Daffodil International University

Department of Software Engineering, FSIT
SWE-431 Project / Thesis

Project: Tax Management Portal for Luxembourg

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APPROVAL

This project titled on "**Tax Management Portal for Luxembourg**", submitted by **Md. Abdur Rahman (ID: 162- 35-1666)** to the Department of Software Engineering, Daffodil International University has been accepted as satisfactory for the partial fulfilment of the requirements for the degree of Bachelor of Science in Software Engineering and approval as to its style and contents.

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DECLARATION

I hereby declare that project titled **"Tax Management Portal for Luxembourg"** is an original record done by me under the supervision of **Mr. Md. Shohel Arman**, Assistant Professor, Department of Software Engineering, Daffodil International University**,** towards the partial fulfilments of requirement for the award of degree of Bachelor of Science in Software Engineering during the period of 2016-2022. I also state that this project has not been submitted anywhere in the partial fulfilments for any degree of this or any other University.

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ACKNOLEDGEMENT

In this present world of competition there is race of existence in which those are having will come to forward succeed. Project is a bridge between theoretical and practical working. With this willing I joined this particular project. First, I would like to thank the supreme power the Almighty ALLAH who is obviously the one who is guided me to work on the right path of life. Without his grace this project could not become a reality. Next to him are my parents, whom I am greatly indebted for brought up with love and encouragement to this stage.

I am feeling oblige in talking the opportunity to study in Daffodil International University. I would like to sincerely thank to Professor Dr. Imran Mahmud, Head, Department of Software Engineering. All the honourable teachers who teach me such an interesting and understandable way full of enjoyment. I am grateful to having them in my journey.

I am exceptionally obligated to Daffodil International University for their direction and steady supervision by Mr. Md. Shohel Arman and in addition for giving necessary information with respect to the venture and additionally for their help in finishing the project.

I am grateful to my department staff members, Lab technicians and non-teaching staff members for their extreme help throughout my project.

Finally, I would like to express my love to my batch mate, member of DIU for their kind co-operation and consolation which help me in finishing of this task.

ABSTRACT

This project is a web-based tax management portal specifically designed for Luxembourg because every county's tax system is different than others. Using this system an agency can store and mange tax profiles of clients. Also, they can compare previous year data easily while they will create new year tax profile. Apart from this, the system is able to generate the govt. PDF file filled with the tax profile information so that it will be easy to generate document easily and the govt. tax file have two versions (French and German). It will also be easy to export any of those language's PDF using same tax profile information.

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CHAPTER 1
INTRODUCTION

1.1 Project Overview

The project **"Tax Management Portal for Luxembourg"** web application where a tax agency can store their clients' tax profile and export govt. issued PDF file to submit on ministry. The application has specially designed for Luxembourg.

To use the application, you must have to authenticate using the agency credentials and then you can create and manage tax profiles. You can transfer existing tax profile information to new year and there is a facility to compare year to year tax information. To ensure security of losing client's tax profile there is a recycle bin facility operating system UI.

"Tax Management Portal for Luxembourg" application is powerful, flexible, and easy to use and is designed and developed to deliver real conceivable benefits to the agency to manage profiles and compare with previous year along with some statistics and document export facility.

1.2 Project Purpose

The main purpose of this project – is a keep record of the clients' tax data and export it while necessary. The agency will able to able to update and delete any tax profile from the portal as necessary. Along with this, a uses year to year tax profile can be compared on the system to make sure his recent data error free.

1.2.1 Background: An agency of Luxembourg was looking for a solution to develop a system to store their clients' tax data which was managed by using traditional file and folder system they were hostelling for creating new year tax data taking a look with previous year 20 pages tax document paper stored as PDF. Also, the same challenge to provide two languages translation (French and German) for the same data as client's demand.

1.2.2 Benefit: Using this application the tax agency will be able store clients' tax profile which in internet space (database) which will be easy to access and manage through this application. The information will be stored securely and there are several features which will reduce cost and time for the agency.

1.2.3 Goal: The main goal of my application is to reduce the complexity of creating or duplicating tax profile along with exporting as PDF documents for the ministry.

1.3 Stakeholders

There are two types of stakeholders in this project.

1. Tax agency.
2. Tax Payer (client of the tax agency).

1.4 Proposed System Model

Proposed system model generally describes what developers are going to do this project. What model is followed in this project? What is the project about and what are the new features in the project than another existing project? How they are working. And these are describing details below, figure [1]

1.4.1 Why Choose Waterfall-Model?

The proposed system model for this application is waterfall model. Because-

- Requirements are very clear and fixed.
- There are no ambiguous requirements.
- Ample resources with required expertise are available freely.
- The project is short.
- It is good to use this model because the technology is well understood.

1.4.2 How I Used Waterfall-Model?

1. Ideate a plan from real life concerning issues.
2. Gathering and changing user requirements are embraced for the users competitive advantage.
3. Concentrate on delivering working software frequently.
4. Projects must be based on people who are motivated. Give them the proper environment and the support that they need.
5. Self-organized teams usually create the best designs. Constant attention to technical excellence and good design will enhance agility.
6. Simplicity is considered to be the art of maximizing the work that is not done, and it is essential.
7. At regular intervals, the team putted their concentration on how to become more effective, and they will adjust their behaviour accordingly.
8. Regular monitoring personnel were attentive to test the system.

WATERFALL MODEL

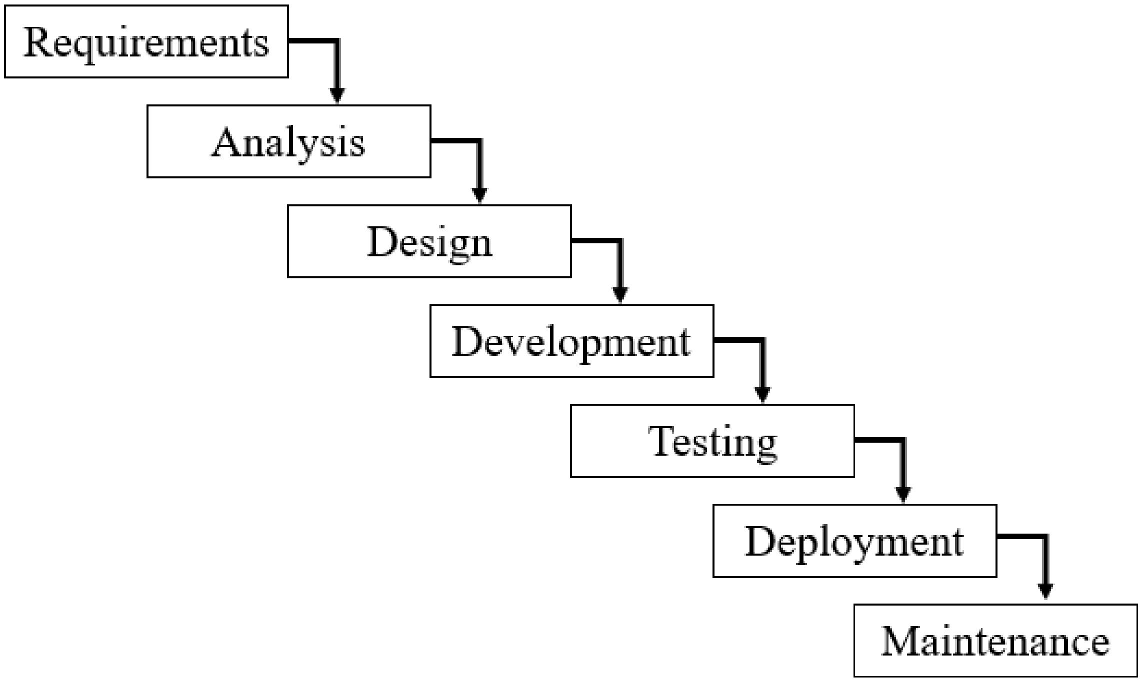


Figure 1: Project Proposed Model (Waterfall)

1.5 Project Schedule

In project management, a schedule is a listing of project's milestones, activities, and deliverables, usually with intended start and finish dates. It describes when the project started and when it will finish and how many times is spent each of the section of project model and also the release date. A schedule is commonly used in the project planning and project portfolio management parts of project management.

1.5.1 Gantt Chart

A Gantt chart is a series of horizontal lines shows the amount of work done or production completed in certain periods in relation to the amount planned for those periods, figure[2]

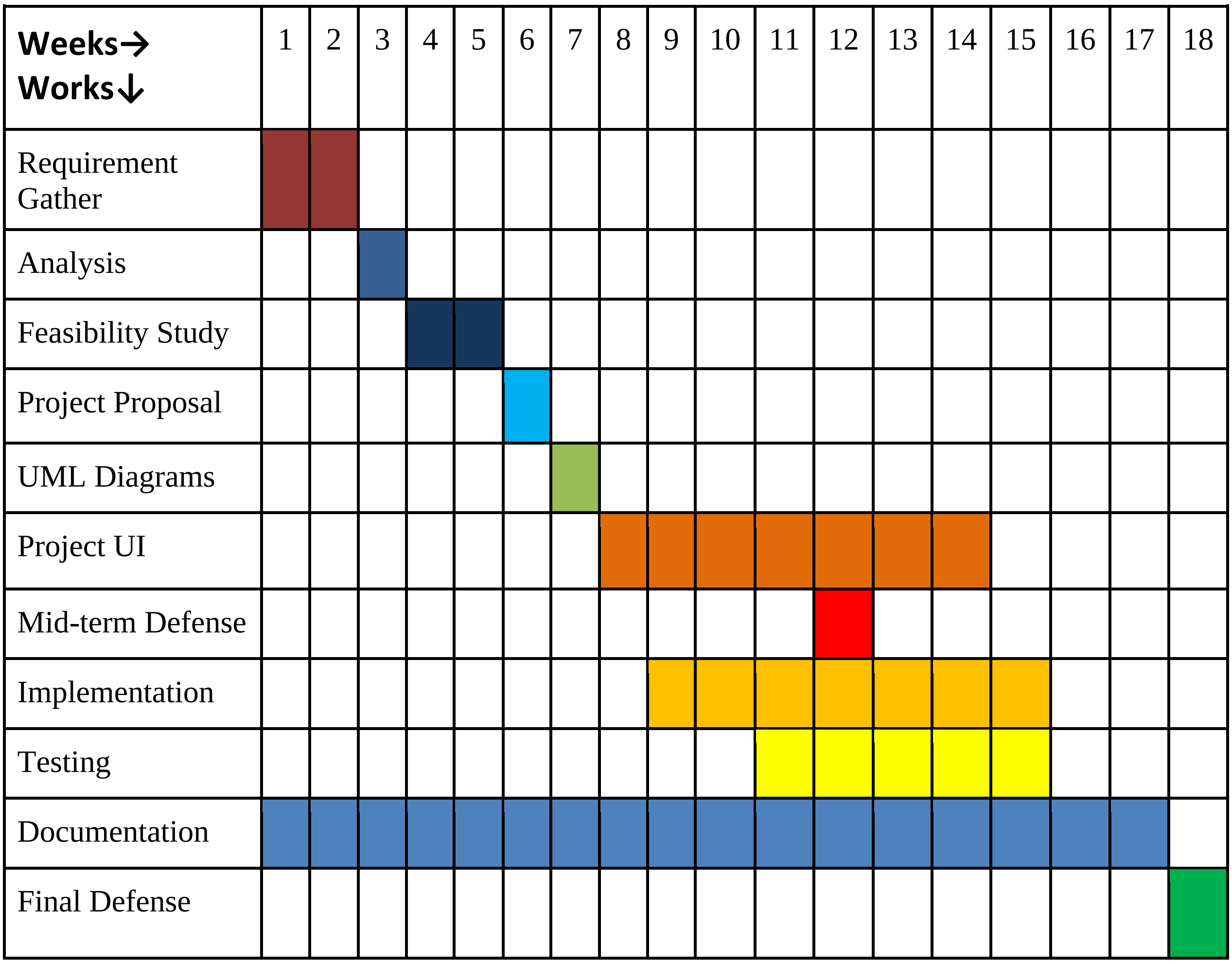


Figure 2: Gantt Chart

1.5.2 WBS Planning for Development Phase

1. Project plan [16th January 2022 to 23th January 2022]

2. Requirement gathering [24th January 2022 to 17h February 2022]

3. Analysis [8th February 2022 to 21th February 2022]
   - Brainstorming
   - Interview
   - Observation
   - Implementation Analysis

4. Feasibility Study [22th February 2022 to 28th February 2022]

5. Design [16 July 2022 to 3 September 2022]
   - System design
   - Database design and Implementation
   - UML design
   - System User Interface (UI)

6. Development [1st March 2022 to 17th May 2022]
   - User Module
   - Administrator Module
   - Others

7. Testing [5th April 2020 to 20th August 2020 (two phases combined)]
   - Test plan
   - Test Case
   - Test Execution

8. Release Plan

Release	Version	Date
1st Release	**Beta version 1.0.0**	**25/08/2021**
2nd Release	**Beta version 2.1.0**	**12/09/2022**
3rd Release	**Version 3.0.0**	**7/10/2022**
4th Release	**Version 3.2.0**	**15/10/2022**

1.6 Related Work

There few web applications which provides the tax profile creation facility for tax payers but there is no facility to provide the service for tax agencies. Even no way to transfer old tax profile data to new one. Also, comparing previous year tax profile is not possible on that system. Some others demand high amount to export the government PDF tax document. Also, there is no grunted to get back accidentally deleted tax profile.

1.7 Problem Statements

Tax is one of important things for each country. Specially, in European counties like – Luxembourg government focus highly on tax. That’s why there are a lot of tax agencies there to provide tax services for local people who don’t have elaborate knowledge of tax and finance. But most of the agencies run their work normal paper work. They face lot of hassle to prepare new year govt. tax paper from previous year data along with storing the clients’ data securely. The great and major problem is to provide and ensure fastest delivery of the clients’ demand and storing the clients’ data in a safe place.

1.8 Proposed Solution

In my web application which I am going to develop, there will be solutions to all the above-mentioned problems. The application named **“Tax Management Portal for Luxembourg”** will store the agencies clients’ data securely in the database to query conveniently while they will need to export or modify the tax profile. Also, the agency admin will be able to transfer client’s tax profile to next year and along with comparing current year data to the previous year data. The proposed system will have a recycle bin feature to ensure unwanted important data loose from the system. Above all, the system will be able a great package the all the problems facing by the tax agencies of Luxembourg.

CHAPTER 2
SOFTWARE REQUIREMENTS SPECIFICATION

2.1 Software Requirements Specification

A Software requirements specification document describes the intended purpose, requirements and nature of software to be developed. It also includes the yield and cost of the software. The purpose of this SRS document is to provide a detailed overview of our software product, its parameters and goals. This document describes the project's target audience and its user interface, hardware, software, functional and non-functional requirements. It defines how user, administrator and developer see the product and its functionality.

2.2 Functional Requirements

Functional requirements are mandatory for any system. For this system functional requirements are mentioned below.

Table 2.2.1: Login User

ID: FR-01
Requirement Name: Login User
Description: User can input valid username and password then user successfully login.
Stockholders: Tax Agency (Admin), Tax Payer (Client)

Table 2.2.2: Logout

ID: FRQ-02
Requirement Name: Logout User
Description: If the user is logged out then the user session will be destroyed totally and JWT token will be expired.
Stockholders: Tax Agency, Tax Payer (Client)

Table 2.2.3: Add Tax Payer (Client)

ID: FRQ-04
Requirement Name: Add Tax Payer (Client)
Description: The tax agency admin will be able to add new tax payer (client) by proving file number, first name, last name, email and phone.
Stockholders: Tax Agency (Admin)

Table 2.2.4: View Tax Profile

ID: FRQ-05
Requirement Name: View Tax Profile
Description: The agency will be able to view all the clients' profile and the tax payer will be able to view only his tax profile available on his email.
Stockholders: Tax agency (Admin), Tax payer (Client)

Table 2.2.5: Transfer Tax Profile to Next Year

ID: FRQ-06
Requirement Name: Transfer Tax Profile to Next Year
Description: The agency will be able to transfer existing tax profile to next year if the tax profile doesn't exist on the target year.
Stockholders: Tax agency (Admin)

Table 2.2.6: Generate Government Tax Document PDF

ID: FRQ-07
Requirement Name: Generate Government Tax Document PDF
Description: There will be a button to export PDF file that has been issued by the govt. to submit tax. The PDF file is a fillable PDF with 20 pages and 2000 input fields.
Stockholders: Tax agency (Admin), Tax Payer (Client)

Table 2.2.7: Delete Tax Profile

ID: FRQ-08
Requirement Name: Delete Tax Profile
Description: The agency will be able to delete any tax profile if needed. Once the tax profile will be deleted then it will be restored in a recycle bin.
Stockholders: Tax agency (Admin)

Table 2.2.8: Restore Delete Tax Profile

ID: FRQ-09
Requirement Name: Restore Delete Tax Profile
Description: The deleted tax profile will be stored in recycle bin and it can be restored any time by clicking the restore button of the specific tax profile.
Stockholders: Tax agency (Admin)

Table 2.2.9: Auto calculation on UI form fields.

