

**SMART LEGAL SYSTEM FOR CASE MANAGEMENT AND SECURE
DOCUMENT HANDLING (ASLAW)**

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DOCUMENT HANDLING (ASLAW)

TENGKU MUHAMMAD AIMAN ALIFF BIN TENGKU AZEEZEE

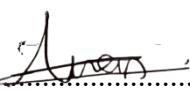
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DEDICATION

This thesis is dedicated to my father, who taught me that the best kind of knowledge to have been that which is learned for its own sake. It is also dedicated to my mother, who taught me that even the largest task can be accomplished if it is done one step at a time.

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ABSTRACT

The legal sector is evolving dramatically in the fast-paced digital age of today to increase the customer satisfaction, security and operational effectiveness in the legal services. Conventional legal services that depend on manual procedures, paper records and unprotected communication is exposed to errors, inefficiencies, and security threats. An example is Adnan Sharida & Associates, which still employed these practices which lowers client trust and reduces productivity. One system is proposed which is Smart Legal System for Case Management and Secure Document Handling (ASLAW) is proposed to overcome these problems. This system intends to create a safe internal system powered by Artificial Intelligence (AI) that is personalized to the firm needs. The solution will prioritize improving the case management process with centralized and encrypted document storage while AI-powered chatbot focus on the customer engagement and also producing document by automated document generation. By incorporating modern encryption technologies such as Advanced Encryption Standard (AES) and Rivest, Shamer Adleman (RSA), the system attempts to protect the sensitive legal information and assure compliance with legal data protection laws. Furthermore, the addition of AI-powered chatbot will give real-time support to both client and future client, providing initial consultation and case updates without the need for manual interaction. The project implementations focus on the three primary areas of Adnan Sharida & Associates legal services which are civil litigation, criminal defence and corporate affairs. The stakeholders in this project are lawyers, administrator, client and future client. The methodology that will be used in the development is hybrid model. In this methodology, it follows the waterfall structure and sequential phase while implement the flexibility and adaptability of agile methodology. This system will be developed using several frameworks such as React framework for reactive front-end and Laravel which is a backend framework. Firebase also will be used to store the information and act as a database for the system. The proposed system is expected to increase client communication with an AI-powered chatbot, document automation and improve case management efficiency. Strong encryption algorithm is used to guarantee safe document storing and adhere to legal data protection requirements. By considering the methods used, ASLAW will raise client happiness and trust in Adnan Sharida & Associates while increasing productivity and reducing human error.

ABSTRAK

Dalam era digital yang serba pantas hari ini, sektor perkhidmatan guaman sedang mengalami transformasi yang ketara untuk meningkatkan kepuasan pelanggan, keselamatan data dan keberkesanannya operasi. Kaedah tradisional yang masih diamalkan seperti penggunaan rekod kertas, proses manual dan komunikasi tidak selamat, seperti yang diamalkan oleh firma Adnan Sharida & Associates, mendedahkan firma kepada risiko kesilapan, ketidakkefisienan dan ancaman keselamatan yang serius. Bagi mengatasi isu ini, satu sistem telah dicadangkan iaitu Smart Legal System for Case Management and Secure Document Handling (ASLAW). ASLAW direka untuk menjadi sistem dalaman yang selamat dan diperibadikan, dikuasakan oleh teknologi Kecerdasan Buatan (AI). Sistem ini mengutamakan penambahbaikan proses pengurusan kes melalui penyimpanan dokumen secara berpusat dan disulitkan, serta penggunaan chatbot AI bagi meningkatkan penglibatan pelanggan dan menjana dokumen secara automatik. Ciri keselamatan dipertingkatkan dengan penggunaan algoritma penyulitan seperti Advanced Encryption Standard (AES) dan Rivest–Shamir–Adleman (RSA) untuk melindungi maklumat guaman yang sensitif dan memastikan pematuhan terhadap undang-undang perlindungan data. Projek ini memfokuskan kepada tiga bidang utama firma iaitu litigasi sivil, pembelaan jenayah dan hal ehwal korporat, dengan melibatkan pemegang taruh seperti peguam, pentadbir, pelanggan dan bakal pelanggan. Metodologi pembangunan yang digunakan adalah model hibrid, menggabungkan struktur fasa berurutan model Waterfall bersama fleksibiliti model Agile. Teknologi pembangunan yang digunakan termasuk rangka kerja React untuk antaramuka pengguna, Laravel untuk backend, dan Firebase sebagai pangkalan data. Secara keseluruhan, ASLAW dijangka mampu meningkatkan komunikasi dengan pelanggan melalui chatbot AI, mempercepat proses pengurusan kes dan automasi dokumen, serta menjamin keselamatan maklumat guaman melalui penyulitan yang kukuh. Dengan pendekatan ini, sistem ini diyakini dapat meningkatkan kepercayaan pelanggan, mengurangkan kesilapan manusia dan meningkatkan produktiviti di Adnan Sharida & Associates.

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LIST OF ABBREVIATIONS

ERD	-	Entity Relationship Diagram
AI	-	Artificial Intelligence
AES	-	Advanced Encryption Standard
RSA	-	Rivest, Shamer Adleman
API	-	Application Programming Interface
UML	-	Unified Modelling Language
UI	-	User Interface
UX	-	User Experience
PWA	-	Progressive Web Apps
CDN	-	Content Delivery Network
TCP	-	Transmission Control Protocol
HTTP	-	Hypertext Transfer Protocol
NLP	-	Natural Language Processing
MFA	-	Multi-Factor Authentication
TLS	-	Transport Layer Security
DES	-	Data Encryption Standard
RBAC	-	Role-Based Access Control
ML	-	Machine Learning
FAQ	-	Frequently Asked Questions
DOM	-	Document Object Model
BaaS	-	Backend as a Service
OTP	-	One-Time Password
CSS	-	Cascading Style Sheets
URL	-	Uniform Resource Locator
OCR	-	Optical Character Recognition

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CHAPTER 1

INTRODUCTION

1.1 Introduction

To maintain efficiency and fairness, legal systems have evolved over time proportionate to cultural shifts and technological advancements. Law firms has relied on considerable amounts of documentation and newly found technology in a long time to provide justice and efficiency to the customers when creating contracts for legal guidance. In this digital age, certain legal firms are progressively using artificial intelligence (AI) and encryption techniques to improve client contact, efficiency and security. By using conventional techniques such as manually handling case, creating contracts, and processing papers can occasionally be slow, and it has the possibility of human error. Using AI to assist in automating these responsibilities allows lawyers to concentrate on intricate legal issues while maintaining precision and uniformity in legal documents.

Additionally, Evangelia, et al. (2018) assert that “by transforming conventional inter-organizational systems into secure cloud-based solutions, we can improve operational flexibility, offer centralized document storage, and also minimize the risk of data breaches from unencrypted emails and messaging applications”. Organizational systems can now be accessed remotely rather than only in workplace using cloud-based solutions. In addition, with integrating cryptography for encryption, we can secure the documents inside the systems from unauthorized users. Aljaafari & Basant (2020) create a comparative analysis of Data Encryption Standard (DES), Advanced Encryption Standard (AES), and Rivest Shamir Adleman (RSA) encryption algorithms focusing on their structural design, strength for security, and the effectiveness in protecting sensitive data within law firms.

1.2 Problem Background

Adnan Sharida & Associates currently uses manual techniques for case management including emails, WhatsApp, and digital storage. This will lead to inefficiencies, delays and security threats. Files also are readily lost or accessed through unprotected routes in the absence of centralized and secure document storage which raises the data leakage probability. While for communications, clients rely on phone conversations or emails which causes delays in relaying information and do not have access to real-time updates. Additionally, lawyers spend a lot of time writing contracts and other legal documents manually, thus increases the possibility of human error and reduce the productivity levels. Inconsistent communication techniques also result in disparities in legal updates and notices.

Billing and quotations are handled manually by the legal department, causing delays, uneven formatting and pricing problems. In addition, finance department is keeping record and verify payment manually, increasing the possibility of fraud, misplacement and lack of real-time tracking. Payment by cheque also exacerbate these problems. Moreover, future clients have trouble in accessing legal services, fees calculation and initial consultations. Future clients need to physically visit the firm or website without a streamlined digital platform, frequently paying in advance. This could lead to frustration as the consultations are time-consuming or expensive.

1.3 Project Aim

The aim of this project is to develop a secure, AI-powered internal system for Adnan Sharida & Associates to enhance efficiency, reduce human error, and improve client-lawyer interaction through encrypted case management, automated document generation, and intelligent customer support.

1.4 Project Objectives

The objectives of the project are:

- (a) To identify the requirement for a case management system with document handling.
- (b) To design and develop a system that enables interaction between lawyers and clients, including an artificial intelligence chatbot to assist potential clients and track case progress.
- (c) To test the functionality of the document handling as per user requirement and AI chatbots

1.5 Project Scope

The scopes of the project are:

- (a) This project will focus on the three cases of the lawyer firm from Adnan Sharida & Associates, such as civil litigation, criminal defences, and corporate.
- (b) Users involved in this application include administrative staff, lawyers, clients, and future clients/ customers.
- (c) This project will focus on generating documents based on the information, chatbots, and management of cases.
- (d) No real payments will be made in this project.

1.6 Project Importance

The proposed system is designed to help Adnan Sharida & Associates firm to resolve issues with efficiencies and human error during the process of law. Both

lawyers and clients can benefit from case management, which they can enjoy seamless and secure interaction with encryption standards. Lawyers can focus on more important things because the system provides document generation, which can decrease time to create a document. Future clients can explore legal services and receive the estimated quotation and billing for the legal services and only approach the firm if they are confident with the firm. By combining this digital transformation, the system can modernize the firm's operation and ensure that the firm's compliance with data security regulations and the industry's best practices, ultimately enhancing client trust and satisfaction also making the operation more efficient, secure and focused on the client,

1.7 Report Organization

This chapter briefly introduce the project and the issues faced by Adnan Sharida & Associates during the case processing. The project aim, objectives and scopes also identified in this chapter. Chapter 2 will describe about the user requirements for the proposed system, comparison with the existing system about the functionalities and technologies of both systems. Chapter 3 will outline the methodology applicable to the proposed system. In addition, each phase of the project will be highlighted in this chapter. Furthermore, this chapter briefly describe the software and hardware with the technology and tools used for the proposed system development process. Chapter 4 will include the requirement analysis, project design, database design and user interface design. Finally, Chapter 5 will wrap up the report with the project achievement and the suggestion for project implementation during Projek Sarjana Muda 2 (PSM2).

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter presents a literature review of the existing system or procedures and outlines the user requirements that need to be addressed to resolve the issues faced by Adnan Sharida & Associates. In addition, a case study is conducted to examine the current system, the problems it encounters, and its organizational background.

The study of comparable existing systems is then conducted, and the benefits and drawbacks of similar existing systems and the suggested system are compared. To ensure that the functionalities of the suggested system satisfy the user requirements, the literature review on the technologies used is discussed in the final section of this chapter.

2.2 Case Study

As is known, most law firms still use traditional methods in handling case documentation, communication and creating reports, letters and many things. This method has led to inefficiencies, security vulnerabilities, human errors and delays in handling cases. As stated by Evangelia, et al. (2018), “by transforming conventional inter-organizational systems into secure cloud-based solutions, we can improve operational flexibility, offer centralized document storage, and also minimize the risk of data breaches from unencrypted emails and messaging applications”. By transforming the traditional method into digitalization, its open the organization systems to a new world, which they can access the system remotely at their home and mobile instead of only at their workstation at office. In addition, by integrating cryptographic algorithms, we can secure the documents inside our system from

unauthorized users. Hamza and Kumar (2020) create a comparative analysis of Data Encryption Standard (DES), Advanced Encryption Standard (AES), and Rivest Shamir Adleman (RSA) encryption algorithms focusing on their structural design, strength for security, and the effectiveness in protecting sensitive data within law firms. Thus, law firms need to improve the workflow of handling cases inside a more centralized system that can ease the burden of the users. This chapter highlights the case study, current system analysis, existing system that is used in other law firms or related industry, and the technology used for this project.

Adnan Sharida & Associates currently faces the problems stated above which the firms have faced operational inefficiencies and security risks because the firms rely on manual processes and unsecure communication channels. Communication channels such as WhatsApp and emails, also physically and locally storing files had led to delays in contracts and reports, lost documents and difficulty on tracking the previous cases. Without centralized documents storage system, it increases the risk of data leaks and denies the clients for real-time access to case progress, forcing them to rely on phone calls or other communication channels for updates.

Lawyers and administrative staff also need to manually generate reports, contracts and invoices, which wastes time and increases the possibility for errors and inconsistent in writing the documents and client communication. The quotation and billing processes also undergo the same process which led to pricing errors and delays. The finance staff use manual verification and physical cheque storage which can risk fraud, lost records and lack of real-time tracking. Furthermore, potential clients have no efficient way to explore legal services, estimate costs or receive preliminary guidance without visiting the firms.

2.2.1 Company Organization Structure

Company organization structure is a diagram that show the relationship hierarchy inside a company. All firms need to have a company structure to ensure that the firm is balanced and stable to face any difficulties.

Adnan Sharida & Associates is a law firm that operates at Bangi, Selangor. This firm was established in 2013. The firm has grown steadily and implemented a well-defined organizational hierarchy to support the operations. Figure 2.2-1 illustrates the firm's organizational structure.

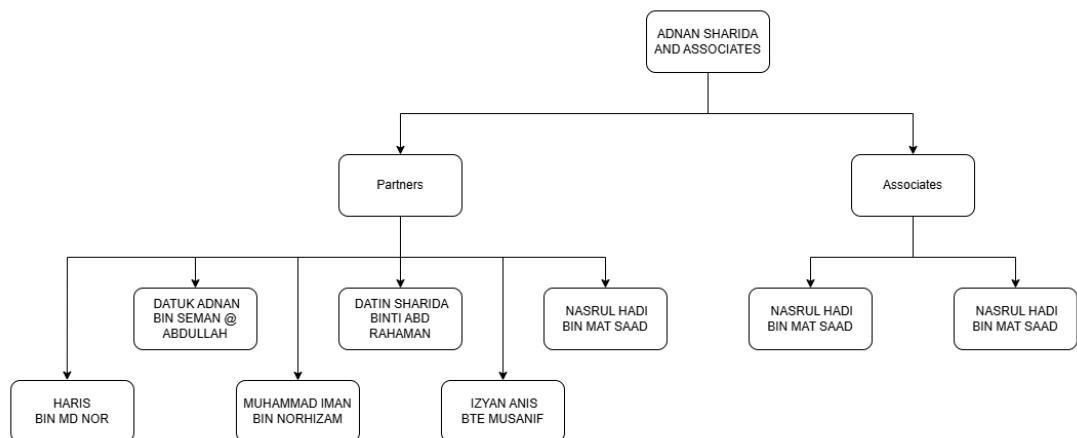


Figure 2.2-1 Organization chart of Adnan Sharida & Associates

Partners are the important members of Adnan Sharida & Associates firm. Typically, partners are the co-owners of the firms or the decision-maker which have a stake in the firm's success. Among the responsibilities of the partners in this firm are strategic leadership, client relations, supervision and mentoring and business development. For example, Datuk Adnan is the one who established Adnan Sharida & Associates firms and the one in charge of leading the firms. The others partner such as Datin Sharida handles the conveyancing department relation, Muhammad Iman which in charges of drafting agreements. The other partners oversee supervision and mentoring the associates, and all the partners can provide legal services in their areas of services.

Another position in the firm is associates. Associates are qualified lawyers who are employed by the firm but do not have ownership rights. They sometimes work under the supervision of their partners. They are responsible for legal research and writing, client consultations, litigation and court representation, and skill development. This structure allows Adnan Sharida & Associates firm to maintain a well-balanced

and efficient workflow. Each responsibility is clearly defined and upheld by a high standard of legal service expected from a professional law firm.

2.2.2 Manual Operation

This project will focus on the three main cases of law, which are Civil Litigation, Criminal Defence, and Corporate Affairs. These three main cases share the same general initial procedure whereby clients need to come to the firm and get the initial consultation from the lawyers.

(a) Civil Litigation

Civil Litigation are the legal services where legal process in which two or more parties become involved in a non-criminal legal dispute and seek a resolution through the court system. From Figure 2.2-2, customer will find lawyer to get the initial consultation for the case. Then, the lawyer will offer the firms services to the customers through quotation. If the customer accepts, they will proceed with the initial fee before proceeding to the first phase of the case, which is the creation of Letter of Demand created by the lawyer and send to the defendant. If defendants accept, the case will stop there, and clients need to pay the lawyer the full payment for the first phase. If not, the case will progress to the second and third phase which are the creation of Writ of Summon and Statement of Claims whereby both clients and defendants need to go to the court to settle the case. Each phase will have payment, and clients need to settle the payments before the case completed.

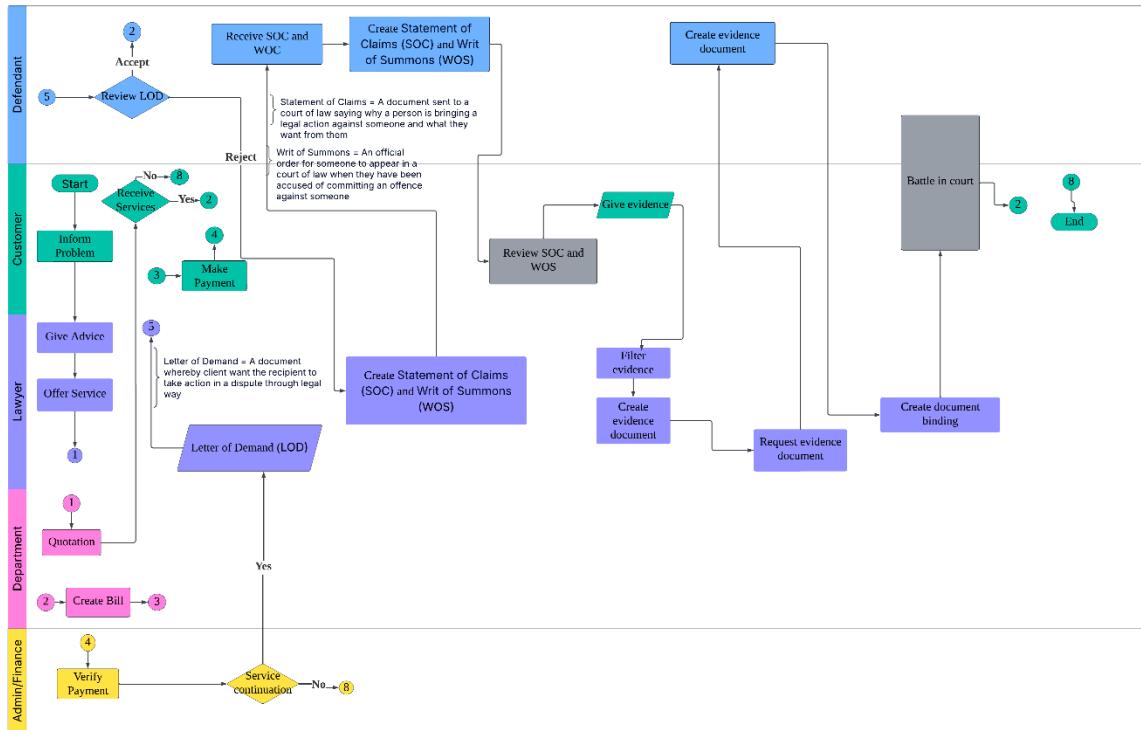


Figure 2.2-2 Current swim lane diagram for Civil Litigation

(b) Criminal Defence

Criminal Defence refers to the legal strategies and actions taken to defend an individual (the defendant) who has been accused of committing a crime. From Figure 2.2-3, customer will find the lawyer for advice in the case. Like civil litigation, after advice, lawyer will hand the quotation, and if customer want to proceed, we will look at the client's status. If the clients are inside the lockout, lawyer will talk with the police to ease the lockout or release the clients. If the clients are charged with prosecution, lawyer need to create several documents to negotiate with the prosecutors. If prosecutor accepts the negotiation, the case will stop there, if not, the case will extend to the court. After each status, client need to make payment to the firms.

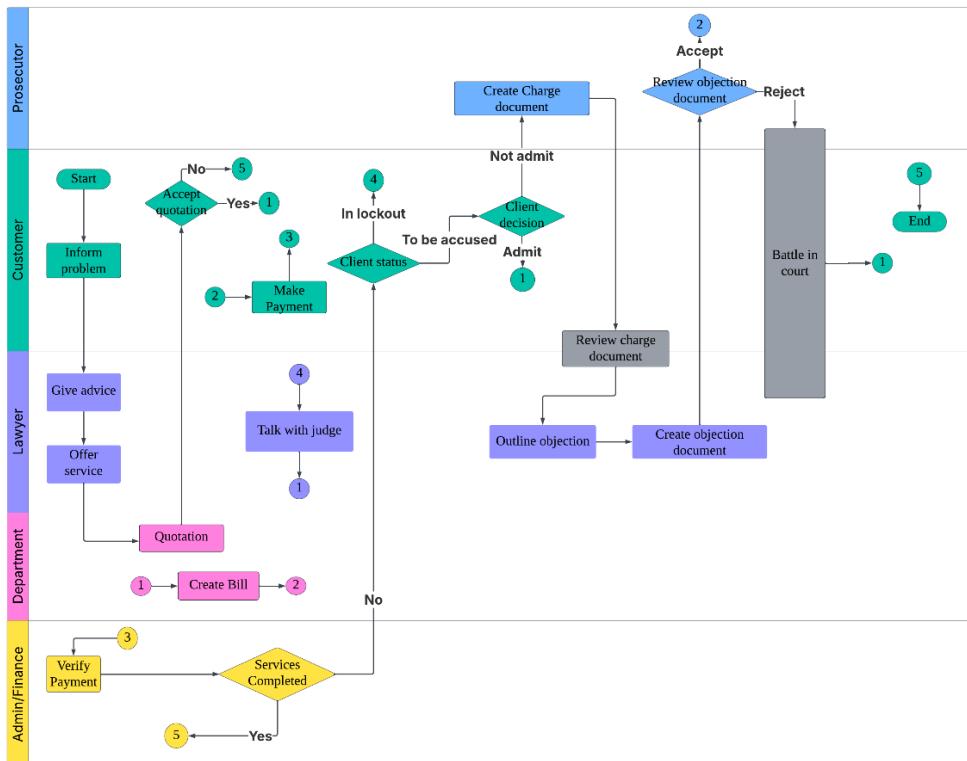


Figure 2.2-3 Current swim lane diagram for Criminal Defence

(c) Corporate Affairs

Corporate Affairs refers to the broad set of activities related to managing a company's external and internal relationships, reputation, compliance, and communication. Based on Figure 2.2-4, clients will come to the firms to get advice from the lawyer about the case. After advice, lawyers will offer the services to the client. If the clients want to proceed with the service, the quotation will come, and client need to pay the initial services. After that, lawyer will request the information of the company that the client want to buy, sell or merge. Lawyer then will conduct and create due diligence report and send the report to the client. Client then needs to pay the lawyers.

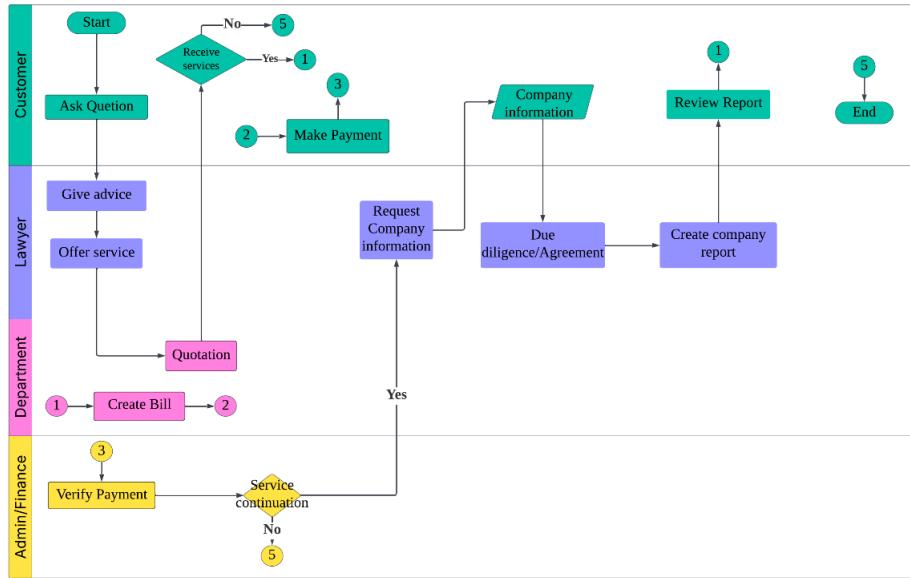


Figure 2.2-4 Current swim lane diagram for Corporate Affairs

2.3 Current System Analysis

Adnan Sharida & Associates rely on manual techniques such as emails, messaging applications, and both physical and digital storage for managing client cases. This results in inefficiencies, delays and security threats. Without a centralized and secure system, lawful materials are transmitted across unsecured routes, increasing the risk of data breaches. Communication also slowed down as client cannot view the case progress in real time and relying on phone calls or emails for update. In addition, lawyers spend a lot of time writing legal documents and reports by hand, thus increasing the possibility of error. The inconsistency in communication strategies could lead to delayed or ambiguous legal notices.

Also, the legal and financial departments undergo similar challenges, with quotations, invoices and payment records handled manually. With the mistakes in pricing, irregular formatting and billing delays can bring a significant chance in lost or fraudulent records especially when cheques are used in payment. Accessing legal services is also difficult for the potential clients as there are no effective ways to look over services, fees calculation, and preliminary consultations without going to the office. The requirement for in-person consultations and upfront payments may cause discontent and discourage future clients from doing business with the firm.

2.4 Comparison between Existing Systems

There are a few existing applications in the market that integrating the features. In this case study, the analysis of the existing applications that provide similar system functions and features are conducted to examine their characteristics, strengths, and weaknesses. It is to obtain ideas on the characteristics and functionality to be adapted to the proposed application. For AI chatbots, the existing system that implements this is Lenovo website. For encrypted document handling, there is Cryptee which provide cloud-based encrypted document handling.

2.4.1 Lenovo

Lenovo is a global technology company that established in Beijing, China and Morrisville, North Carolina, USA. This company was founded in 1984 as Legend, then rebranded to Lenovo in 2003. Lenovo is one of the world's leading manufacturers of personal workstations, and others digital devices. In recent years, Lenovo constantly ranks among top personal workstations or computer vendors globally and growing in areas such as cloud infrastructure, AI and edge computing (About Lenovo, n.d.).

Lenovo has implemented AI chatbot systems to enhance customer service, streamline support operations and provide 24 hours assistance to users. These chatbots are implemented in Lenovo's website, support portals and digital communication channels, offering instant responses to common questions such as product troubleshooting, warranty look over, driver downloader and tracking the order. By integrating Natural Language Processing (NLP), these chatbots can understand and respond to queries in human manners thus improving the user's experience. Lenovo also has document generation for the receipt and quotation after users purchase the product. This document will be auto generated in the back end by receiving the information of the product from the database.

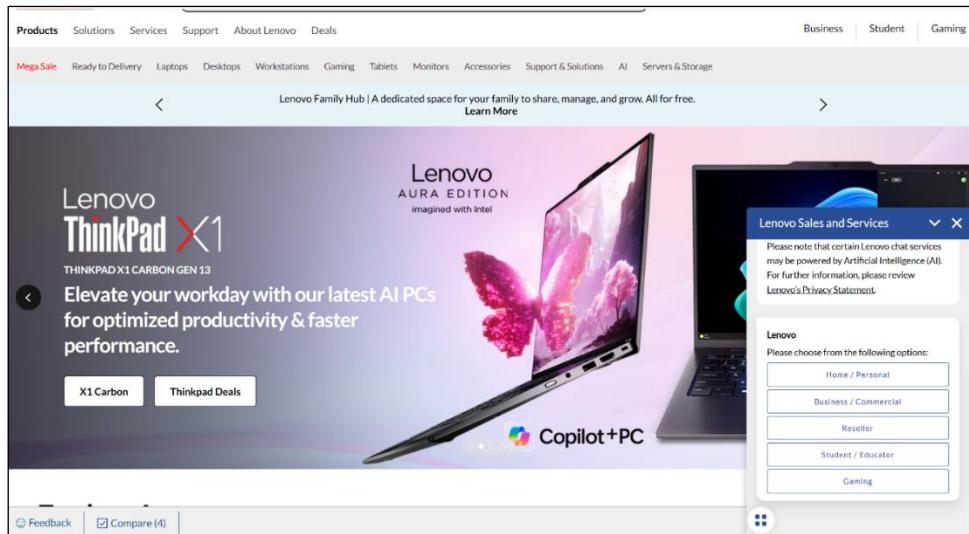


Figure 2.4-1 AI chatbots on the Lenovo website (Lenovo, n.d.)

Product	Description	Qty	Unit Price	SST Tax Value	SST Rate	Amount
21M5000EMY	ThinkPad E16 AMD G2 Serial Number: PF53D3HN PO number: SO Number: G900223085 L505056552-13-Sep-2024 Expeditors- Expeditor:	1	4,265.10	0.00	0.00%	4,265.10
4X30M56888	ThinkPad Essential Wireless Mo Serial Number: PO number: SO Number: G900223085 L505056552-13-Sep-2024 Expeditors- Expeditor:	1	1.00	0.00	0.00%	1.00
4X40K09936	ThinkPad 15.6-inch Basic Backpack Serial Number: PO number: SO Number: G900223085 L505056552-13-Sep-2024 Expeditors- Expeditor:	1	1.00	0.00	0.00%	1.00
62CAUAR1WW	ThinkVision M15 15.6" FHD Mobile Monitor Serial Number: V30CPHTF PO number:	1	644.45	0.00	0.00%	644.45
This invoice is issued as a result of the Lenovo CUSTOMER AGREEMENT or the equivalent agreement between us.						
Payment by Wire: Lenovo Technology Sdn Bhd, Citibank Berhad, Level 45, Menara Citibank, 165 Jalan Ampang, 50450 Kuala Lumpur Account No.: 0-115766-007 (MYR), CITIMYKL, (swiftcode).						
Payment by Check/Post To: Attention: RESO, Lenovo Technology Sdn Bhd (685098-H), Unit 301A and 301B, Level 3, Tower B Uptown 5 No.5 Jalan SS 21/39, Damansara Uptown, 47400 Petaling Jaya, Selangor, Malaysia						
E. & O.E. "The Lenovo logo is a trademark of Lenovo Group Limited or one of its subsidiaries" ORIGINAL COPY - FOR YOUR RECORDS						
PAGE NO 1 OF 2						
This is a computer generated output and requires no signature						

Figure 2.4-2 Lenovo invoices (Lenovo, n.d.)

2.4.2 Cryptee

Cryptee is a privacy-focused, encrypted productivity platform that offers secure cloud-based services such as document management and photo storage. This company is based on Estonia and designed to secure the user's privacy by implementing end-to-end encryption thus making sure that only users have access to their data, even Cryptee has no access to it (Cryptee, n.d.). File manager also supports

a variety of files including PDFs, Docx, and images. The user experience also is great as users can create folders, rename files and move items between directories. The design is also clean and minimalist to make navigation intuitive while keeping all data private.

This platform offers alternative to mainstream services such as Google Photos, Google docs and others. However, Cryptee does not compromise on security or anonymity. It runs entirely in the browser or any others internet such as Google Chrome and Firefox and available across devices including web, Android also has progressive app support for IOS (Cryptee, n.d.). Figure 2.4-3 shows the Cryptee page. Others are shown in Appendix A.

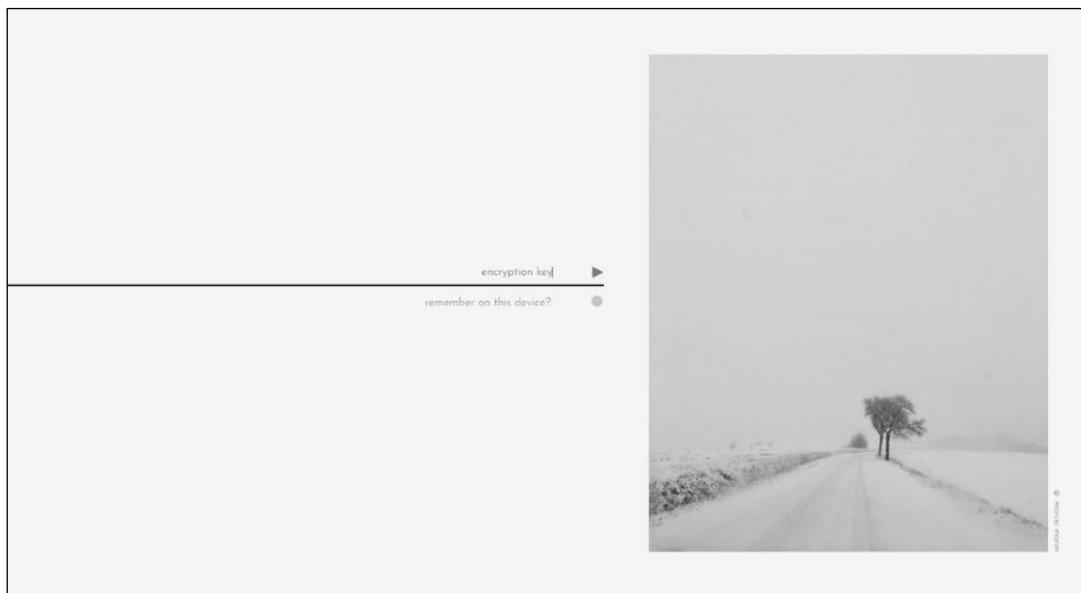


Figure 2.4-3 Cryptee encryption key (Cryptee, n.d.)

2.4.3 Clio

Clio is a cloud-based legal practice management platform that was created just for law firms. This company officially registered as Themis Solutions Inc, which founded in 2008 at Vancouver, British Columbia, Canada (Legal Practice Management Software, n.d.). It provides many features for law firms such as billing, online payments, task management and case management. The most standout features in the system are document generation.

These features allow law firms to automate the creation of frequently used documents, thus improving efficiency and accuracy. Several key features of document generation are templates with merge field whose user can upload templates that include merge fields such as client name and case number. Others feature include in-browser actions and integration with third-party tools and collaboration and sharing. These key components make Clio document generation accessible to both lawyers and clients, and they can monitor the progress of documents. However, these templates need to be edited or created manually which means that we need to insert the template manually, if we want to edit the document, we need to download it, edit it, then upload it again. Figure 2.4-4 shows the Clio page. Others are shown in Appendix A.

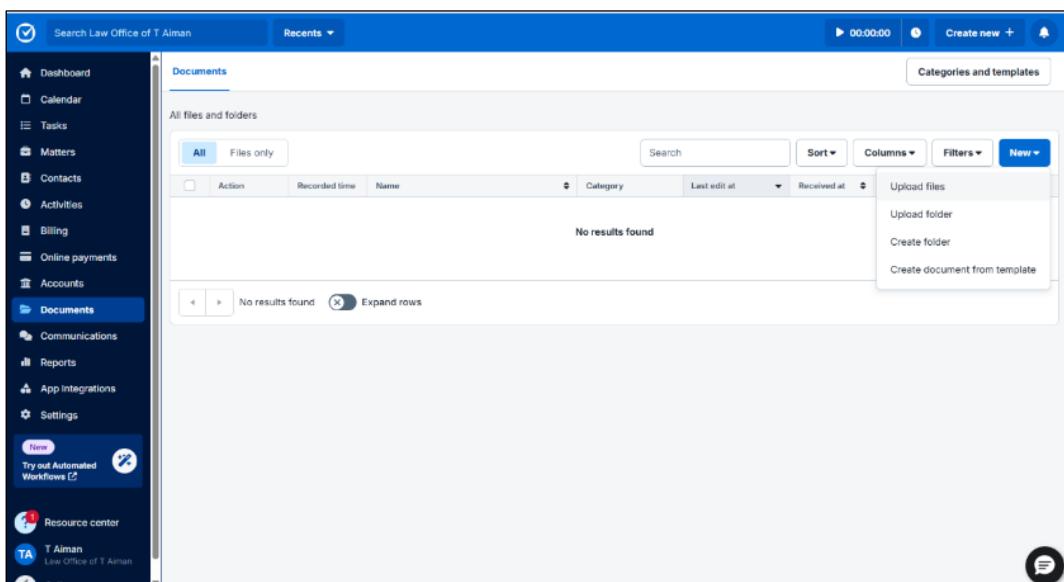


Figure 2.4-4 Clio adding new templates (Legal Practice Management Software, n.d.)

