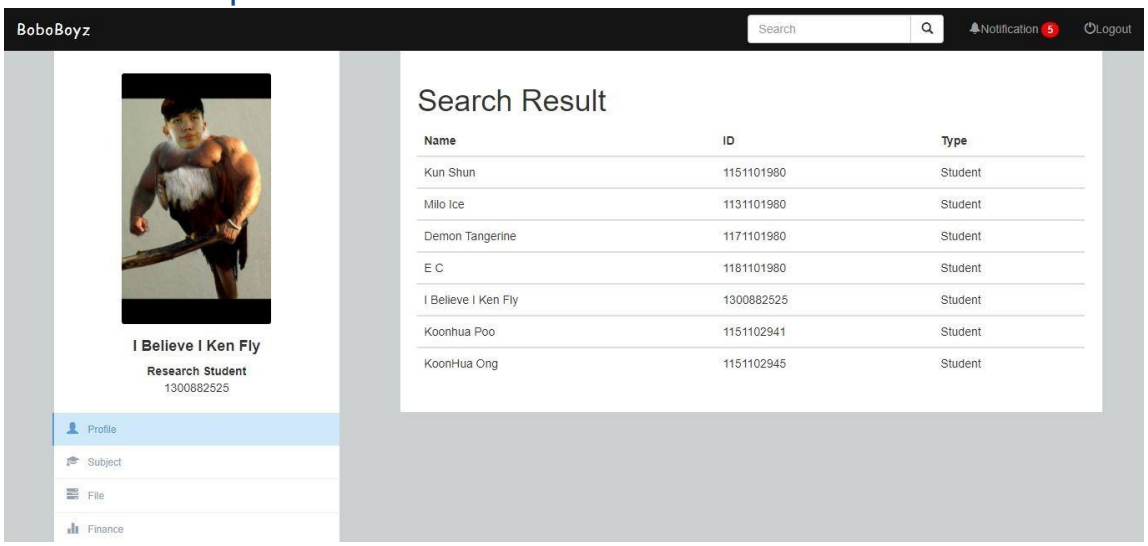
4.3.2. Update Info

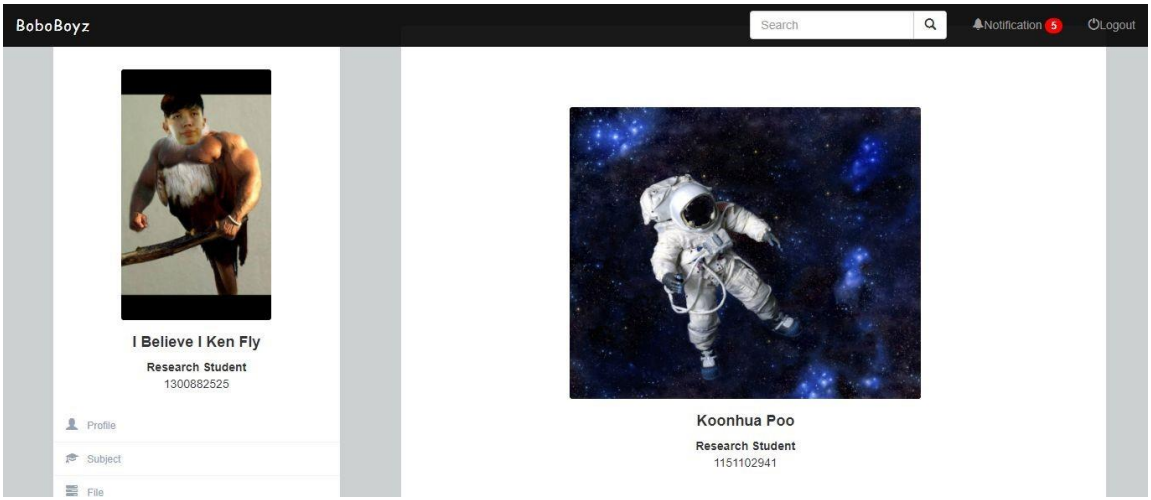


4.3.3. Change password