ID: FRQ-10
Requirement Name: Auto calculation on UI form fields.
Description: In the tax document form there are multiple fields those are auto calculated value from user inputted value. The system should have same thing in the web UI form.
Stockholders: Tax agency (Admin)

2.3 Non-Functional Requirements

For this system non-functional requirements are mentioned below.

Table 2.3.1: Privacy

ID: FRQ-1
Requirement Name: Privacy.
Description: System has to protect user data and confidential information.
Stockholders: Tax Agency (Admin)

Table 2.3.2: Data Capacity

ID: FRQ-2
Requirement Name: Data Capacity.
Description: This system needs to handle at least two thousands tax payer’s data.
Stockholders: Tax Agency (Admin)

Table 2.3.3: Interface Requirement.

ID: FRQ-3
Requirement Name: Interface Requirement.
Description: System should be user friendly for all users.
Stockholders: Agency (Admin), Tax Payer (Client)

2.4 Software Requirements

Operating System: Ubuntu 18.02

Frontend: Angular 1.9

Backend: Node 14.4.0 (Express.js)

Database: MongoDB Community Edition

Code Editor: VS Code

2.5 Hardware Requirements

Processor: 1 Core CPU (Database in Mongo Atlas).

RAM: 2GB

Hard Disk: At least 120 MB free space

CHAPTER 3
SYSTEM ANALYSIS

3.1 USE CASE DIAGRAM

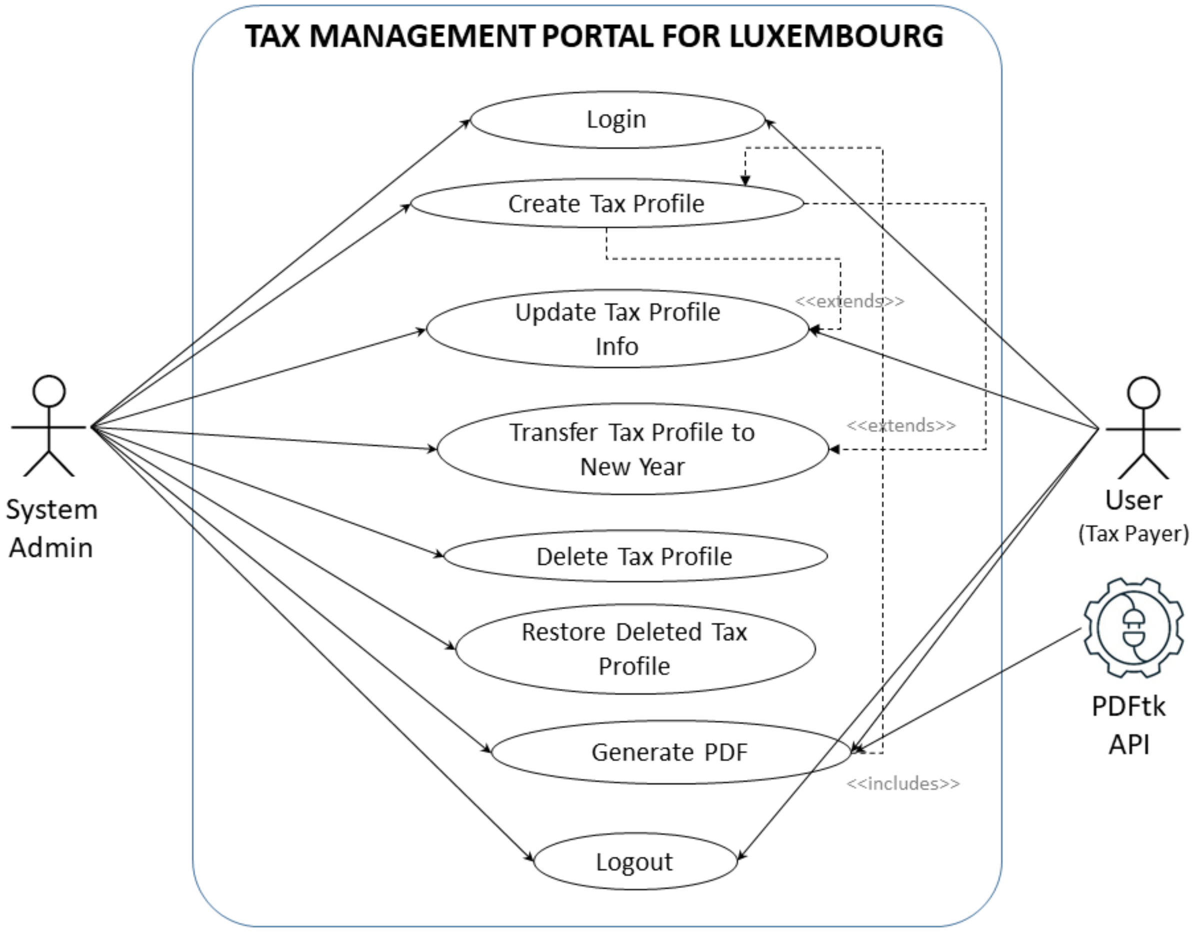


Figure 3: Use Case Diagram

3.2 USE CASE DESCRIPTION

Table 3.2.1: Use Case Description of User Login

<table>
<tr><td>Use Case No.</td><td colspan="2">01</td></tr>
<tr><td>Use Case Name</td><td colspan="2">User Login</td></tr>
<tr><td>Actor</td><td colspan="2">Admin, Client</td></tr>
<tr><td>Trigger</td><td colspan="2">User hits URL without previous login session.</td></tr>
<tr><td>Brief Description:</td><td colspan="2">The users of the system will have facility to login to get their defined services.</td></tr>
<tr><td>Stakeholders</td><td colspan="2">Agency, Tax Payer</td></tr>
<tr><td>Precondition</td><td colspan="2">1. User must be an admin or have a tax profile under their email.
2. User must not have previous login session.</td></tr>
<tr><td>Post Condition</td><td colspan="2">User can access the system.</td></tr>
<tr><td rowspan="2">Flow of Activities</td><td>Actor</td><td>System</td></tr>
<tr><td>1. User enter into the website.
2. User enter the credentials in the login form.</td><td>1. Service will redirect to dashboard.</td></tr>
<tr><td>Exception Condition</td><td colspan="2">1. If User is not registered on the system then and error message will show.
2. If credentials are wrong then the error message will show.
3. If any field is black then the errors will show.</td></tr>
</table>

Table 3.2.2: Use Case Description of Create Tax Profile

<table>
<tr><td>Use Case No.</td><td colspan="2">02</td></tr>
<tr><td>Use Case Name</td><td colspan="2">Create Tax Profile</td></tr>
<tr><td>Actor</td><td colspan="2">Admin</td></tr>
<tr><td>Trigger</td><td colspan="2">Once the admin hit the create button.</td></tr>
<tr><td>Brief Description:</td><td colspan="2">A new tax profile will be created for a tax payer whose tax profile is not yet created.</td></tr>
<tr><td>Stakeholders</td><td colspan="2">Tax Agency</td></tr>
<tr><td>Precondition</td><td colspan="2">1. Admin must have to login in the system.
2. Admin must have to input unique user email and tax document file number with regarding information needed on the form.</td></tr>
<tr><td>Post Condition</td><td colspan="2">The tax payer information will show on the existing list.</td></tr>
<tr><td rowspan="2">Flow of Activities</td><td>Actor</td><td>System</td></tr>
<tr><td>1. Agency Admin will login into the system.
2. Admin will fill up the create tax profile form.</td><td>1. Server will check and validate the tax payer data and previous data.
2. The tax payer list reload.</td></tr>
<tr><td>Exception Condition</td><td colspan="2">1. If the year and tax profile matched to an existing profile then the existing profile error will show.
2. If any fields are blank then the errors will show.
3. If server doesn’t respond to reload the list the server error will show in toast notification.</td></tr>
</table>

Table 3.2.3: Use Case Description of Update Tax Profile Info

Use Case No.	03	
Use Case Name	Update Tax Profile Info	
Actor	Admin, Client	
Trigger	Once clicked on a tax payer from the admin dashboard client's list or from the client is logged in using his/her credentials.	
Brief Description:	A form to update the tax payer detail tax information based on govt. issued PDF form.	
Stakeholders	Agency, Tax Payer	
Precondition	1. User must have to login. 2. Agency have to select tax payer profile from clients' list.	
Post Condition	The detail tax document form will show.	
Flow of Activities	Actor	System
	1. Select year from dashboard. 2. Select tax payer profile.	1. Load tax payer (clients) list. 2. Load tax information in web form.
Exception Condition	1. If not logged the redirect to login page. 2. If tax payer doesn't exist then show error and redirect to dashboard.	

Table 3.2.4: Use Case Description of Transfer Tax Profile to New Year.

Use Case No.	04	
Use Case Name	Transfer Tax Profile to New Year	
Actor	Admin	
Trigger	Clicking transfer icon from the right action icons of clients list.	
Brief Description	The agency can move a tax payer's tax profile to next selected year using transfer action.	
Stakeholders	Agency	
Precondition	1. User must be logged in. 2. Must be selected previous year from year list on dashboard. 3. User must not be transfer before.	
Post Condition	New tax profile will be created on the selected year keeping some basic info of the user.	
Flow of Activities	Actor	System
	1. Select year from the dashboard (default – last tax year). 2. Click on transfer icon. 3. Choose and confirm year.	1. Load clients list of the selected year. 2. Popup will show with available year list. 3. New tax profile will be created for the use based on the selected year.
Exception Condition	1. If not logged the user will not be redirected to the dashboard. 2. If the user is already transferred the year will not show on the target year list.	

Table 3.2.5: Use Case Description of Delete Tax Profile

<table>
<tr><td>Use Case No.</td><td colspan="2">05</td></tr>
<tr><td>Use Case Name</td><td colspan="2">Delete Tax Profile</td></tr>
<tr><td>Actor</td><td colspan="2">Admin</td></tr>
<tr><td>Trigger</td><td colspan="2">Once click on the delete icon from the client list.</td></tr>
<tr><td>Brief Description:</td><td colspan="2">The system admin will be able to delete any of his client’s profile but the deleted profile will be stored in recycle bin and can be restored anytime until available on recycle bin.</td></tr>
<tr><td>Stakeholders</td><td colspan="2">Agency</td></tr>
<tr><td>Precondition</td><td colspan="2">1. User must be logged in and have admin right.
2. Target profile must be a client’s profile.
3. User must have to confirm the login popup.</td></tr>
<tr><td>Post condition</td><td colspan="2">The client profile of the specified year will move to recycle bin.</td></tr>
<tr><td rowspan="2">Flow Of Activities</td><td>Actor</td><td>System</td></tr>
<tr><td>1. Admin will login to the system.
2. Click on delete icon.</td><td>1. Load clients list.
2. The profile will be removed from the clients list and stored on recycle bin.</td></tr>
<tr><td>Exception Conditions</td><td colspan="2">1. If user doesn’t have admin right the delete icon will not show.
2. If any server error will happen then the error will show on toast notification.</td></tr>
</table>

Table 3.2.6: Use Case Description of Restore Tax Profile

Use Case No.	06	
Use Case Name	Restore Tax Profile	
Actor	Admin	
Trigger	Once admin will click on the restore button from the recycle bin user list.	
Brief Description:	All delete profiles will be listed on recycle bin and the admin can restore the profile anytime by clicking the recycle icon.	
Stakeholders	Agency	
Precondition	1. User must be the system admin. 2. Selected profile must be deleted and not restored previously.	
Post Condition	Restored profile will be store back to the tax profiles user list for the selected user and year.	
Flow of Activities	Actor	System
	1. Admin will login to the system 2. Visit on the recycle bin page. 3. Click on the restore button from the user list	1. System will load the dashboard of clients list. 2. System will load the deleted clients list showing the deleted profile year. 3. Selected profile will be restored on main tax profile list and remove from the recycle bin.
Exception Condition	1. If doesn’t have admin access then the system will deny to restore the user. 2. If the user is already restored then the server will not restore once again. 3. If any system error happen on reload list page then the error will show on toast notification.	

Table 3.2.7: Use Case Description of Generate PDF

<table>
<tr><td>Use Case No.</td><td colspan="2">07</td></tr>
<tr><td>Use Case Name</td><td colspan="2">Generate PDF</td></tr>
<tr><td>Actor</td><td colspan="2">Admin, Client</td></tr>
<tr><td>Trigger</td><td colspan="2">Clicking on pdf icon from the clients list.</td></tr>
<tr><td>Brief Description:</td><td colspan="2">User will be able to generate pdf for his tax profile. There are two languages (French and German) available to export as PDF fillable form issued by Luxembourg government.</td></tr>
<tr><td>Stakeholders</td><td colspan="2">Agency, Tax Payer</td></tr>
<tr><td>Precondition</td><td colspan="2">1. User must have to login in the system.
2. A language must be selected from the top language flat (Default – French)</td></tr>
<tr><td>Post Condition</td><td colspan="2">The government issued fillable PDF form will be populated based on the tax profile information and respond as PDF document in browser.</td></tr>
<tr><td rowspan="2">Flow of Activities</td><td>Actor</td><td>System</td></tr>
<tr><td>1. Login to the system as admin.
2. Choose the PDF document language from top bar.
3. Click on the PDF icon from the right action of the client list item.</td><td>1. Load all clients’ tax profiles.
2. Replace the link for the selected language.
3. Populate the government fillable PDF form with the tax profile data and respond back to the user agent.</td></tr>
<tr><td>Exception Condition</td><td colspan="2">1. If user is not logged in the system will redirect to the login page.
2. If any system error happens on PDF populating process the error will show in a toast notification.</td></tr>
</table>

Table 3.2.8: Use Case Description of Logout

<table>
<tr><td>Use Case No.</td><td colspan="2">08</td></tr>
<tr><td>Use Case Name</td><td colspan="2">Logout</td></tr>
<tr><td>Actor</td><td colspan="2">Admin, Client</td></tr>
<tr><td>Trigger</td><td colspan="2">Clicking on the logout out menu from the right profile avatar navigation.</td></tr>
<tr><td>Brief Description:</td><td colspan="2">There will be a process of logging out from the system for already authenticated users who has active login session.</td></tr>
<tr><td>Stakeholders</td><td colspan="2">Agency, Tax Payer</td></tr>
<tr><td>Precondition</td><td colspan="2">1. The user must have logged in.
2. There must be an active login session.</td></tr>
<tr><td>Post Condition</td><td colspan="2">A login session will be created and JWT token will be issued. And the system will redirect to the dashboard.</td></tr>
<tr><td rowspan="2">Flow of Activities</td><td>Actor</td><td>System</td></tr>
<tr><td>1. Login to the system.
2. Hits the login menu.</td><td>1. Load dashboard of user’s tax profiles list.
2. User’s current login session will be destroyed and JWT token will be expired.</td></tr>
<tr><td>Exception Condition</td><td colspan="2">1. If user doesn’t have any login session then the user will be redirected to the login page.
2. If user token not expired then it will be destroyed on the next successful login.</td></tr>
</table>