These systems implement features that this system proposed. With variety of the features offers, it can broaden the proposed system functionalities to cater with Adnan Sharida & Associates as enterprise-level document management security and collaboration to privacy-focused, encrypted personal storage. By integrating features and functionalities from these platforms, the proposed system can offer enhance versatility and appealing to the users. The comparison of these systems features is shown in the Table 2.4-1.

Table 2.4-1 Comparison between existing systems

Feature/Function	Lenovo	Clio	Cryptee
AI Chatbots	/		
Encrypted Document			/
Document Generator	/	/	
Case Management		/	
User Authentication	/	/	/
Access Control	/		

2.5 Proposed System

The proposed system, Smart Legal System for Case Management and Secure Document Handling is intended to facilitate effective communication between lawyers, administrators, and clients. A lawyer-client portal for monitoring the status of the case, managing document, create report and automate email notifications are some of the main features. To save manual labour and guarantee consistency, an AI chatbot is also implemented in to help future clients understand the problems and services provided by Adnan Sharida & Associates. Both clients and lawyers can easily access the case and documents with case management portal which also facilitates formal contacts. To secure the confidential documents from unauthorised access, security is given top priority through the usage of Role-Based Access Control (RBAC), Multi-Factor Authentication and encryption algorithm with Advanced Encryption Standard (AES) and Rivest, Shamer Adleman (RSA).

The second features are the document template generation for reports in Corporate Affairs, and Letter of Demand, quotations, and billing. This can reduce the burden of each user because this system can create the document in a short time and can reduce human errors in each creation. Also, each time a payment is made, the administrator will store the cheque in the system to make sure that if there are missing cheque payments during the progress of the case, the administrator can refer to this system to the latest cheque payment stored by the administrator.

In addition, AI chatbots for future customers can be added to the system for potential customers to search and ask for simple counselling instead of messaging the lawyers or coming to the firm. The addition of Natural Processing Language (NLP) and Machine Learning (ML), Adnan Sharida & Associates can manage consultations, contract and interact with clients efficiently. AI chatbots can increase the knowledge for potential clients and what they need to provide for the case while reducing the amount of time for meeting as both lawyers and clients can focus on more important parts of the case.

This feature also can provide the quotation for services, exploring the firm's legal services and how to contact the dedicated lawyer for their case. This feature can increase the engagement on the system as well as educate client to their case. The burden of legal staff can also be lessened as we will be automating frequently asked questions (FAQ). Research has shown that using AI chatbots can significantly increase the accessibility of law firms with quick responses while guiding clients in legal inquiries stated by (Armour & Sako, 2020). The workflow from Figure 2.5-1 to 2.5-3 shows the proposed system for ASLAW for Civil Litigation, Criminal Defence and Corporate Affairs.

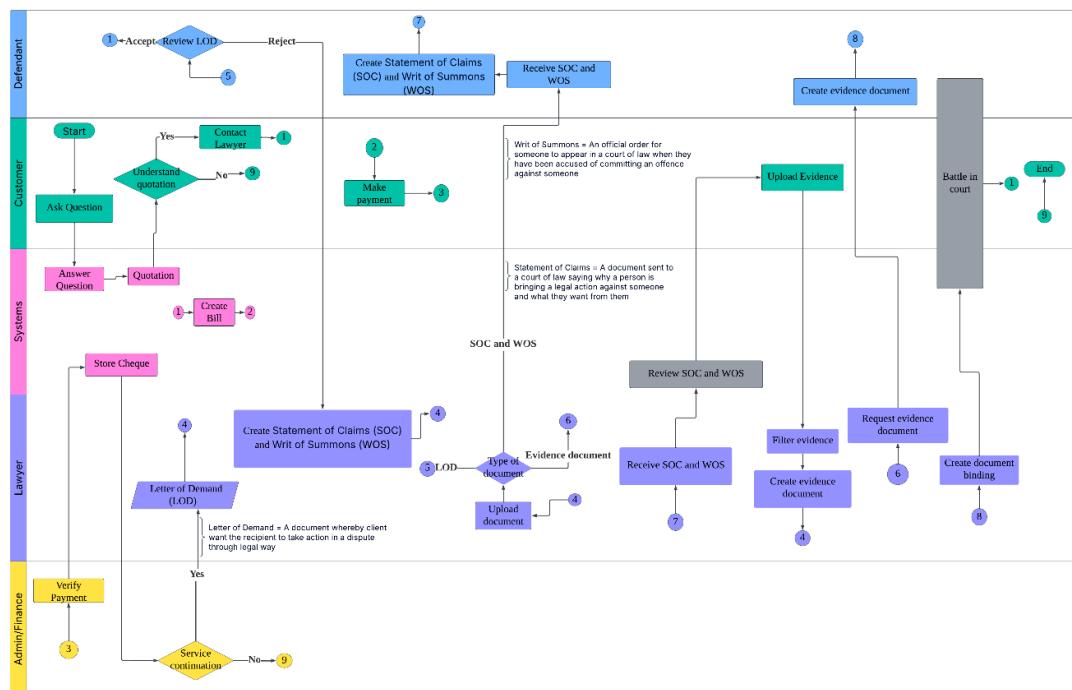


Figure 2.5-1 Proposed workflow for Civil Litigation

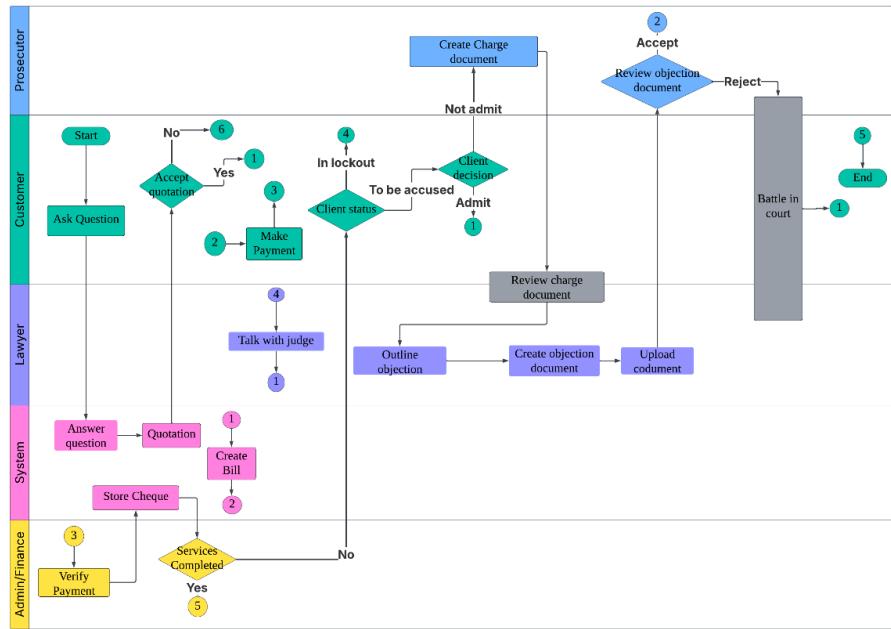


Figure 2.5-2 Proposed workflow for Criminal Defence

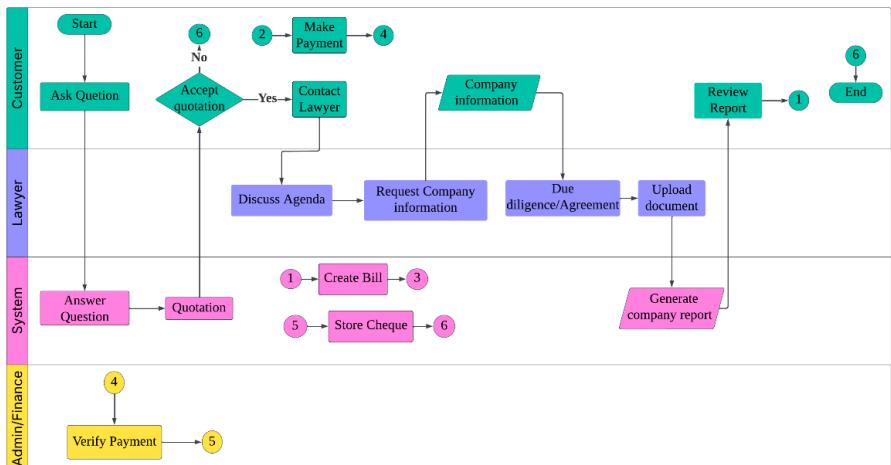


Figure 2.5-3 Proposed workflow for Corporate Affairs

2.6 Literature Review of Technology Used

The technologies that will be used in this project are a client-server architecture, Laravel, React, and Firebase. We also be using encryption algorithms such as Advanced Encryption Standard (AES-256) and Rivest, Shamer Adleman (RSA-4096) to store the documents.

2.6.1 Client-Server Architecture

In this project, client-server architecture is implemented for communication between the server and the client. This architecture enables centralized control to our system whereby server will manage the document and any other files, process it and utilize access control. While clients act as an interface for users such as lawyers, clients and administrative tasks to interact with our system.

This architecture can ensure efficient resource management, enhanced scalability and easier maintenance for the system. Furthermore, this architecture allows secure data transferring and supports redundant access by multiple clients, hence it is very suitable for real-time system. From paper written by (Nyabuto & Mony, 2024), this architecture facilitates rapid deployment and communication between different services, leveraging both client and server hardware resources to efficiently service request.

2.6.2 Laravel

Laravel is one of the PHP web applications that are powerful to help users create a web-based system. In our case, we will use Laravel to create a system for Adnan Sharida & Associates. This framework has simple and intuitive syntax; thus, users can develop the system easily and efficiently. This project will leverage comprehensive features in this framework such as built-in authentication, RESTful routing and streamline legal workflows. The system is designed to handle key operations such as case tracking, secure document uploading and document generating (Laravel, n.d.).

Furthermore, one of Laravel's strengths is the smoothness of integration between API and third-party services makes this framework suitable for development with Artificial Intelligent (AI) platforms. This integration can provide intelligent, context-aware response, thus allowing the system to continuously grow through

machine learning. In addition, developers can customize the chatbots and make it suitable for Adnan Sharida & Associates workflow and terminology.

2.6.3 React

React is one of the frameworks that can be used to develop a front-end which is user interface for the system. It is used to create a dynamic, responsive and user-friendly interface. With its component-based architecture, React allows developers to build a reusable user interface (React, n.d.). In addition, it enables real-time updates and seamless user interaction. This is very important and crucial for modules such as chatbots, document management and case filtering. By making use of state management and virtual Document Object Model (DOM), it ensures that changes in interface take place smoothly without requiring the page to be full reloads, thus improving the user experience.

2.6.4 Firebase

Firebase is a comprehensive Backend-as-a-Service (BaaS) platform, which offers developers a variety of tools to build and scale modern web-based and mobile-based systems. Moroney (2017) highlights Firebase Hosting as a key feature tailored for web applications, particularly Progressive Web Apps (PWAs). This platform makes it easier to host static online assets such as HTML, CSS and JavaScript thanks to its globally distributed content delivery network (CDN), secure HTTPS connections and smooth deployment using Firebase CLI. Thus, allowing developers to focus on integrating front-end with Firebase while it handles performance, security and availability. To complement this, Pankaj Chougale (2021) has discussed the broader usage of Firebase to develop web-based including real-time database integration, cloud storage and user authentication. Thus, enable dynamic and real-time web-based system without the need to maintain backend infrastructure. Firebase's mixture of static and dynamic services boosts them to be a comprehensive platform for web-based system.

However, both sources point to the challenges in Firebase such as restricted querying in real time databases and potential vendor lock-in, thus need the developer's consideration during developing and designing scalable web-based system. Its simplicity of integration, cross-platform support and extensive web-centric features appeal to the developers for fast and dependable web-based system deployment.

2.6.5 Advanced Encryption Standard and Rivest, Shamer Adleman

AES-256 is frequently used to manage documents inside the system to ensure that data is safe during transferring and storing. This ensures that even if data is intercepted or accessed unlawfully, the contents remain unreadable without the correct decryption key. According to Barnwal, et al. (2024), this algorithm can give strong defences against both classic and quantum attacks, thus a great choice to protect important documents. Therefore, it can prevent the attacker from accessing the original file content from the system.

With the addition of RSA-4096 as digital signature to this system for the purpose of hiding AES encryption key, can further increase the security of the algorithm from the attacker stated by Barnwal, at al. (2024). It is an asymmetric encryption algorithm with 4096-bit key length employed to encrypt the AES key itself. Additionally, RSA can be used to verify the integrity and authenticity of the documents by providing digital signatures. Hence, the combination of AES-256 and RSA-4096 offers a strong encryption while maintaining efficiency for the system.

2.6.6 User Authentication and Verification

The system will ensure that only authorized users can access sensitive data. For example, administrative staff and lawyers. User authentication is the first in line for the defense. By comparing the passwords provided during authentication, the system will verify with the passwords provided at the early stage, same as username. From Shah (2019), “Password are stored using strong hashing algorithms to prevent unauthorized access even if the database is compromised”.

After successful authentication, the system will verify the user and assign the roles of the users in the system to determine the resources and function users can interact. This is called user verification and access control. One of the verification methods is verification by email or phone message with Multi-Factor Authentication (MFA) such as one-time password (OTP) before users can access. After the registration of users in the system, users need to change their passwords before they can log in so that the password is only known by the users. “MFA, such as sending one time password (OTP) via email or SMS, adds an extra security layer by verifying the user’s identity before granting access” stated by Editos (2021).

2.6.7 Access control

Role-Based Access Control (RBAC) will be implemented to assign the roles of each user so that the system can authorize the user’s accessibility inside the system. Moreover, RBAC will help Adnan Sharida & Associates to prevent privilege escalation by strictly limiting the user’s access to the functionalities that are specifically for the role. This can improve workflow efficiency other than improving system security by eliminating unnecessary access. From Singh (2021), “This mechanism prevents privilege escalation and reduces the risk of internal threats by strictly limiting each user’s access to only the functionalities necessary for their role”.

In addition, RBAC can improve organizational workflow efficiency by providing clear boundaries between each actor, thus simplifies the user management and auditing processes. Moreover, with centralized access policies, it can support compliance with regulatory standards and facilitate security monitoring complex systems. “This structured approach to access control improves scalability and maintainability for enterprise-level applications other than increases system security”, said by Singh (2021).

2.6.8 Push Technology

Push technology is a critical component of modern web-based and mobile-based systems for providing real-time updates and improving user engagement. This technology enables servers to deliver updates to the client as changes occur in a flash. According to Lim (2021), WebSockets provide a full-duplex communication channel over a single, long-lived TCP connection thus enable real-time interactions such as messaging, live tracking and collaborations. This approach reduces the overhead in the server and decreases the response time making it highly efficient for any systems where immediate data synchronization is crucial.

Moreover, it is widely used in notification systems which will alert the users about any events, reminders or changes in the system. The use of WebSocket-based push technology significantly enhances user experience in web-based systems especially for updates in case management, and other related modules. Their research has shown that push technology such as WebSockets results in faster message delivery and high responsiveness compared to traditional polling or HTTP request-based approaches. In conclusion, push technology has become a critical facilitator for creating seamless, responsive and real-time user experience across platform.

2.6.9 AI Chatbot Technology

The incorporation of AI has transformed chatbot technology, increasing its capabilities throughout industry notably. Modern chatbot, powered by AI, NLP and machine learning can grasp human intent, manage multi-turn conversations and provide personalized interaction. As stated by Adamopoulou (2020), “conversational agents are now increasingly used in complex domains such as education, healthcare and customer support due to the ability to simulate human dialogue and respond contextually”.

Furthermore, AI-driven advancements have led to the development of more sophisticated chatbot frameworks that support sentiment analysis, multilingual support

and adaptive learning from user interactions. These advancements improve customer satisfaction while helping business run more efficiently by automating high-volume communication chores. Constant progress in chatbot technology reflects the importance of intelligent and responsive chatbot development and responsive system so that it can fulfill the modern use.

2.6.10 Representational State Transfer (REST) API

RESTful API is one of the primary models in developing scalable, loosely linked web-based systems. Its architectural principle emphasizes stateless, uniform interface, and resource-based interactions with standard HTTP methods such as GET, POST, PUT, DELETE simplifies system design and enhances interoperability, said by Arcuri (2019). REST API has become commonly used in both enterprise-level systems and the usage of public APIs because of its user-friendly and compatible with the current web architecture. The RESTful approach enables developers to build robust APIs that are easy to consume and maintain due to their predictable structure and use of standard web technologies.

One of the advantages of RESTful APIs is its scalability and the simplified integration. However, there are also several challenges in terms of security, performance and managing intricate processes. Arcuri (2019) emphasize the importance of versioning, proper resource modeling, and adherence to best practices to prevent common pitfalls in RESTful API design. Furthermore, it does not impose rigid requirements, thus resulting in inconsistency during implementation while offering freedom. In conclusion, this technology will remain as one of the fundamental components of contemporary software development despite the challenges especially in cloud-native and microservices.

2.6.10.1 Firebase Auth API

Firebase Authentication is a versatile and secure service to manage user authentication flows while protecting web-based systems. The chapter from Tyagi (2024) explores the usage of Firebase in frontend web, emphasizing on how this API strengthens authentication and authorization process to bolster defenses against common web-based attacks. From this study, it shows that the integration with this API can improve user experience and security by enforcing robust access control, reducing data breaches and support interactive user interface while mitigating vulnerabilities that are common in the customize system.

In addition, Luthfan Hadi Pramono ((n.d.) evaluates Firebase Auth in backend-centric scenarios. It demonstrates how Firebase Auth works smoothly with cloud services to authenticate users in enterprise applications. By using token-based, it will provide stateless, scalable security for REST APIs.

2.6.10.2 OpenSSL API

OpenSSL is a foundational component in securing web applications because of its robust support for Transport Layer Security (TLS) and cryptographic APIs. However, there are notable challenges of implementation. Tomita (2022) highlight a critical security weakness affecting OpenSSL's usage in web servers by demonstrating how side-channel attacks like RAMBleed can extract RSA private key material during TLS handshake. The attack reveals how sensitive data will stay in memory in predictable pattern by taking advantage of memory access patterns in web-based system's OpenSSL-based APIs. This underscores the necessity of safe key handling and cautious memory management in web-based systems that use OpenSSL.

Additionally, Chatterjee (2018) examines the usability of OpenSSL EVP API, which is the commonly used API in web-based applications for encryption, decryption and hashing operations. Despite the versatility and wide range of its functionality, EVP

API's verbose and low-level C code might give problems to the developer while increasing the possibility of misconfiguration in security-critical web-based system.

2.6.10.3 Filestack API

Filestack is a powerful web-based file handling service designed to streamline uploads, transformations and delivery. Developers can integrate rich file management workflows into their online apps without having to start from scratch. filestack (n.d.) claims that its File Picker UI provides smooth connections with configurable JavaScript SDKs, including drag-and-drop, multi-cloud sourcing such as Google Drive and real-time device capture. Once the file has been uploaded, it will be assigned to CDN URLs for instantaneous, transformation-ready delivery. This enables seamless resizing, OCR, virus scanning and transcoding through unified REST APIs (filestack, n.d.).

Moreover, filestack (n.d.) has claimed that their user testimonials have reinforce the value such as “we just drop in JavaScript file and run it Super-fast”, while e-commerce sites note a 27% reduction in load time and praise the clean dialog UI and underlying API design. These opinions are supported by independent reviews, which continuously emphasize capabilities like multi-file support, intelligent transformations, and ease of integration as well as API dependability. However, some of these reviews raise concerns regarding cost at scale. Thus, filestack’s web-centric platform increases the speed of development workflows by providing a rich, safe, and scalable file pipeline with integrated content intelligence that extends from user interface to worldwide delivery supported by CDNs. Future analyses might compare this to serverless or open-source upload alternatives and examine its cons-benefit tradeoffs.

2.6.11 API Security

API has transformed into one of the critical components in developing web-based systems because of its smooth integration and communication across multiple

systems. However, there are serious security flaws that can be exploited by attackers. As articulated by Madden (2020), API security involves protecting APIs from threats such as injection attacks, broken authentication and data exposure. To prevent this, safe API architecture is required for the implementation of robust authentication and authorization, data encryption during transit and server input validation.

Furthermore, Ronghua Sun (2022) said that the significance of adopting security frameworks and standards such as OAuth 2.0 and OpenID Connect is to mitigate risks associated with access control. They also emphasize the importance of constant monitoring and analysis to recognize and respond to any suspicious activity immediately. Given the improvement in API technology, API security is a dynamic task that requires both proactive and reactive methods to protect sensitive data and preserve confidence in web-based systems.

2.7 Chapter Summary

This chapter concluded with discussing the background of the case study and the workflow Smart Legal System for Case Management and Secure Document Handling (ASLAW) now operates. The characteristics and operations of comparable current systems were also covered in this chapter. The development of the Smart Legal System for Case Management and Secure Document Handling (ASLAW) can incorporate the corresponding features and functions based on a comparison of the benefits and drawbacks of comparable systems. Finally, this chapter covers the ideas and technology that will be used in creating the new system.

CHAPTER 3

SYSTEM DEVELOPMENT METHODOLOGY

3.1 Introduction

This chapter will cover the entire system development process for this project. Every system that needs to be developed requires a structured and methodical approach to ensure each functional and non-functional requirement are met efficiently. The need to select an appropriate methodology will affect the success of the project, as it acts as a guide for the planning, analysis, design, implementation and maintenance phase. From Gbaranwi (2021), “these methodologies help in streamlining activities, ensure that the deadline is met and maintaining quality of the system. The selection of an appropriate methodology should align with the expectation and operations of the stakeholder and the users by considering the factors such as project scope, complexity, and the requirements”. Each methodology has the strengths and weakness. Thus, by understanding the suitability of each methodology is crucial for the successful system development.

3.2 Methodology Choice and Justification

Smart Legal System for Case Management and Secure Document Handling (ASLAW) will follow the hybrid approach which is the combination of Waterfall and Agile model. This hybrid methodologies enable the project to benefit from the structural and sequential process from the waterfall model while implementing the flexibility and adaptability of agile process. In legal services business, compliance, documentation and stability of the system are critical in maintaining business, thus Waterfall model is suitable for this as it ensures that each phase such as requirement analysis, system design and security planning is complete before developers proceed to the next phase. Agile methods on the other hand will be implemented during the

development and testing phase which allow iterative enhancement, having feedback from stakeholders and early detection of potential errors.

This approach will make ASLAW maintain the rigor necessary for legal services while remaining responsive to changing client and regulatory needs. For example, core modules such as case management, document generation and automation email or messages can be developed in structural way while user interfaces and security tools can be refined through agile sprint. This combination will reduce risk, enhance collaboration and increase the quality and usability of the system. According to Gbaranwi (2021), hybrid models are increasingly used in modern system development as this model has both control and adaptability, thus making the models suitable for environments that need both precision and continuous improvement.

3.3 Phases of the Chosen Methodology

Smart Legal System for Case Management and Secure Document Handling (ASLAW) process involves nine stages which includes planning, requirements, design, development, integration, testing, deployment, maintenance and risk analysis as stated by What is a Hybrid Work Model? (2024). In the next section, the process will be discussed how each step will be accomplished.

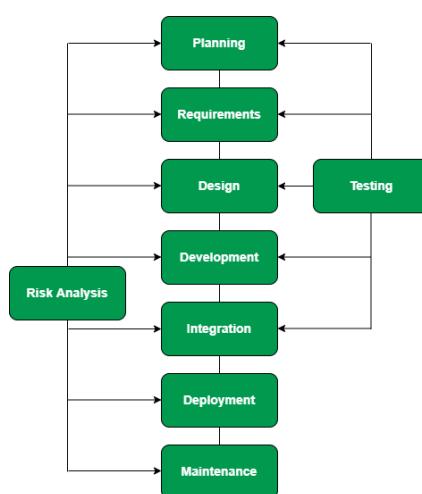


Figure 3.3-1 Phases of hybrid model (What is a Hybrid Work Model?, 2024)

3.3.1 Planning Phase

As developers are executing a successful work, it needs a correct planning process which is planning phase which are the foundation of the project. In this stage, goals and objectives are clearly defined during proposal planning. This methodology incorporates agile flexibility with iterative adjustments to the project plan with stakeholders' input while will maintaining a comprehensive project roadmap aligns with the system requirements. From study by Reddy PCS (2021), a hybrid model using Scrum methodology enhance this phase effectively by combining the adaptability of agile frameworks with the strategic oversight of traditional planning.

In this phase, developers will identify the stakeholders such as lawyer, lawyer department, and end users. After successfully identified, developer then describes the project scope, workflow and feasibilities study are performed. Furthermore, risk factors, technical feasibility and resource availability are also evaluated. This allows the developers to identify potential issues and prepare for contingency plans.

3.3.2 Requirement Phase

In this phase, detailed user needs are identified through interviews with the stakeholders and observation of legal workflow. Both functional requirements and non-functional requirements are documented. According to Ahmad (2017) the hybrid approach to requirements elicitation combines variation of techniques such as interviews, questionnaires and document analysis. By integrating various elicitation methods, it is crucial for obtaining both functional and non-functional requirements effectively.

The primary requirement gathering in ASLAW is interviewing with the stakeholder. The interview session has taken place for two months from February to March iteratively. During the interview session, we have identified several issues that can be addressed for the system. Adnan Sharida & Associates rely on manual processes for communication such as email and WhatsApp while managing client cases

physically or stored in local digital storage. This leads to delays, lost files, security risks and inconsistent communication.

While clients cannot track the progress of the case in real-time and rely on manual communications, lawyers need to spend time manually preparing documents and billing thus increasing the risk of errors. The finance team also needs to manually verify and records payment that is made with checks that can lead to lost records and fraud risks. Finally, potential clients face difficulties accessing the legal services with cost and initial guidance without visiting the firm. Figure 3.3-2 shows the picture of developers with the stakeholder while the interview session is noted at Appendix B.



Figure 3.3-2 Interview session with Iman, a lawyer at Adnan Sharida & Associates

3.3.3 Design Phase

In the design phase, the requirements will be translated into a system technical blueprint. This includes database schema, application architecture, user interface

mockups and system workflows. With consideration to security and privacy, which are important features for handling legal documents, are addressed at this stage. From Reddy PCS (2021), “The design phase in hybrid model with Scrum methodology involves developing and producing all process tools and features based on specific requirements. This includes operating systems, presentation layers, network management functions and situational improvement functions”.

For Adnan Sharida & Associates, prototypes and mockups will be created to allow users to visualize and comment on it. These sessions will improve and refine the system’s usability immediately as it interacts with the real users. In design phase, developers will use Figma to visualize the big design for overall system before converting it to code. The design then will be checked by the stakeholder to ensure that it meets the stakeholder taste. Thus, it will result in a balance between comprehensive documentation with user-centered interface design.

3.3.4 Development Phase

By using agile methodology, development of the system will be carried out by iterative cycle using agile sprints. By collaborating with the stakeholders throughout each sprint cycle, it can enable rapid adjustments and early delivery of usable features. While the waterfall structure can ensure that each core system components such as backend framework and security are implemented consistently without deviation from the design plan. From Your Guide to the Agile Software Development Life Cycle, (2024), the emphasis on stakeholder engagement and continuous improvement inherent in this methodology to ensure that the final product is both functional and aligned with the user expectations.

During this phase, developers will develop each module into a real system and need feedback from the stakeholder by testing it so that the requirements are met before the integration phase and developers can find any bugs or improve the module. The module of this system includes case management; document encryption and generation will be developed incrementally. This phase involves both front-end designs with back-end framework with database.

3.3.5 Integration Phase

In the integration phase, all the successfully developed system modules will be unified to become a bigger system. With agile methodology, it can support continuous integration where each module's code will be merged regularly, and the conflicts will be resolved quickly while waterfall methodology will provide a structured approach to planning and executing the final integration thus reducing the risk of system instability. According to Miroslav Krupa (2024), "Integration phase in a hybrid methodology combines traditional predictive methods with agile adaptive approaches. This allows for structural planning and flexibility, facilitating the integration of various system components while accommodating changes and uncertainties."

In this phase, developers will integrate the modules into one big system that is functional. For example, integrate the case handling module with report handling module. The compatibility and interoperability of these modules will be tested to ensure seamless operation. This is an important phase during the development process because in order for the fully functional website to be deployed, complete integration must be done to the modules so that each of them is integrated smoothly and efficiently.

3.3.6 Testing Phase

To verify the functionality, performance and security requirements of ASLAW, the testing phase is an important phase to find the issues within the system. By conducting unit testing and user acceptance testing, we can identify the bugs and usability issues. The priority will be given to legal data and security testing which are the sensitive part of the system. Agile methodology allows continuous testing during each sprint cycle which means that the issues are caught early and will be fixed inside the sprint cycle. Moreover, the waterfall aspect ensures comprehensive documentation of all the test cases and results. As Reddy PCS (2021) said, "By conducting testing early, developers can identify defects promptly, validate system components against requirements and ensure that each module correctly with the larger system architecture".

Each development phase will undergo testing phase to make sure that each module that is to be published is functioning properly. After integration phase, testing phase is crucial so that the ASLAW is functioning great before we deploy it in the real world. The development phase can take up to 5 weeks to complete.

3.3.7 Deployment Phase

Once the system passes the testing phase, the local system will be deployed to the production environment. This means that the system will be published to the real world such as configuring servers, migrating any existing data and setting up user roles and permissions. To ensure smooth operation to ASLAW, user training will be held for all the staff and the user manual will be published for future clients. This phase followed the structured rollout plan of Waterfall methodology.

The deployment of pilot testing or phase rollout can be applied with a small user group to allow feedback gathering and to find any issues and bug before a full-scale implementation be made. ASLAW will be deployed into real-world hosting using website hosting to complete integration to test with the real data traffic and any real-world issues. With this, it can ensure a successful and controlled launch of ASLAW.

3.3.8 Maintenance Phase

Every system needs maintenance once occasionally, after deployment. Maintenance is crucial in improving the security and efficiency of the system as technology is always evolving. Maintenance such as monitoring, updating and improving the system based on real-world usage. During the maintenance phase, developers will fix bugs, develop new features, and optimize the system performance. Ongoing support from developers is crucial for user satisfaction and long-term reliability.

Using agile methodology, continuous support enhancement is done through short development cycle based on user feedback. While waterfall methodology

complements the agile method, it provides structured version control which will be done in certain amounts of time with patch update and formal update procedures. With this, the system will remain effective, secure and aligned with evolving legal practices. This phase will not be conducted for Projek Sarjana Muda.

3.3.9 Risk Analysis Phase

Finally, risk analysis phase which are the phase where the risks related to legal compliance, data security, case delays and technical limitations are identified and assessed. A mitigation strategy will be planned to handle high-priority risks. For example, unauthorized access, data breaches and system downtimes. It offers a balanced framework for risk management by leveraging the predictability of plan-driven methods and responsiveness of agile techniques. This phase will not be conducted for the Projek Sarjana Muda.

3.3.10 PSM Gantt Chart

Projek Sarjana Muda is divided into two parts, Projek Sarjana Muda 1 (PSM1) and Projek Sarjana Muda 2 (PSM2). In Projek Sarjana Muda 1, developers will create documentation needed for the project and in Projek Sarjana Muda 2, developers will develop full system with the functionalities. Each project needs a Gantt chart to make sure that it preserves the structure and organization of the development process under the hybrid development model as indicated in Figure 3.1. In accordance with the waterfall structured planning and agile iterative cycles, these charts illustrate the project timeline, including important phases, tasks, deadlines and milestone.

In addition to flexible, sprint-based progress tracking for development and testing, it enables the developers to plan the timetables for fundamental stages such as planning and design. By effective planning, progress tracking and on-time deliverable, the project will be made possible. Moreover, with recording changing priorities over the course of the project, stakeholders can utilize the charts to support agile decision making while tracking the project's progress and modifying resources accordingly. The Gantt Chart for PSM1 and PSM2 are shown in Appendix C.

3.4 Technology Used Description

Table 3.4-1 displays the applications and technologies used for documentation and software development. By researching the most used applications, the technology that will be used in this project have been chosen.

Table 3.4-1 Technology Used Description

Technology/Software	Description
Operating System	
Visual Studio Code	Code editor for the project
Firebase	NoSQL (non-relational) document-oriented database used for storing large volumes of data in a flexible, scalable, and high-performance manner.
Laravel	Server-side scripting language
React	To add interactivity to web pages and creates animations
GitHub	Version control
Bootstrap	CSS framework
Operating System	
Draw.io	To design and draw related diagrams
Figma	To design website interfaces of proposed system
Documentation	
Microsoft Word	To prepare documents for reporting purpose
Microsoft PowerPoint	Preparing presentation slides
Storage	
Microsoft OneDrive	Store document and file

3.5 System Requirement Analysis

To make sure that the system will function well in the long term, research has been carried out where the requirements of both hardware and software will be displayed in the table.

Table 3.5-1 Hardware and Software Requirements Table

Component	Description	Developer
Software		
Operating System	Windows: At least Windows 7 Mac OS: Version 10.13 and above	Minimum Windows 10
Web browser	Google Chrome, Mozilla Firefox, Safari, Microsoft Edge	
Hardware		
Processor	At least 1.60 GHz	At least 1.80 GHz
RAM	At least 4GB Ram or above	At least 8GB Ram or above
Storage	Minimum of 64GB solid-state drive (SSD) or hard disk drive (HDD)	Minimum of 128GB solid-state drive (SSD) or hard disk drive (HDD)
I/O Devices	Keyboard, mouse	
Network interface card	Any internal or external network cards	

3.6 Chapter Summary

This chapter provides an overview of the hybrid strategy used for the system development process, including each step and how it was carried out. Additionally, Appendix C contains two Gantt charts that enable efficient scheduling and show the project timeframe. The chapter also provides an overview of the technologies used during the project and an analysis of the system requirements.

CHAPTER 4

REQUIREMENT ANALYSIS AND DESIGN

4.1 Introduction

Chapter 4 present the requirement analysis and design of ASLAW. The result of this analysis is depicted using Unified Modelling Language (UML). Different diagrams are employed to depict the system's structure and functionality such as sequence diagrams, class diagrams, entity relationship diagrams (ERD), activity diagrams and data dictionaries. This chapter also addresses the system architecture and user interface design, thus providing insights into the overall structure of the system and visual arrangement for user engagement. The thorough analysis and design stage establishes a robust basis for the following development and implementation phases of ASLAW.

4.2 Requirement Analysis

Requirement analysis is conducted to identify, present and clarify various diagrams such as use case diagram, activity diagram and class diagram to improve users understanding on the system.

4.2.1 Use Case Diagram

Use case diagram for Smart Legal System for Case Management and Secure Document Handling (ASLAW) is shown in Figure 4.2-1. The diagram provides a visual depiction of how the actors and system interactions. With an emphasis on roles and responsibilities, the diagram shows the precise activities that the actors inside the system capable of performing. Using a diagram, the system may show the functions and relationships between various parts of the system, giving a clear view of how the system worked the user interaction with it. The system's actors and the roles are

elaborate in Table 4.2-1 while Table 4.2-2 shows a description on one of the use case . The remaining use case description will be placed at Appendix D.