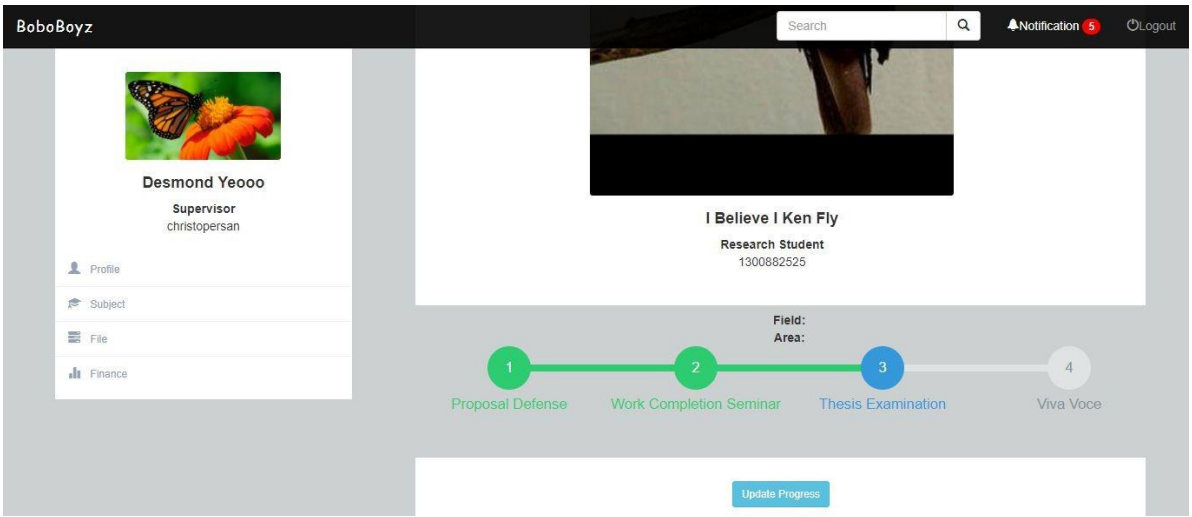


4.3.4. Search profile



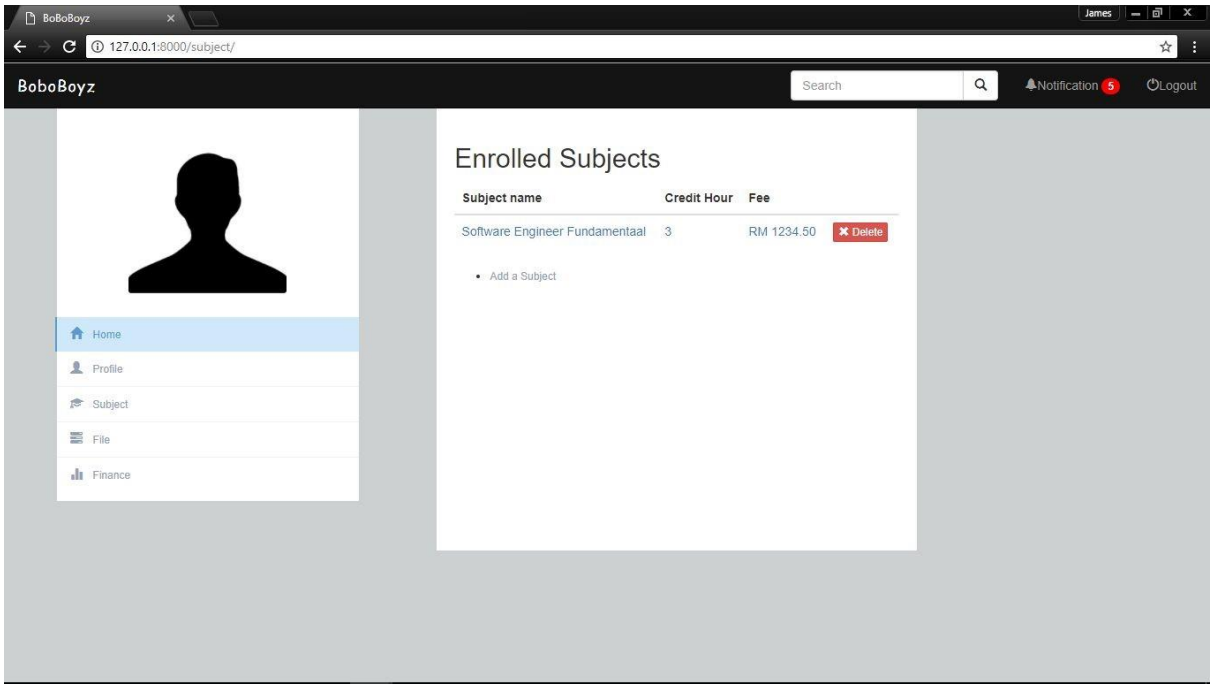


4.3.5. Update progress (For Admin)