3.3 ACTIVITY DIAGRAM

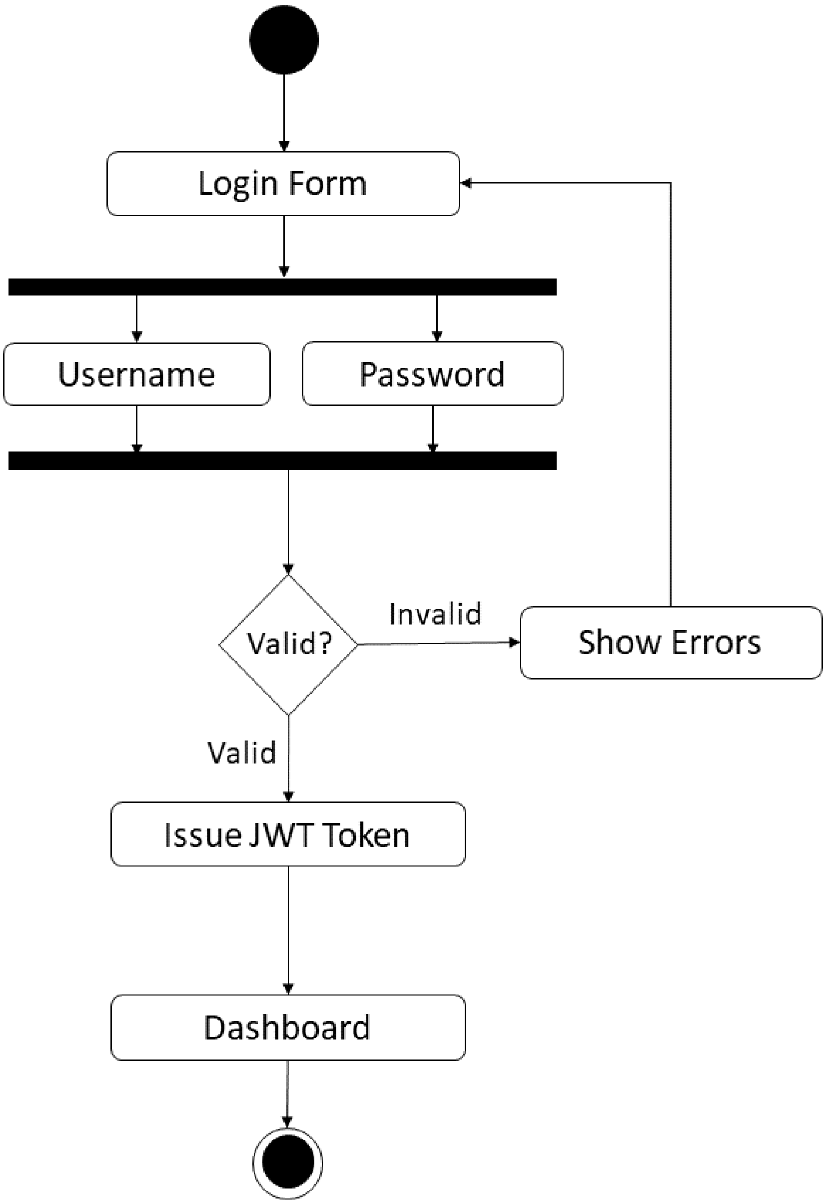


Figure 4: Activity Diagram of User Login.

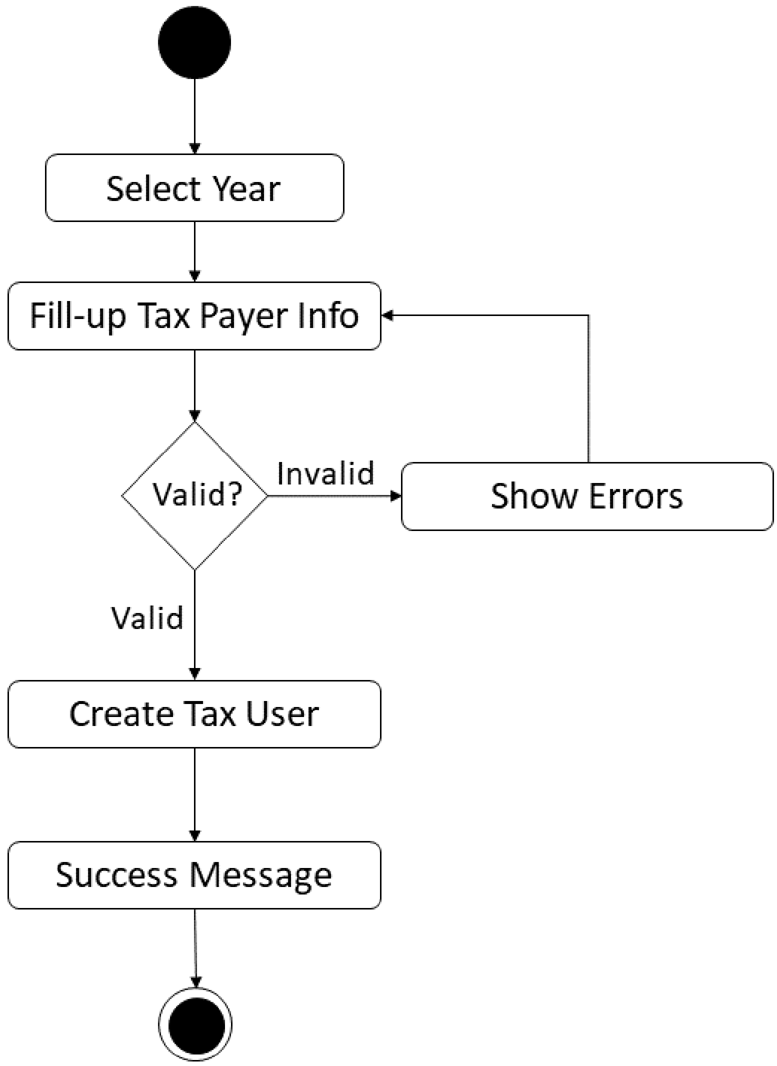


Figure 5: Activity Diagram of Create Tax Profile.

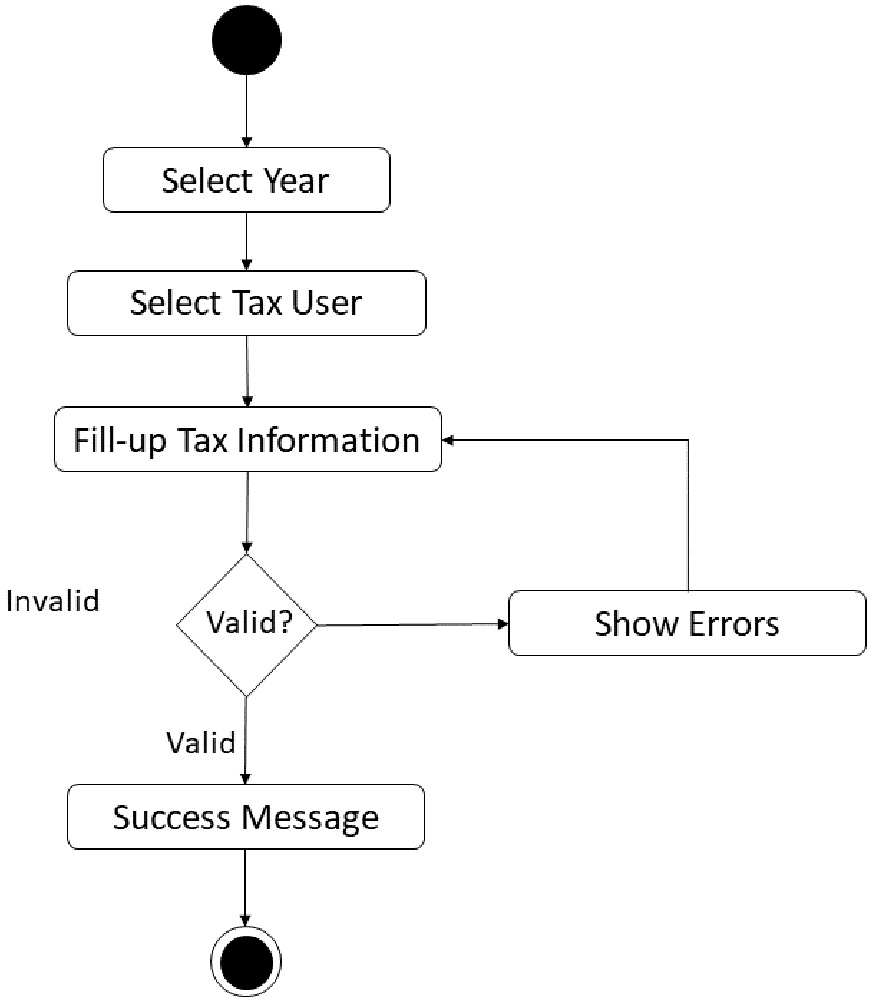


Figure 6: Activity Diagram of Update Profile Info.

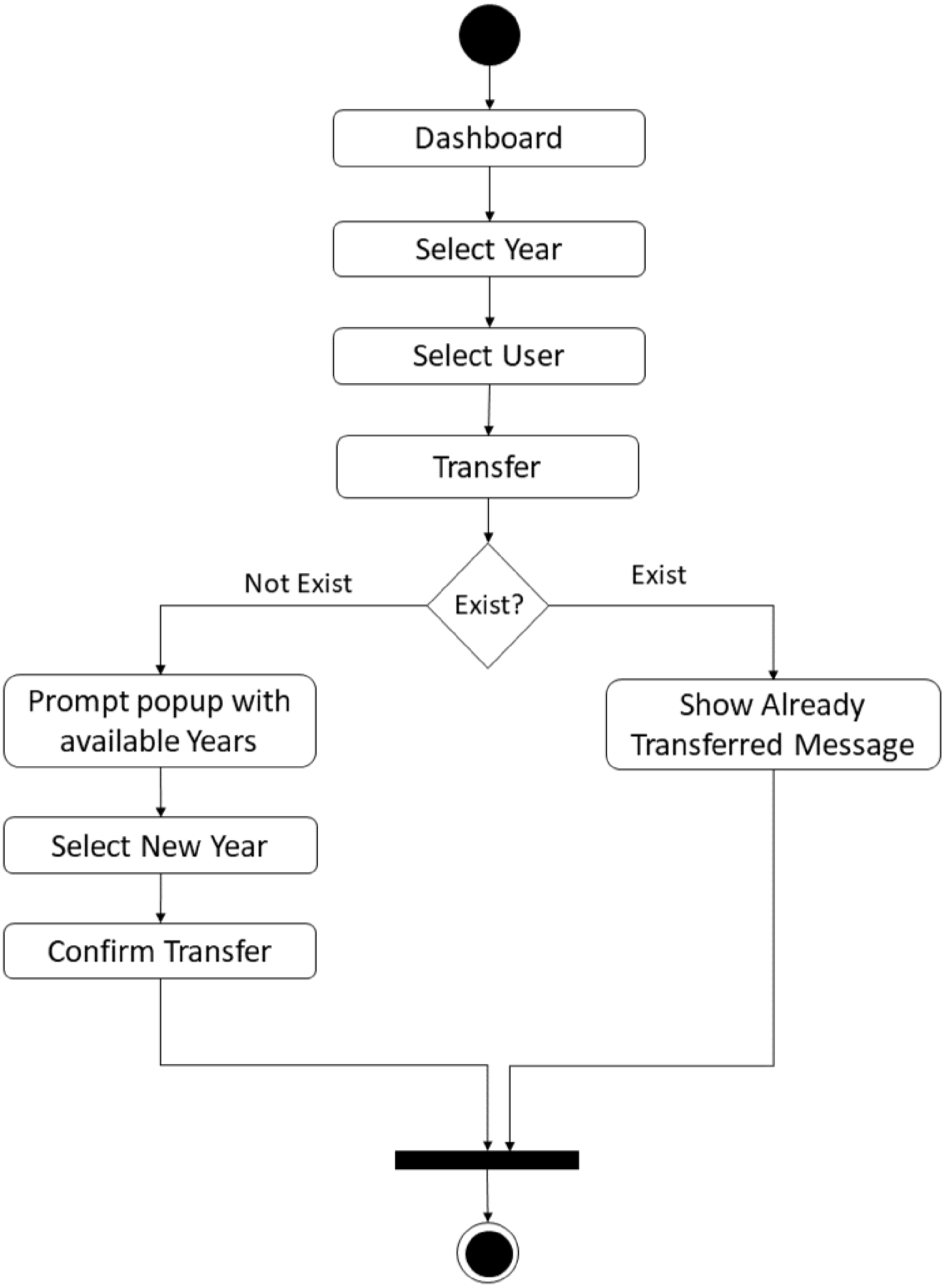


Figure 7: Activity Diagram for Transfer Tax Profile to New Year.

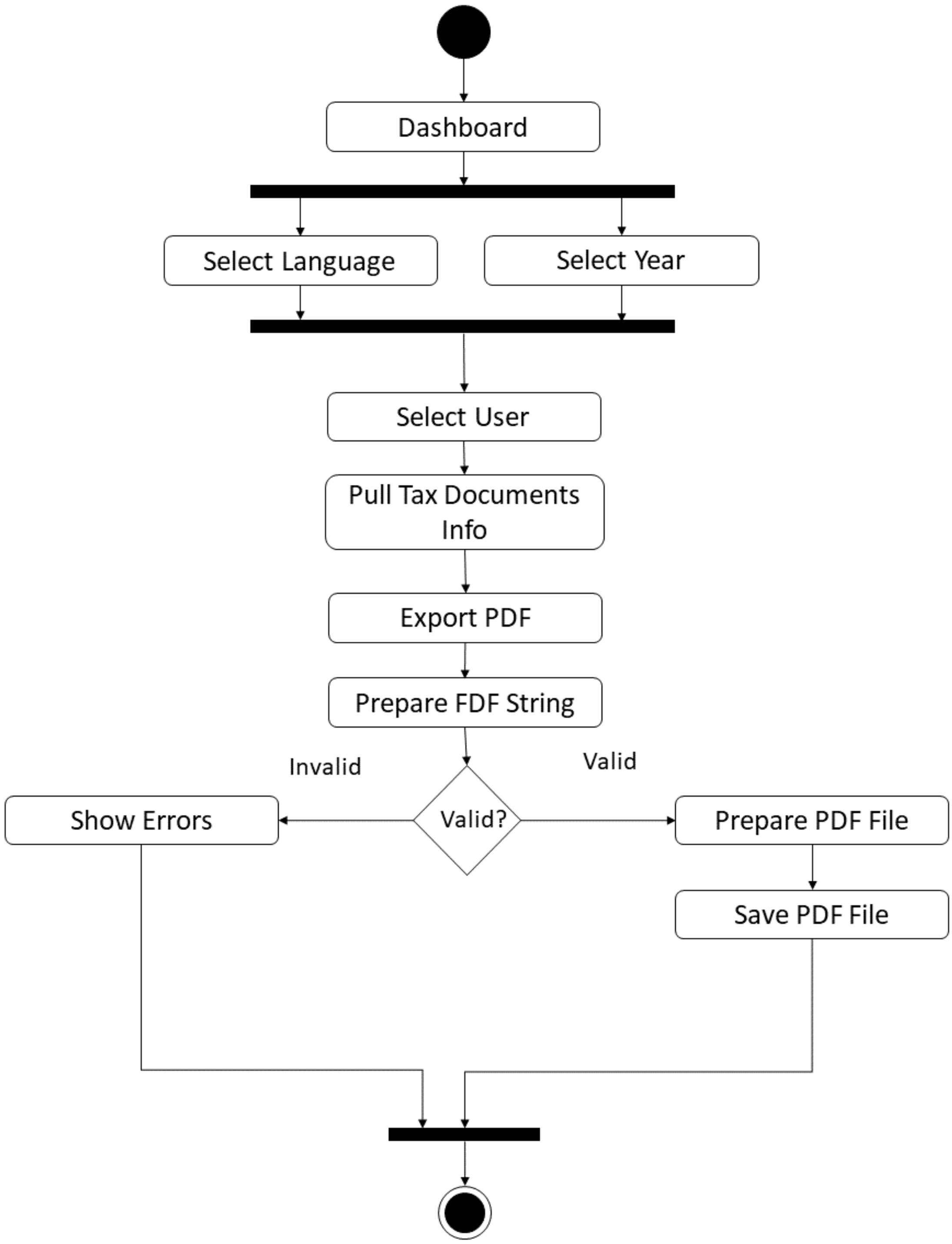


Figure 8: Activity Diagram of Generate PDF.