Figure 4.2-1 ASLAW Use Case Diagram

Table 4.2-1 Actors involved and their role description

Actors	Actor's Description
Lawyer	Registered legal professional who uses the system to manage cases and interact with clients. Lawyers can update case details; archive completed cases and generate documents from the system and ensure that client receives the paperwork.
Client	End user who utilizes the platform to access legal services. Clients interact with chatbot to receive answers to frequently asked questions or initial and simple legal guidance. Clients can request and download legal documents, view the status of the ongoing cases. They need to register, logging in into the system then reset their password before accessing the system
Administrator	High-level user who oversees the whole system and workflow. They are responsible for assigning a case to the designated lawyer, uploading the paid cheque to the system. Administrators need to maintain the integrity and security of the platform. They have access to archived cases, access to view the history of cheque transactions and serve as the primary roles of platform activity

Table 4.2-2 Use case description of UC02 Case Handling

Name of Use Case	Case Handling
Use Case ID	UC02
Brief Description	This use case encompasses the complete lifecycle management of legal cases within the system, including assign, update, archive, and notify and view.
Actor	Administrator, Lawyer, Client
Pre-condition	User must be authenticated and have appropriate role permissions
Post-condition	Case information is properly managed and maintained in the system
Sub Use case	<ul style="list-style-type: none"> - UC02-01 Assign Case - UC02-02 Update Case - UC02-03 Notify Case - UC02-04 Archive Case - UC02-05 View Case

Table 4.2-3 Use case description of UC02-01 Assign Case

Name of Use Case	Assign Case
Use Case ID	UC02-01
Brief Description	Assigns a new or unassigned case to a lawyer for handling.
Actor	Administrator
Pre-condition	<ul style="list-style-type: none"> - Case exists and is not yet assigned.
Post-condition	Case is now associated with a specific lawyer.
Primary Flow	<ul style="list-style-type: none"> - Admin views unassigned cases. - Selects a case. - Chooses a lawyer to assign. - Confirms assignment. - System updates the case record.
Use Case Name	<ul style="list-style-type: none"> - Assign Case

4.2.2 Sequence Diagram

Sequence diagram illustrates the interaction among actor, interface, controller and entity arranged in order. It records the details of flow carried out by each use case. Figure 4.2-2 displays the sequence diagram for the UC02-01 Assign Page. Other sequence diagrams can be found on Appendix E.

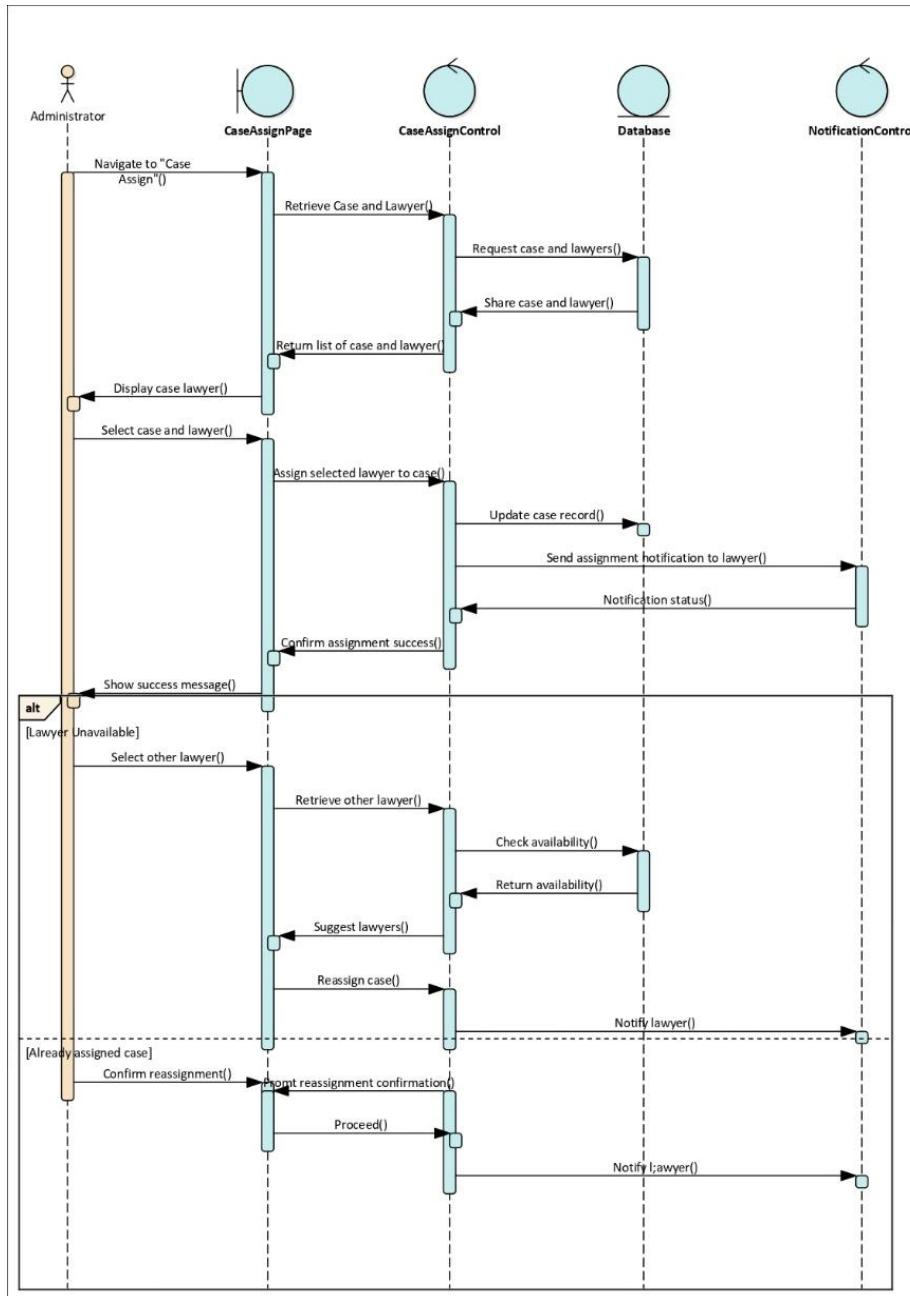


Figure 4.2-2 Sequence Diagram of UC02-01 Assign Case

4.2.3 Activity Diagram

Activity diagram for the overall system can be found on Chapter 2 Figure 2.5-

1. This chapter will present the activity diagram specifically for the use case of the system. Figure 4.2-3 shows an activity diagram for UC02-01 Assign Case. The full collection of activity diagrams for other functionalities can be found in Appendix F.

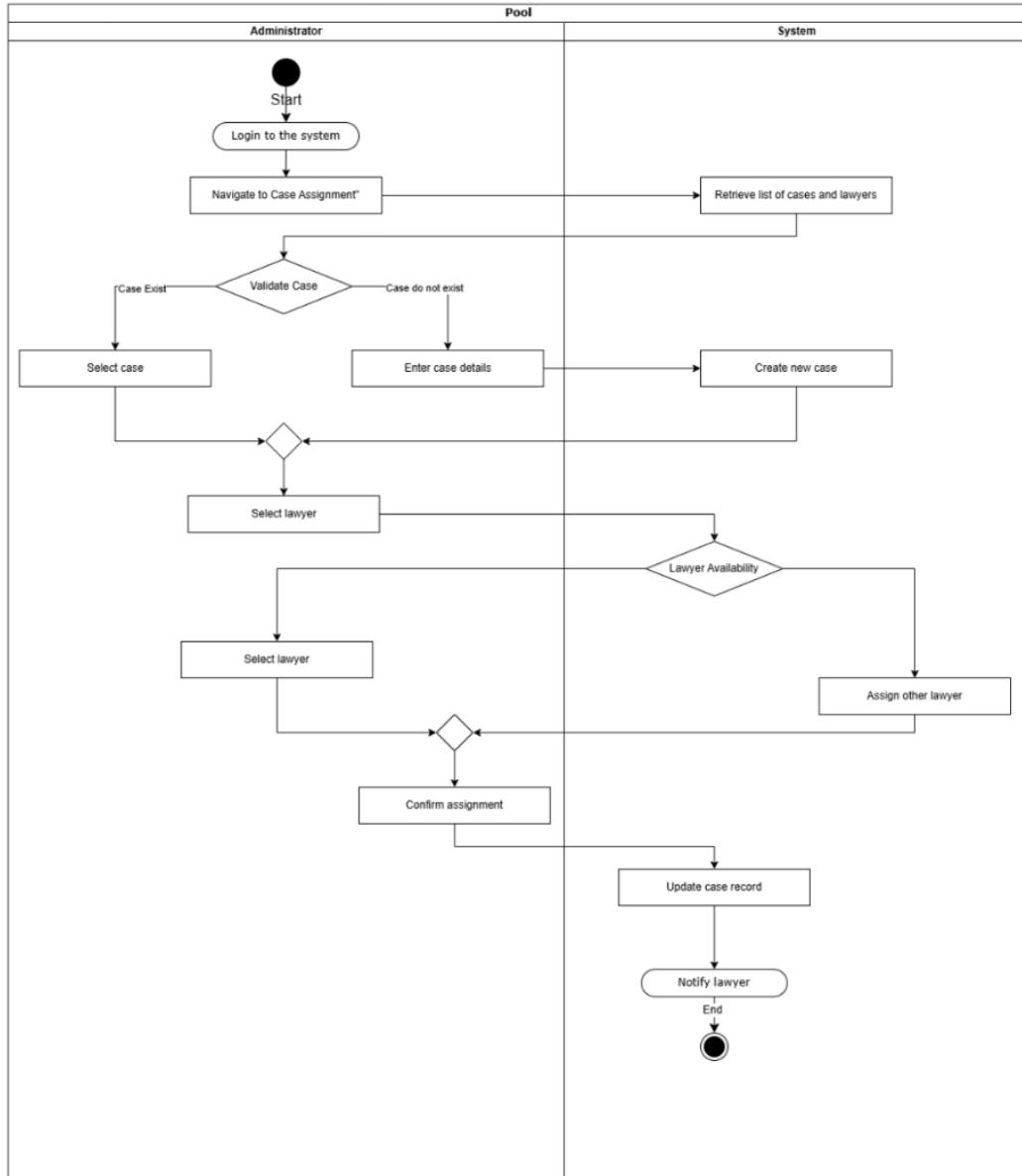


Figure 4.2-3 UC02-01 Assign Case Activity Diagram

4.3 Project Design

Figures 4.3-1 and 4.3-2 show the class diagram and system architecture diagram used to visualize the project design. A web-based system, ASLAW, will be developed with client-server architecture utilization. Users can interact with the system through a device such as a laptop and mobile phone to request services from the server. Moreover, the system will be using password hashing to securely store the password. In addition, the server will handle any requests made by the client from the database. Lastly, the server will send email notifications from the system to the client.

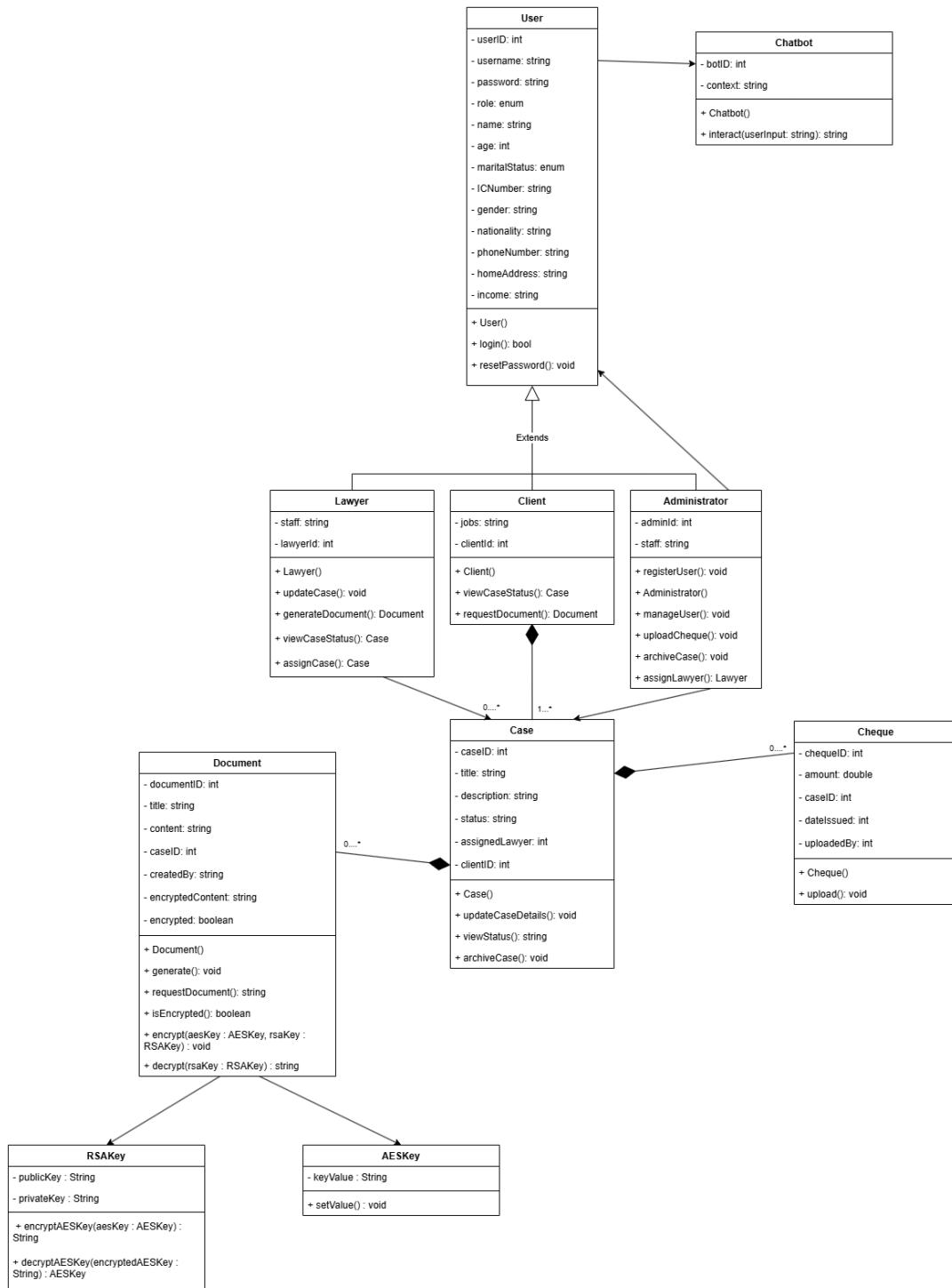


Figure 4.3-1 Class Diagram of ASLAW

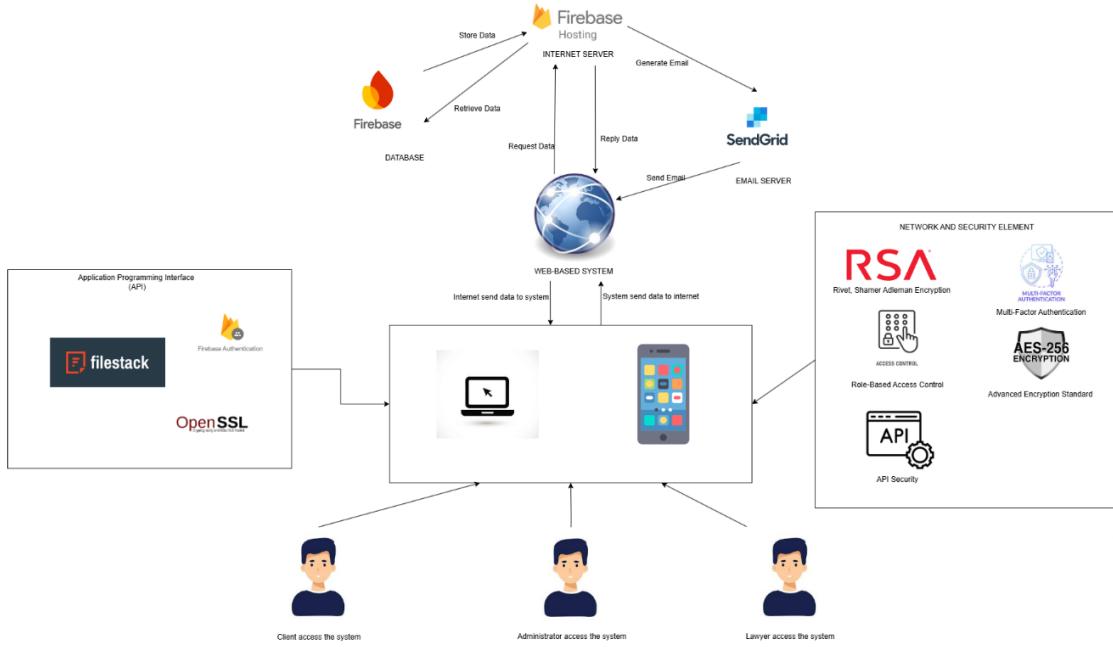


Figure 4.3-2 Architecture Diagram of ASLAW

4.4 Database Design

Database structure is a crucial aspect of the system for system's peak performance guarantee. It is used to ensure data consistency, removes redundancy in data and execute database queries effectively. Database design establishes several structures of the system used to plan, store and manage system data. A frequent method in database design is the Entity Relationship Diagram (ERD).

4.4.1 Entity Relationship Diagram

By using Entity Relationship Diagram (ERD), a frequently employed technique for this purpose for accuracy of data. Figure 4.4-1 below show the connections between entities.

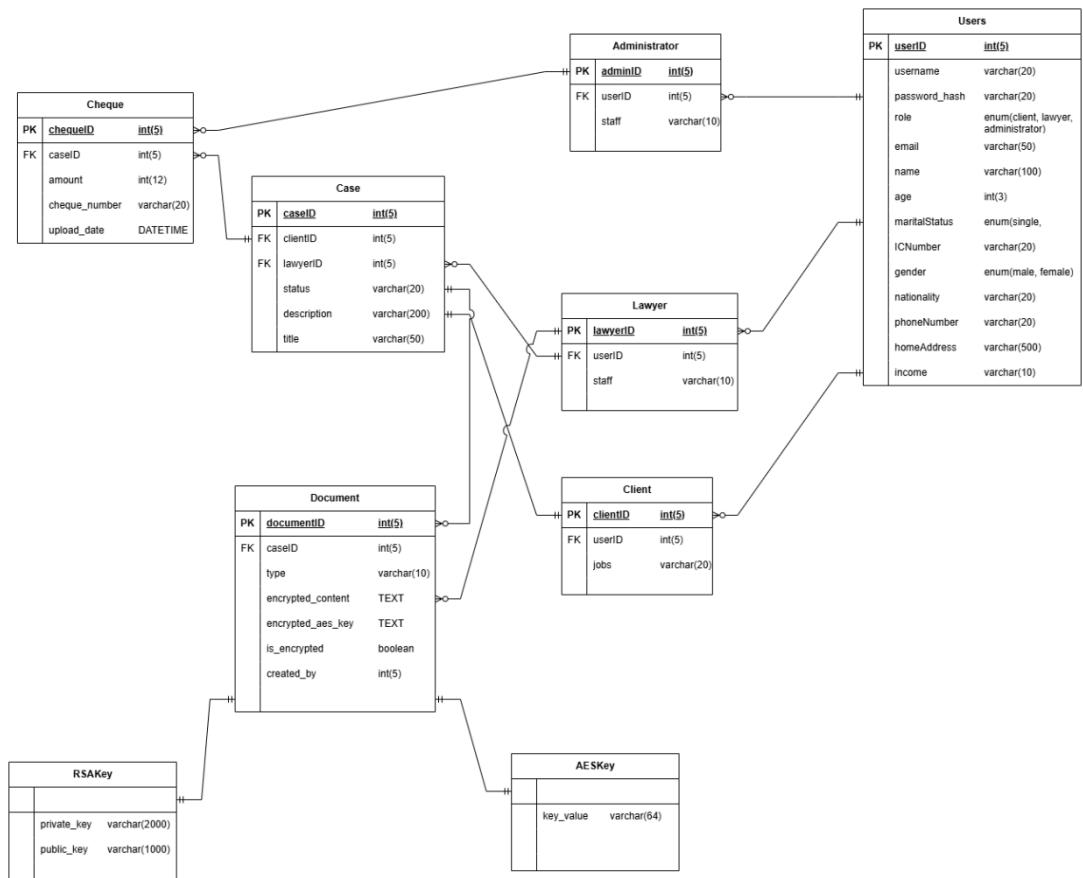


Figure 4.4-1 ERD of ASLAW

4.4.2 Data Description

The data description stores brief information of each entity. Table 4.4-1 shows the data description of ASLAW.

Table 4.4-1 Data description of each entity

Entity Name	Description
User	Store user's personal information
Client	Store client's information
Lawyer	Store lawyer's information
Administrator	Store administrator's information
Case	Store information about a case
Document	Store information of a document
Cheque	Store information of a scanned cheque

4.4.3 Data Dictionary

Data dictionary consists of several lists of attribute names, data types and descriptions for the data of each entity to be used in the project. The data dictionary for User entity is displayed in Table 4.4-2. Other data dictionaries will be placed in Appendix G.

Table 4.4-2 Data dictionary of User Entity

Attribute's Name	Type	Attribute's Description
userID	INT	User's unique ID
username	VARCHAR	Username of the user
password_hash	VARCHAR	Hashed password
role	ENUM	Defines the roles within the system to distinguish access levels and responsibilities
email	VARCHAR	The email of user
name	VARCHAR	Full name of the user
age	INT	Age of the user
maritalStatus	ENUM	Defines the marital status of the user
ICNumber	VARCHAR	Identification number of the user
gender	ENUM	Gender of the user
nationality	VARCHAR	Nationality of the user
phoneNumber	VARCHAR	Phone number of the user
homeAddress	VARCHAR	Home address of the user
Income	VARCHAR	Income per month of the user

4.5 Interface Design

Interface design is also an important aspect for user satisfaction. Figure 4.5-1 shows the system navigation and content design. User will be presented with Adnan Sharida & Association original homepage with login button. From the login button, the user will be separated into the roles where each role will have different pages.

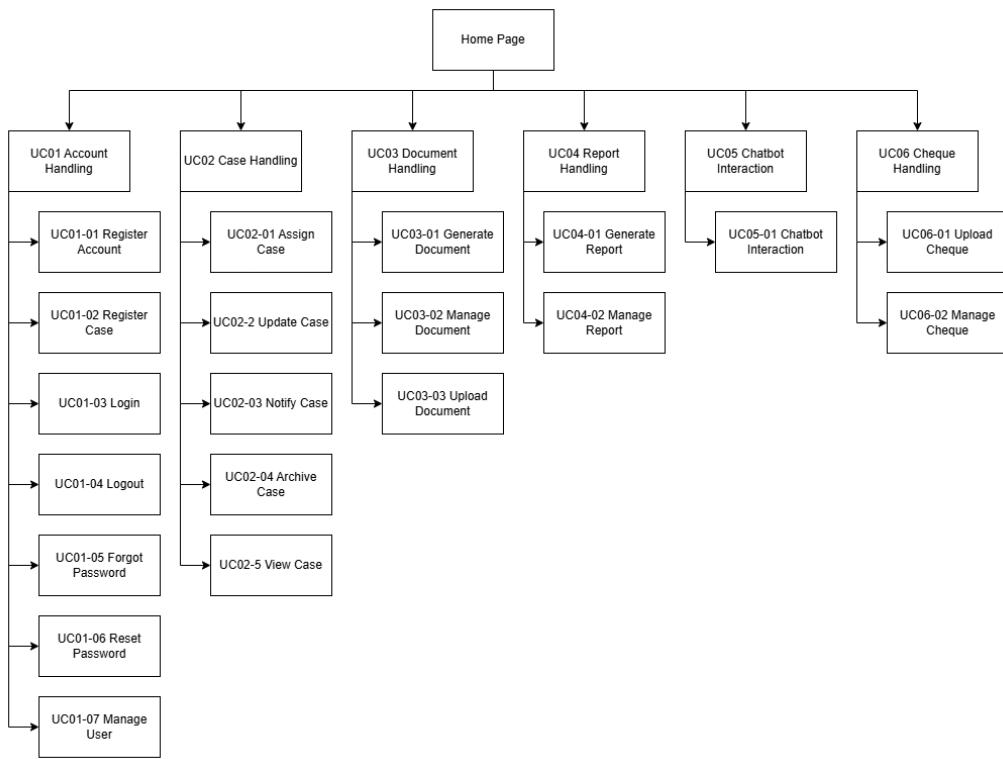


Figure 4.5-1 System navigation and content design

While Figure 4.5-2 and 4.5-3 shows the UC02-01 Assign Case interface design. Other interface designs will be presented at Appendix H.



Figure 4.5-2 UC02-01 Assign Case interface

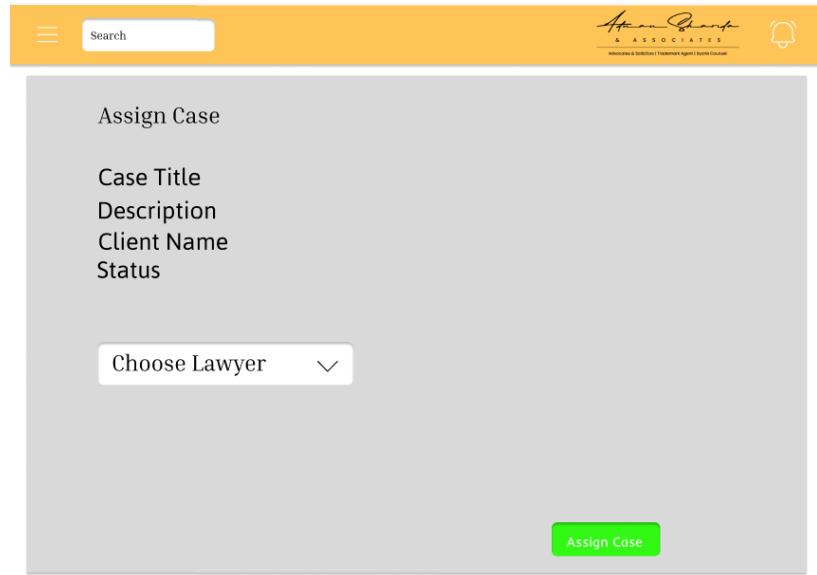


Figure 4.5-3 UC02-01 Assign Case interface

4.6 Chapter Summary

An extensive summary of the ASLAW requirement analysis and system architecture is given in Chapter 4. Numerous diagrams, such as class diagrams, swim lane diagrams, sequence diagrams, and use case diagrams. Diagrams are used to improve understanding. A thorough description of the system architectural design is also included in the project design. The chapter also explores the database design subchapter, which goes into detail about the Entity Relationship Diagram (ERD) and data dictionary. Finally, the system interface design is presented, providing thorough overview of general layout and aesthetics of the system.

CHAPTER 5

CONCLUSION

5.1 Introduction

This chapter provides an overview of the goals and objectives of the project as determined during PSM1. A decision has been reached regarding the system that will be created, considering the results from various research with literature review, project goal and recommended project implementation for PSM2. The project will bring effectiveness to Adnan Sharida & Associates manual case management.

5.2 Achievement of Project Objectives

From the literature review in Chapters 2 and 3, the constraints and inadequacies of manual case management. Consequently, by examining the system that incorporates the features of the proposed system available in the market, ASLAW is suggested to address the challenges and issues encountered by the company. This system will incorporate the strengths of comparable existing systems while disregarding irrelevant features.

The primary goal of this project is to be completed, which involves determining the need for a case management system that incorporates document management. In Chapter 2, several interview sessions with company lawyer Iman bin Norhizam have revealed the existing issues within the law firm. The system's requirements are evaluated following analysis and comparison with similar existing systems available in the market. The suggested system will build upon the strengths and benefits of each comparable existing system to meet the user's needs. Furthermore, Chapter 3 details the analysis of system requirements, outlining the hardware and software necessities at the system level for the development of the project.

The second objective involves creating a system that facilitates communication between lawyers and clients, incorporating an AI chatbot to help potential clients and monitor case advancement, which is partially completed. In Chapter 4, the user needs are examined through Unified Modeling Language (UML) to create the requirements model and system architecture. The system design specifies the process, whereas the requirements will aid in the system's development. This goal will be achieved during PSM2.

The third goal, evaluating the efficiency of document management according to user needs, and AI chatbots will not be finished in this PSM1 since the system development is still ongoing.

5.3 Suggested Plan for Project Implementation (PSM 2)

To ensure the success of the project implementation, the system development will strictly follow the phases planned as discussed in Chapter 3. The project progress will also be measured and monitored based on the Gantt Chart in Appendix B to control the tasks and deadlines. The project should be monitored on a weekly basis to keep track of the course of project. Moreover, system development should follow the project design and ensure that the modules developed can meet the user's requirements and expectations. Chapter 4 should be treated as a roadmap and guidelines to assist the project development from delivery to closure.

5.4 Chapter Summary

The planned development of Smart Legal System for Case Management and Document Handling (ASLAW) for Adnan Sharida & Associates was completed in this chapter. This chapter also lists the accomplishments of the project's goals. Finally, the chapters presented the recommended plan to implement the system in PSM2.

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Appendix A Similar Existing System



Figure A.1 Cryptee uploading document (Cryptee, n.d.)

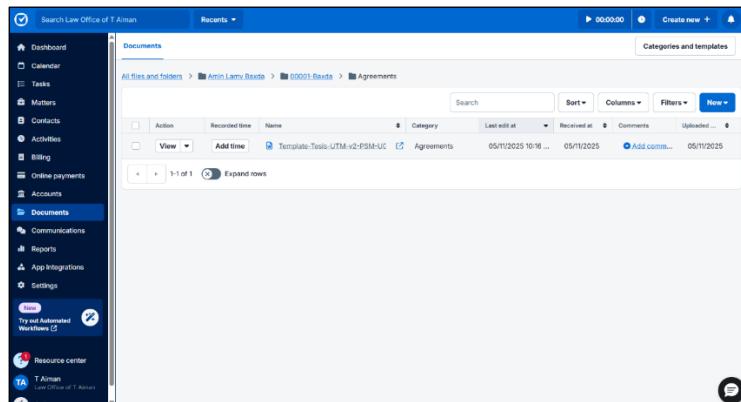


Figure A.2 Clio Client folder document (Legal Practice Management Software, n.d.)

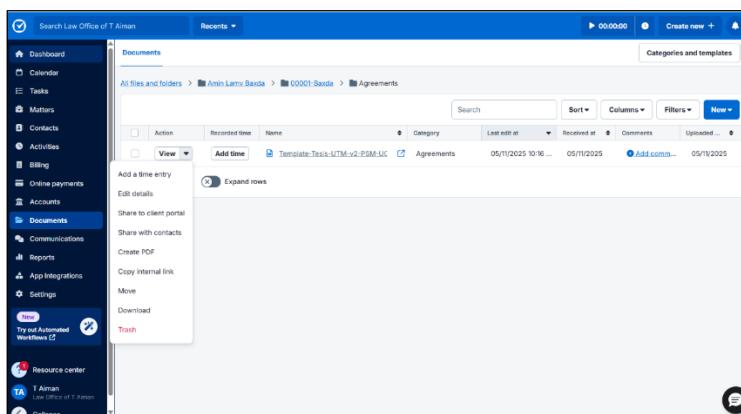


Figure A.3 Clio document generation management (Legal Practice Management Software, n.d.)

Appendix B Interview Report

Interview 1

Date: 25th February 2025

Time: 3.00 – 5.00 pm

Venue: Adnan Sharida & Associates Office

Interviewer: Tengku Muhammad Aiman Aliff

Interviewee: Muhammad Iman bin Norhizam

Interview Questions

Q1: What is the procedure for each client that wants to get advice?

Answer: The first thing they need to do is make an appointment with the lawyer, and then they can get initial consultation with the lawyer. There might be payment for initial consultations.

Q2: What are the processes of the case for civil litigation, criminal defense and corporate affairs?

Answer: For each client, they will get an initial consultation first, and we will offer our services to them. If the lawyers are interested, we will be discussing the quotation of the legal services. Does the client agree with the price and services, the legal processes will take place into three phases.

Q3: What is the difference between each process of civil litigation, criminal defense and corporate affairs?

Answer: For civil litigation, the first phase of the legal services is where lawyers will produce a Letter of Demand (LOD) and send it to the defendant. This letter of demand is a document where the client wants to demand a certain amount of money or other things from the one who makes a report on them. If the defendant accepts the LOD, the services will end here, and clients need to pay the law firm. If not, it will go the second phase and clients need to pay the law firm for the first phase service. The second phase is where lawyers from both sides will produce two

documents which is Writ of Summons (WoS) and Statement of Claims (SoC) and send to each other. We will go to the court to get the date for trial session. After receiving the SoC from the defendant, we will discuss their claims and will categorize it. Then after that, the new document will be made before going to court. Lastly, phase 3 which is trial at the court. In this phase, whether the client will lose the case or not, they need to pay for the services. For criminal defense, there are also two phases which are when the client is in the lockout and accused by a prosecutor. If the first phase, lawyer will go to the police station and talk with the police to release the client. In the second phase, the lawyer will wait for the accusation document from the prosecutor before producing a reply. If the prosecutor accepts the reply, the case will end there; if not, it will proceed with the trial at the court. For corporate affairs, there will be only one phase where client will find the lawyer to make a due diligence of the certain company for any actions, for example, buying the company, merging two companies and many more.

Q4: What is the type of payments usually clients make?

Answer: Usually, clients will make a payment by cheque because the payment consists of a large amount of money, then the administrative department will go and check out the money and transfer it to the company account.

Q5: Usually how long each case will take place?

Answer: Each case will take place a long time, the quickest one usually completes in one month.

Q6: How do lawyers and clients communicate during the legal services? Are there any problems during communication?

Answer: We communicate using WhatsApp or sometimes by email. As the case progresses, sometimes the message or information from the lawyer is forgotten by the client, thus the lawyer needs to remind the client. Also, sometimes both lawyers and clients lose track of the case because of the time it takes.