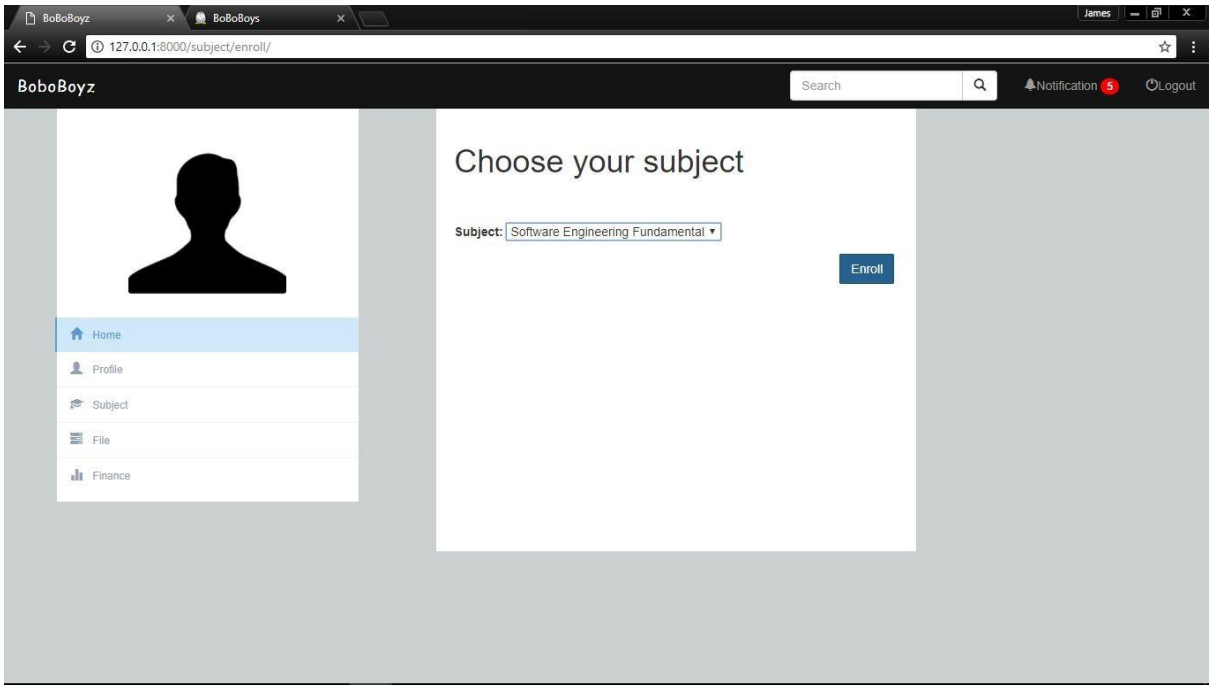


4.4. Demo (Subject Management Module)

4.4.1. Main Page