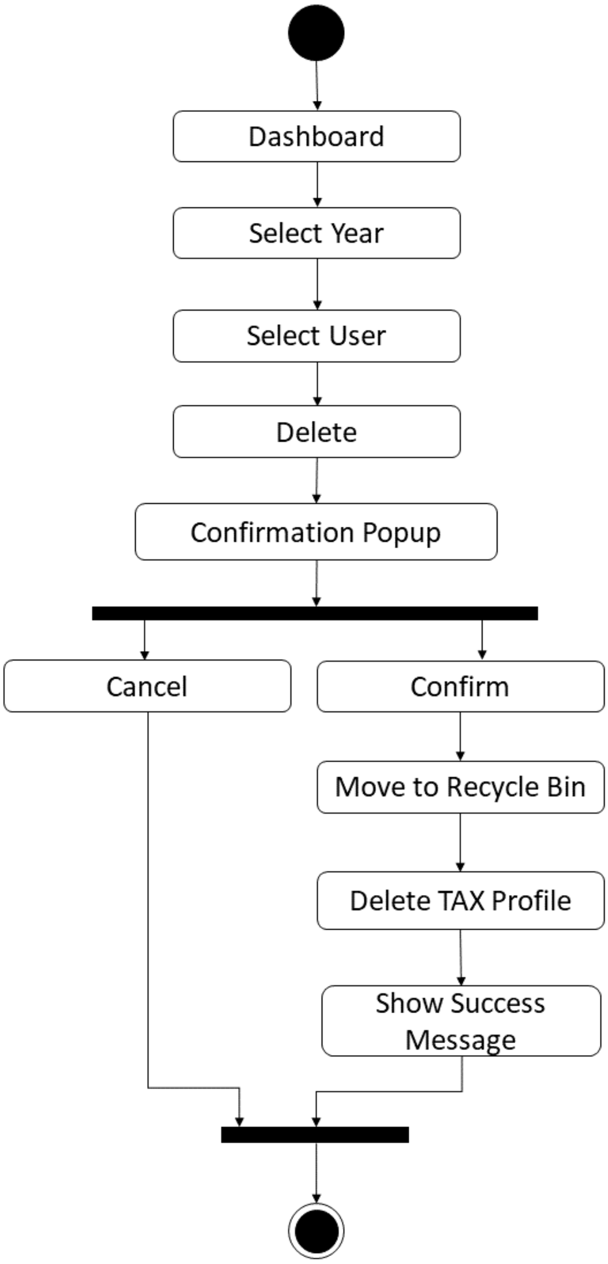


Figure 9: Activity Diagram of Delete Tax Profile.

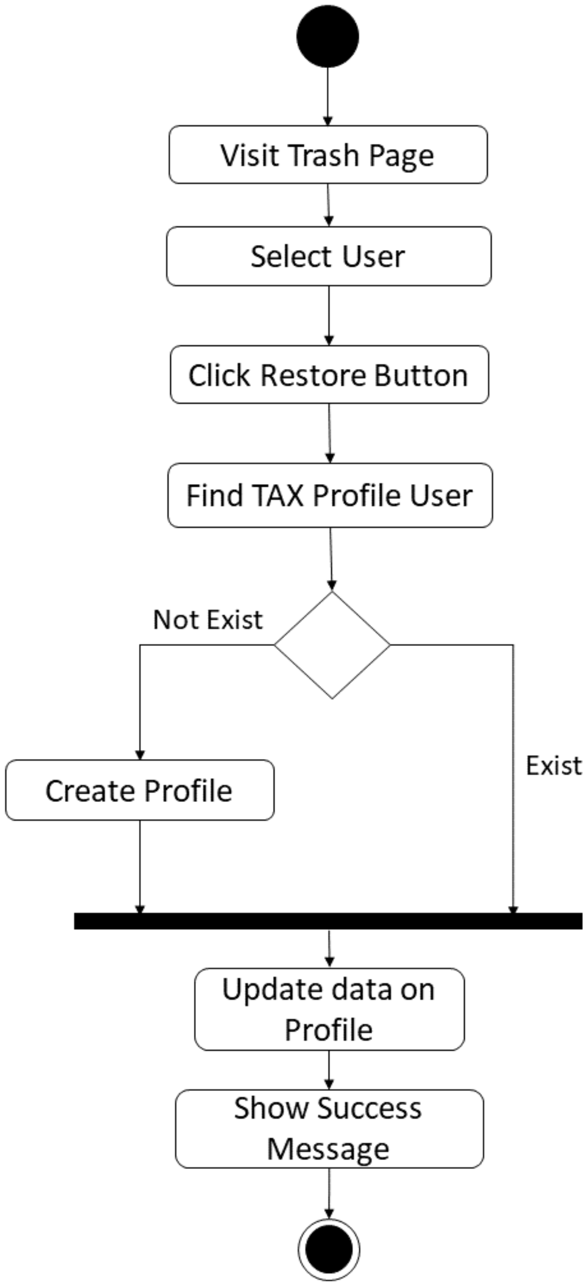


Figure 10: Activity Diagram of Restore Tax Profile.

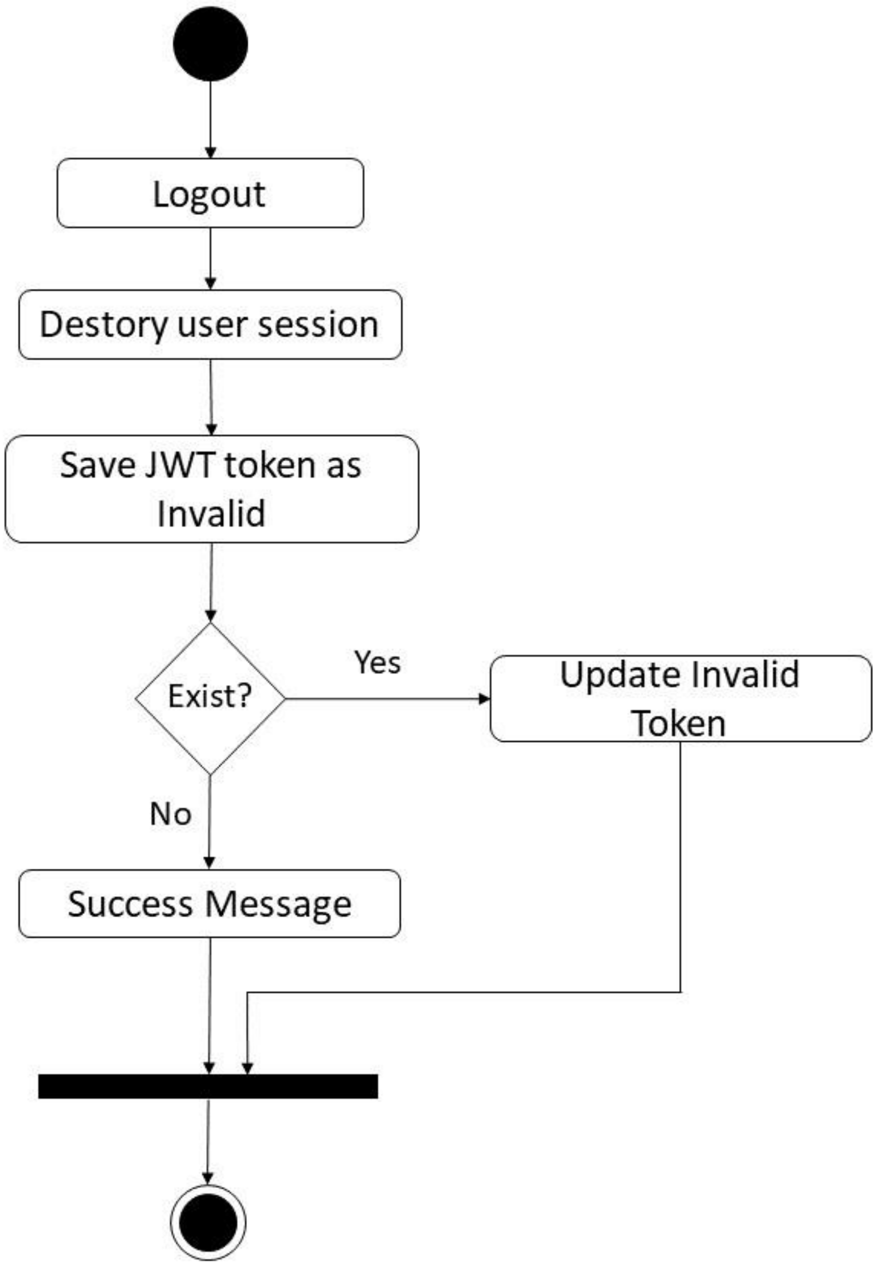


Figure 11: Activity Diagram of Logout.

3.4 SEQUENCE DIAGRAM

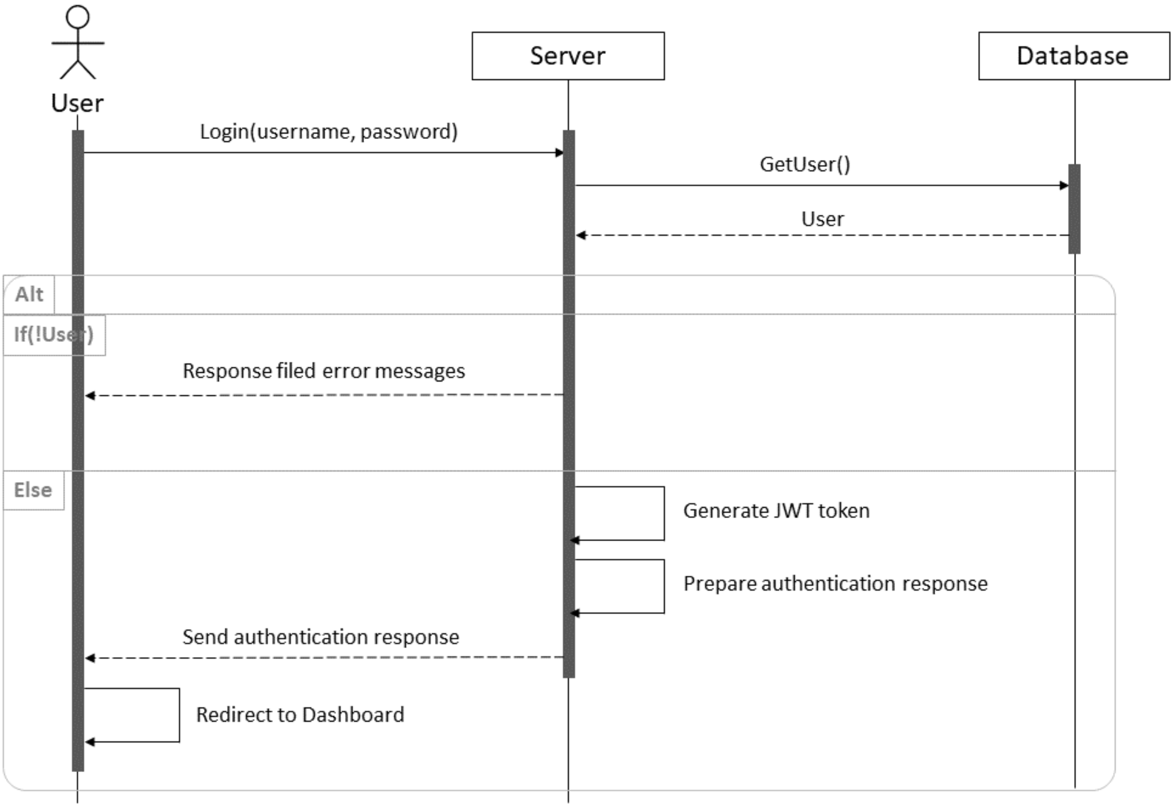


Figure 12: Sequence Diagram of User Login.

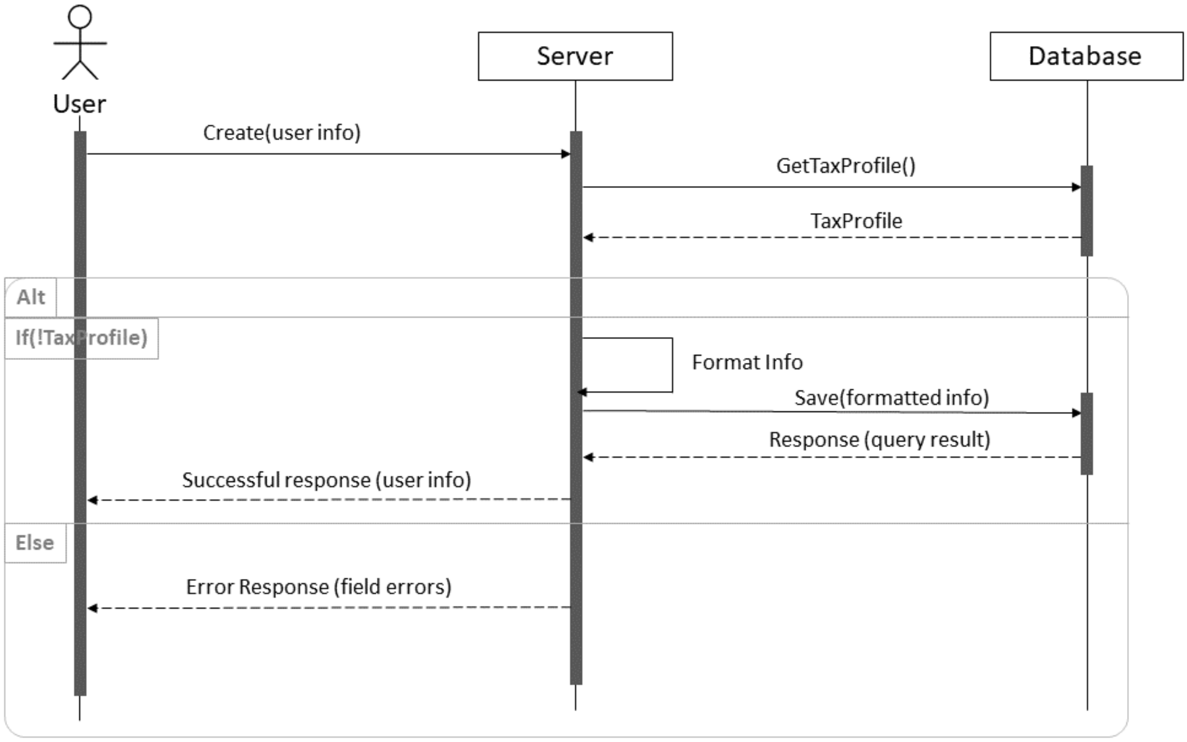


Figure 13: Sequence Diagram of Create Tax Profile**.**

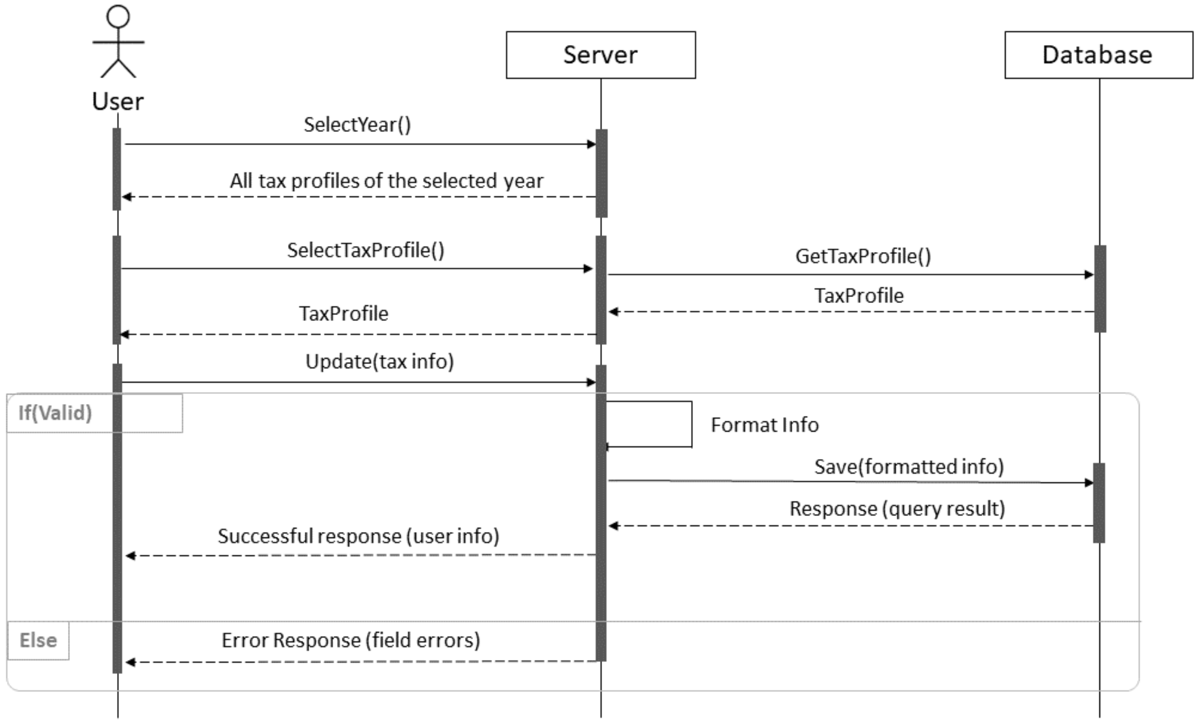


Figure 14: Sequence Diagram of Update Tax Profile Info.