Appendix C Gantt Chart

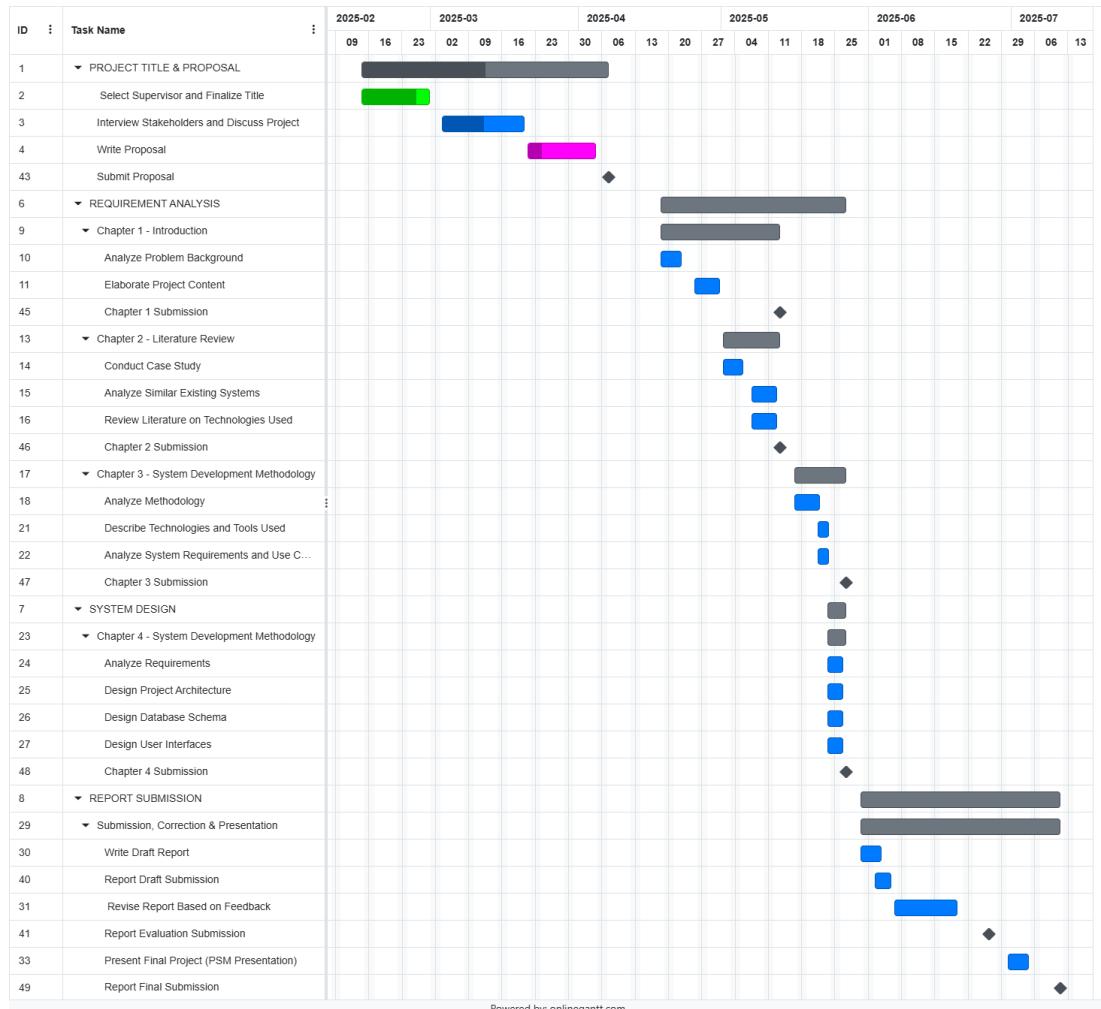


Figure C.1: PSM1 Gantt Chart

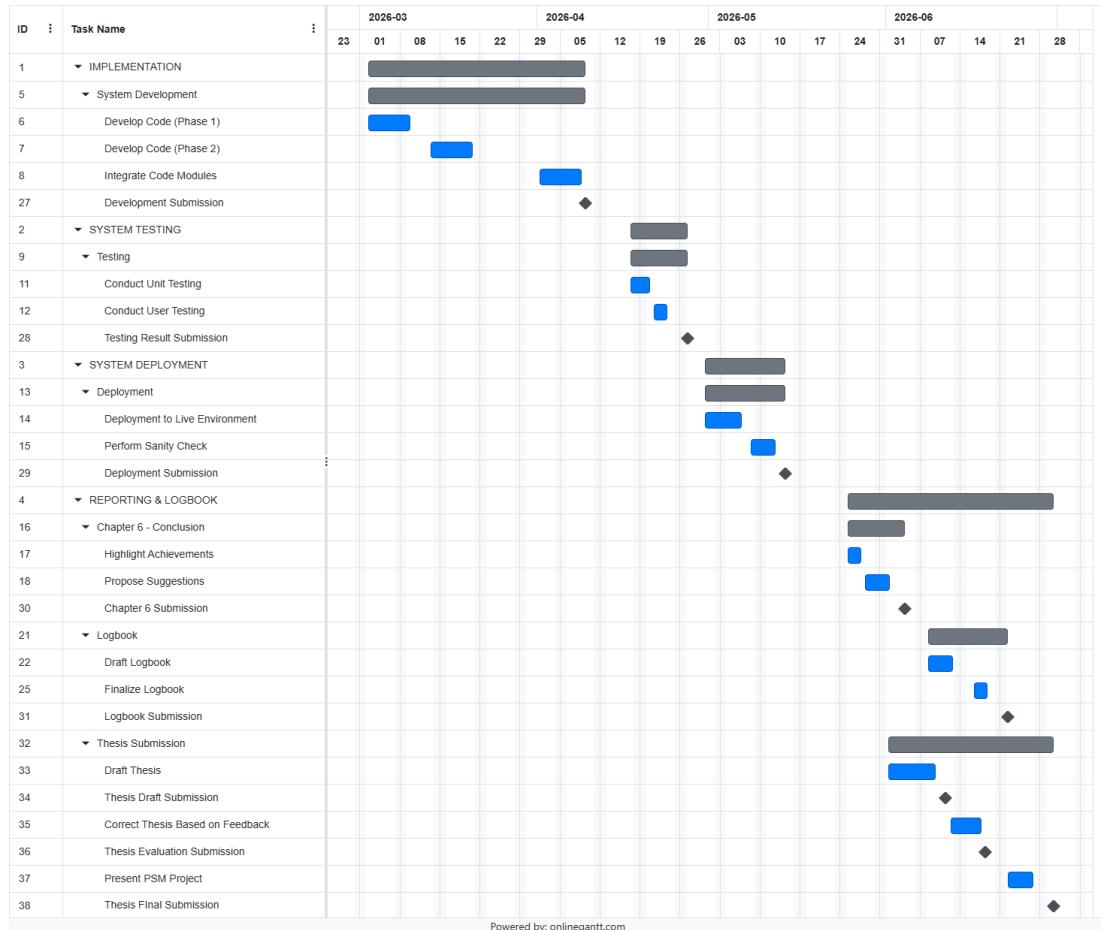


Figure C.2: PSM2 Gantt Chart

Appendix D Use Case Table

Table D.1: Use case description of UC01 Account Handling

Use Case Name	Account Handling
Use Case ID	UC01
Brief Description	This use case encompasses the complete lifecycle management of user accounts within the system, including creation, updating, deactivation, and viewing capabilities.
Actor	Administrator, Lawyer, Client
Pre-condition	User must be authenticated and have appropriate role permissions
Post-condition	User information is properly managed and maintained in the system
Sub Use case	<ul style="list-style-type: none"> - UC01-01 Register Account - UC01-02 Login - UC01-03 Logout - UC01-04 Forgot Password - UC01-05 Reset Password - UC01-06 Manage User

Table D.2: Use case description of Register Account

Use Case Name	Register Account
Use Case ID	UC01-01
Brief Description	The Administrator is responsible for registering new users (Clients and Lawyers) in the system. This ensures that only verified individuals are granted access. The administrator inputs personal details, assigns roles, and sets initial credentials for each user.
Actor	Administrator
Pre-condition	Administrator is authenticated and has the necessary permissions
Post-condition	<ul style="list-style-type: none"> - A new user account is created and stored in the system - Login credentials are provided to the user
Primary Flow	<ul style="list-style-type: none"> - Administrator navigated to the “User Management” or “Register User” interface - Select the user role - Enter user details - Sets or auto-generates an initial password - Submits the registration form - System saves the user data and confirms registration

	<ul style="list-style-type: none"> - Administrator communicates credentials to the new user
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Table D.3: Use case description of Register Case

Use Case Name	Register Case
Use Case ID	UC01-02
Brief Description	The Administrator is responsible for registering new legal cases in the system. This involves creating a case record with all relevant details, assigning a unique case number, and linking the case to the appropriate client and legal matter type.
Actor	Administrator
Pre-condition	Administrator is authenticated and has the necessary permissions
Post-condition	<ul style="list-style-type: none"> - A new case for the client created - Login credentials are provided to the user
Primary Flow	<ul style="list-style-type: none"> - Administrator navigates to the "Case Management" or "Register Case" interface - Selects or searches for the client account - Enters case details: <ul style="list-style-type: none"> o Case title (VARCHAR) o Case description (VARCHAR) - System automatically generates unique caseID (INT) - Optionally assigns lawyerID (INT) if lawyer is selected - Submits the case registration form - System validates all required fields - System saves case data with generated caseID - System confirms successful registration - System creates initial case activity log entry - Administrator can optionally assign case to a lawyer immediately

Table D.4: Use case description of Login

Use Case Name	Login
Use Case ID	UC01-03
Brief Description	Authenticates a user to allow access to the system.
Actor	Administrator, Lawyer, Client
Pre-condition	The user must already be registered.
Post-condition	User is logged in and redirected to the appropriate dashboard.

Primary Flow	<ul style="list-style-type: none"> - User enters username and password. - System verifies credentials. - If valid, access is granted. - User is redirected to their dashboard.
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Table D.5: Use case description of Logout

Use Case Name	Logout
Use Case ID	UC01-04
Brief Description	Ends the user session and securely logs the user out of the system.
Actor	Administrator, Lawyer, Client
Pre-condition	User must be logged into the system
Post-condition	User is logged out and redirected to the login or home page. Session is terminated.
Primary Flow	<ul style="list-style-type: none"> - User selects "Logout" - System terminates the active session - System clears session-related data - User is redirected to the login or home page - Confirmation of successful logout may be displayed

Table D.6: Use case description of Forgot Password

Use Case Name	Forgot Password
Use Case ID	UC01-05
Brief Description	Allows users to reset their password when they cannot remember their current credentials.
Actor	Administrator, Lawyer, Client
Pre-condition	User must have a registered account in the system.
Post-condition	User receives password reset instructions and can access their account with new credentials.
Primary Flow	<ul style="list-style-type: none"> - User clicks "Forgot Password" link. - User enters email address. - System sends reset link to email. - User clicks reset link. - User enters new password. - System updates password. - User redirected to login page.

Table D.7: Use case description of Reset Password

Use Case Name	Reset Password
Use Case ID	UC01-06
Brief Description	Allows users to set a new password using a valid reset link or code received via email or SMS.
Actor	Lawyer, Client
Pre-condition	User has received a valid password reset link or code.
Post-condition	User's password is securely updated in the system.
Primary Flow	<ul style="list-style-type: none">- User clicks the password reset link or enters the reset code- System verifies the validity and expiry of the token/code- User enters and confirms a new password- System validated and update the password- System notifies the user of the successful reset

Table D.8: Use case description of Manage User

Use Case Name	Manage User
Use Case ID	UC01-07
Brief Description	Enables the Administrator to manage all registered users in the system, including Clients and Lawyers. It covers functionalities such as viewing user profiles, editing user information, activating/deactivating accounts, and resetting passwords. This ensures proper oversight, access control, and user lifecycle management.
Actor	Administrator
Pre-condition	The Administrator is authenticated and has administrative privileges.
Post-condition	User accounts are updated, deactivated, reactivated, or reset as required.
Primary Flow	<ul style="list-style-type: none">- The Administrator logs in and navigates to the "Manage Users" panel.- The system displays a searchable and filterable list of all users.- The Administrator selects a user to manage.- The Administrator can:<ol style="list-style-type: none">- 1. View user details- 2. Edit profile information (name, email, role, etc.)- 3. Reset password- 4. Activate or deactivate the account- The changes are saved in the system.

	- System confirms success.
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Table D.9: Use case description of Update Case

Use Case Name	Update Case
Use Case ID	UC02-02
Brief Description	Allows lawyers to update the details or progress of a legal case.
Actor	Lawyer
Pre-condition	Case must already exist and be assigned.
Post-condition	Case information is updated in the system.
Primary Flow	<ul style="list-style-type: none"> - Lawyer selects a case from the dashboard. - Edits relevant details or adds progress notes. - Submits the updates. - System saves the changes.

Table D.10: Use case description of Notify Case

Use Case Name	Notify Case
Use Case ID	UC02-03
Brief Description	System automatically notifies clients about updates, changes, or progress on their assigned legal cases through email
Actor	System
Pre-condition	<ul style="list-style-type: none"> - Case must exist and be assigned to a client - Client must have valid contact information (email/phone) on file - Case update or status change has occurred
Post-condition	<ul style="list-style-type: none"> - Client receives notification about case update - Notification record is logged in the system - Client's notification preferences are respected
Primary Flow	<ul style="list-style-type: none"> - System detects a case update (status change, new document, progress note, etc.) - System identifies the client associated with the case - System retrieves client's notification preferences - System generates appropriate notification message - System sends notification via preferred method (email/SMS/in-app) - System logs the notification in the case history

	- Client receives and can view the notification
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Table D.11: Use case description of Archive Case

Use Case Name	Archive Case
Use Case ID	UC02-04
Brief Description	System automatically notifies clients about updates, changes, or progress on their assigned legal cases through email
Actor	Client
Pre-condition	Case must be marked as complete.
Post-condition	Case is stored in an archive and removed from active lists.
Primary Flow	<ul style="list-style-type: none"> - Administrator selects a completed case. - Chooses “Archive”. - Confirms the action. - System archives the case

Table D.12: Use case description of View Case

Use Case Name	View Case
Use Case ID	UC02-05
Brief Description	Displays the status and progress of a legal case.
Actor	Client
Pre-condition	Case must exist and be accessible to the actor.
Post-condition	Status is displayed; no data is changed.
Primary Flow	<ul style="list-style-type: none"> - Client logs into their dashboard. - Navigates to “My Cases” - Selects a case. - System shows the status and updates.
Exception Flow	<ul style="list-style-type: none"> - If credentials are incorrect: <ul style="list-style-type: none"> - 1. System display error message - 2. Provides option “Forgot Password?” - The user selects the option to reset their password. - The system redirects the user to the Reset Password use case flow. - Once reset, the user can retry login.

Table D.13: Use case description of UC03 Document Handling

Use Case Name	Document Handling
Use Case ID	UC03
Brief Description	This use case encompasses the complete lifecycle management of documents within the system, including generate, manage, and upload
Actor	Lawyer, Client
Pre-condition	User must be authenticated and have appropriate role permissions
Post-condition	Document information is properly managed and maintained in the system
Sub Use case	<ul style="list-style-type: none">- UC03-01 Generate Document- UC03-02 Manage Document- UC03-03 Upload Document

Table D.14: Use case description of Generate Document

Use Case Name	Generate Document
Use Case ID	UC03-01
Brief Description	Allows lawyers to generate legal documents (e.g., contracts, affidavits) using case data
Actor	Lawyer
Pre-condition	Case must exist and be active.
Post-condition	A new document is created and linked to the case.
Primary Flow	<ul style="list-style-type: none">- Lawyer opens a case.- Chooses “Generate Document”.- Selects document type and fills necessary fields.- System creates the document.- Document is saved and available for download or approval.

Table D.15: Use case description of Manage Document

Use Case Name	Manage Document
Use Case ID	UC03-02
Brief Description	Allow lawyers to view, generate, edit, or upload legal documents related to assigned cases

Actor	Lawyer
Pre-condition	Lawyer must be logged in and assigned to a case
Post-condition	Document is generated, updated, uploaded or marked as completed
Primary Flow	<ul style="list-style-type: none"> - Lawyers logs in and navigated to “My cases” - Selects a case with a document request - View or generates the required document - Optionally uploads or edits a document - System stores or updates the document record - Client may be notified when the document is ready.

Table D.16: Use case description of Upload Document

Use Case Name	Upload Document
Use Case ID	UC03-03
Brief Description	Allows clients to upload supporting documents, pictures, and files related to their legal case for lawyer review and case processing.
Actor	Client
Pre-condition	<ul style="list-style-type: none"> - Client must be logged into the system - Case must exist and be accessible to the client - Client must have valid documents/files to upload
Post-condition	<ul style="list-style-type: none"> - Documents are successfully uploaded and stored in the system - Documents are linked to the specific case - Lawyer is notified of new document uploads - Upload activity is logged in case history
Primary Flow	<ul style="list-style-type: none"> - Chooses "Upload Documents" option - Selects files from their device (documents, pictures, PDFs, etc.) - Adds description/category for each file (optional) - Confirms upload - System validates file types and sizes - System stores documents and links them to the case - System sends notification to assigned lawyer - Client receives confirmation of successful upload

Table D.17: Use case description of Encrypt Document

Use Case Name	Encrypt Document
Use Case ID	UC03-04
Brief Description	System automatically encrypts sensitive legal documents immediately upon upload or generation based on predefined rules, document types, or security policies to ensure confidentiality and secure storage within the case management system.
Actor	System
Pre-condition	<ul style="list-style-type: none"> - Document has been uploaded to the system or generated by the system - System encryption services are operational and available - Document classification and encryption rules are configured
Post-condition	<ul style="list-style-type: none"> - Document is encrypted using system security protocols - Encrypted document replaces original in secure storage - Document status is updated to reflect encryption state
Primary Flow	<ul style="list-style-type: none"> - System detects a newly uploaded or generated document - System evaluates document against encryption rules and policies - System applies appropriate encryption algorithm to the document - System stores encrypted version in secure storage location - System removes unencrypted version from temporary storage - System updates document metadata and status to "Encrypted" - System logs encryption activity with timestamp and document details
Alternative Flow	<p>Encryption Failure Recovery:</p> <ol style="list-style-type: none"> 1. If encryption process fails due to technical error 2. System retains original document in temporary secure location 3. System generates error log and alerts system administrator 4. System retries encryption process after resolving technical issues 5. Upon successful encryption, system proceeds with primary flow steps 4-7
Exception Flow	Document Classification Error:

	<ol style="list-style-type: none"> 1. If system cannot determine encryption requirements for document type 2. System applies default high-security encryption protocol 3. System flags document for manual review by administrator 4. System proceeds with encryption using maximum security settings
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Table D.18: Use case description of Decrypt Document

Use Case Name	Decrypt Document
Use Case ID	UC03-05
Brief Description	System automatically decrypts encrypted documents on-demand when an authorized user requests download, creating a user-specific decrypted version that remains secure if shared with unauthorized parties.
Actor	System, Administrator, Client, Lawyer
Pre-condition	<ul style="list-style-type: none"> - Encrypted document must exist in the system - User download request is received and authenticated - User has appropriate access permissions for the document - System decryption services are operational and available
Post-condition	<ul style="list-style-type: none"> - Document is temporarily decrypted for the specific authorized user - User receives decrypted document for download - User-specific decryption activity is logged in the audit trail - Original encrypted document remains unchanged in secure storage - Downloaded document is protected against unauthorized access
Primary Flow	<ul style="list-style-type: none"> - System receives download request for encrypted document from authenticated user - System validates user authorization and access permissions for the document - System retrieves user-specific decryption keys and credentials - System decrypts document using user-specific encryption parameters - System creates temporary decrypted version accessible only to the requesting user

	<ul style="list-style-type: none"> - System provides decrypted document for download to authorized user - System logs decryption and download activity with user details and timestamp - System securely disposes of temporary decrypted version after download completion
Alternative Flow	<p>Multiple Concurrent Downloads:</p> <ul style="list-style-type: none"> - If multiple authorized users request the same document simultaneously - System creates separate user-specific decrypted versions for each user - Each decrypted version is bound to the requesting user's credentials - System processes each download independently with user-specific security
Exception Flow	<p>Unauthorized Access Attempt:</p> <ol style="list-style-type: none"> 1. If user lacks sufficient permissions for document access 2. System denies decryption request 3. System logs unauthorized access attempt 4. System returns access denied message to user <p>Decryption Service Failure:</p> <ol style="list-style-type: none"> 1. If decryption process fails due to technical error 2. System logs error details and notifies system administrator 3. System returns service unavailable message to user 4. System retries decryption after resolving technical issues

Table D.19: Use case description of UC03 Report Handling

Use Case Name	Report Handling
Use Case ID	UC04
Brief Description	This use case encompasses the complete lifecycle management of reports within the system, including generation and managing.
Actor	Lawyer
Pre-condition	User must be authenticated and have appropriate role permissions
Post-condition	Document information is properly managed and maintained in the system

Sub Use case	<ul style="list-style-type: none"> - UC04-01 Generate Report - UC04-02 Manage Report
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Table D.20: Use case description of Generate Report

Use Case Name	Generate Report
Use Case ID	UC04-01
Brief Description	Allows the user to generate reports related to case statistics, client activity or system usage.
Actor	Lawyer
Pre-condition	User must be logged in with appropriate access rights
Post-condition	A report is generated and displayed or exported in the selected format
Primary Flow	<ul style="list-style-type: none"> - Lawyer logs in and navigates to the "Report" section - Selects the type of report to generate - Specifies filters or date ranges if applicable - System retrieves and processes relevant data - Report is generated and displayed on the screen - User can choose to export or download the report

Table D.21: Use case description of Manage Report

Use Case Name	Manage Report
Use Case ID	UC04-02
Brief Description	Allows lawyers to view, edit, delete, schedule, and organize previously generated reports within the system.
Actor	Lawyer
Pre-condition	<ul style="list-style-type: none"> - Lawyer must be logged in with appropriate access rights - At least one report must exist in the system - Lawyer must have permission to manage reports
Post-condition	<ul style="list-style-type: none"> - Report management actions are completed successfully - Changes are saved and reflected in the system - Report history and audit trail are updated
Primary Flow	<ul style="list-style-type: none"> - Lawyer logs in and navigates to the "Reports" section - System displays list of existing reports with details (name, date created, type, status) - Lawyer selects a report to manage - System presents management options:

	<ul style="list-style-type: none"> ○ View/Preview report ○ Edit report parameters ○ Delete report ○ Archive/Restore report - Lawyer selects desired action - System executes the selected action - System provides confirmation of completed action
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Table D.22: Use case description of Chatbot Interaction

Use Case Name	Chatbot Interaction
Use Case ID	UC05-01
Brief Description	Enables users to interact with the AI chatbot for legal guidance, document assistance, or system help.
Actor	Client
Pre-condition	User must be logged in or on the main interface.
Post-condition	Information is provided, or query is escalated.
Primary Flow	<ul style="list-style-type: none"> - User opens chatbot. - Enters a query. - Chatbot responds with automated info or options. - If query is complex, it is routed to a lawyer. - User receives a response or acknowledgment.

Table D.23: Use case description of UC06 Cheque Handling

Use Case Name	Cheque Handling
Use Case ID	UC06
Brief Description	This use case encompasses the complete lifecycle management of cheques within the system, including uploading and managing.
Actor	Administrator
Pre-condition	User must be authenticated and have appropriate role permissions
Post-condition	Cheque information is properly managed and maintained in the system
Sub Use case	<ul style="list-style-type: none"> - UC06-01 Upload Cheque - UC06-02 Manage Cheque

Table D.24: Use case description of Upload Cheque

Use Case Name	Upload Cheque
Use Case ID	UC06-01
Brief Description	Allows the administrator to upload cheque details or scanned copies of physical cheques related to client payments, settlements, or legal case transactions.
Actor	Administrator
Pre-condition	The Administrator must be logged in and authorized to manage cheque records.
Post-condition	The cheque details and/or scanned image are securely uploaded and linked to the corresponding case.
Primary Flow	<ul style="list-style-type: none">- The Administrator logs in and navigates to the "Cheque Management" section.- Selects or searches for the relevant case or client.- Fills in cheque details (e.g., amount, date, cheque number).- Uploads a scanned image of the cheque (if available).- Submits the form.- System validates and stores the data, linking it to the appropriate case file.- System confirms successful upload.

Table D.25: Use case description of Manage Cheque

Use Case Name	Manage Cheque
Use Case ID	UC06-02
Brief Description	Allows administrators to view, edit, update status, track, and organize cheque records related to client payments, settlements, or legal case transactions.
Actor	Administrator
Pre-condition	<ul style="list-style-type: none">- Administrator must be logged in with appropriate access rights- At least one cheque record must exist in the system- Administrator must have permission to manage financial records
Post-condition	<ul style="list-style-type: none">- Cheque management actions are completed successfully- Changes are saved and reflected in the system

	<ul style="list-style-type: none"> - Audit trail and financial records are updated - Related case files reflect cheque status changes
Primary Flow	<ul style="list-style-type: none"> - Administrator logs in and navigates to the "Cheque Management" section - System displays list of existing cheques with details (cheque number, amount, date, status, case reference) - Administrator selects a cheque to manage - System presents management options: <ul style="list-style-type: none"> o View cheque details o Update cheque status (Pending, Cleared, Bounced, Cancelled) o Link/Unlink to different cases - Administrator selects desired action and makes necessary changes - System validates the changes against business rules - System saves changes - System provides confirmation of completed action