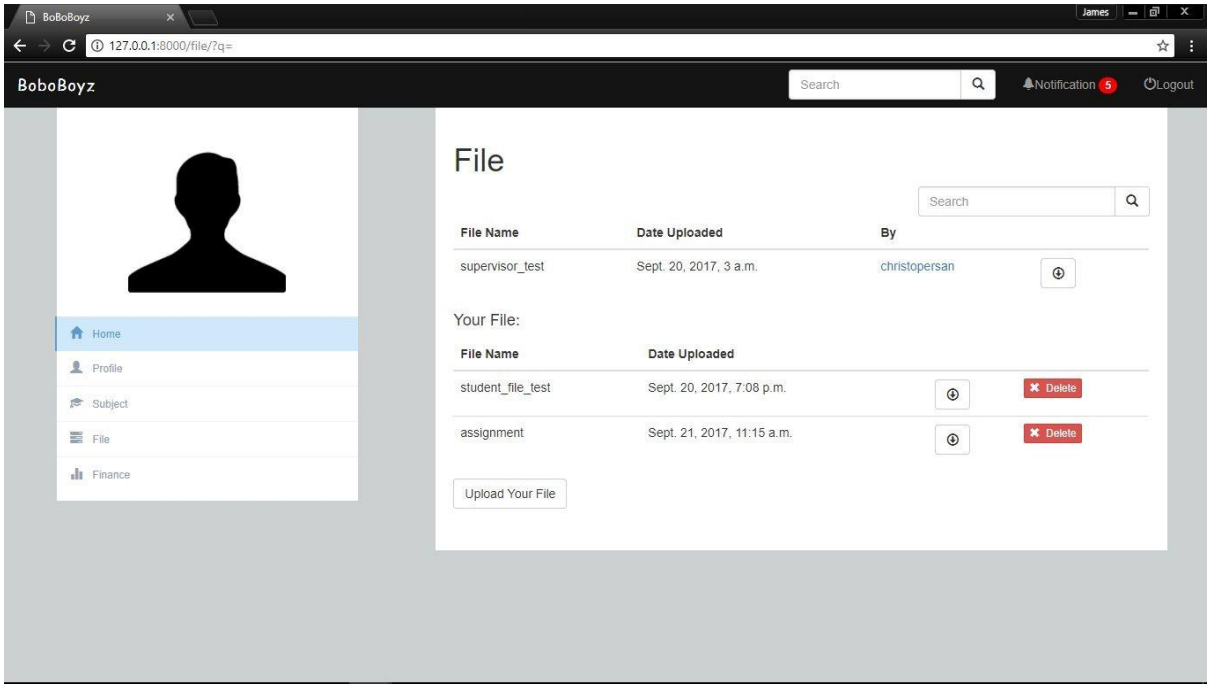


4.4.2. Choosing Subject

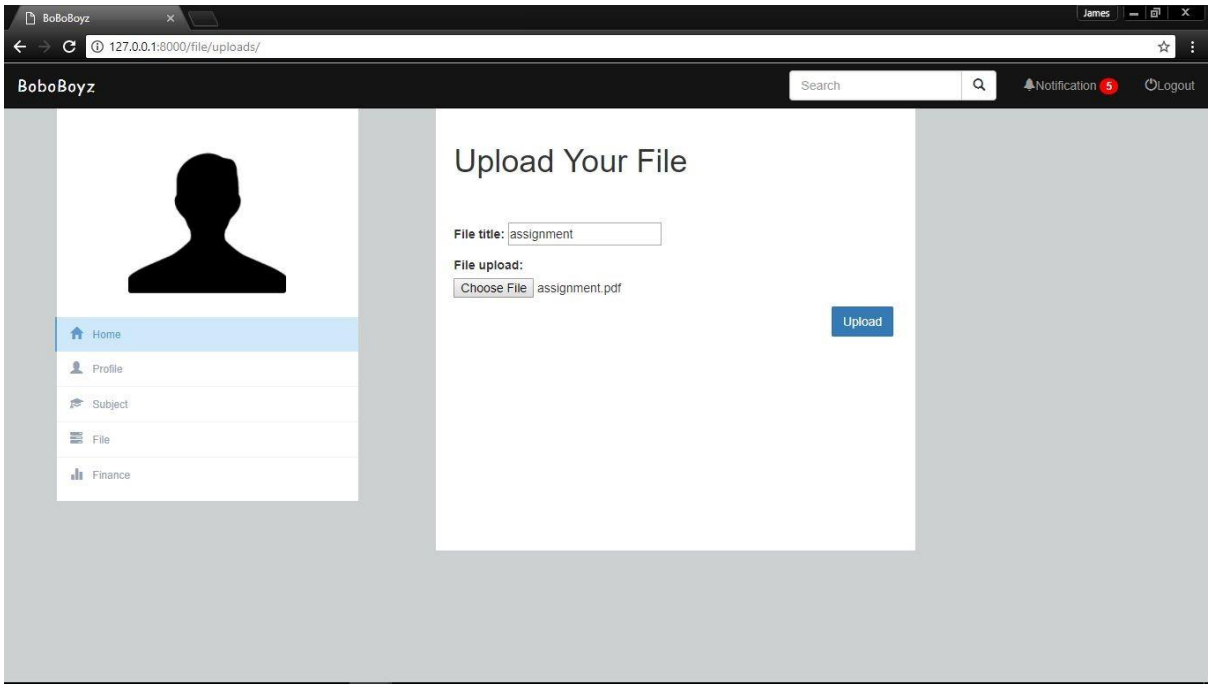


4.5. File Management Module