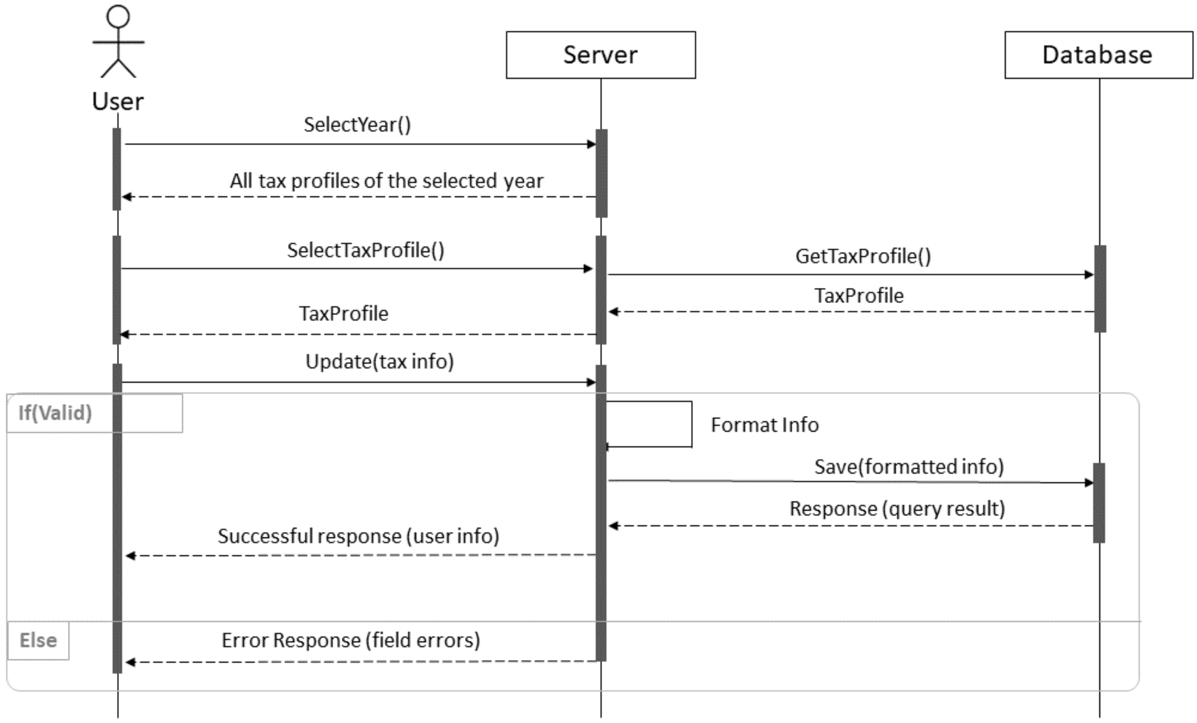


Figure 15: Sequence Diagram of Generate Tax document PDF.

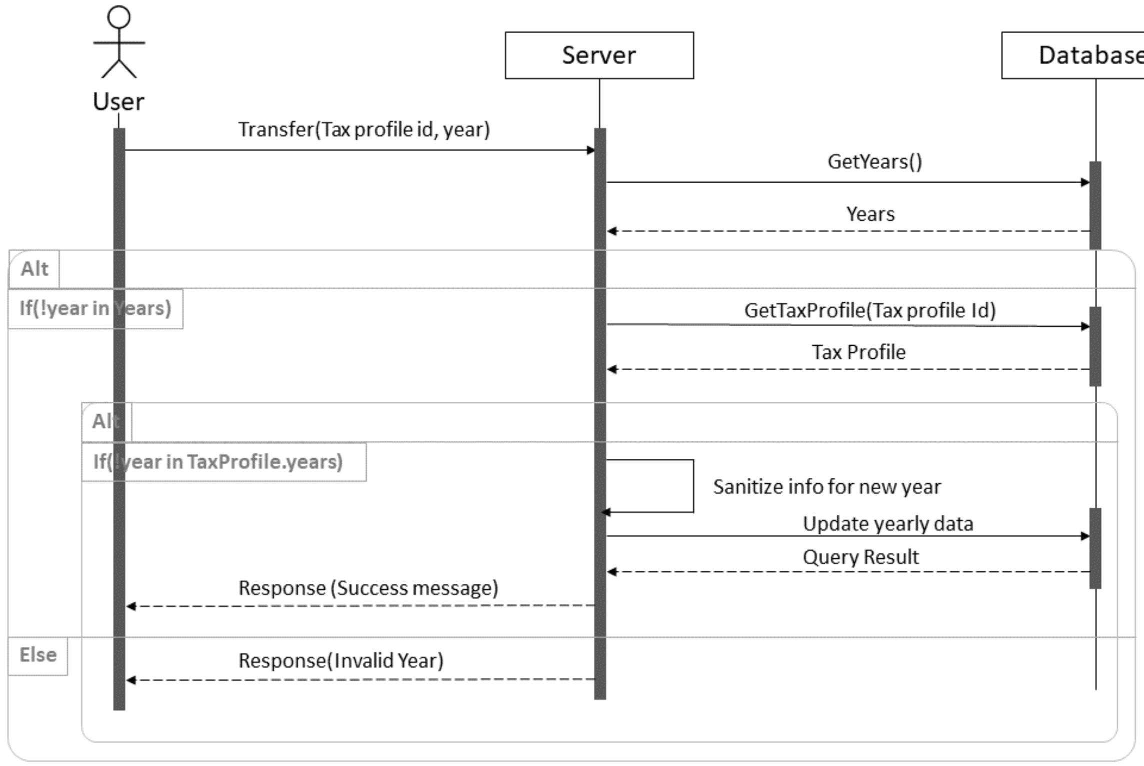


Figure 16: Sequence Diagram of Transfer Tax Profile.

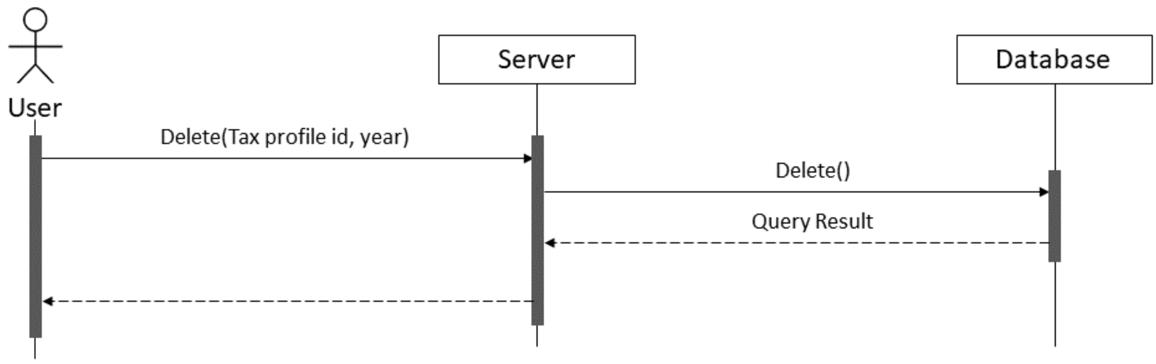


Figure 17: Sequence Diagram of Delete Tax Profile.

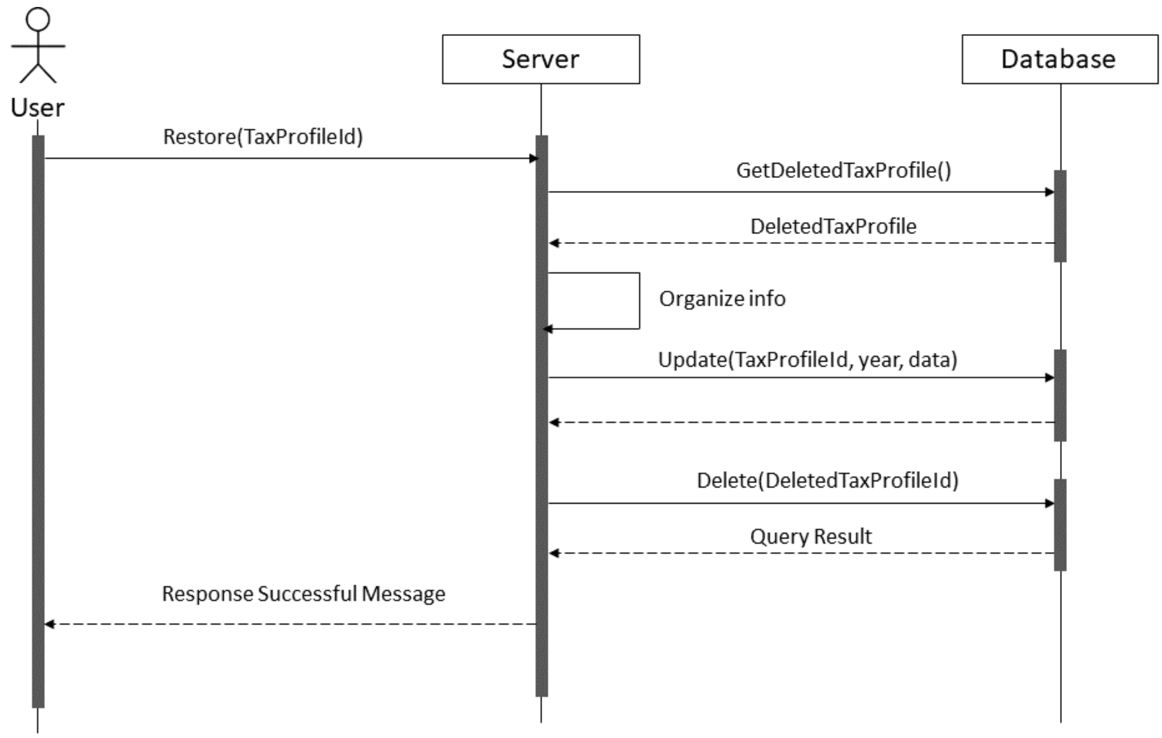


Figure 18: Sequence Diagram of Restore Tax Profile.

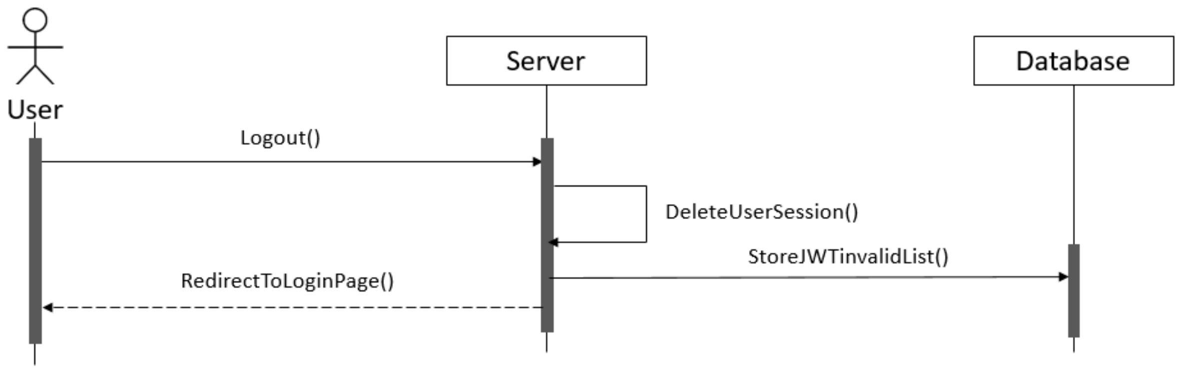


Figure 19: Sequence Diagram of logout process.

3.5 ENTITY RELATIONSHIP DIAGRAM

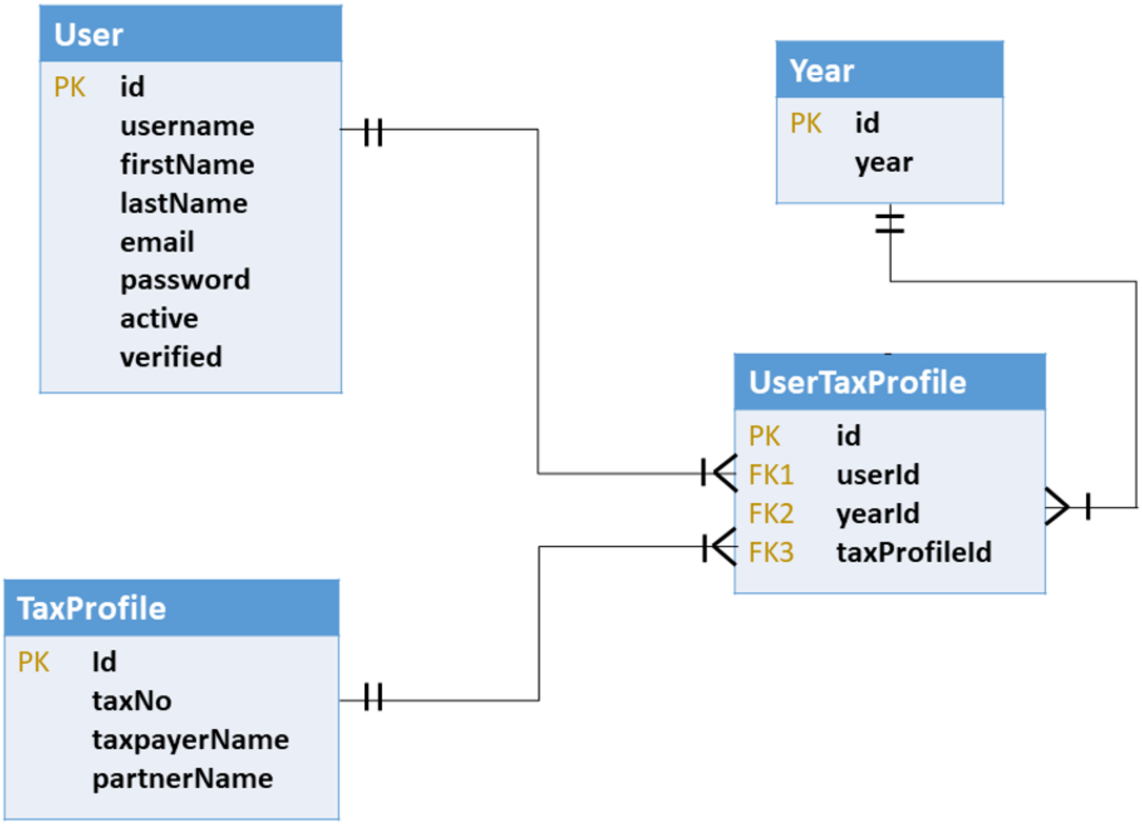


Figure 20: Entity Relationship Diagram.

CHAPTER 4
DEVELOPMENT TOOLS & TECHNOLOGIES

4.1 Tools and Technology

The proposed system **"Tax Management Portal for Luxembourg"** is a web application. I used several tools and technologies to build this software are listed below -

- **Presentation Layer:** HTML5, SCSS, JavaScript
- **Presentation Layer Frameworks:** W3CSS, jQuery, Angular 1.9, Lodash
- **Application Layer:** Node.js 14.4.0
- **Application Layer Frameworks:** Express.js, Lodash, PDFtk CLI
- **Data Layer:** MongoDB Community Edition.
- **Tools:** VS Code, NVM, Google Chrome
- **Presentation Layer Testing:** Cypress
- **Application Layer Testing:** Mocha, Chai, Supertest.