Appendix E Sequence Diagram for Each Use Case

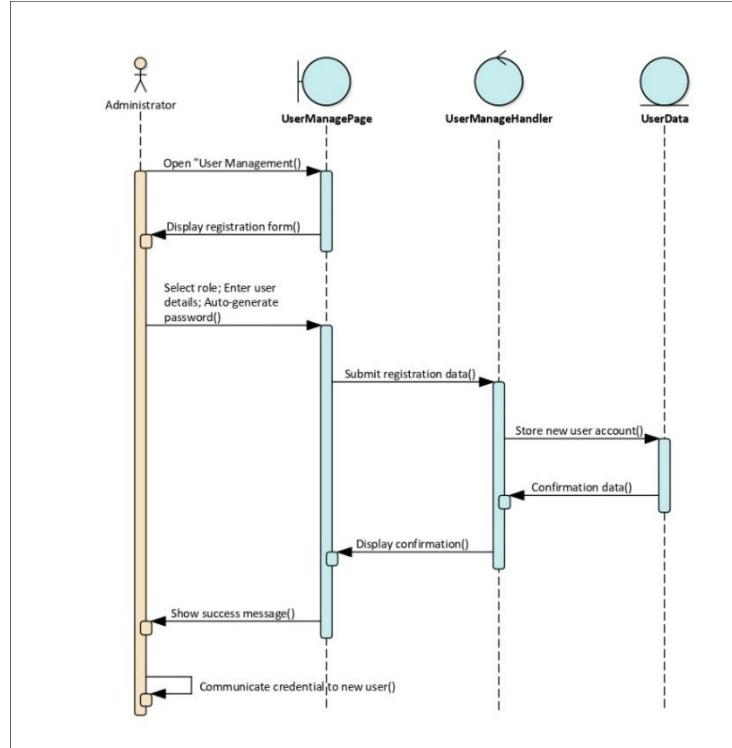


Figure E.1: Sequence Diagram of UC01-01 Register Account

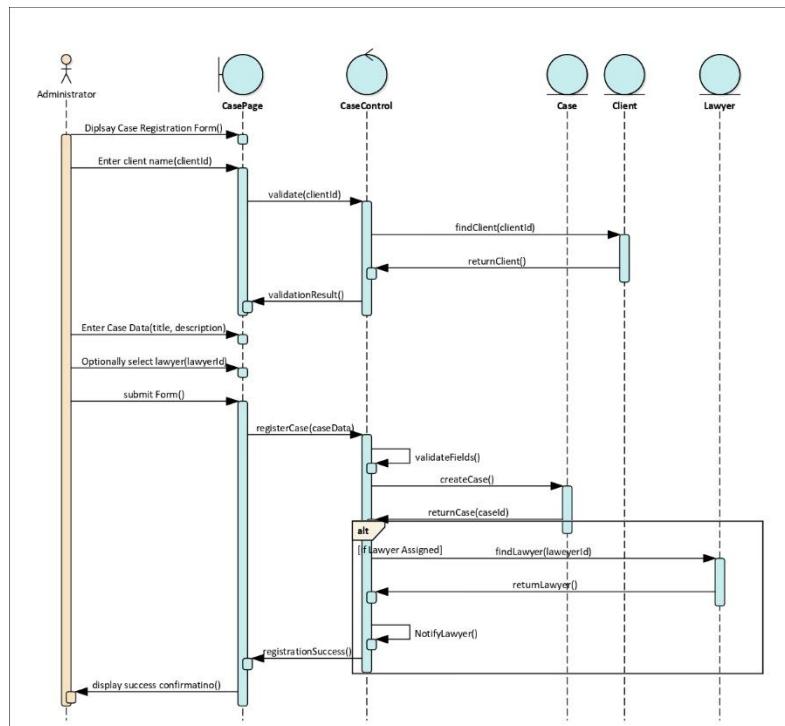


Figure E.2: Sequence Diagram of UC01-02 Register Case

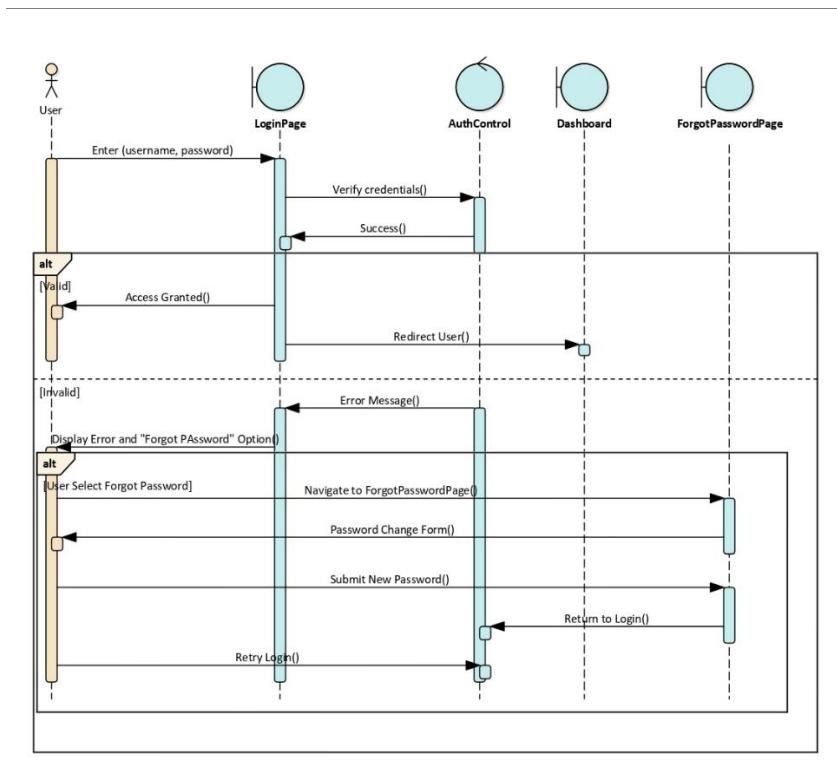


Figure E.3: Sequence Diagram of UC01-03 Login

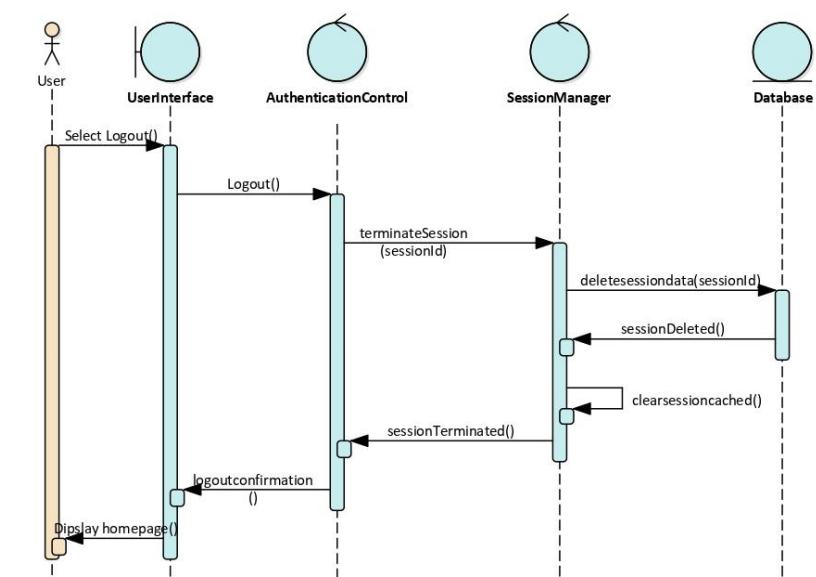


Figure E.4: Sequence Diagram of UC01-04 Logout

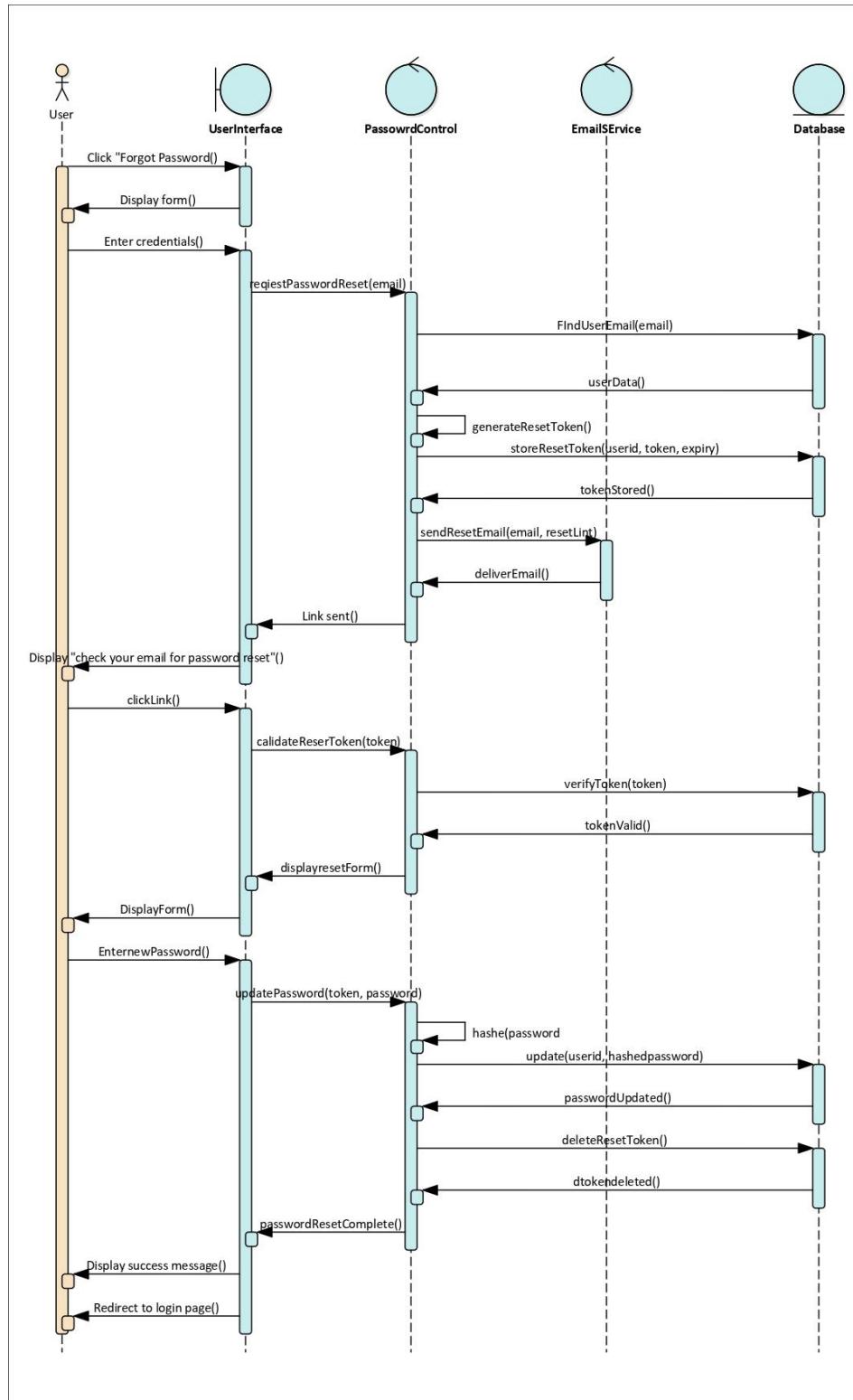


Figure E.5: Sequence Diagram of UC01-05 Forgot Password

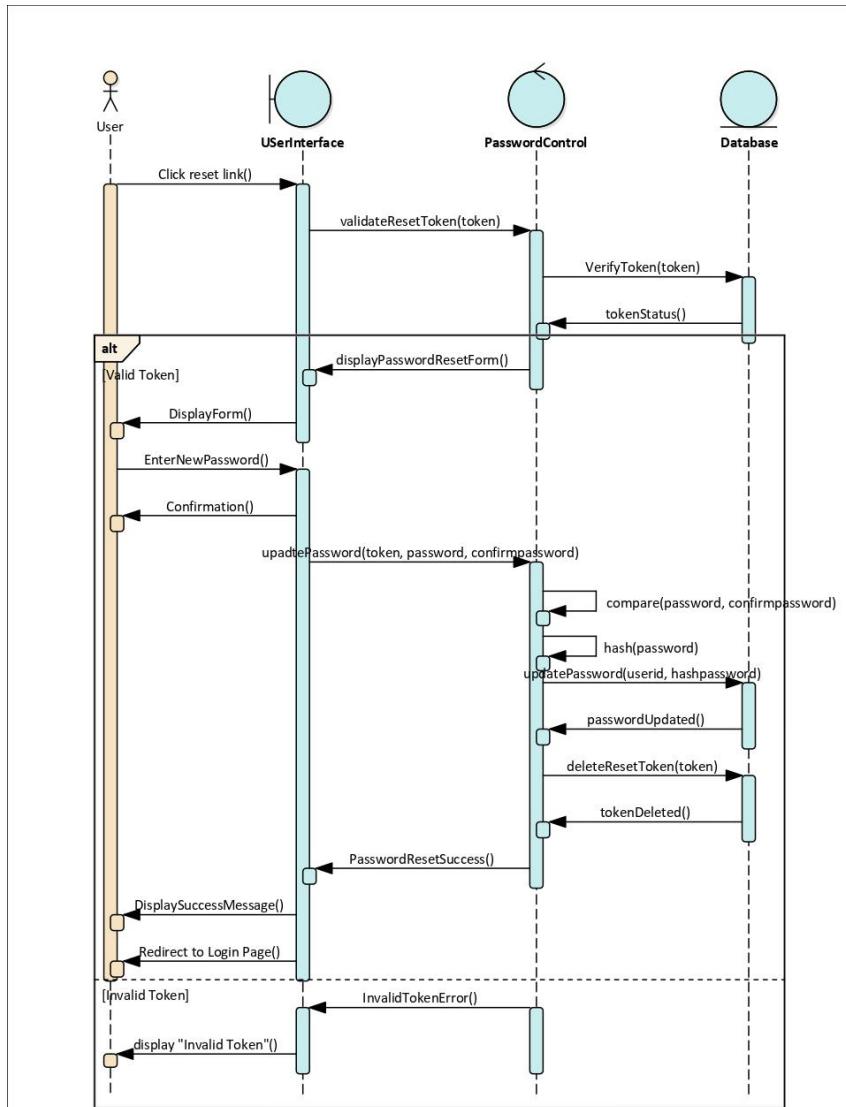


Figure E.6: Sequence Diagram of UC01-06 Reset Password

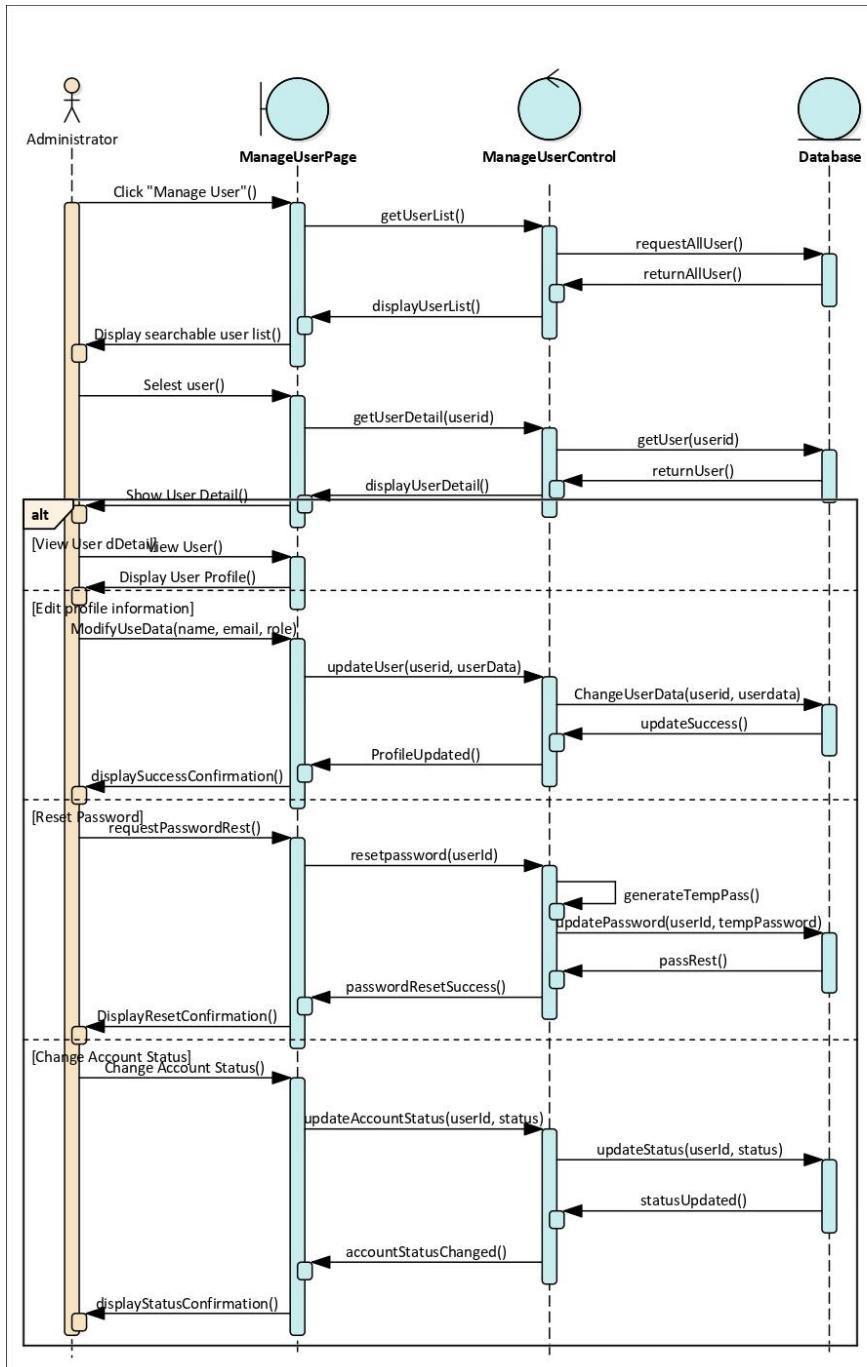


Figure E.7: Sequence Diagram of UC01-07 Manage User

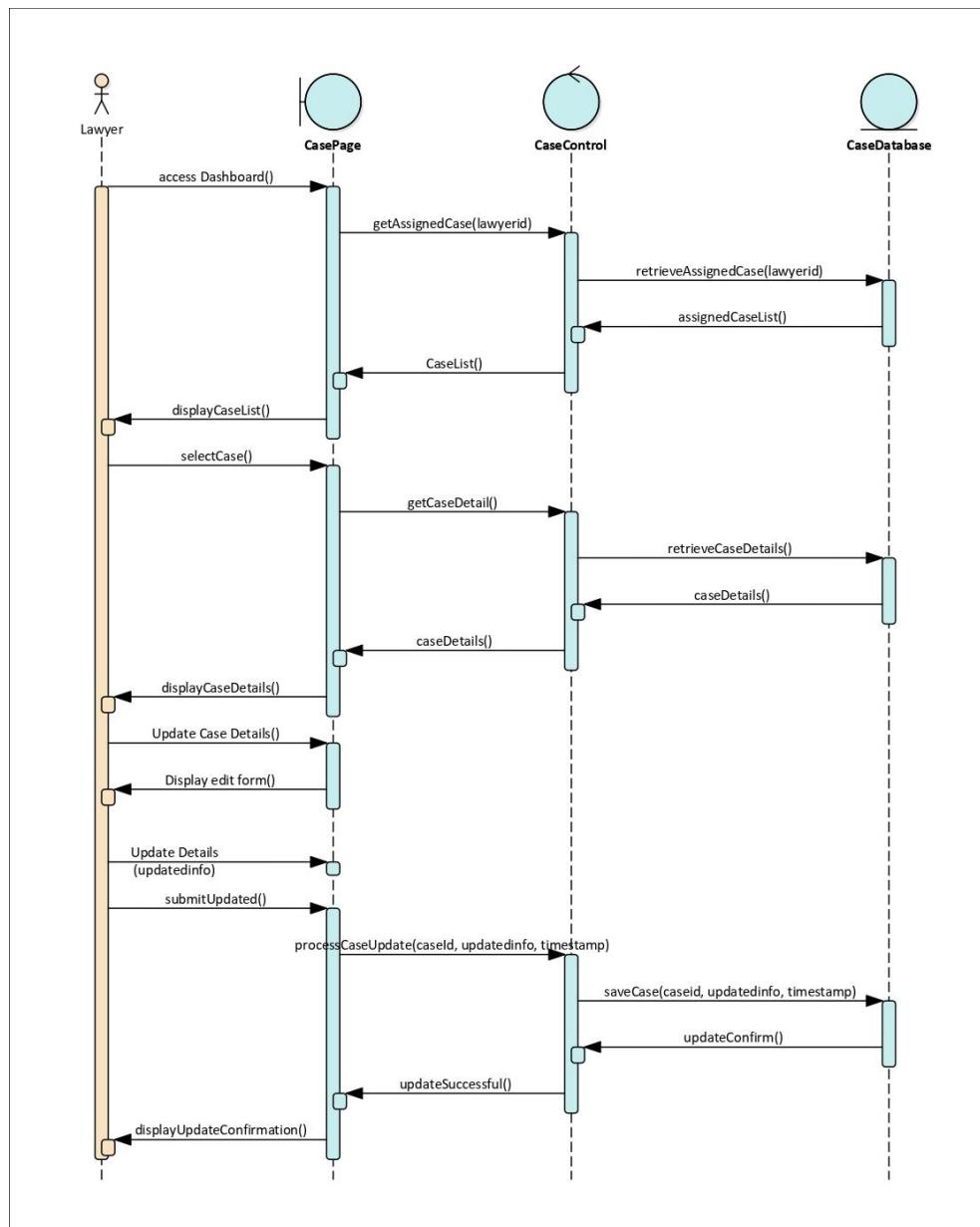


Figure E.8: Sequence Diagram of UC02-02 Update Case

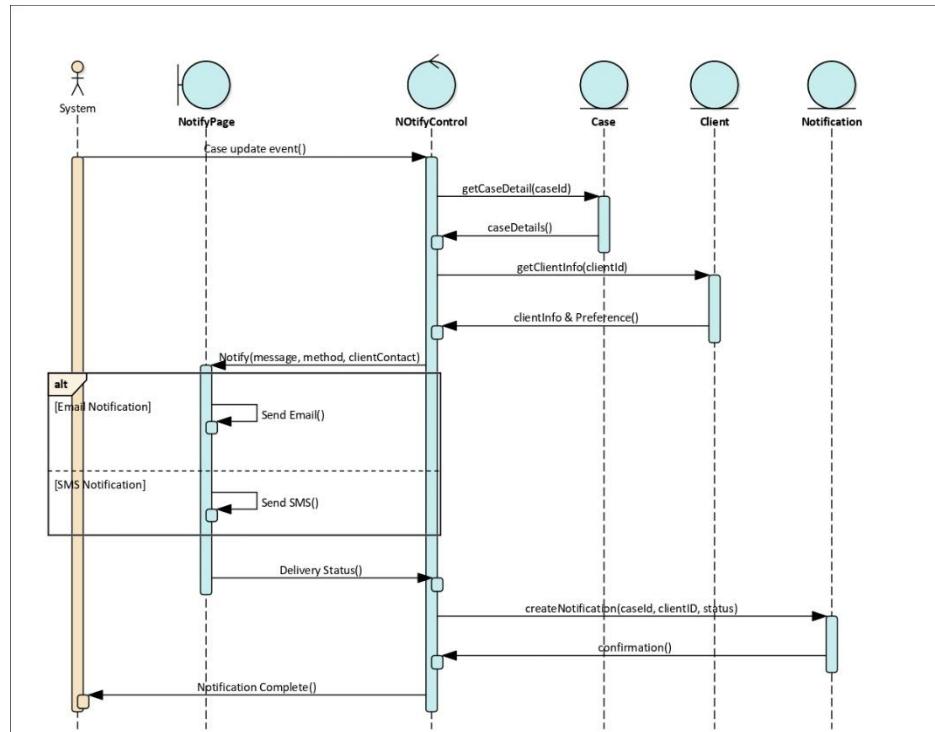


Figure E.9: Sequence Diagram of UC02-03 Notify Case

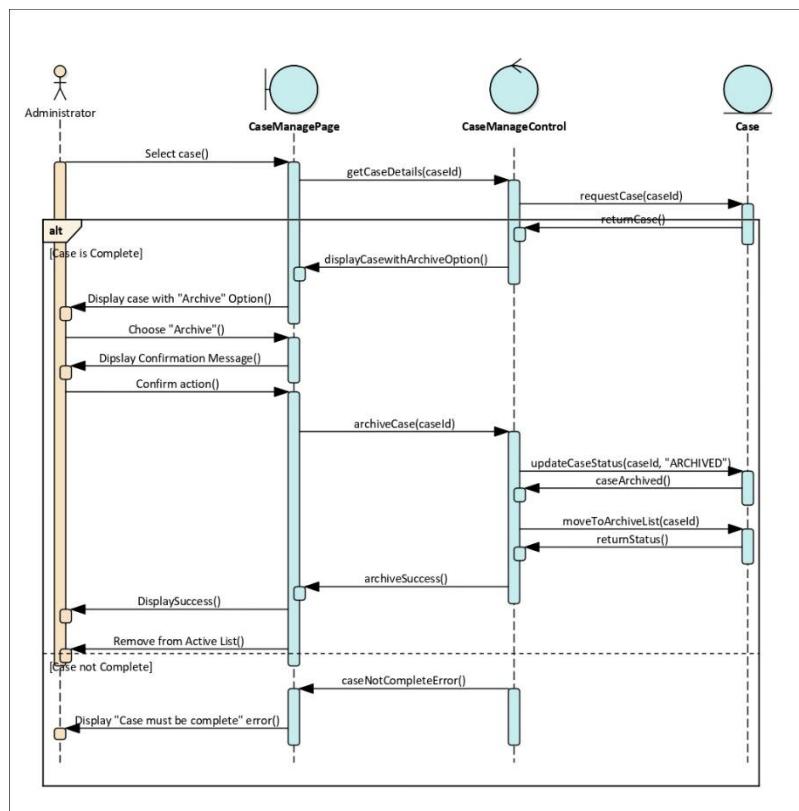


Figure E.10: Sequence Diagram of UC02-04 Archive Case

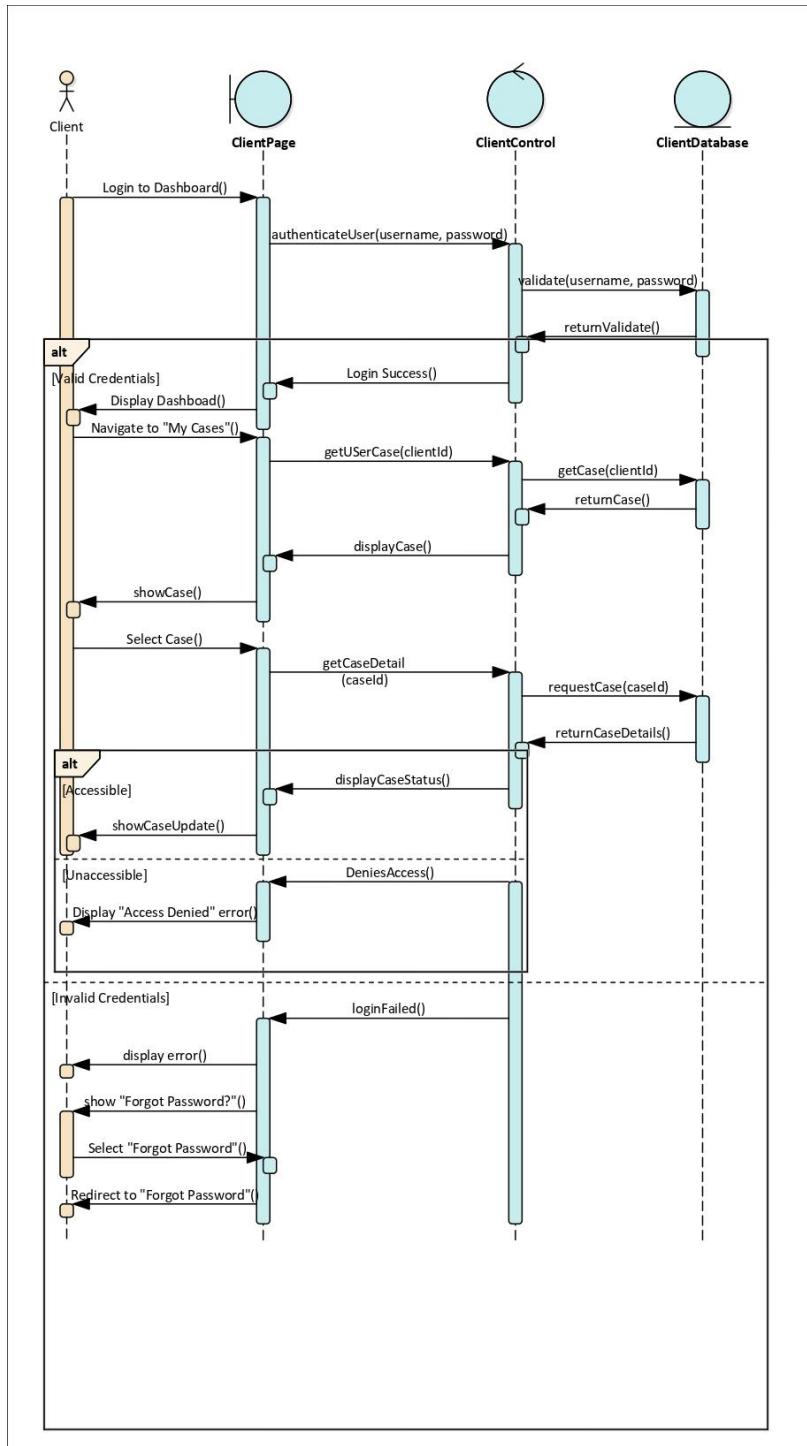


Figure E.11: Sequence Diagram of UC02-05 View Case

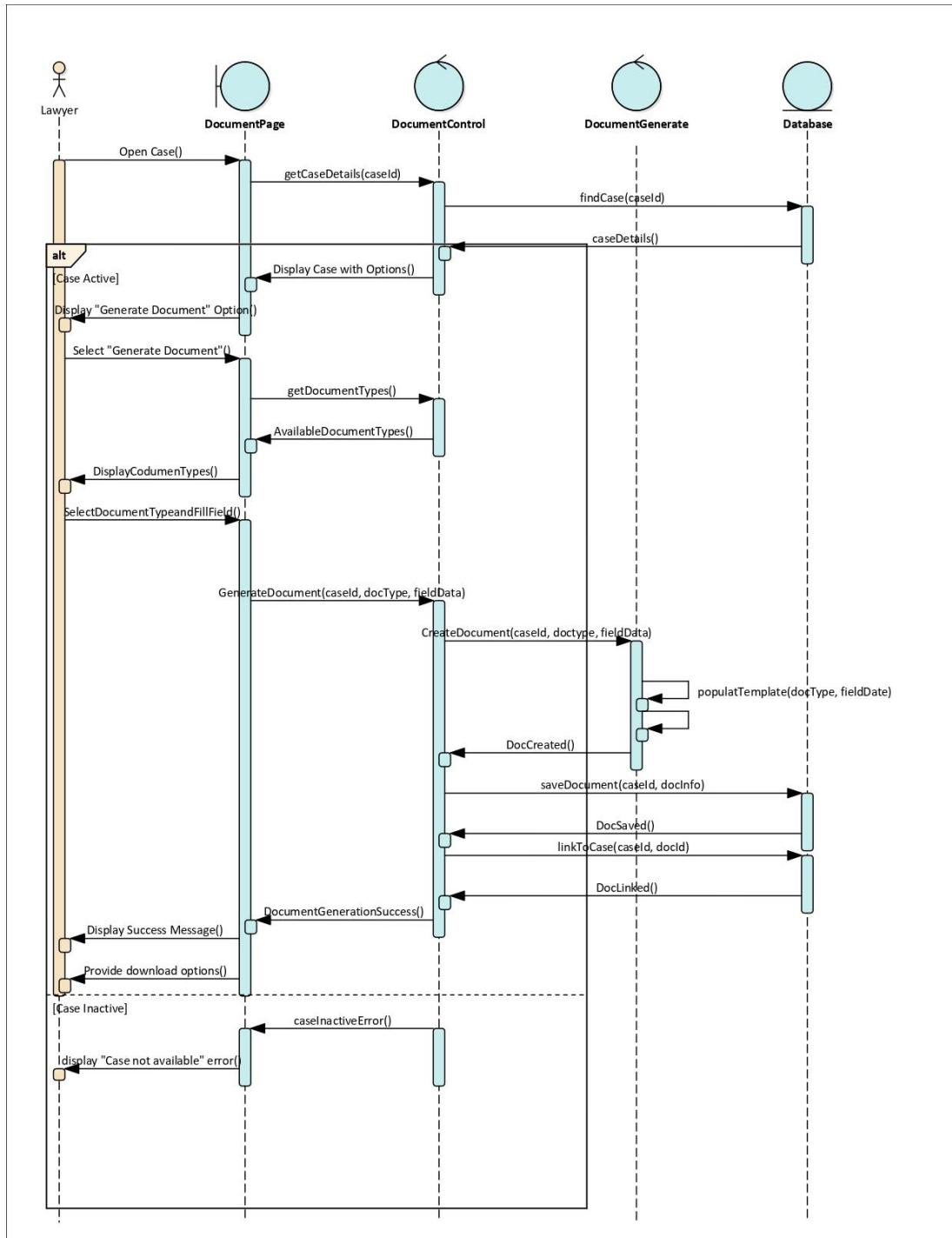


Figure E.12: Sequence Diagram of UC03-01 Generate Document

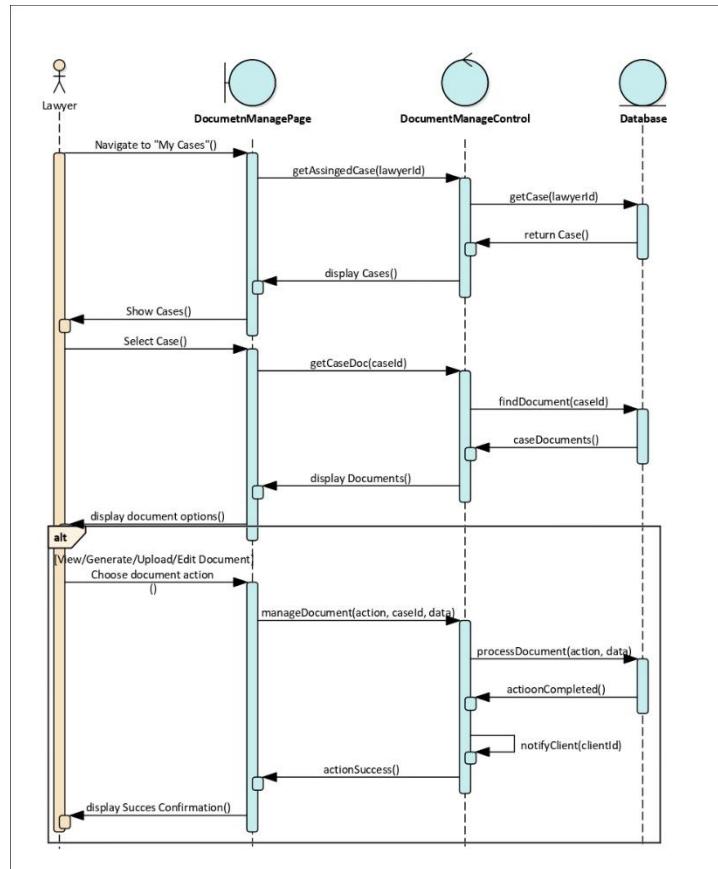


Figure E.13: Sequence Diagram of UC03-02 Manage Document

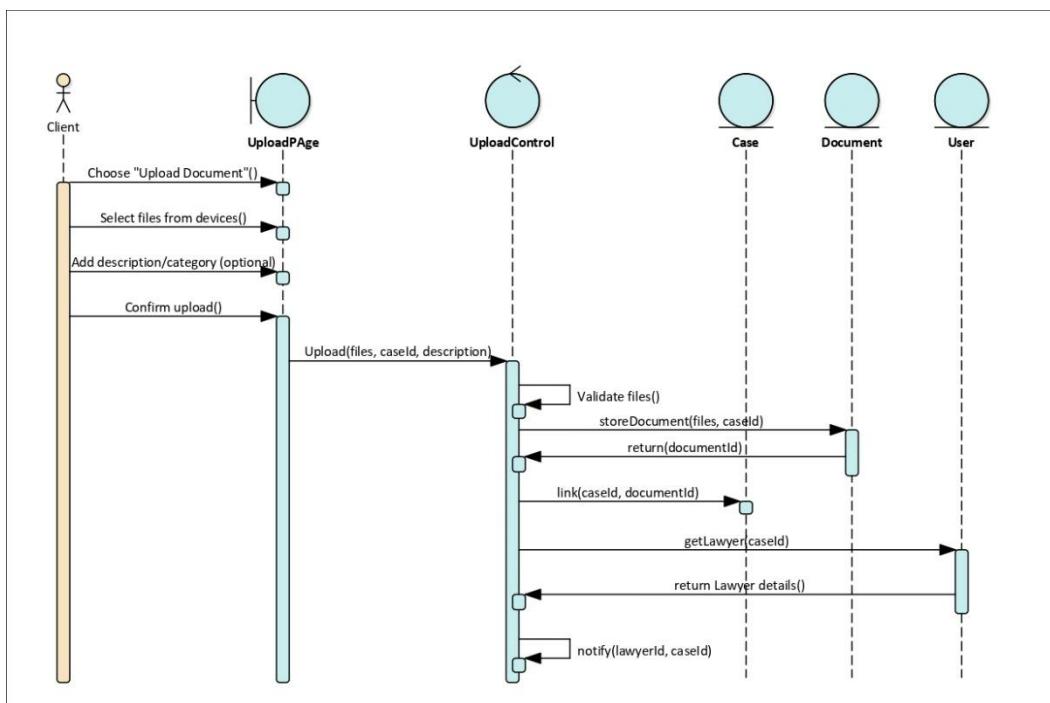


Figure E.14: Sequence Diagram of UC03-03 Upload Document

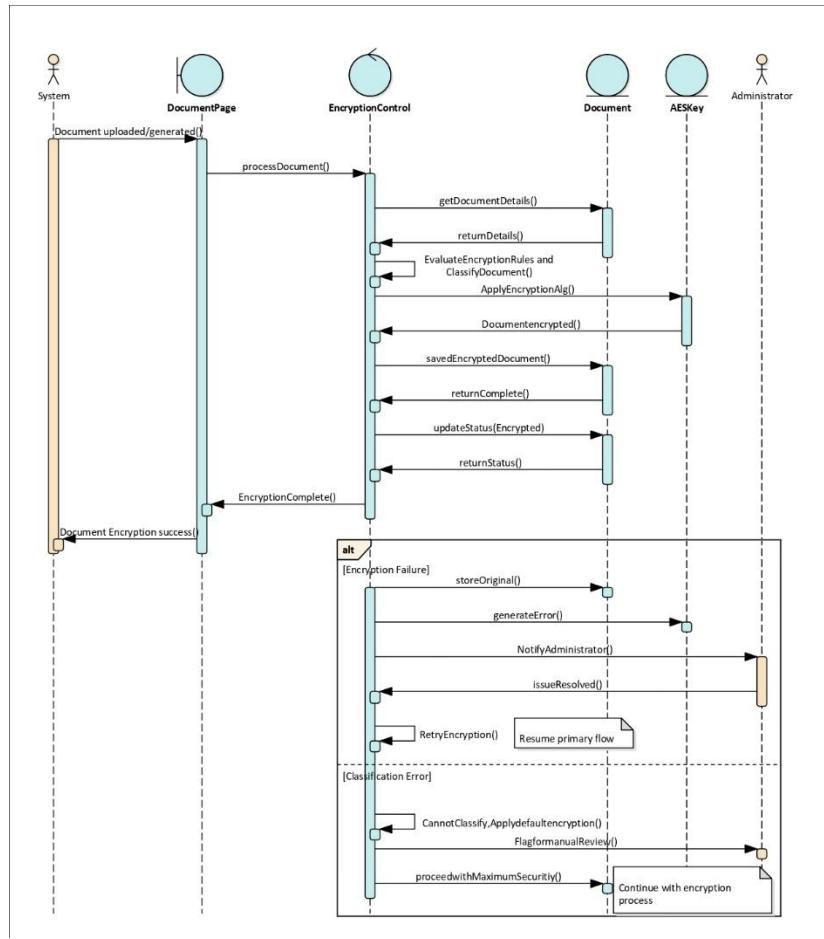


Figure E.15: Sequence Diagram of UC03-04 Encrypt Document

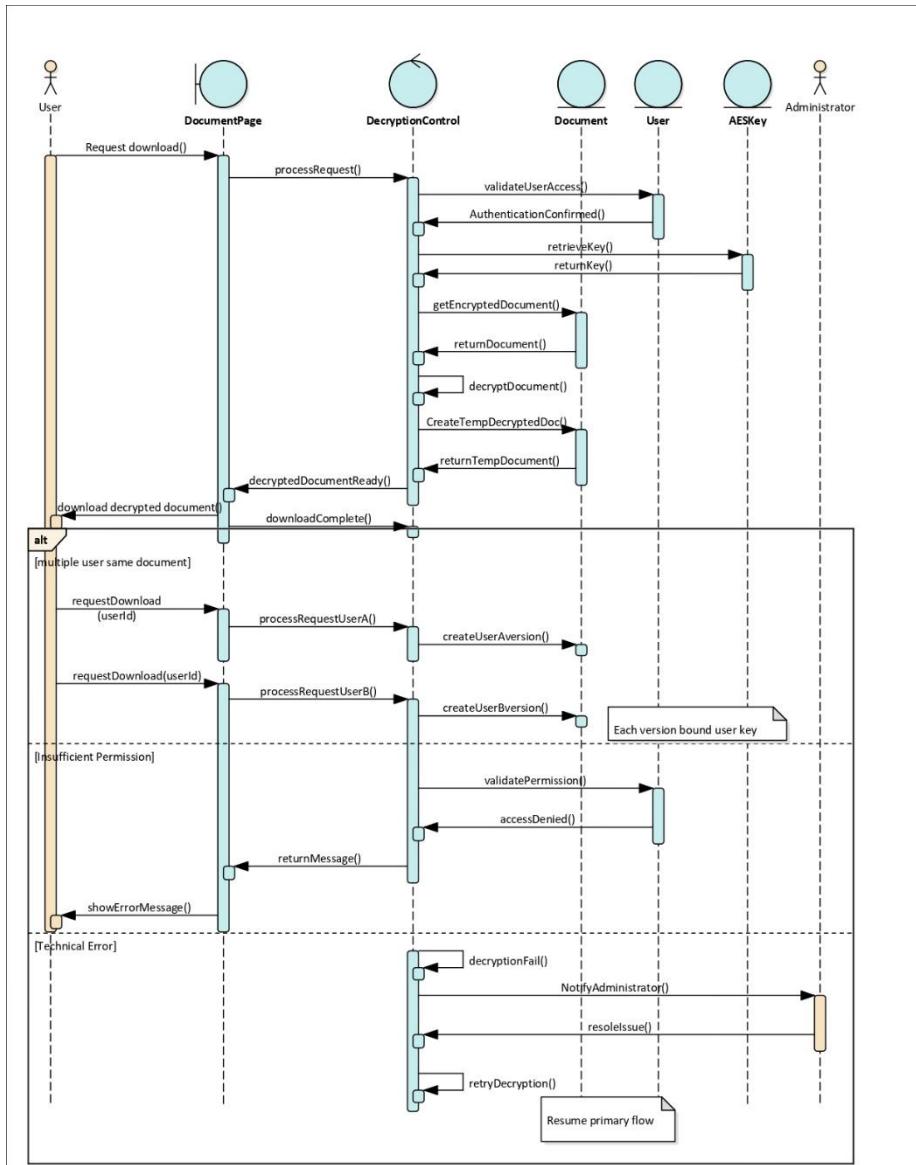


Figure E.16: Sequence Diagram of UC03-05 Decrypt Document

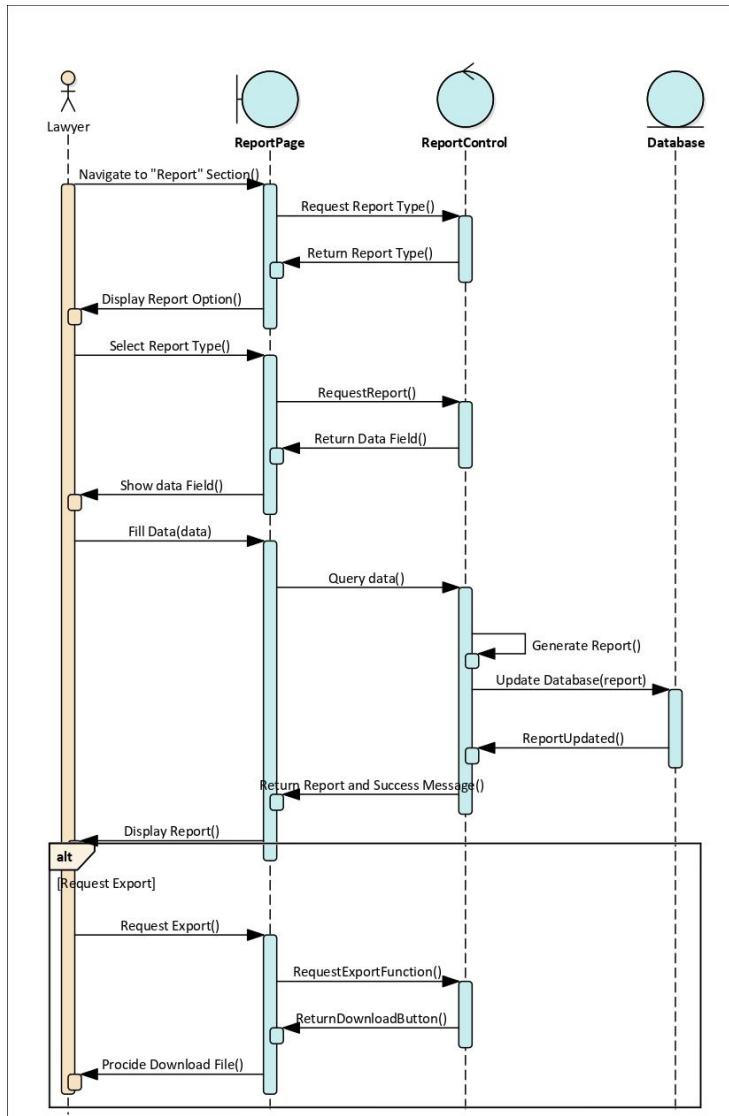


Figure E.17: Sequence Diagram of UC04-01 Generate Report

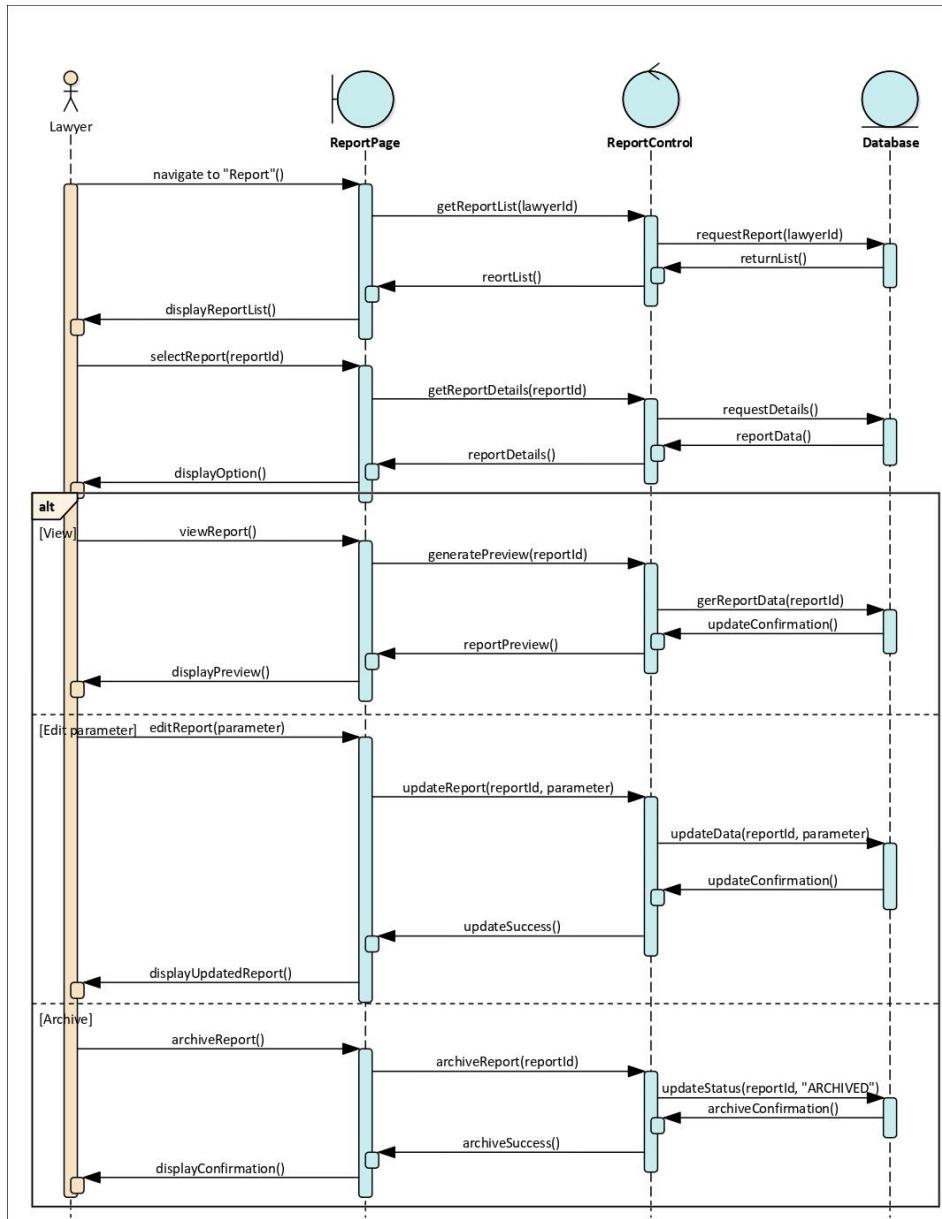


Figure E.18: Sequence Diagram of UC04-02 Manage Report

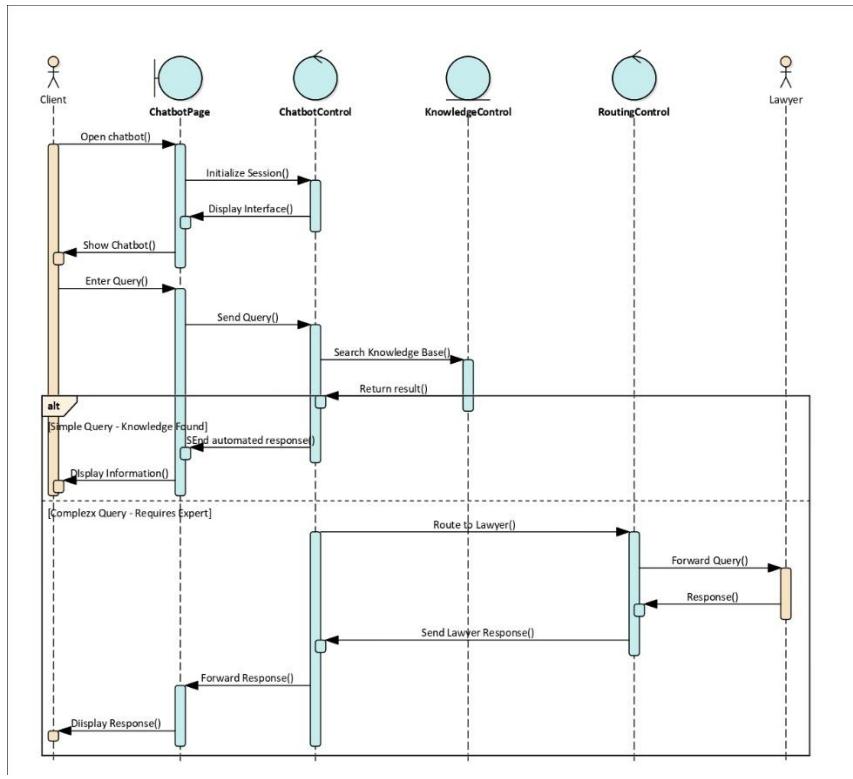


Figure E.19: Sequence Diagram of UC05-01 Chatbot Interaction

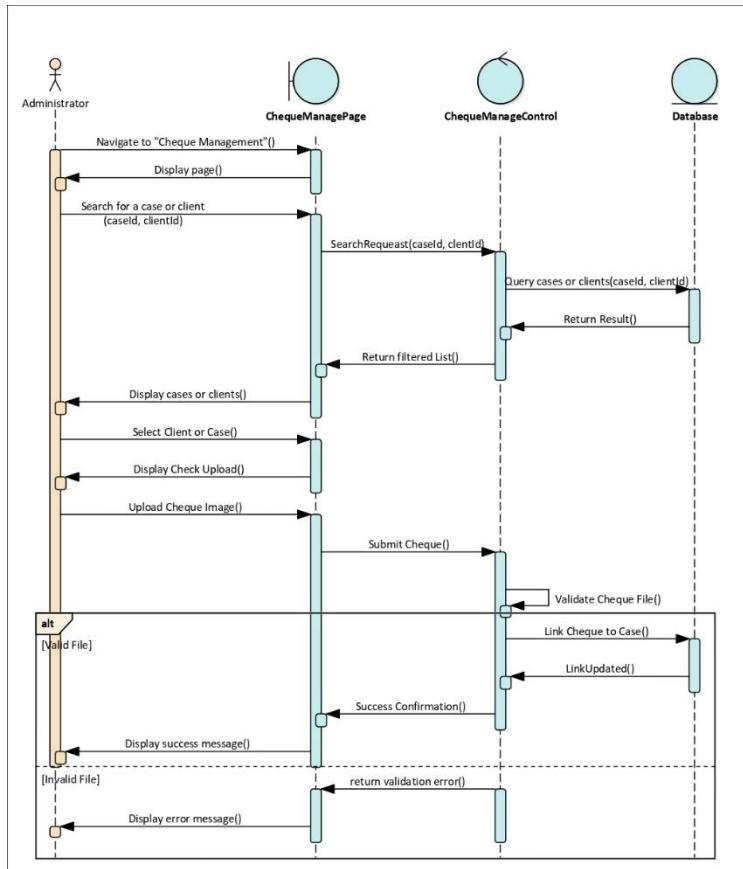


Figure E.20: Sequence Diagram of UC06-01 Upload Cheque

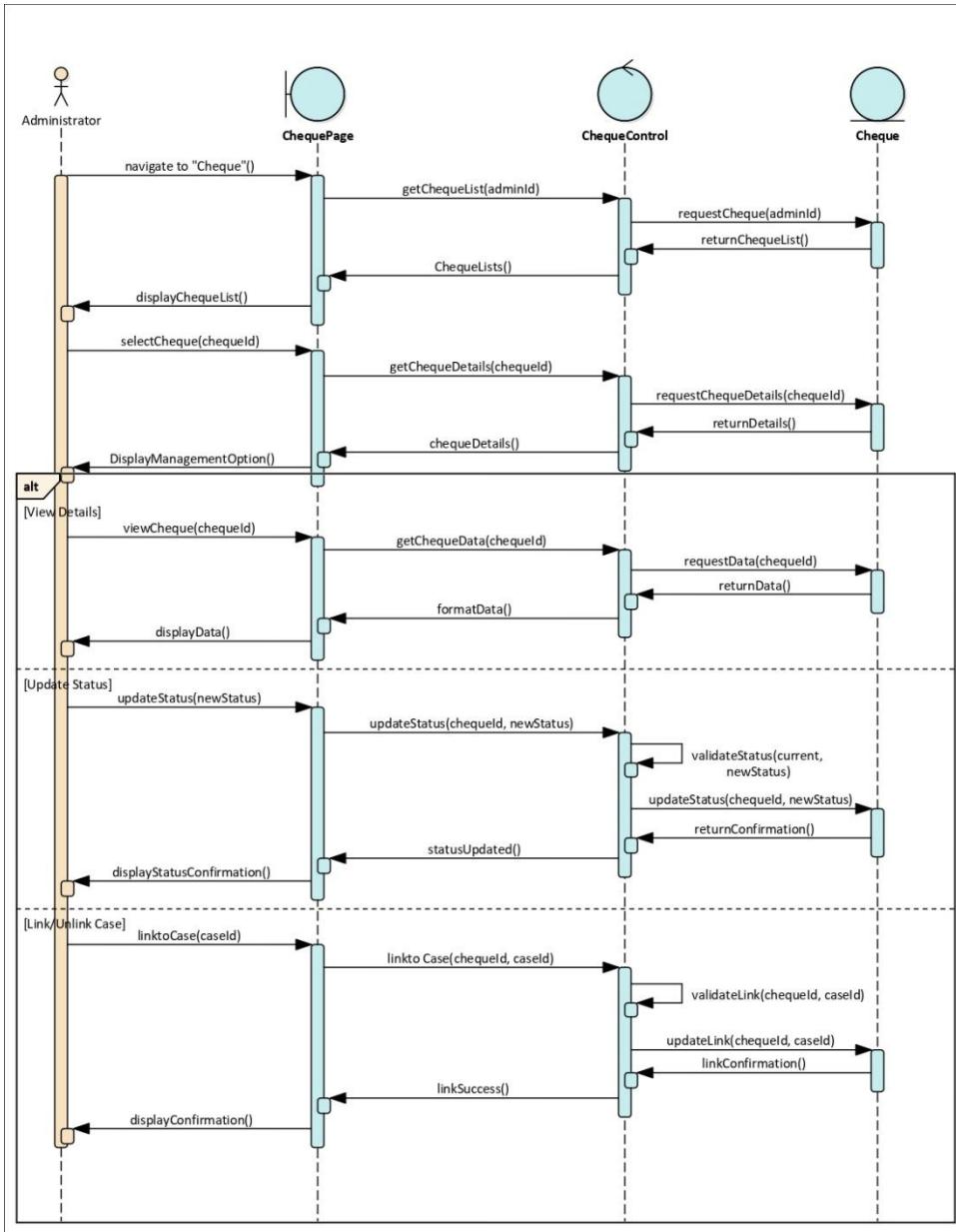


Figure E.21: Sequence Diagram of UC06-02 Manage Cheque

Appendix F Activity Diagram for Each Use Case

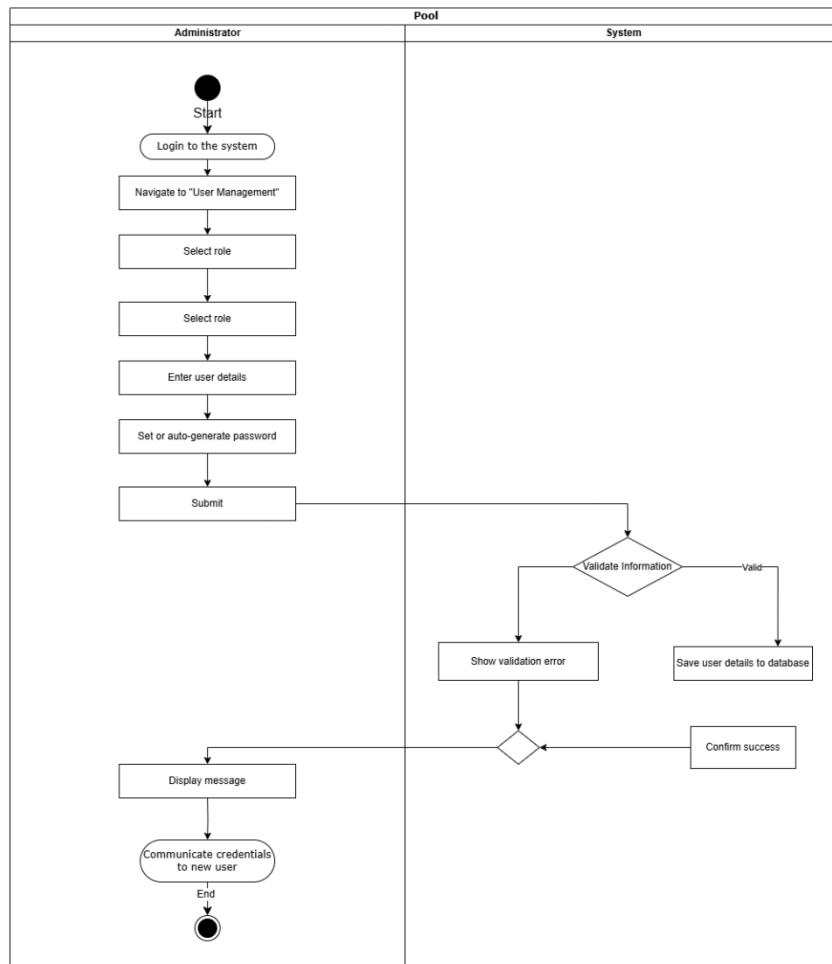


Figure F.1: Activity Diagram of UC01-01 Register Account

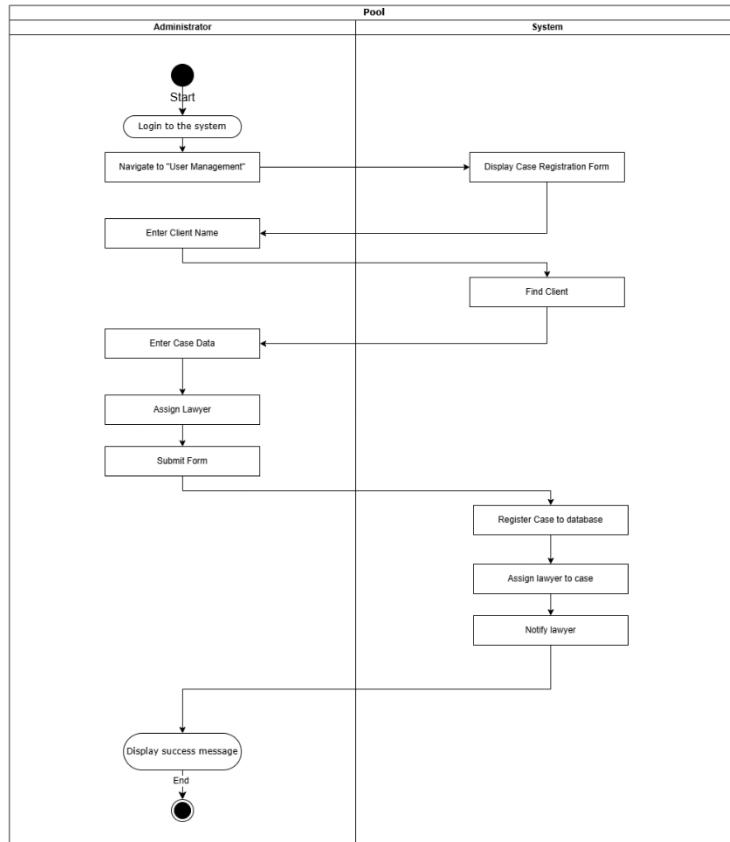


Figure F.2: Activity Diagram of UC01-02 Register Case

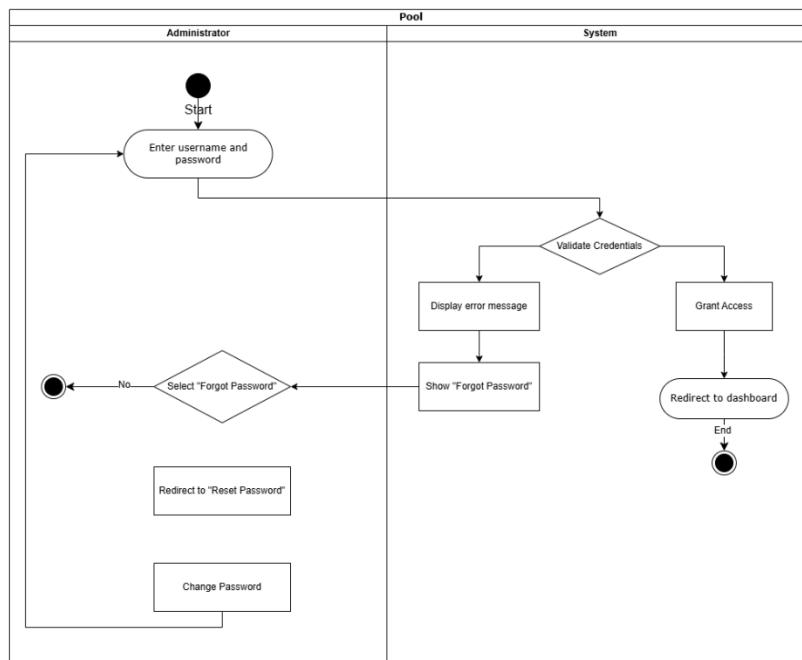


Figure F.3: Activity Diagram of UC01-03 Login

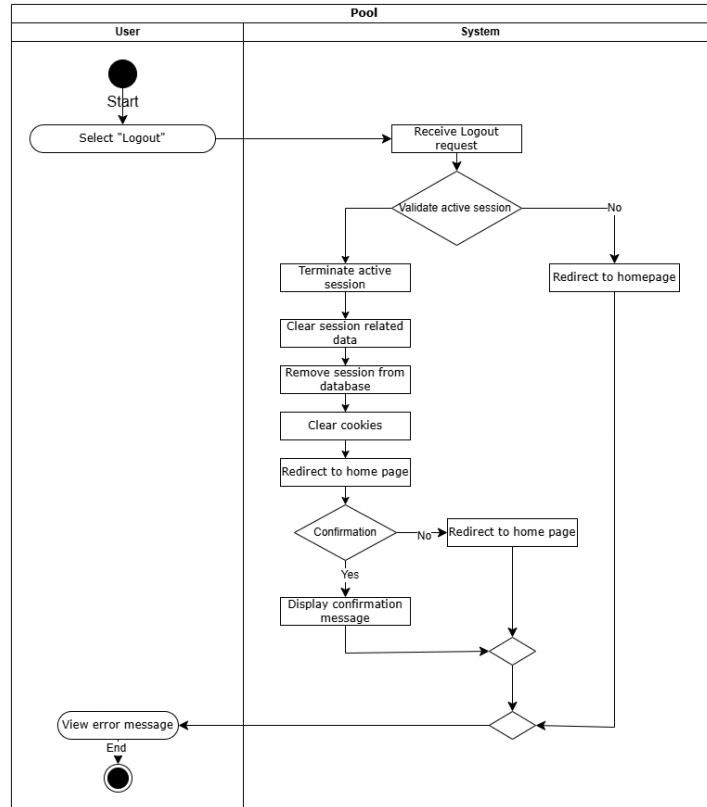


Figure F.4: Activity Diagram of UC01-04 Logout

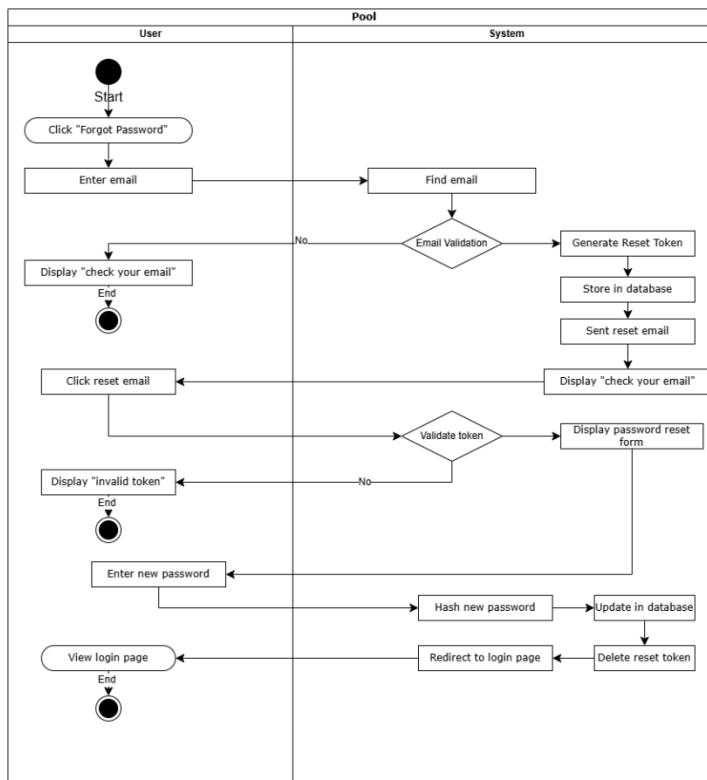


Figure F.5: Activity Diagram of UC01-05 Forgot Password

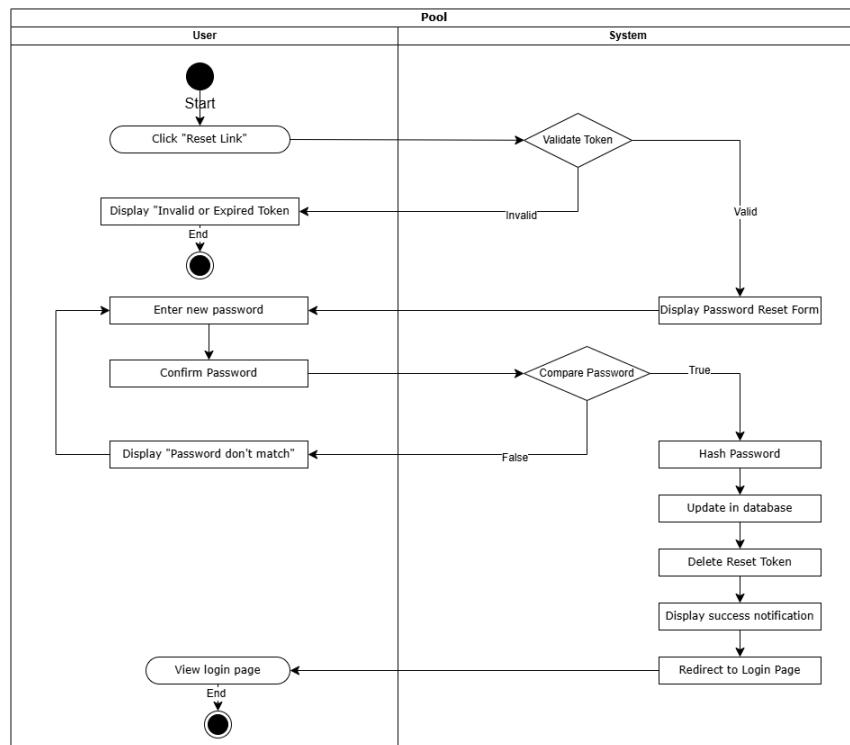


Figure F.6: Activity Diagram of UC01-06 Reset Password

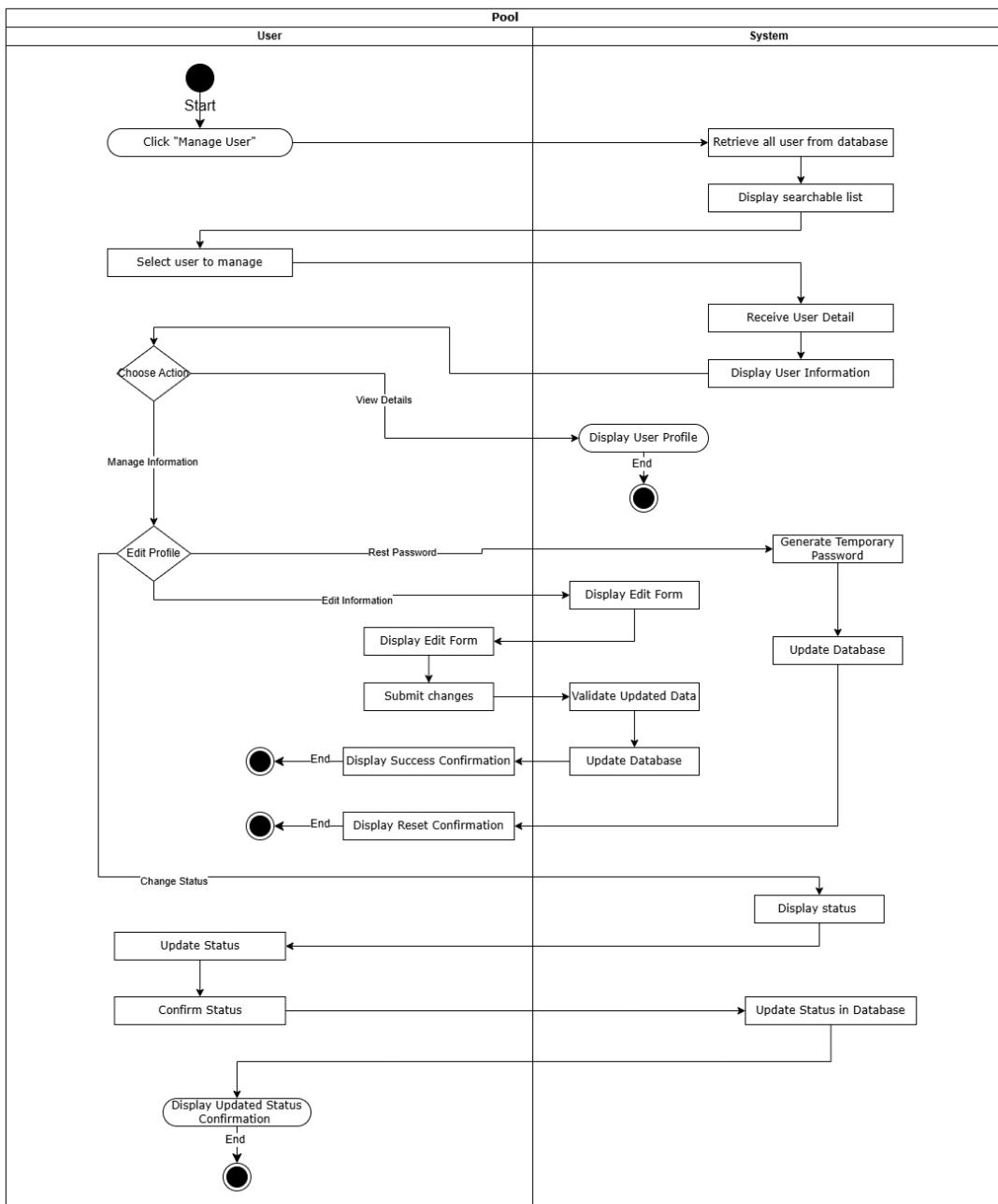