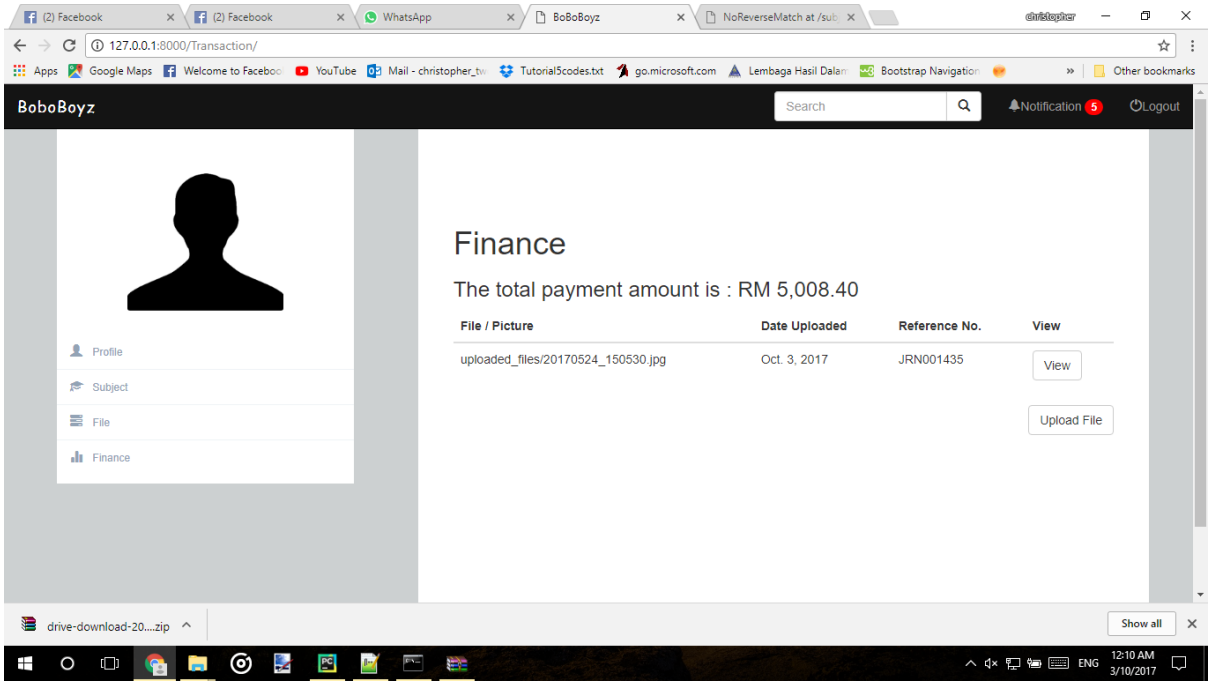
4.5.1. Main Page



4.5.2. Upload File



4.6. Transaction Module



4.7. Appointment Module