4.2 Reasons behind Choosing Tools and Technologies

- **HTML5:** HTML5 used to build the structure of web page and there are modern tags to build the web page structure.
- **SCSS:** SCSS is a powerful CSS pre-process for modern web application development. SCSS has great features to do CSS in minimal time because the cascading is convenient and easy to write because there is functions, mixins, extends and so on which helps to write CSS rules.
- **JavaScript:** JavaScript is widely used powerful client-side language which helps to implement the business logics in client side. JavaScript has lot of popular frameworks to build front-end layer and there is facility of component and state based development.
- **W3CSS:** W3Schools is designed using W3CSS. The CSS library is very minimal and easy customize for implementing any minimal UX design and my client's UX design was minimal and convenient to design using W3CSS.
- **jQuery:** jQuery is a great JavaScript library to work in front-end also Angular 1.9 use jQuery by default. I have done some DOM manipulation and animations using jQuery.
- **Angular:** Angular is one of the best front-end frameworks to build client side application with some great features like routing and manipulating front-end view based on UI event trigger.
- **Lodash:** Lodash is a popular JavaScript framework to work with several data structure like array, object and number. There are lot of methods which are easy to use rather than core JS methods and techniques.
- **Node.js:** Node.js is a popular server-side runtime engine. I used this because of the easiness of development logic and in build available functions. Along with this, there are lot of available frameworks which is helpful to develop business logics in minimal time. Even the main language is JavaScript so it will be easy to use JavaScript for developing both front-end and back-end.
- **NVM:** To test and develop the back-end with different Node.js versions NVM provides

version controlling and navigation facility.

- **Express.js:** Express.js is a popular and faster Node.js web-application framework using widely by developers. There are great features in this framework like static and dynamic routing, middleware, request, response and error hander system which is helpful to develop back-end APIs faster than other frameworks with proper security maintenance.
- **PDFtk CLI:** The application needs to populate government issued fillable PDF form file. PDFtk is a great tool to populate fillable PDF form. This CLI tool is also available on Windows and Linux (Ubuntu) system.
- **MongoDB:** The application has a PDF document which has 20 pages fillable form to populate with server data. The data is document based and nested that’s why MongoDB is a great choice to store and query data for the application layer.
- **VS CODE:** VS Code is a popular and faster IDE facilities usable extensions installation, code formatting with integrated terminal facility.
- **Google Chrome:** In order to preview the presentation layer, testing and debugging, Google Chrome is a popular and great browser with facility of inspecting console and network tab along with checking the DOM structure.
- **Cypress:** Cypress is one of the best UI testing and debugging tool. I choose this testing tool to test the UI of the application because there is a great feature to screenshot and inspect the test cases steps state view.
- **Mocha:** Mocha is a JS testing tool to define the test cases. I used this for backend API testing.
- **Chai:** I choose chai assertion tool to integrate with mocha test case defining framework because this assertion framework is easy to use and highly powerful.
- **Supertest:** Supertest is one of the popular API testing tool to request on API endpoints. It has been integrated with Mocha and Chai. There is a great facility to define base url of API, before and after run facility with header definition and so on.

CHAPTER 5

USER MANUAL

USER LOGIN

Once you will enter into the main URL of the application, the system will redirect you to the login page if you are not logged before. The agency have to use their username specified to the database and client (tax payer) will use their email instead of username and password will be sent to the email once the agent will add the tax payer in the system.

If you use wrong username or password then the system will show the error of invalid username or password.

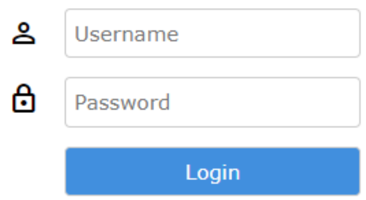
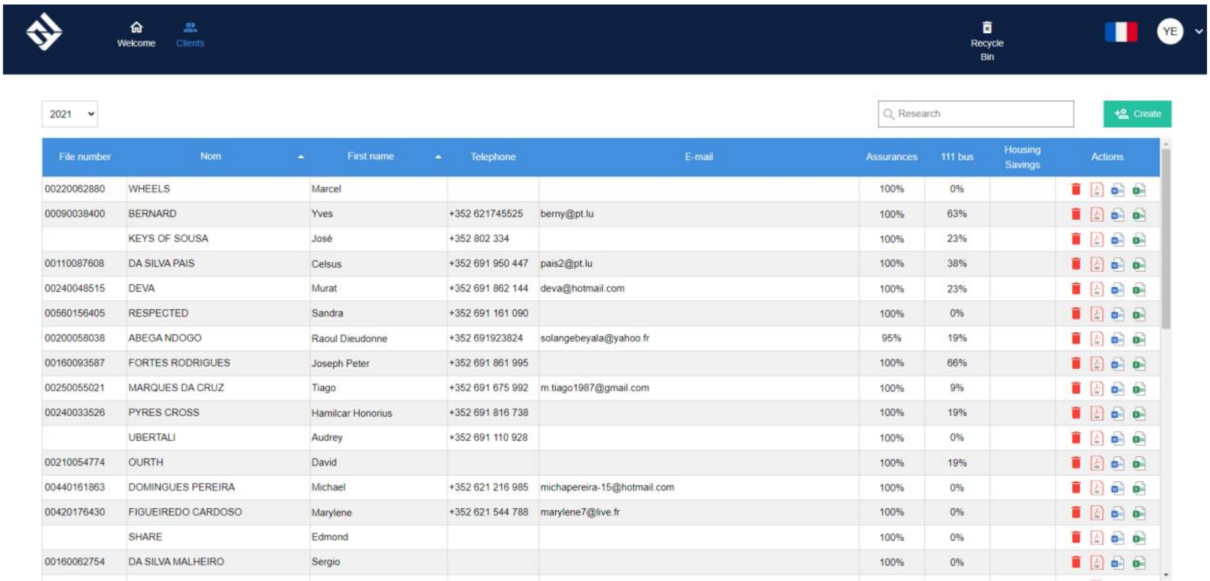


Figure 21: UI for User Login

DASHBOARD

If the user login as agency then the agency's clients list will show on dashboard. If a tax payer is logged in then the tax payer's different years profile list will show on the dashboard.

In the right side of the list table have some actions to delete, export pdf, and transfer to next year.

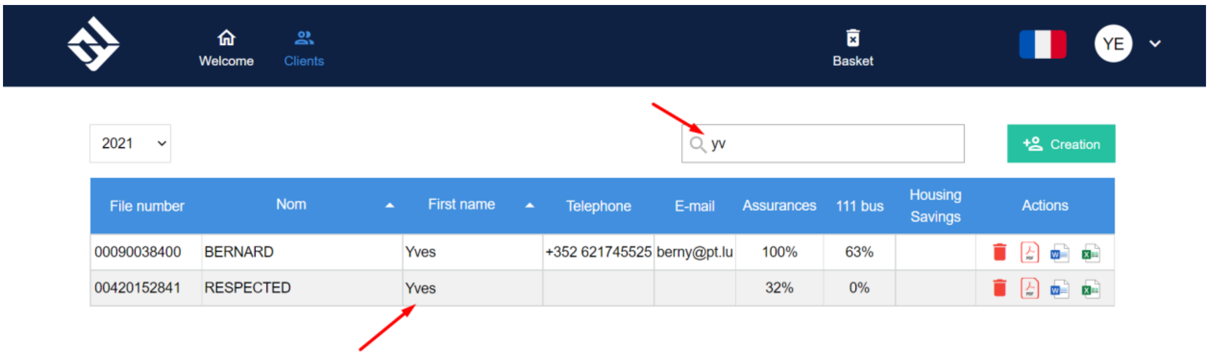


File number	Nom	First name	Telephone	E-mail	Assurances	111 bus	Housing Savings	Actions
00220062880	WHEELS	Marcel			100%	0%		
00090038400	BERNARD	Yves	+352 621745525	berny@pt.lu	100%	63%		
	KEYS OF SOUSA	José	+352 802 334		100%	23%		
00110087608	DA SILVA PAIS	Celsus	+352 691 950 447	pais2@pt.lu	100%	38%		
00240048515	DEVA	Murat	+352 691 862 144	deva@hotmail.com	100%	23%		
00560156405	RESPECTED	Sandra	+352 691 161 090		100%	0%		
00200058038	ABEGA NDOGO	Raoul Dieudonne	+352 691923824	solangebeyala@yahoo.fr	95%	19%		
00160093587	FORTES RODRIGUES	Joseph Peter	+352 691 861 995		100%	66%		
00250055021	MARQUES DA CRUZ	Tiago	+352 691 675 992	m.tiago1987@gmail.com	100%	9%		
00240033526	PYRES CROSS	Hamilcar Honorius	+352 691 816 738		100%	19%		
	UBERTALI	Audrey	+352 691 110 928		100%	0%		
00210054774	OURTH	David			100%	19%		
00440161863	DOMINGUES PEREIRA	Michael	+352 621 216 985	michapereira-15@hotmail.com	100%	0%		
00420176430	FIGUEIREDO CARDOSO	Marylene	+352 621 544 788	marylene7@live.fr	100%	0%		
	SHARE	Edmond			100%	0%		
00160062754	DA SILVA MALHEIRO	Sergio			100%	0%		

Figure 22: UI of the Dashboard (Profile List)

SEARCH CLIENT

In right side of agency's dashboard there is a search bar to search client using first or last name, phone and email.



File number	Nom	First name	Telephone	E-mail	Assurances	111 bus	Housing Savings	Actions
00090038400	BERNARD	Yves	+352 621745525	berny@pt.lu	100%	63%		
00420152841	RESPECTED	Yves			32%	0%		

Figure 23: UI of Search Client

CREATE TAX PROFILE

On the right side of the admin's dashboard there is a search bar and create button to create new client's tax profile. There needs to input the tax payer first name, last name, telephone, email to create the profile.

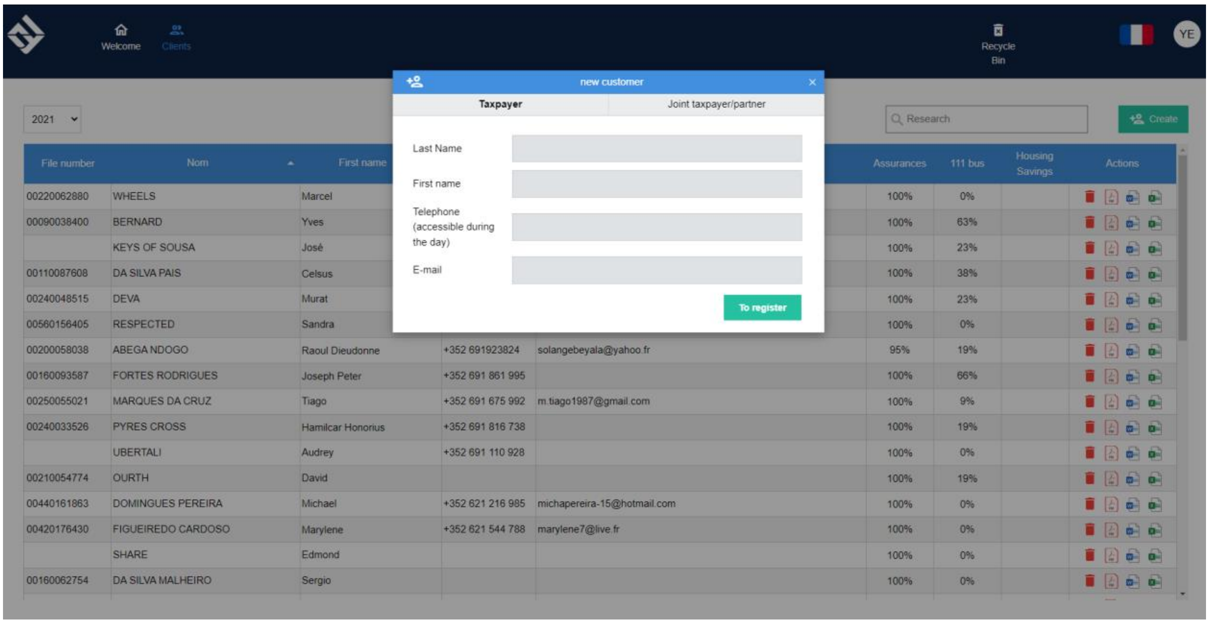
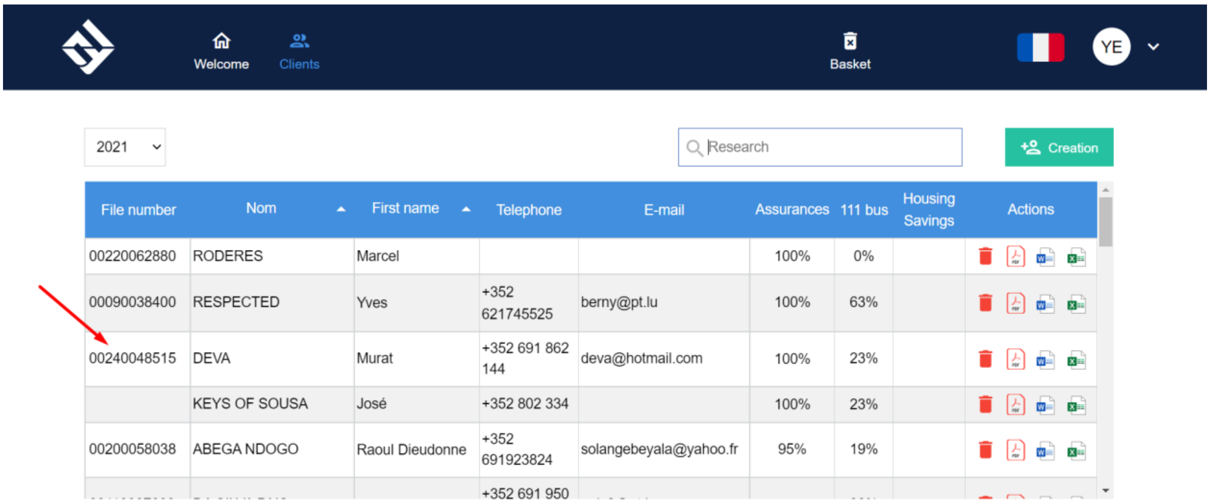


Figure 24: UI of Create Tax Profile.

TAX PROFILE VIEW

One the agency admin or client will click on a profile from the list of the dashboard then the profile page will open with all the tax information view.

User can edit information and see the page status from the left menu green mark. If there is green mark the page has some data filled up on that tab other don’t have any data filled up on that tab.