Figure F.7: Activity Diagram of UC01-07 Manage User

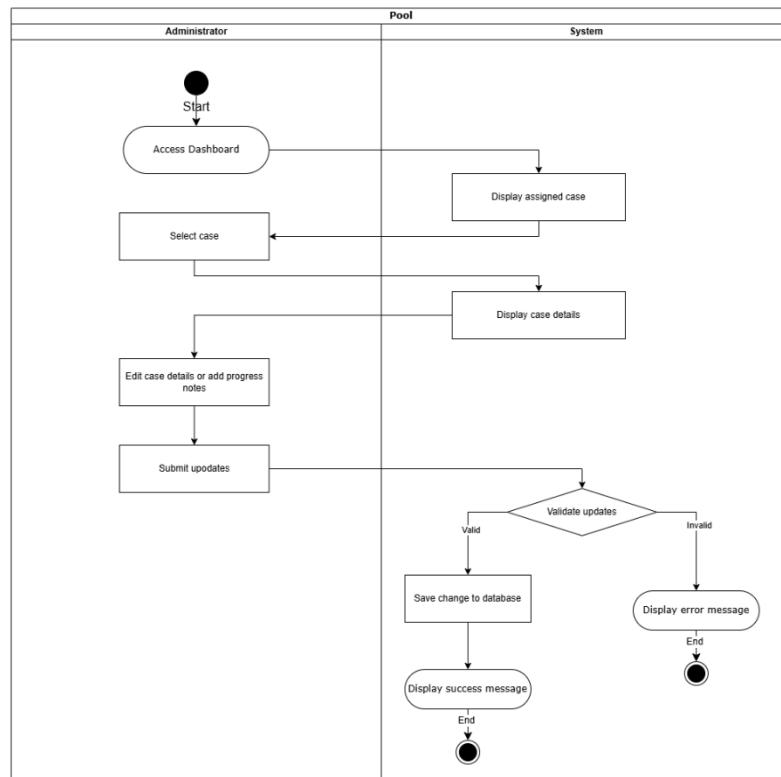


Figure F.8: Activity Diagram of UC02-02 Update Case

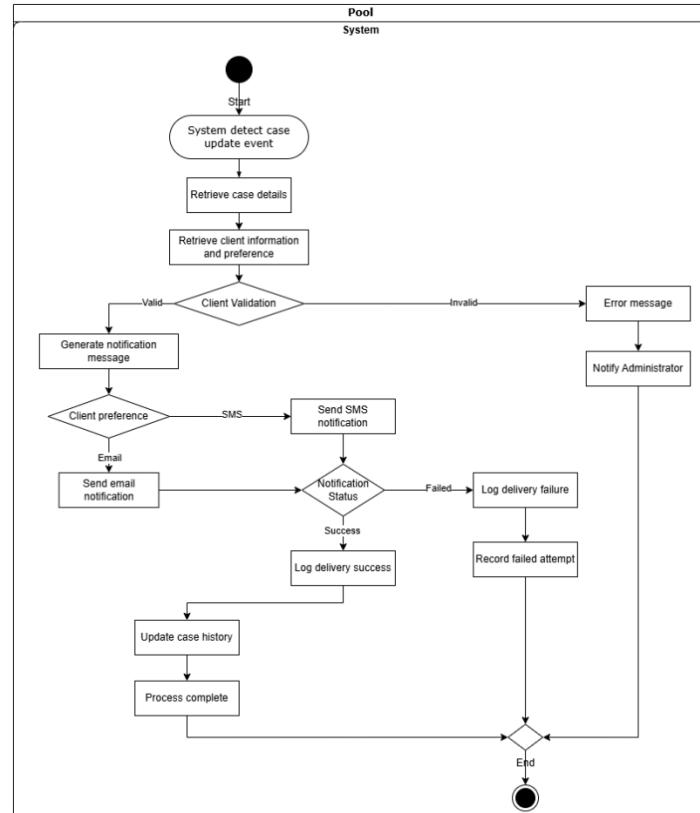


Figure F.9: Activity Diagram of UC02-03 Notify Case

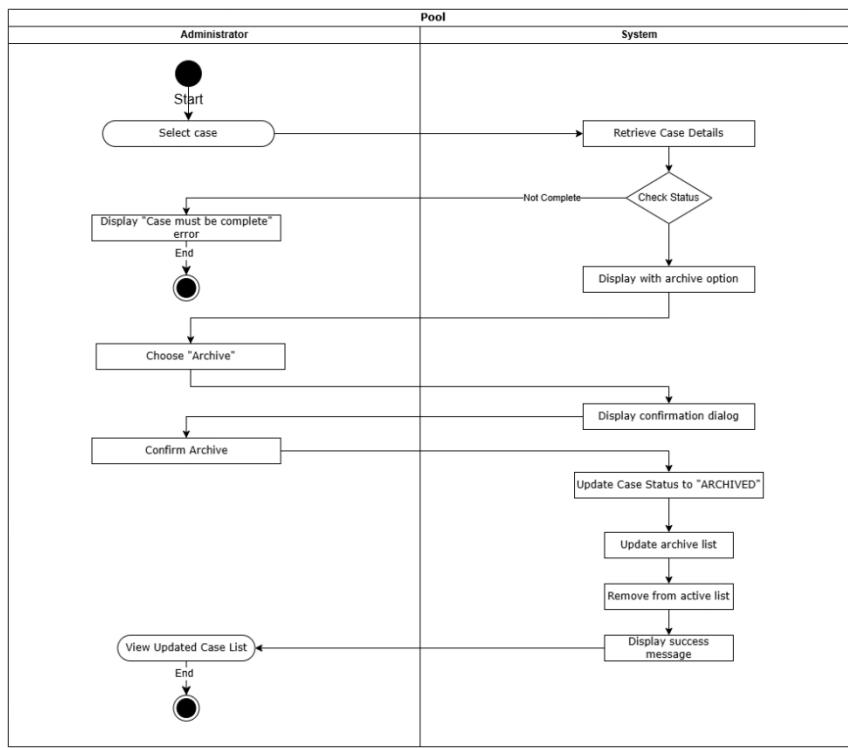


Figure F.10: Activity Diagram of UC02-04 Archive Case

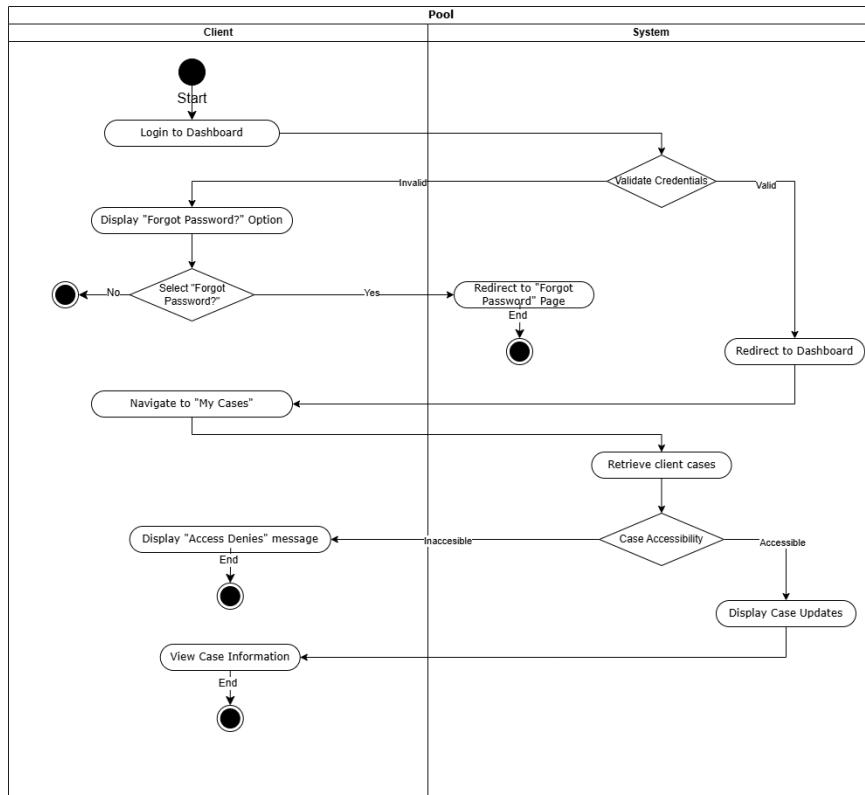


Figure F.11: Activity Diagram of UC02-05 View Case

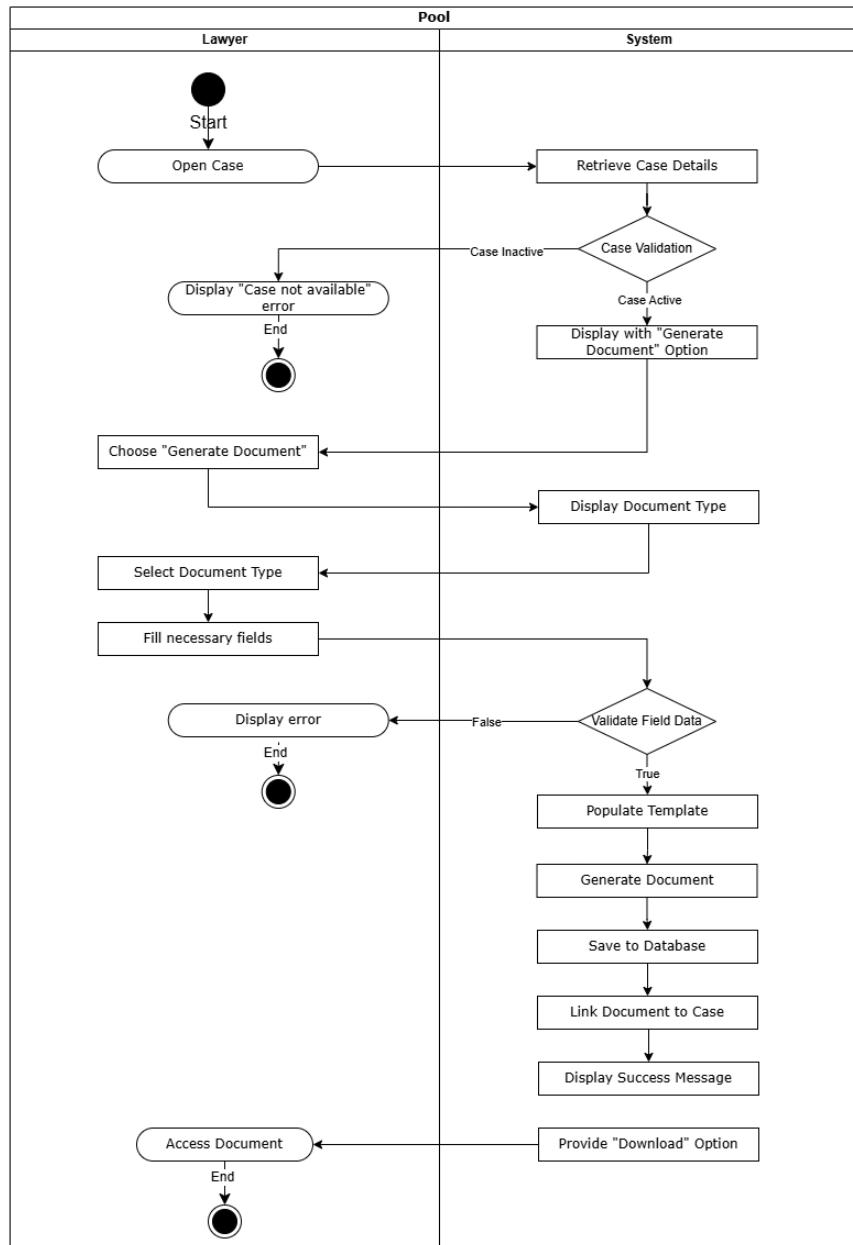


Figure F.12: Activity Diagram of UC03-01 Generate Document

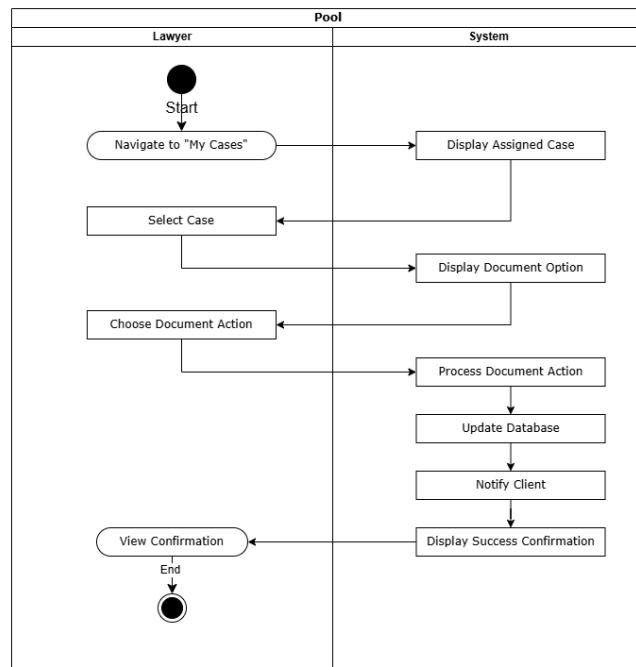


Figure F.13: Activity Diagram of UC03-02 Manage Document

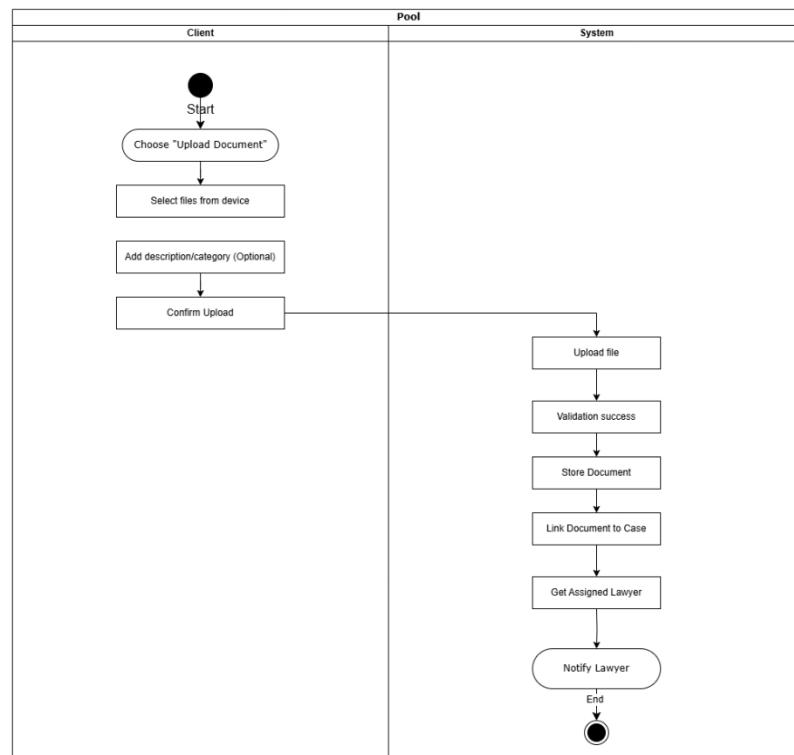


Figure F.14: Activity Diagram of UC03-03 Upload Document

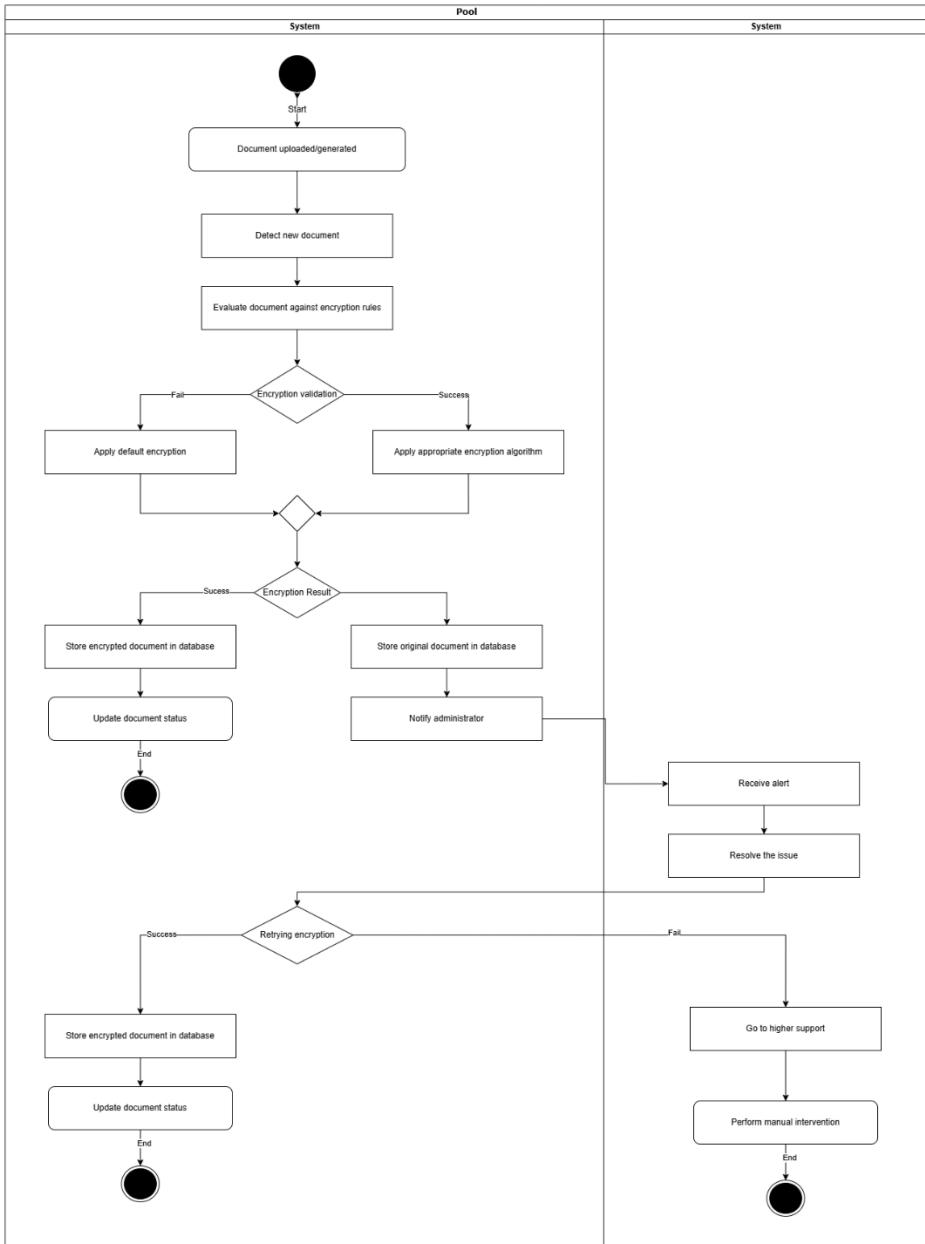


Figure F.15: Activity Diagram of UC03-04 Encrypt Document

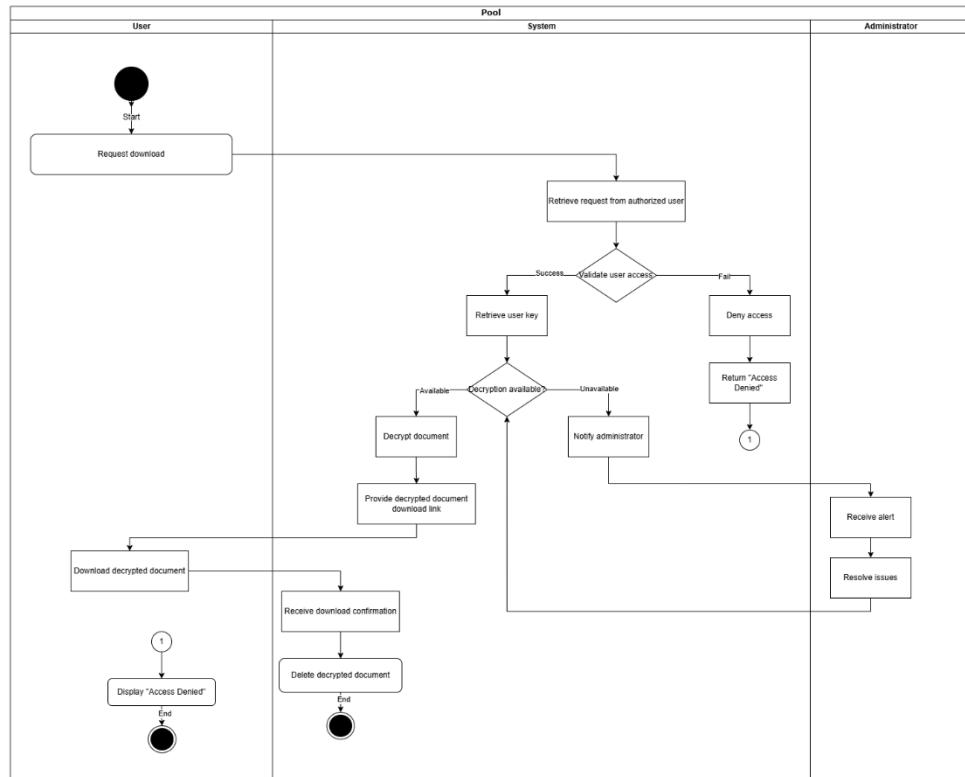


Figure F.16: Activity Diagram of UC03-05 Decrypt Document

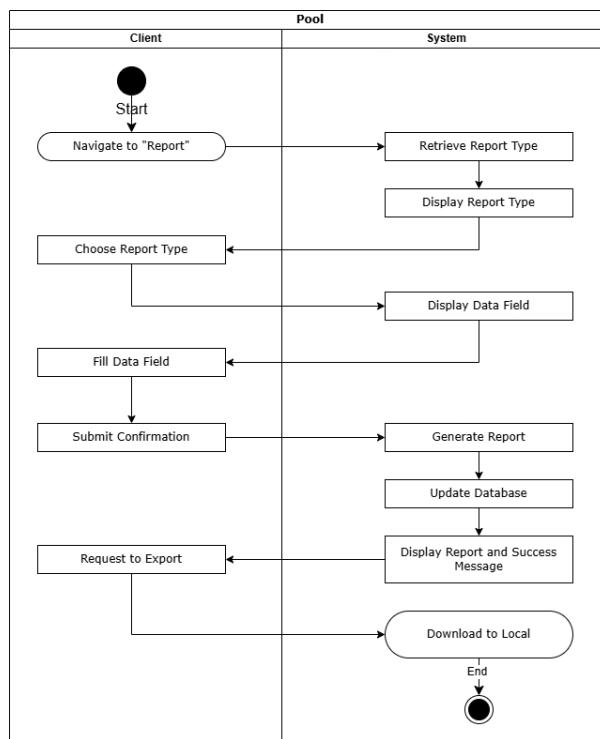


Figure F.17: Activity Diagram of UC04-01 Generate Report

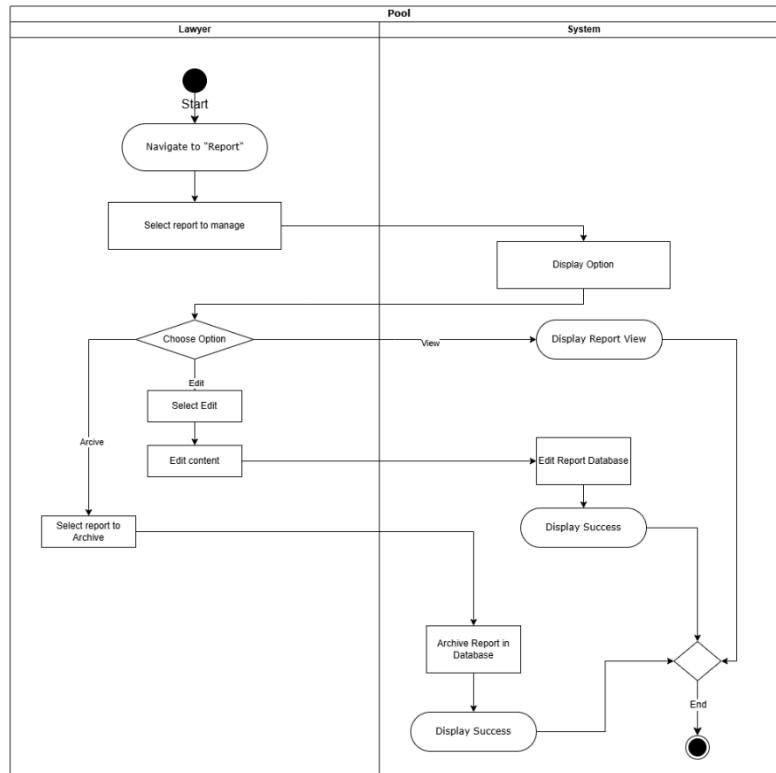


Figure F.18: Activity Diagram of UC05-02 Manage Report

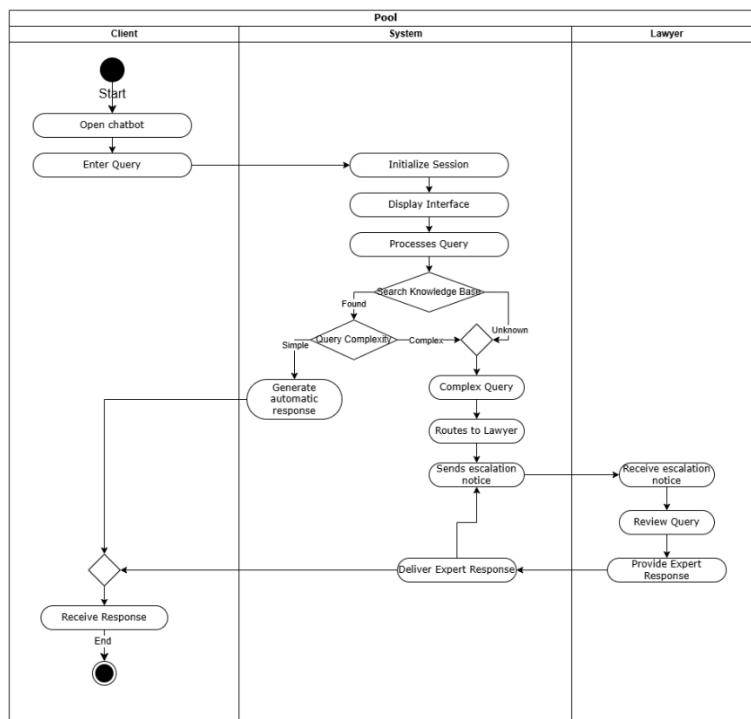


Figure F.19: Activity Diagram of UC05-01 Chatbot Interaction

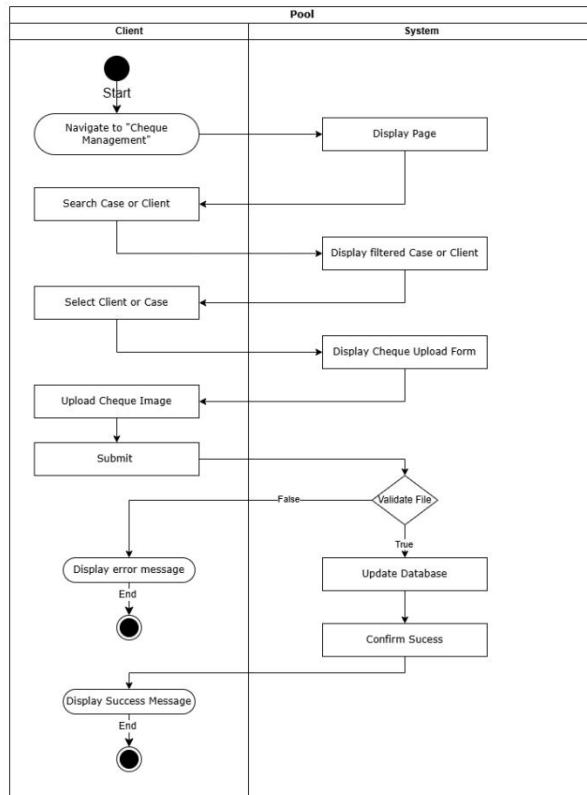
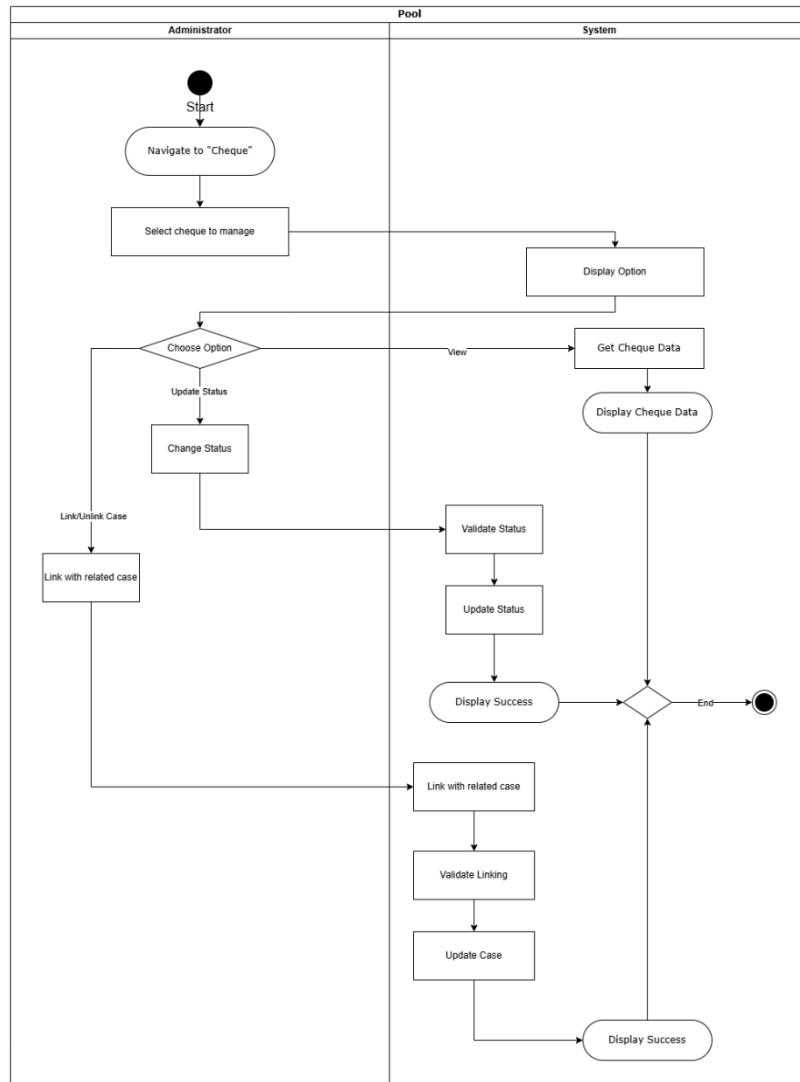


Figure F.20: Activity Diagram of UC06-01 Upload Cheque



Appendix G Data Dictionary for Each Entity

Table G.1: Data dictionary of Administrator Entity

Attribute Name	Type	Description
adminID	INT	Unique ID of an Admin
userID	INT	Unique ID of the user
staff	INT	Type of staff

Table G.2: Data dictionary of Lawyer Entity

Attribute Name	Type	Description
lawyerID	INT	Unique ID of a Lawyer
userID	INT	Unique ID of the user
staff	INT	Type of staff

Table G.3: Data dictionary of Client Entity

Attribute Name	Type	Description
clientID	INT	Unique ID of a Client
userID	INT	Unique ID of the user
jobs	VARCHAR	Current job of client

Table G.4: Data dictionary of Case Entity

Attribute Name	Type	Description
caseID	INT	Unique ID of a Case
clientID	INT	Unique ID of a Client
lawyerID	INT	Unique ID of a lawyer
status	VARCHAR	Status of the case
description	VARCHAR	Description of the case
title	VARCHAR	Title of the case

Table G.5: Data dictionary of Cheque Entity

Attribute Name	Type	Description
chequeID	INT	Unique ID of a Cheque
amount	INT	Amount of money
cheque_number	VARCHAR	Number of the cheque
upload_date	DATETIME	Date the cheque uploaded

Table G.6: Data dictionary of Document Entity

Attribute Name	Type	Description
documentID	INT	Unique ID of a Document
caseID	INT	Unique ID of a Case
encrypted_content	TEXT	Encrypted Content
encrypted_aes_key	TEXT	Encrypted AES key
is_encrypted	BOOLEAN	Status of the Document
created_by	INT	Unique ID of a Lawyer
created_at	DATETIME	Date the document is uploaded