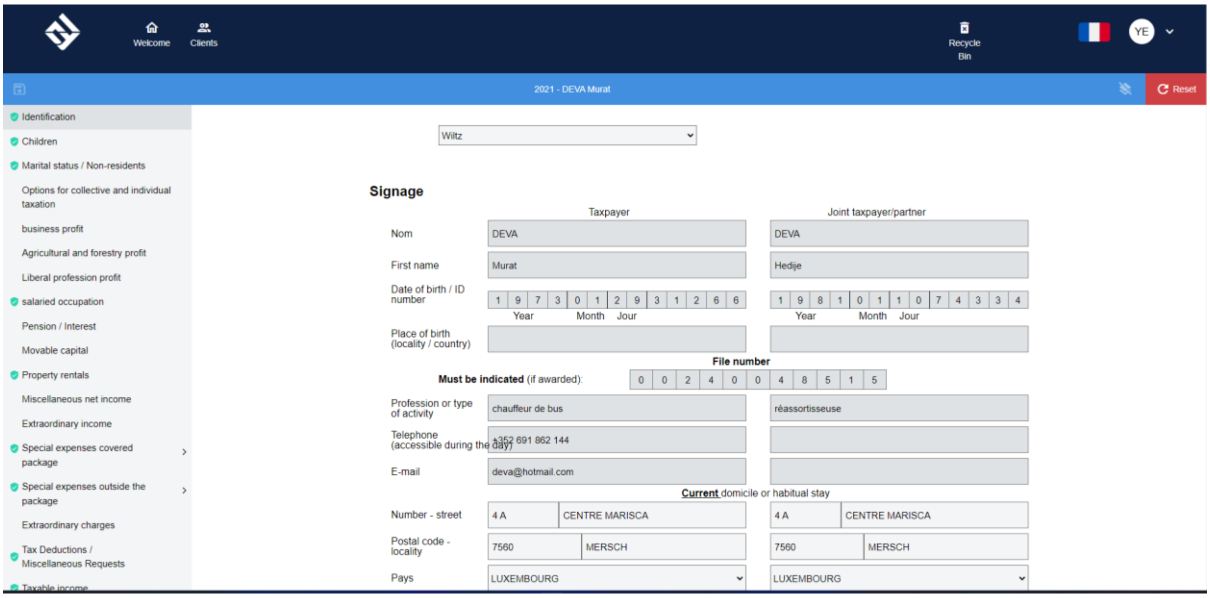
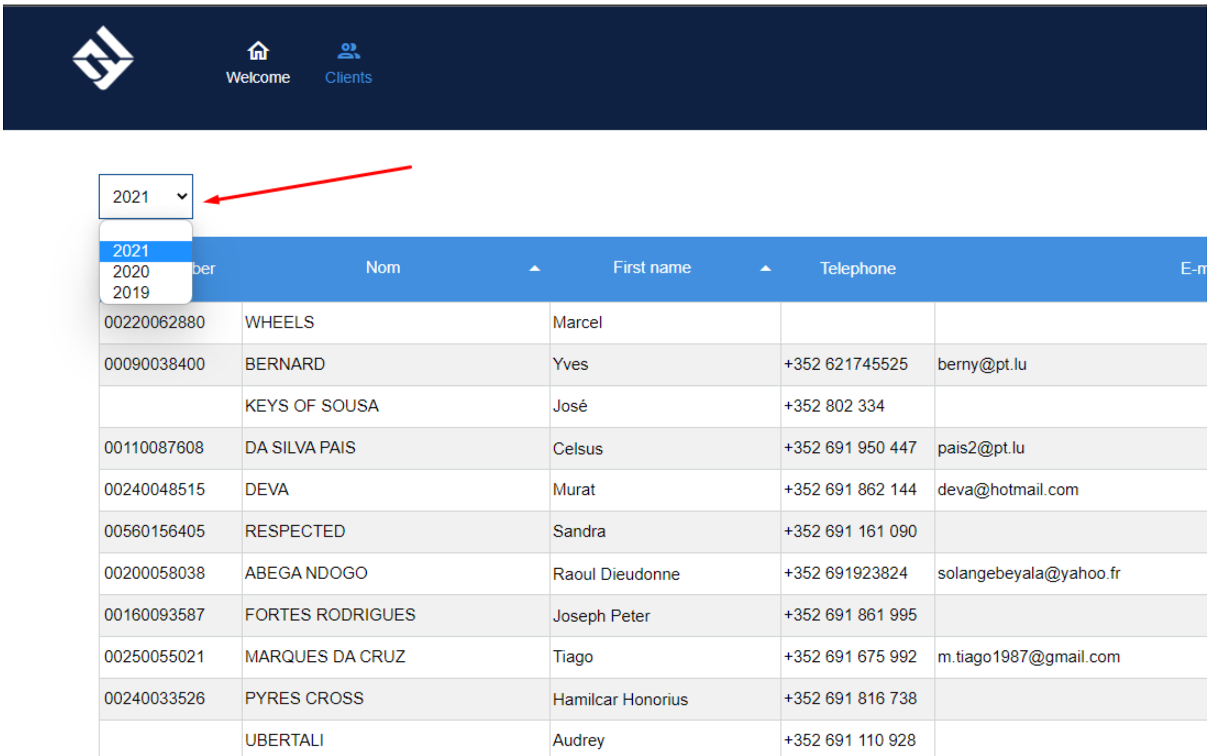


Figure 25: UI of Tax Profile View.

YEARLY TAX PROFILE

The agency admin can view a dropdown of all years to filter the clients list of the selected year.



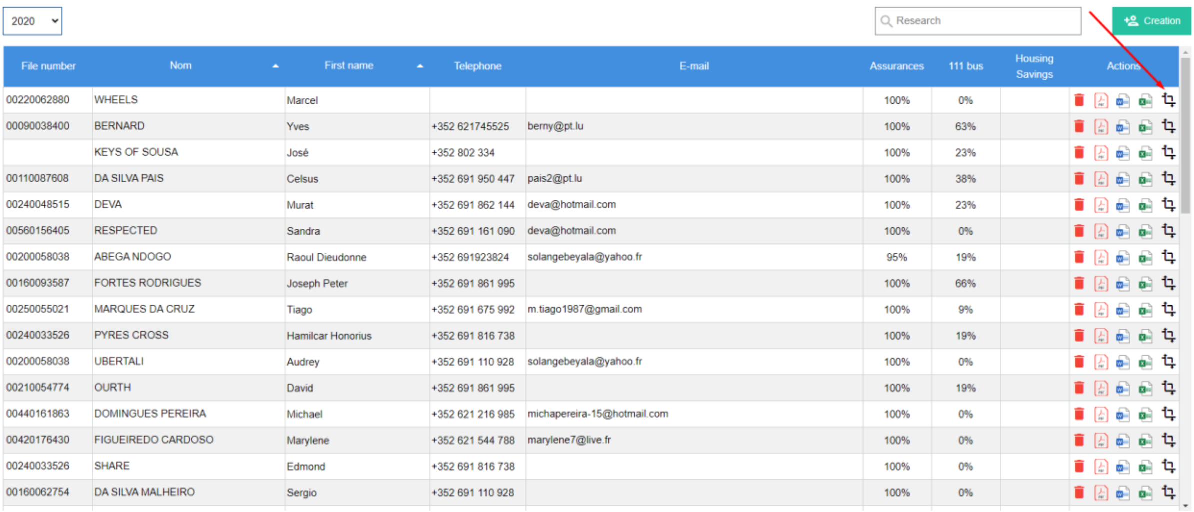
ber	Nom	First name	Telephone	E-m
00220062880	WHEELS	Marcel		
00090038400	BERNARD	Yves	+352 621745525	berny@pt.lu
	KEYS OF SOUSA	José	+352 802 334	
00110087608	DA SILVA PAIS	Celsus	+352 691 950 447	pais2@pt.lu
00240048515	DEVA	Murat	+352 691 862 144	deva@hotmail.com
00560156405	RESPECTED	Sandra	+352 691 161 090	
00200058038	ABEGA NDOGO	Raoul Dieudonne	+352 691923824	solangebeyala@yahoo.fr
00160093587	FORTES RODRIGUES	Joseph Peter	+352 691 861 995	
00250055021	MARQUES DA CRUZ	Tiago	+352 691 675 992	m.tiago1987@gmail.com
00240033526	PYRES CROSS	Hamilcar Honorius	+352 691 816 738	
	UBERTALI	Audrey	+352 691 110 928	

Figure 26: UI of Yearly Tax Profile.

TRANSFTER ONE YEAR TAX PROFILE TO NEXT YEAR

From the agent dashboard, old year's tax profile can be transfer to new year by clicking on the transfer button which available only for the years except of the last registered year for the system.

After clicking to the transfer button a popup with all the years will show and the profile will be transferred to selected year once **"Yes"** button will be pressed.



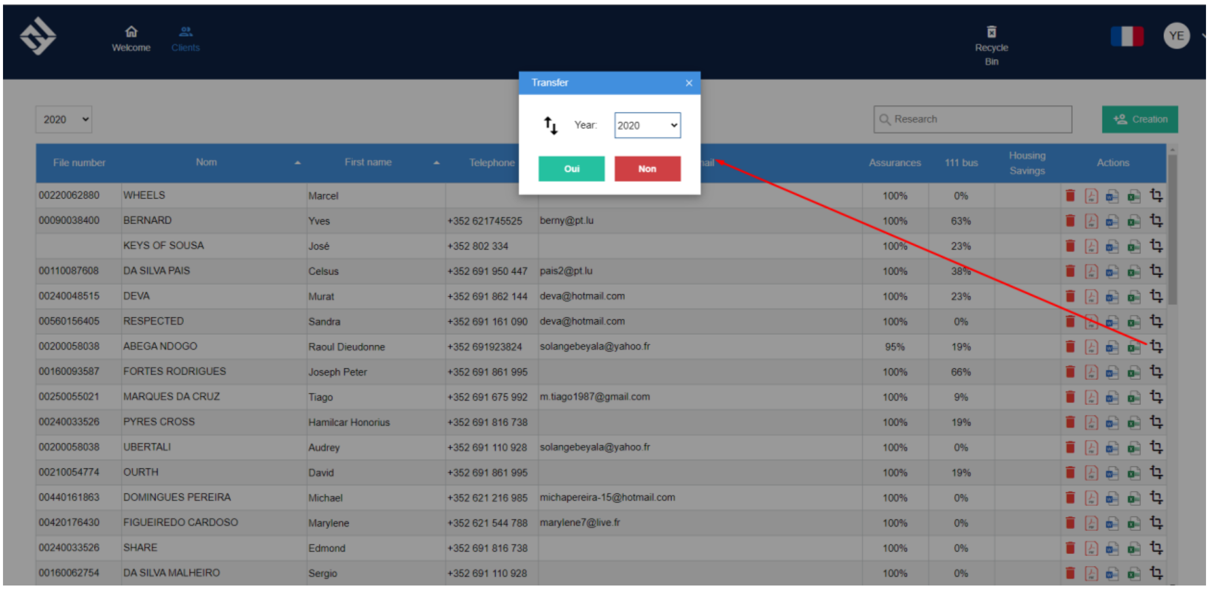


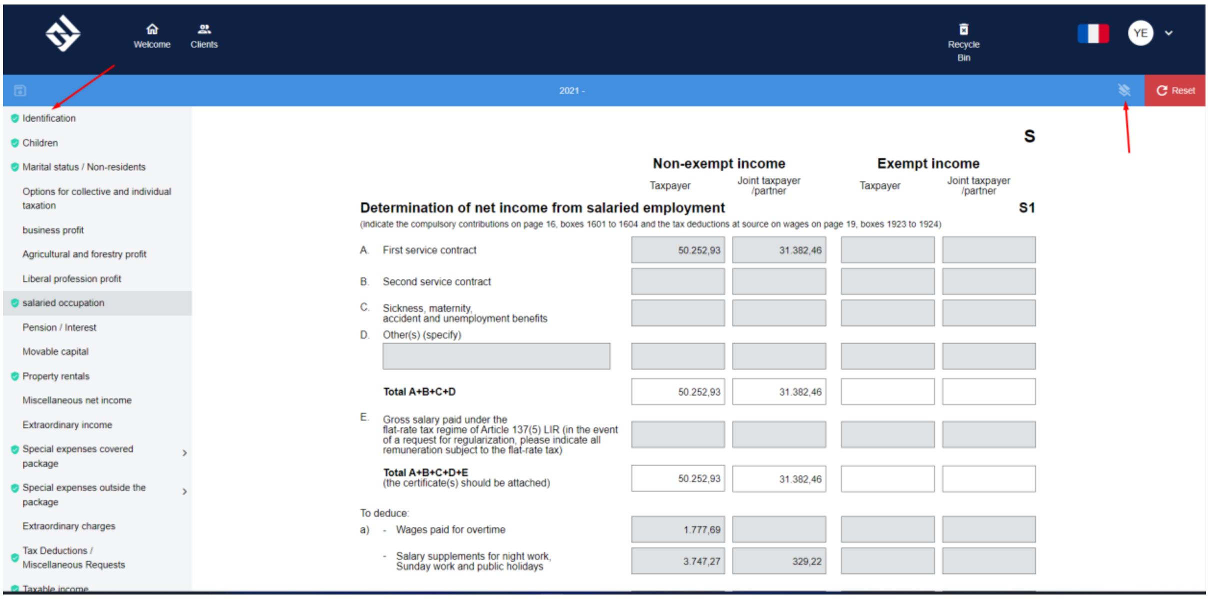
Figure 27: UI for transferring one year to next year.

COMPARE TAX PROFILE WITH PREVIOUS YEAR DATA

In the tax profile view page, there is a layer icon on just left of the right reset button to enable the view of previous year data.

Once the previous data will show then the left menus will indicate by the red colour for those pages have data.

The layer button is basically a toggle button. Clicking again the view will be for current year data.



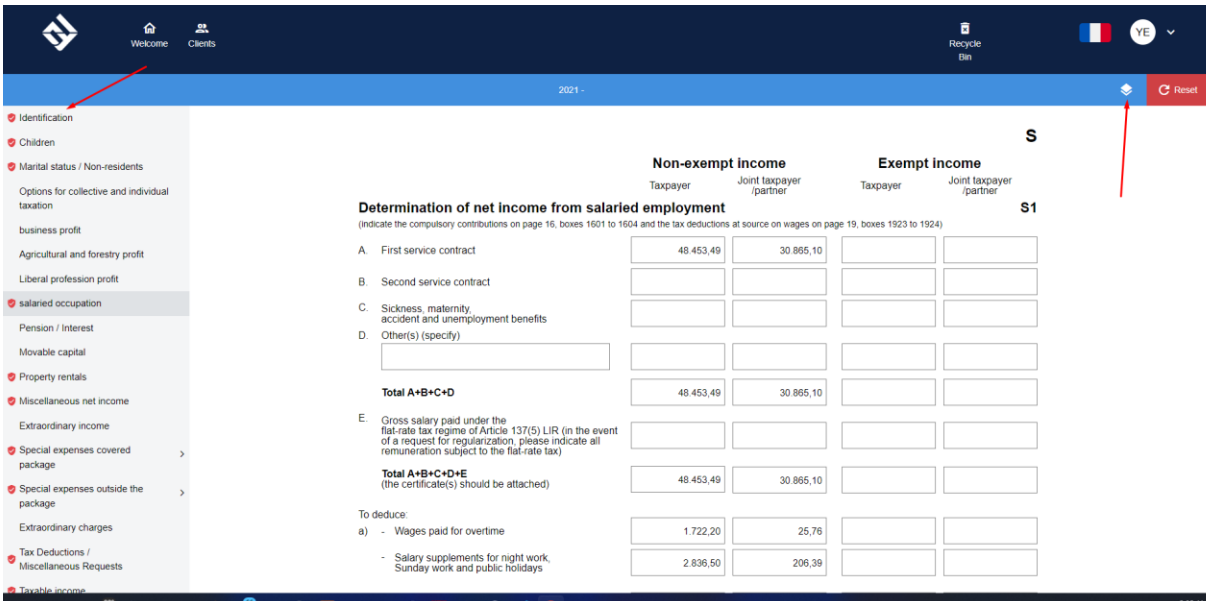


Figure 28: UI of current and previous year tax profile comparing.

DELETE TAX PROFILE

The agency admin can delete any of the tax profile from the tax profile list on dashboard by clicking the delete icon.

After clicking on the delete icon a popup will show to confirm the delete action. If pressed **"Yes"** then the delete will trigger otherwise the delete action will be canceled.

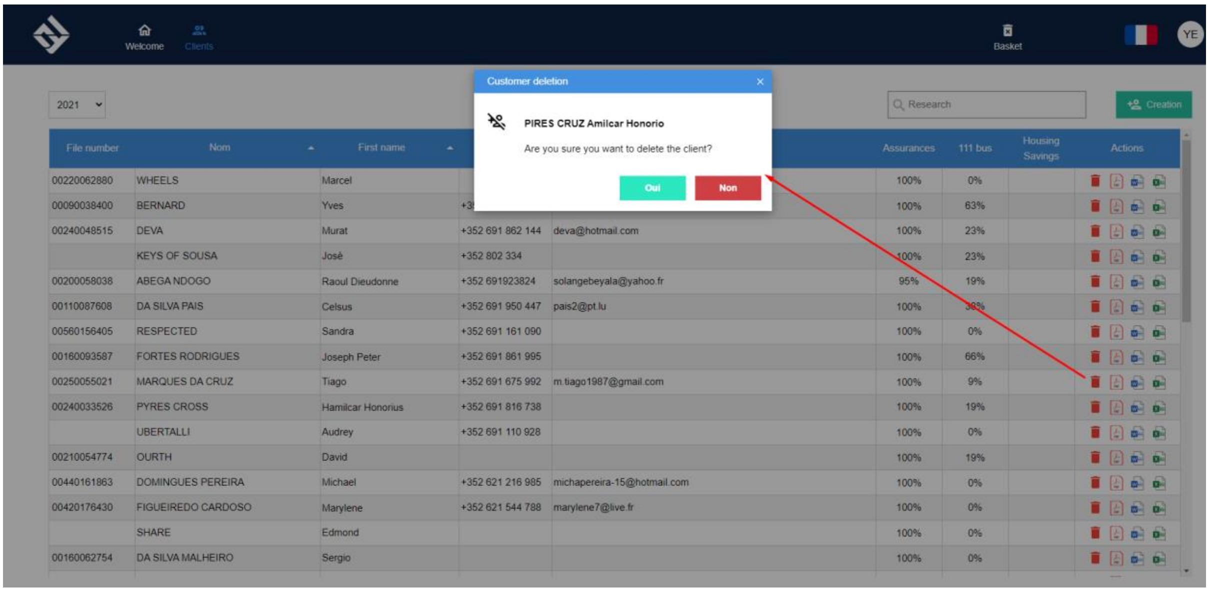


Figure 29: UI of Delete Tax Profile.