Table G.7: Data dictionary of RSAKey

Attribute Name	Type	Description
private_key	VARCHAR	Private Key description
public_key	VARCHAR	Public Key description

Table G.7: Data dictionary of AESKey

Attribute Name	Type	Description
key_value	VARCHAR	Key description

Appendix H Interface Design

The screenshot shows the 'User Management' application interface. At the top, there is a yellow header bar with a search bar, the title 'User Management', and a logo for 'Aman Ghanta & ASSOCIATES'. Below the header is a section titled 'Personal Information' containing the following fields:

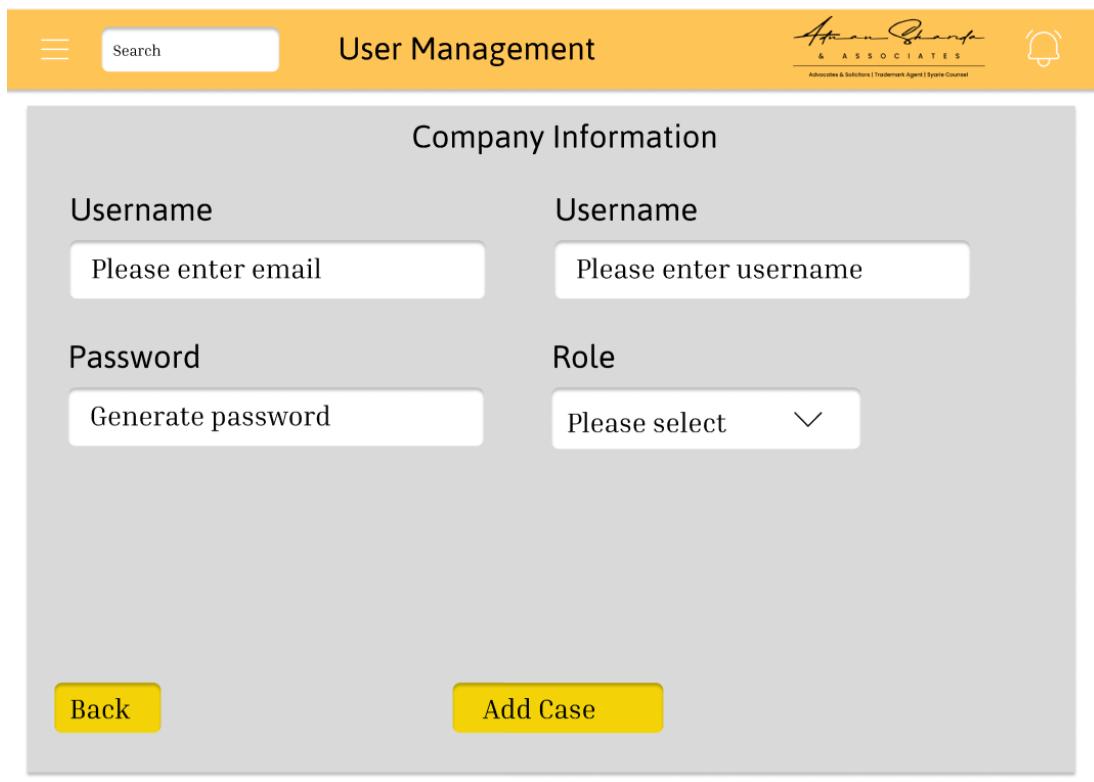
- Full Name: Input field placeholder 'Please enter full name'.
- Age: Input field placeholder 'Please enter age'.
- Identification Number: Input field placeholder 'Please identification number'.
- Marital Status: A dropdown menu placeholder 'Please select' with a downward arrow icon.
- Gender: A dropdown menu placeholder 'Please select' with a downward arrow icon.
- Nationality: A dropdown menu placeholder 'Please select' with a downward arrow icon.
- Income: Input field placeholder 'Please enter monthly income'.
- Job: Input field placeholder 'Please enter jobs'.

A yellow 'Next' button is located at the bottom right of the form.

Figure .1: UC01-01 Register Account Interface Design

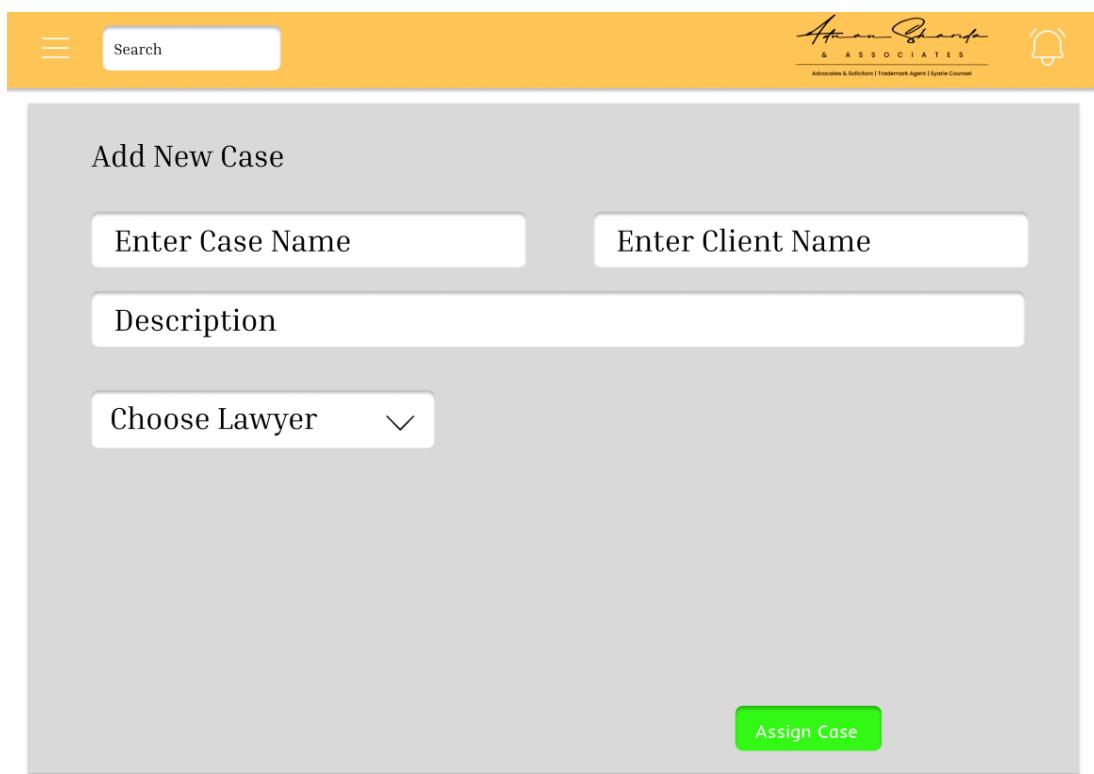
This screenshot shows the same 'User Management' application interface as Figure .1, but with a modified 'Personal Information' section. The 'Job' field has been replaced by a 'Staff' field, which is a dropdown menu placeholder 'Please select staff' with a downward arrow icon. All other fields and the overall layout remain the same as in Figure .1.

Figure H.2: UC01-01 Register Account Interface Design



The screenshot shows the 'User Management' interface. At the top, there is a search bar and the 'User Management' title. On the right, there is a logo for 'Aman Ghanta & ASSOCIATES' and a bell icon. Below the title, the section 'Company Information' is displayed. It contains two sets of input fields: 'Username' (placeholder: 'Please enter email') and 'Username' (placeholder: 'Please enter username'). Below these are 'Password' (placeholder: 'Generate password') and 'Role' (placeholder: 'Please select'). At the bottom left is a 'Back' button, and at the bottom right is an 'Add Case' button.

Figure H.3: UC01-01 Register Account Interface Design



The screenshot shows the 'Add New Case' interface. At the top, there is a search bar and the 'Aman Ghanta & ASSOCIATES' logo with a bell icon. Below the title, the section 'Add New Case' is displayed. It contains four input fields: 'Enter Case Name', 'Enter Client Name', 'Description', and 'Choose Lawyer'. At the bottom right is a green 'Assign Case' button.