RECYCLE BIN (BASKET)

A recycle bin that is access able by clicking the Basket icon from the top navigation bar.

All the deleted tax profile will show on the list indicating the year of the tax of on the table left column. There are some action icons on right of the list.

Figure 30: UI of Recycle Bin

RESTORE TAX PROFILE

Admin will be able to restore any tax profile from the recycle bin by clicking on the restore icon from right actions of the list.

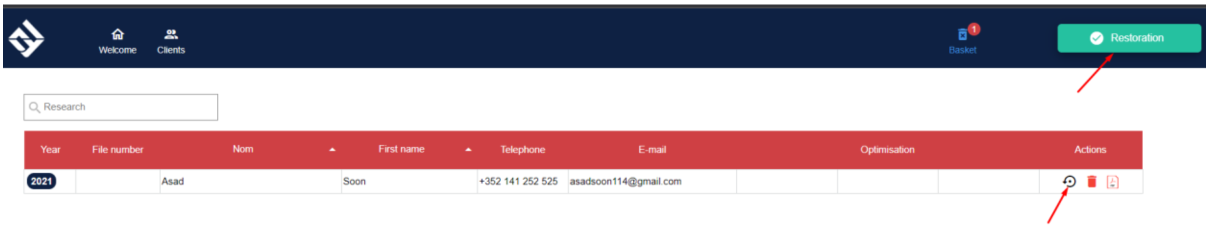


Figure 31: UI of restoring recycled tax profile.

DELETE FROM RECYCLE BIN (DELETE FOREVER)

There is a delete button on right of the recycled client list. If the delete icon is pressed then a confirmation popup will show. By clicking the **"Yes"** button, the profile will be deleted forever and can't restored back later anyway.

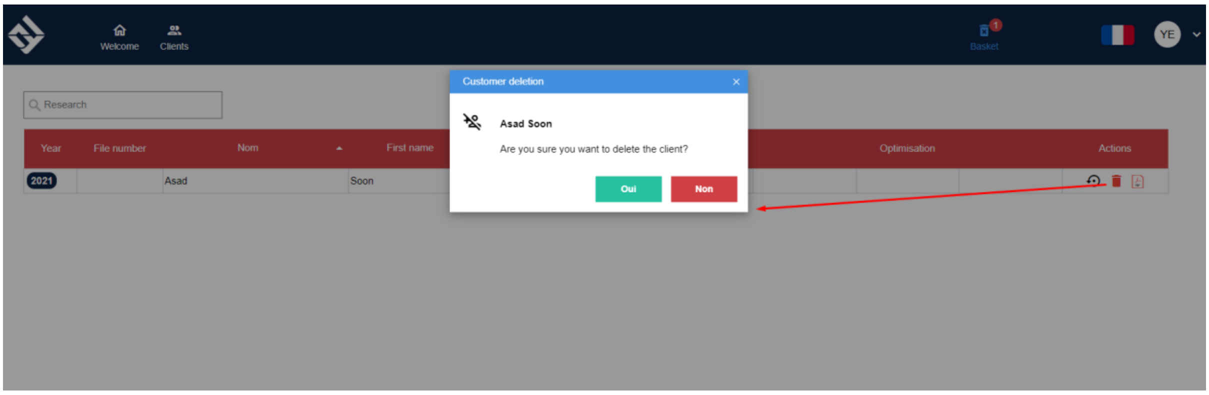


Figure 32: UI of delete from recycle bin (delete forever).

SWITCH LANGUAGE FOR PDF FILE

There is a toggle able flat on top which will toggle from French to German and vice-versa by clicking on it. The language will be used for PDF that will generate and export.

Figure 33: UI of switching language flag for PDF file.

EXPORT GOVERNMANT TAX PDF FILE

On dashboard's clients list of tax profiles has a PDF icon on right of each item. By clicking on the PDF icon, a PDF will export based on the selected year and top language flag selection.

If 'French' flag is selected the then the PDF will export in French languages for the specified year and same for the 'German' flag.

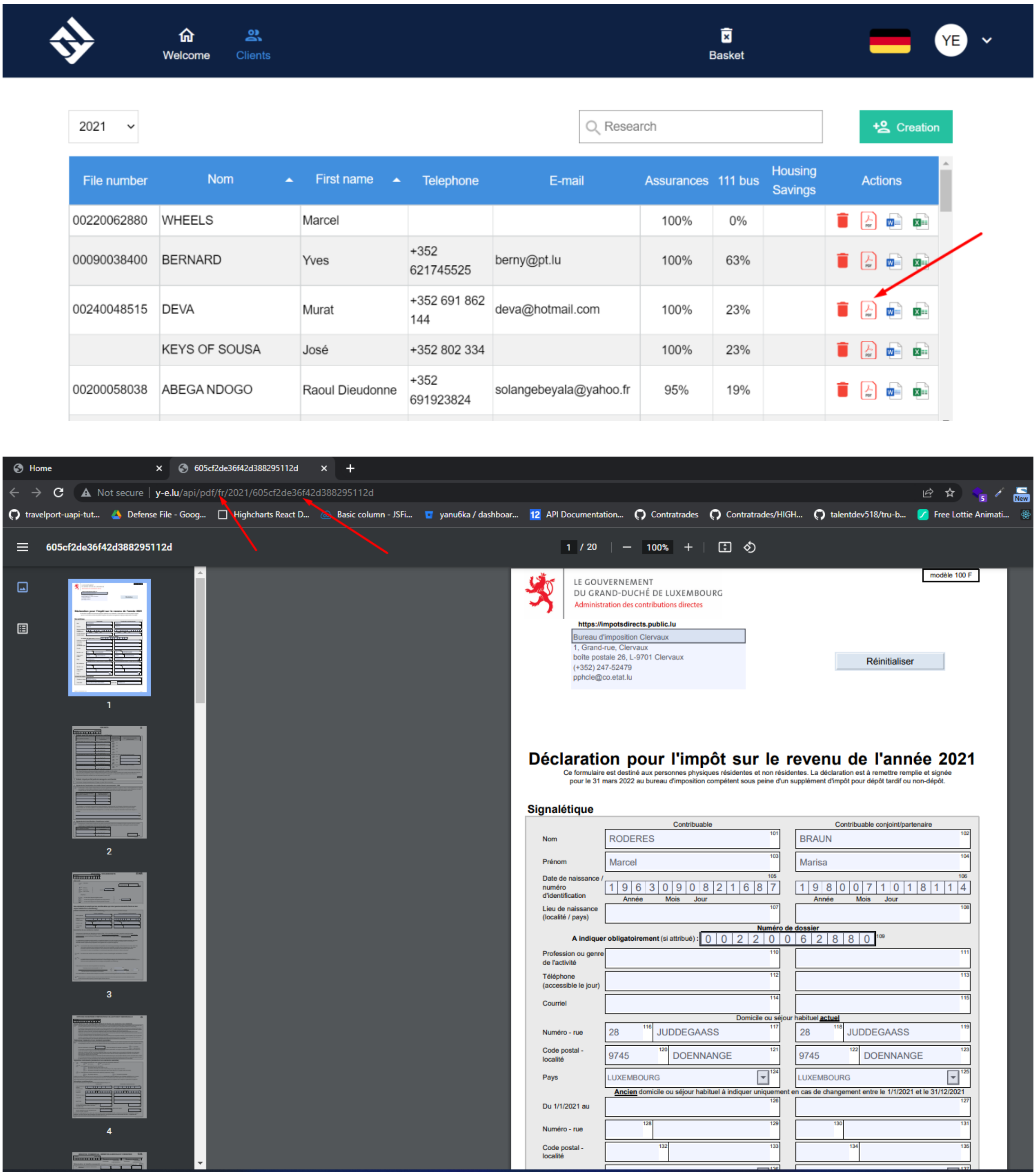


Figure 34: UI for government tax PDF file export.

CHAPTER 6

SYSTEM TESTING

6.1 Testing Features

6.1.1 Features to be tested

Which features or functionalities of the system will be tested, it is included as "Features to be tested". Features to be tested are given bellow.

No.	Feature/Functionality
01	User login
02	Logout
03	Add tax payer (client)
04	View tax payer profile.
05	Update tax payer profile.
06	Transfer tax payer profile to next year.
07	Generate govt. issued tax PDF document.
08	Delete tax profile.
09	Restore tax profile.
10	Auto calculation on UI form fields.

Table 6.1.1: Features to be tested.

6.1.2 Features Not Tested

Which features or functionalities are in relation to other features that is already tested, it is included as "Features not to be tested". Features not to be tested are given bellow.

No.	Feature/Functionality
01	View profile by years.
02	Fillable PDF files fields.
03	Loading Spineer.
04	Add parts category
05	Recycle bin profile list.

Table 6.1.2: Features Not Tested

6.2 Testing Strategies

6.2.1 Test Approach

Testing is one of the important steps of Software development lifecycle. There are many testing approaches. I used API and UI Testing separately. Some of checks that I followed is below list -

- Validate API response based on request and headers.
- Tested UI input fields are working properly or not.
- Validate redirection URLs.

6.2.2 Pass/Fail Criteria

When all the test cases of a feature successfully executed without any problem and got expected result then test passed.
On the other hand, when all the test cases showed failed status on automation testing process then the test cases marked as failed.

6.2.3 Suspension and Resumption

Suspension can happen when the external components are not readily available or when an effective bug is traced. Suspension is also known as test-stop criteria for the testing process. Basically testing processes are suspended when actual result is not same as expected result.
When suspension criteria is met then resolve the bug of the system and resume the testing phase again, it is included as resumption. If defect is no detected then resumption closed.

6.2.4 Testing Schedule

This project mainly focused on functional testing. The testing schedule is given below -

Table 6.2.4: Testing Schedule

System Study		Write Test Cases		API Testing	UI Testing	Integration Testing
05/04/22	12/04/22	13/04/22	19/09/22	22/09/22	23/09/22	24/09/22

6.2.5 Traceability Matrix

Table 6.2.5: Testing Traceability Matrix

Req. ID	Req. Description	Test Case ID	Status
FR-01	User login	TC-1 TC-2	TC-1 Passed TC-2 Passed
FR-02	Logout	TC-3	TC-3 Passed
FR-03	Add tax payer (client)	TC-4 TC-5 TC - 6	TC-4 Passed TC-5 Passed TC-6 Passed
FR-04	View tax payer profiles.	TC - 6	TC-6 Passed
FR-05	Update tax payer profile.	TC-7 TC-8	TC-7 Passed TC-8 Passed
FR-06	Transfer tax payer profile to next year.	TC-9 TC-10 TC-11	TC-9 Passed TC-10 Passed TC-11 Passed
FR-07	Generate govt. issued tax PDF document.	TC-17	TC-17 Passed
FR-08	Delete tax profile.	TC-12 TC-13	TC-12 Passed TC-13 Passed
FR-09	Restore tax profile.	TC-14 TC-15 TC-16	TC-14 Passed TC-15 Passed TC-16 Passed
FR-10	Auto calculation on UI form fields.	TC-18	TC-18 Passed

6.3 Testing Environment

Environment we setup for testing environment is called testing environment.

6.3.1 Hardware requirements

- Processor – Intel® Core™ i7
- CPU Frequency – 2.80GHz to 2.90GHz
- RAM – 16.00 GB
- ROM – 256.00 MB
- System Type – 64-bit OS, x64-based processor

6.3.2 Software requirements

- Operating System – Windows 11
- Browser – Google Chrome
- Testing Report – Microsoft Excel
- API Testing – Mocha, Chai, Supertest
- UI Testing – Cypress

6.4 Test Cases

Table 6.4: Test Cases

ID	Test Case	Expected result
TC-1	User login with valid username and password.	Will successfully logged in and redirected to dashboard.
TC-2	User login with invalid username or password.	Will show error message of invalid login.
TC-3	User logout.	User logged out and redirected to the login page.
TC-4	Create new tax profile with valid first name, last name, email, phone number.	A success message returned with the created tax profile data.
TC-5	Check main tax profiles list.	Will return an array of all clients.
TC-6	Create tax profile with empty email or phone number.	Will return an error message with the errors description.
TC-7	Update tax profile with tax information.	A success message with the updated data will return.
TC-8	Check tax profile updated with the given information.	The updated information will show on the tax profile view.
TC-9	Transfer tax profile to next year.	A success message will return
TC-10	Check main tax profiles list for the transferred tax profile.	The transferred profile will be found in the list.
TC-11	Attempt to transfer already transferred tax profile.	An error will return with ‘Profile already exist’ message
TC-12	Delete recycle bin tax profile.	A success message will show.
TC-13	Check recycle bin tax profiles.	The delete profile will show on the recycled profiles list.
TC-14	Restore recycled tax profiles	A success message will show.
TC-15	Check main tax profiles for the restored profile.	The restored profile will be in the main tax profiles list.
TC-16	Check delete profile exists in recycle bin or not	No tax profile will be found in the recycle bin.
TC-17	Generate PDF file	Will return a PDF document.
TC-18	Auto calculate on UI form fields.	Will auto generate the sum of the inputs on a specific field.

CHAPTER 7

PROJECT SUMMARY

7.1 Limitations

- The system doesn't have facility to register and create their own tax profile under and the system agency admin. Because the agency paid to develop this product, want to add the feature later.
- The MongoDB Atlas has a free limit of 512 MB and works slowly for simultaneous connections. I used that because paid MongoDB cost a bit high.
- The query hasn't optimized due to lack of time.
- The project will not work properly to generate the govt. tax PDF file on shared hosting because there is an operating system dependency named 'PDFtk' to populate the fillable PDF form.

7.2 Obstacles and Achievement

Obstacles:

- The tax document had almost 1600+ fields to store for each document so the schema definition for the data structure was extremely challenging and hard to do.
- Populating PDF form was need all the variables defined for the govt. PDF, that was difficult to note all the fields variables specially checkbox and radio inputs.
- Each year the govt. change something in the tax document PDF form, accommodating that is quite bit hard to do.

Achievement:

- The system is implemented based on the functional and non-functional requirements and finally all the functional features are working correctly. So far the system has been tested for real scenario, all the non-functional criterial was more than enough on testing.
- The system is able to populate the govt. issued PDF for successfully by the third party CLI software with Node.js runtime environment.
- Recycle bin feature is working perfectly after testing with random and same name, tax year contained data.

7.3 Future Work Plan

So far the system has been developed is working perfectly and all the test cases are passed. But still now there are some things that I should improve and some features will be so helpful to empower the existing system. I have a plan to add some new features on the next version and there may needs some security updates. The future plan that I have are listed below -

- I want to open the system for clients to register their tax profile which will go for agency admin or moderator review panel. If the accept that then the client will be able to manage or update his/her tax profile.
- I will create a contact us form for clients to contact with the agency.
- To populate and generate the fillable PDF file, I want to create a micro service so that system can be distributed for several agency and all of them will use a central PDF generating service.
- I will create short link system to share the PDF document for clients who is not resisted in this system. They will be able to view and download the PDF file as necessary.

7.4 GitHub Link: https://github.com/rjabdurrahman/tax-management-portal

7.5 Live Link: http://y-e.lu/myapp

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