Figure H.4: UC01-02 Register Case Interface Design

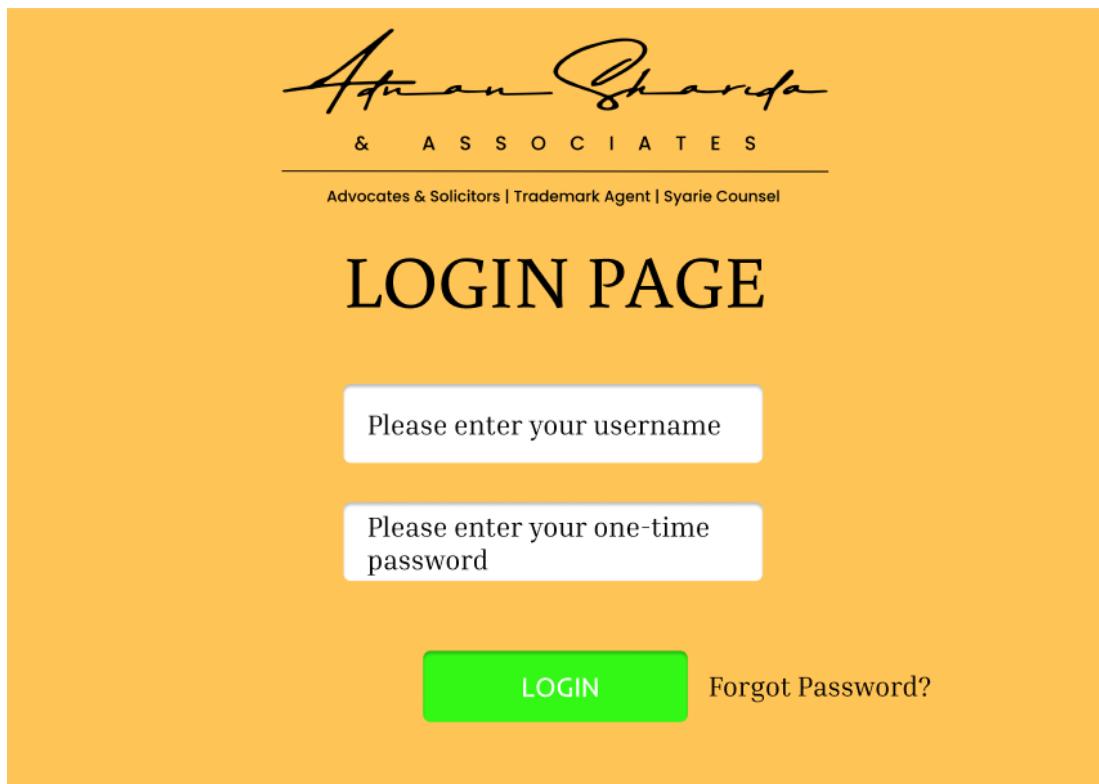


Figure H.5: UC01-03 Login Interface Design

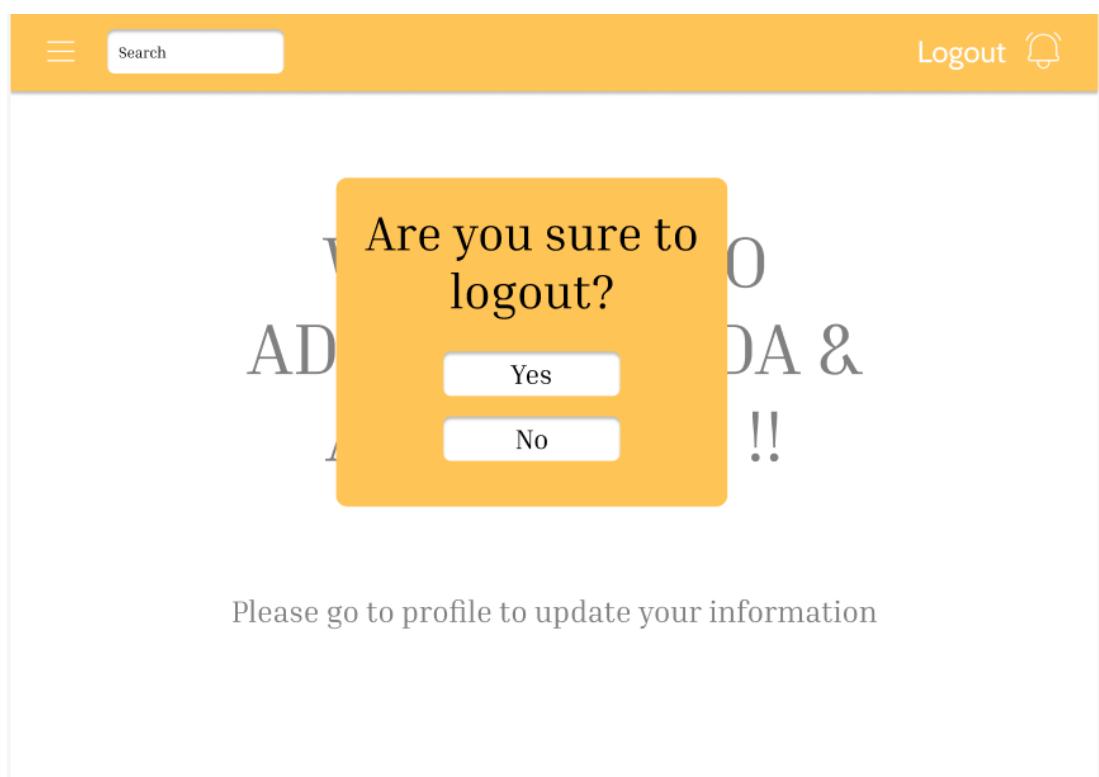


Figure H.6: UC01-04 Logout Interface Design

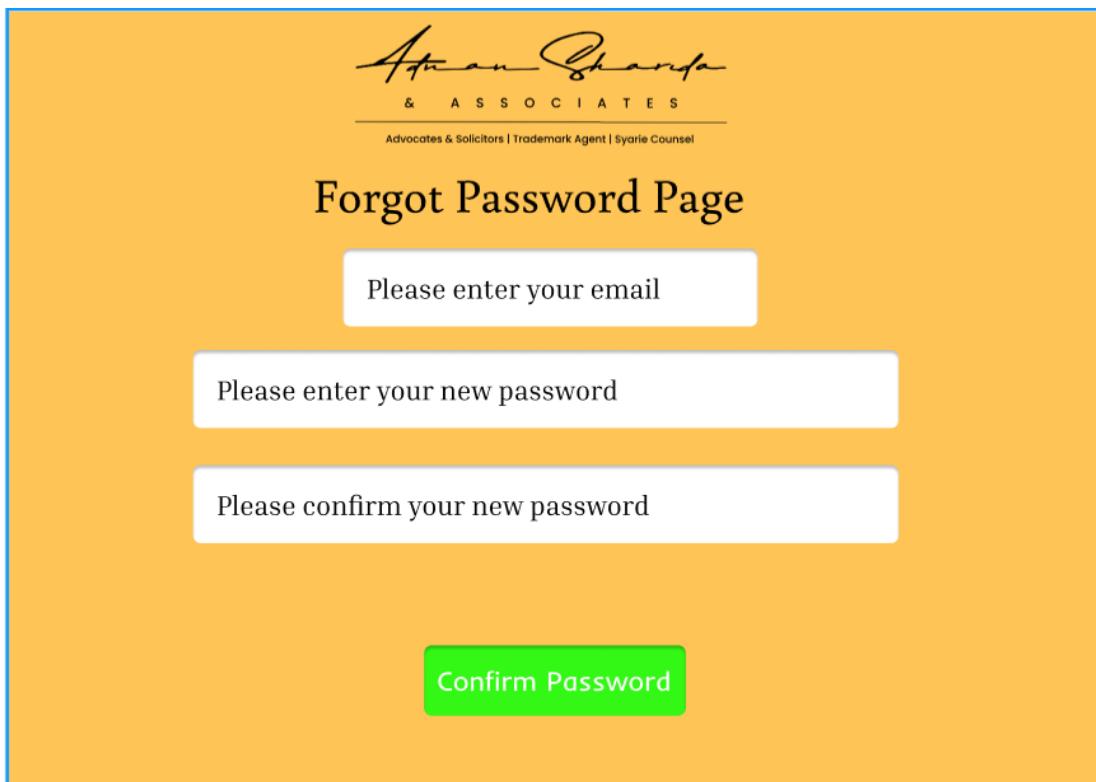


Figure H.7: UC01-05 Forgot Password Interface Design

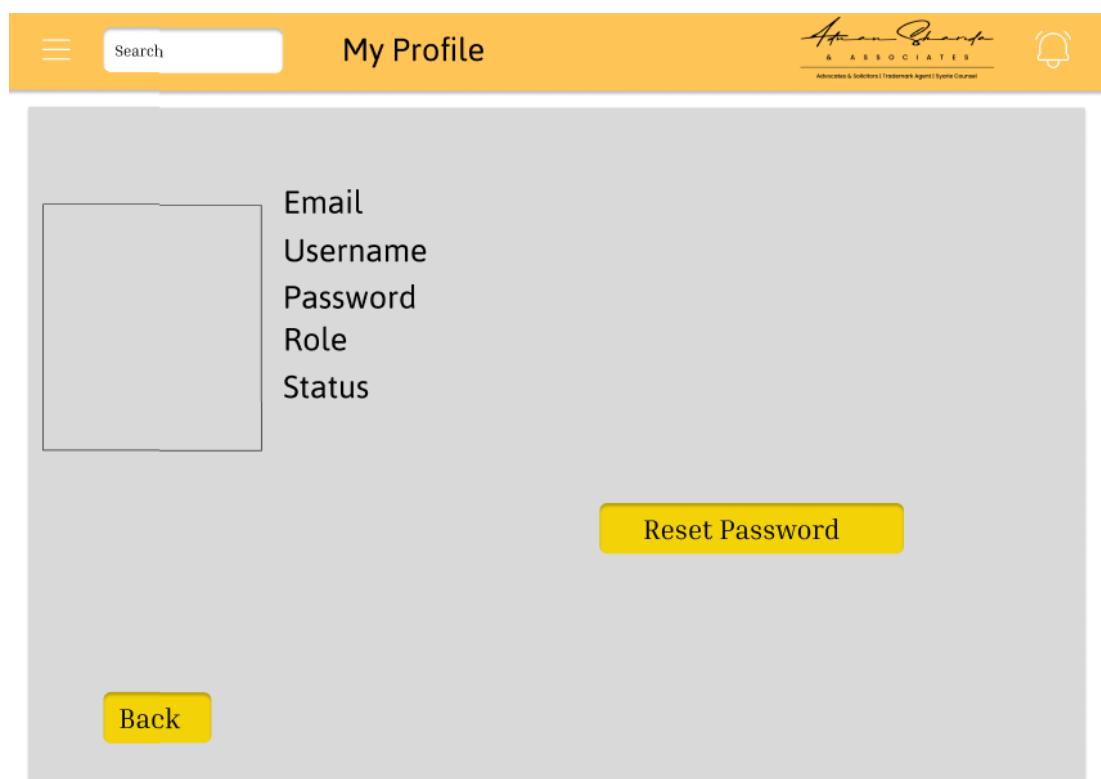


Figure H.8: UC01-06 Reset Password Interface Design

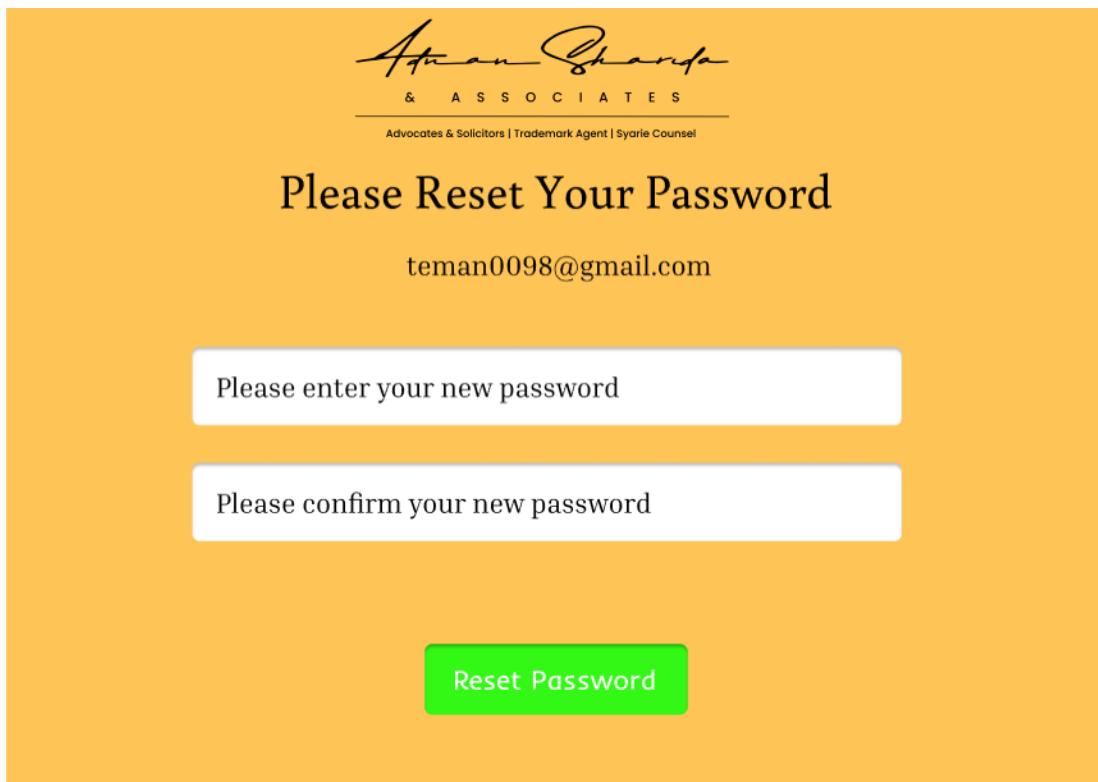


Figure H.9: UC01-06 Reset Password Interface Design

A screenshot of a user management interface. The header features a search bar, a menu icon, the 'Aman Ghanta & ASSOCIATES' logo, and a notification bell icon. The main section is titled 'User's List' and contains a table with columns for 'Name' and 'Status'. The table has six empty rows. At the bottom of the table is a navigation bar with left and right arrows.

Figure H.10: UC01-07 Manage User Interface Design

The screenshot shows a mobile application interface titled "My Profile". At the top, there is a search bar and a logo for "Aman Ghanta & ASSOCIATES" which includes the text "Advocates & Solicitors | Trademark Agent | Syntex Counsel". A notification bell icon is also present. The main content area contains a large empty rectangular box on the left and a list of personal information fields on the right:

- Full Name
- Age
- Identification Number
- Marital Status
- Gender
- Nationality
- Income
- Jobs

Below the list are two yellow buttons: "Edit" on the left and "Next" on the right.

Figure H.11: UC01-07 Manage User Interface Design

The screenshot shows a mobile application interface titled "My Profile". At the top, there is a search bar and a logo for "Aman Ghanta & ASSOCIATES" which includes the text "Advocates & Solicitors | Trademark Agent | Syntex Counsel". A notification bell icon is also present. The main content area contains a large empty rectangular box on the left and a list of account management fields on the right:

- Email
- Username
- Password
- Role
- Status

Below the list are three yellow buttons: "Edit" on the left, "Reset Password" in the middle, and "Change Status" with a dropdown arrow on the right. At the bottom left is a yellow "Back" button.

Figure H.12: UC01-07 Manage User Interface Design

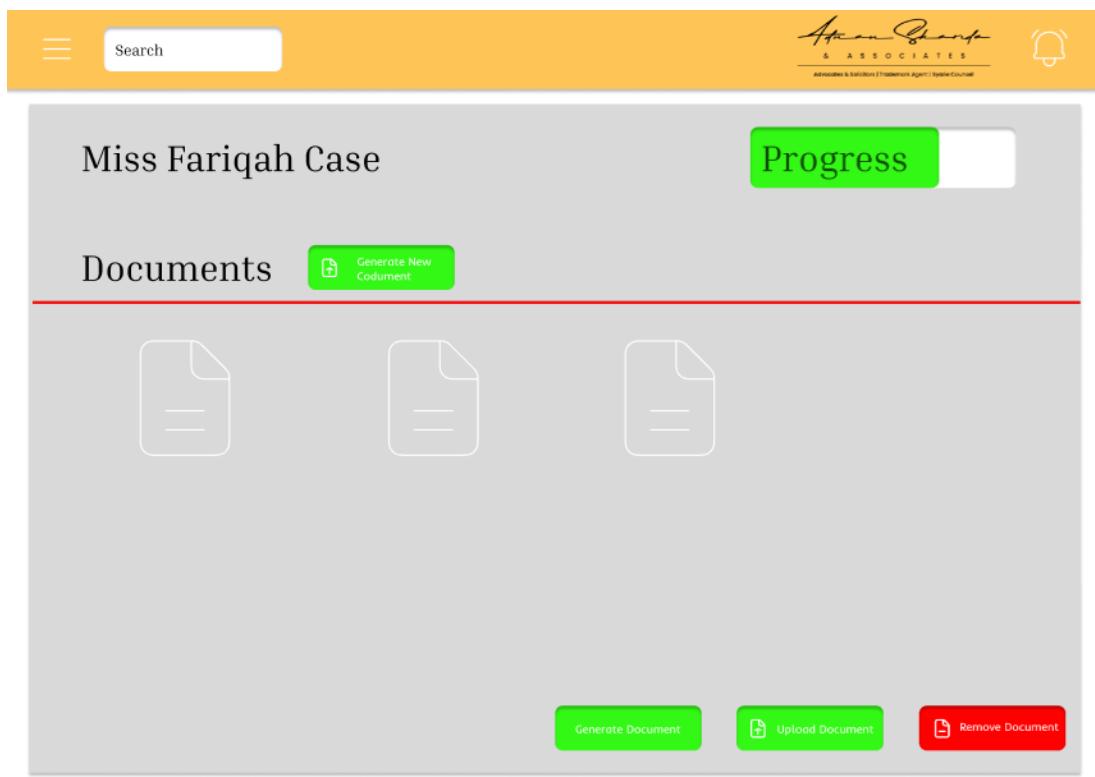


Figure H.13: UC02-02 Update Case Interface Design

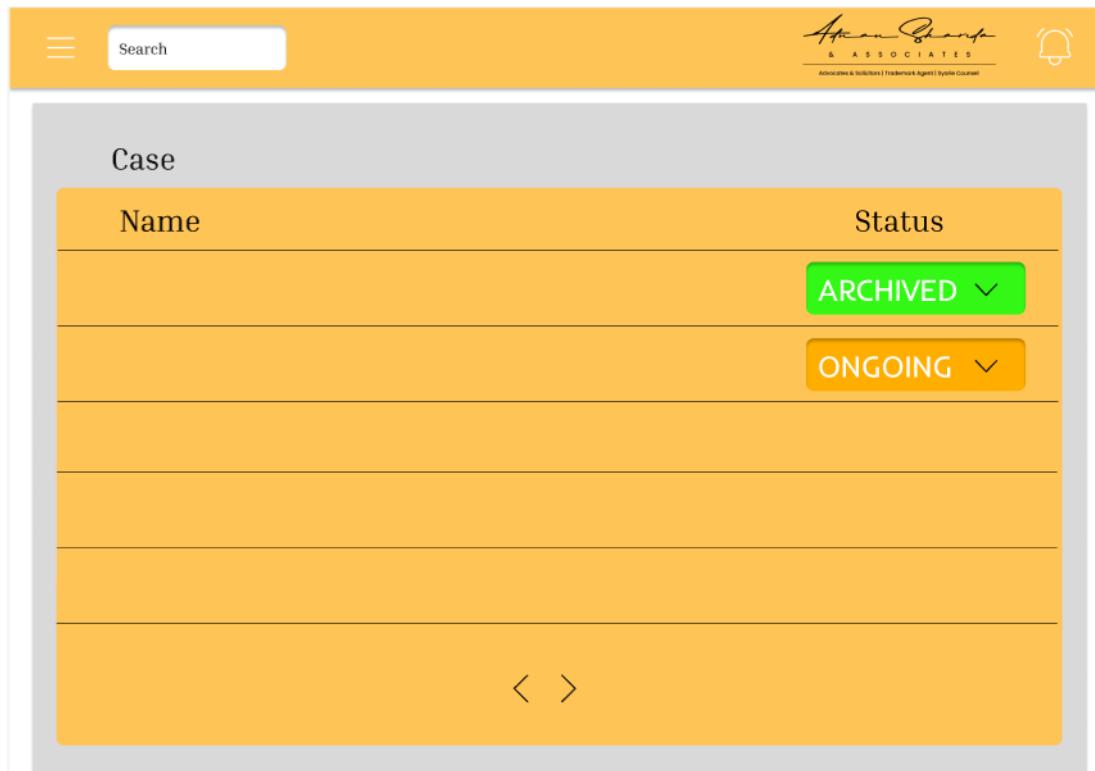


Figure H.14: UC02-04 Archive Case Interface Design

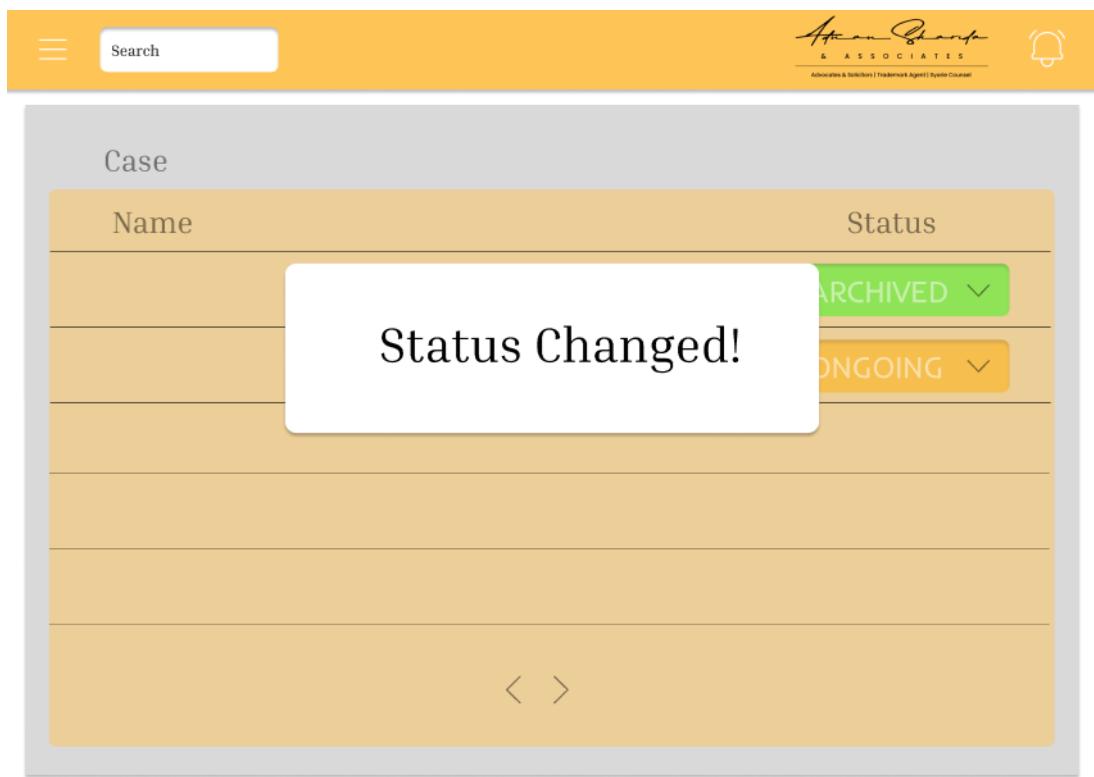


Figure H.15: UC02-04 Archive Case Interface Design



Figure H.16: UC02-04 Archive Case Interface Design

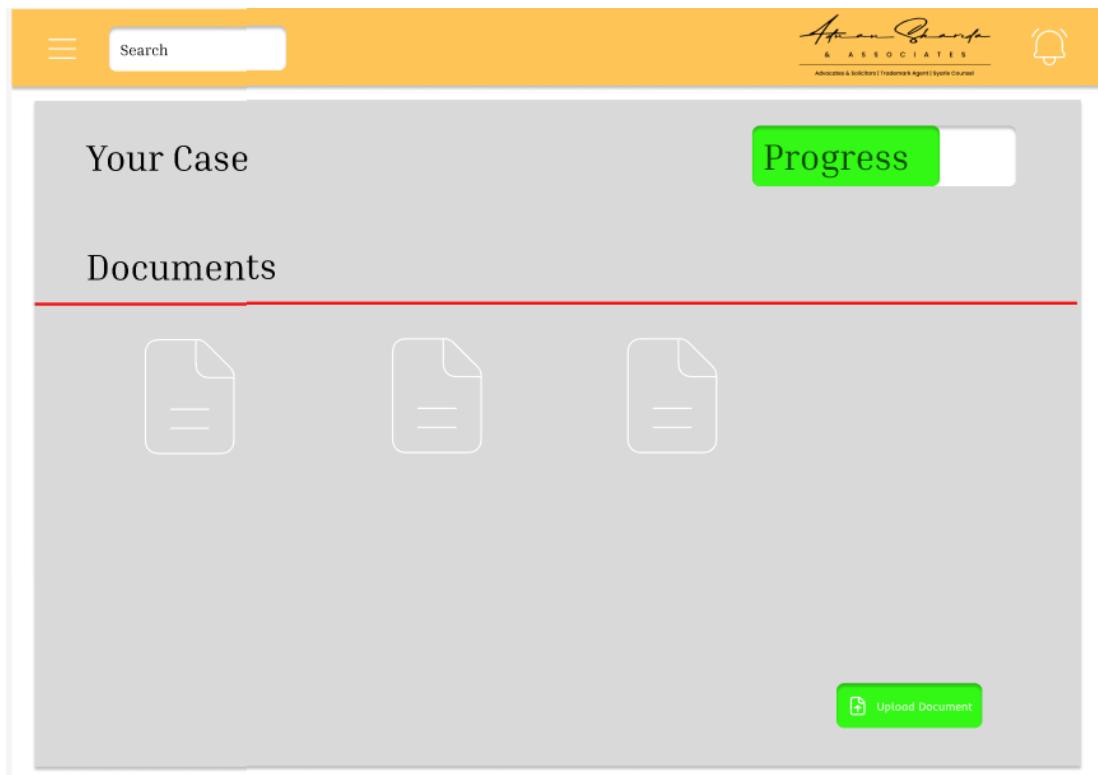


Figure H.17: UC02-05 View Case Interface Design

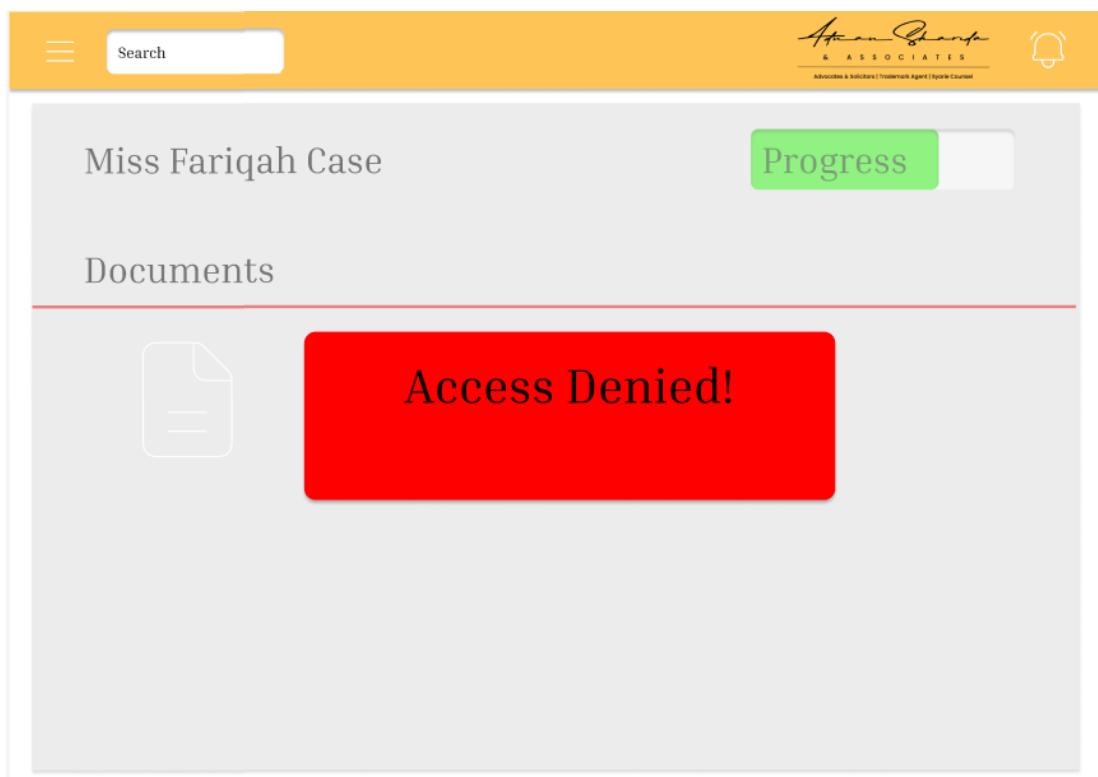


Figure H.18: UC02-05 View Case Interface Design

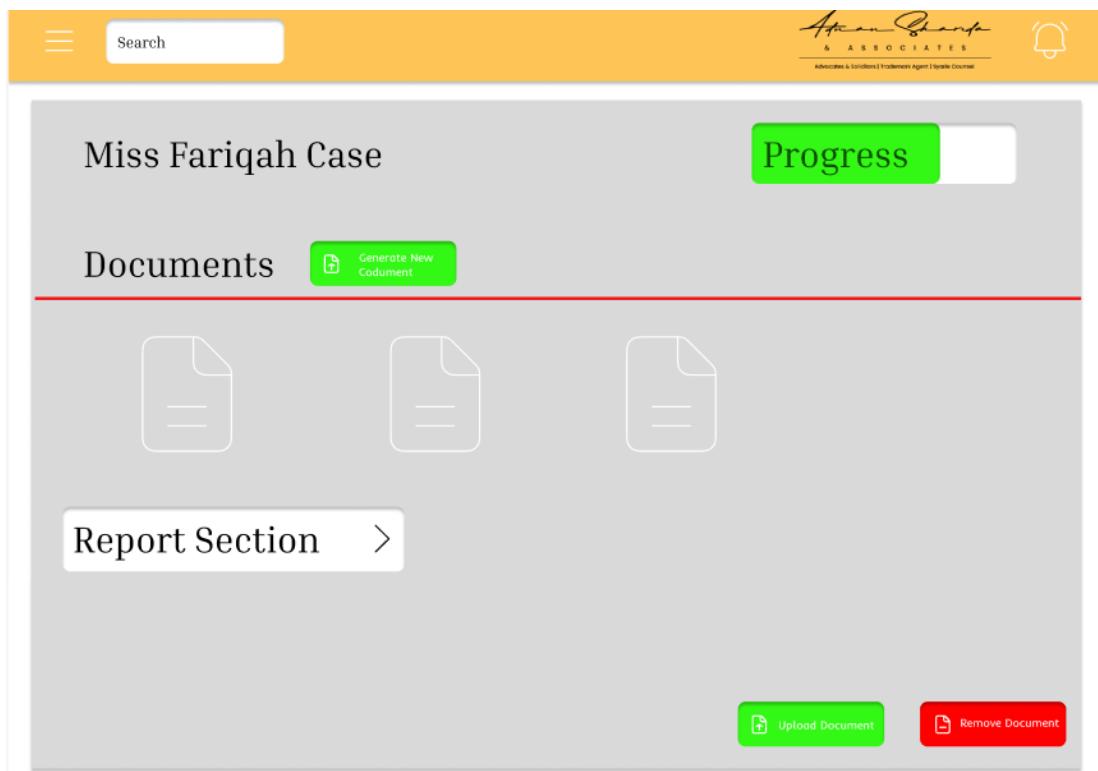


Figure H.19: UC03-01 Generate Document Interface Design

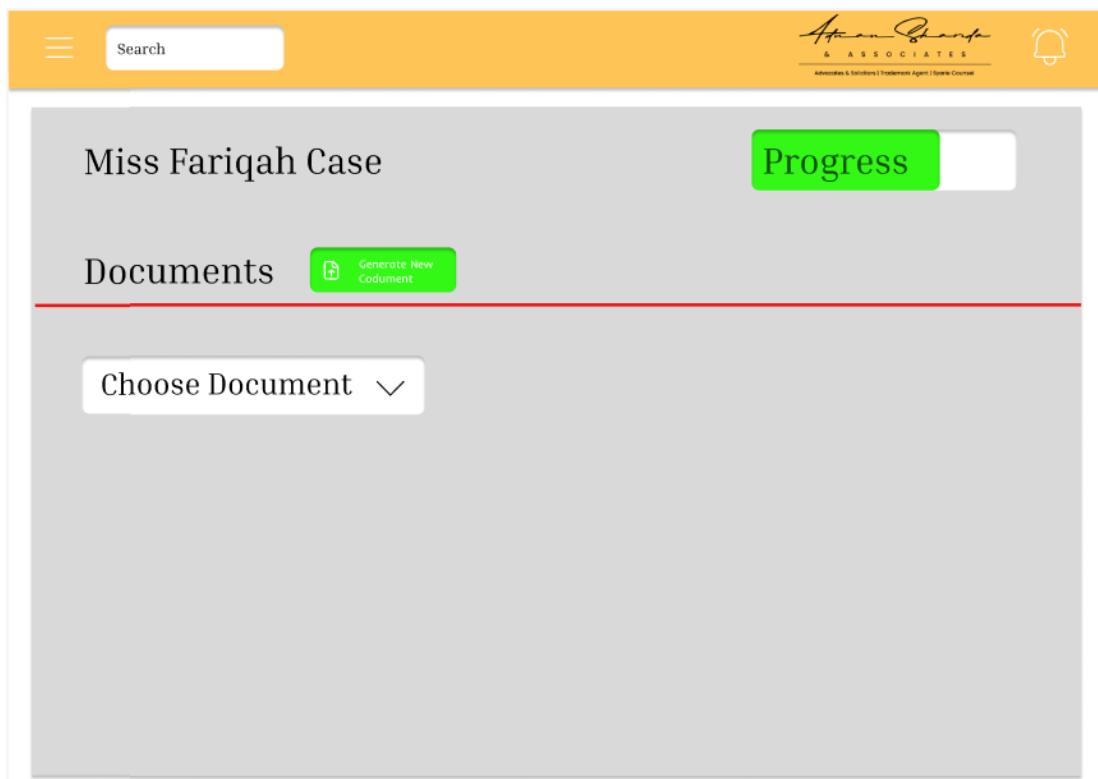


Figure H.20: UC03-01 Generate Document Interface Design

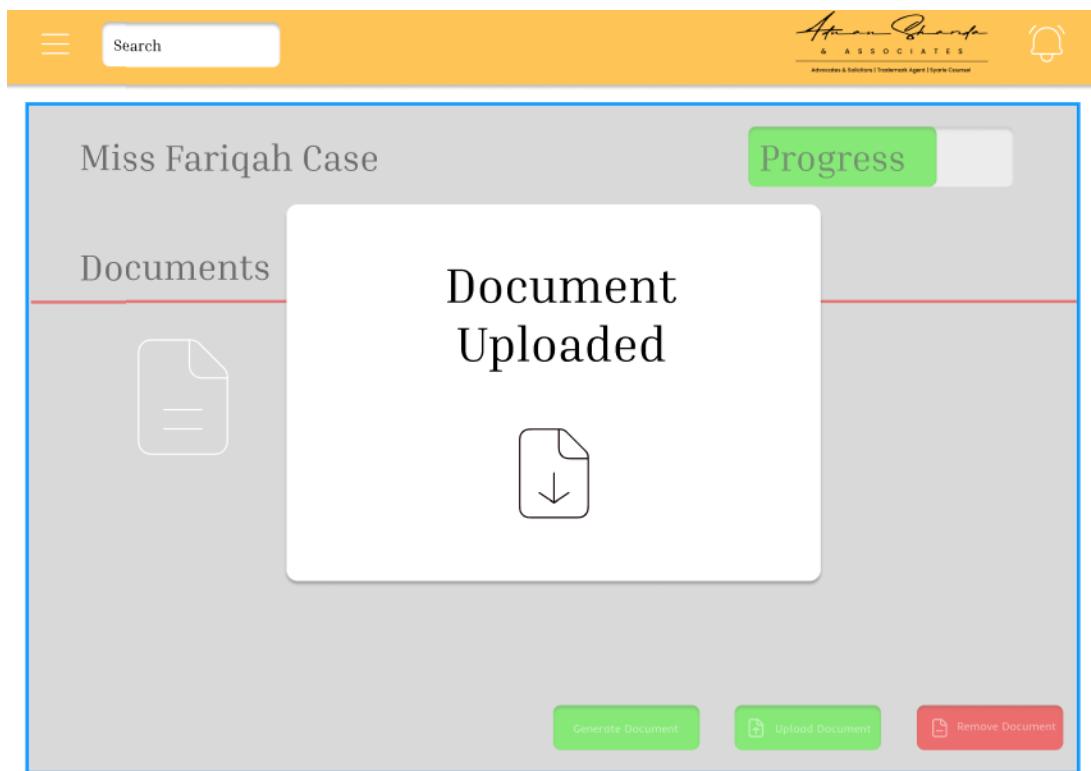


Figure H.21: UC03-01 Generate Document Interface Design



Figure H.22: UC03-01 Generate Document Interface Design

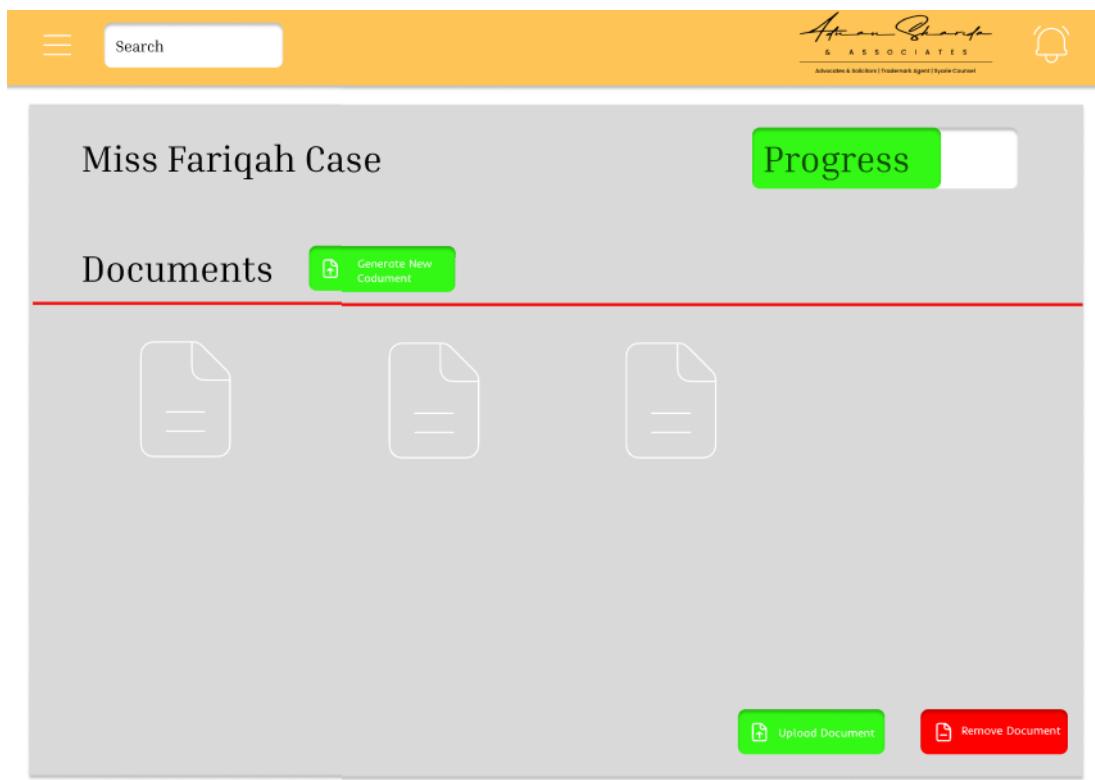


Figure H.23: UC03-02 Manage Document Interface Design

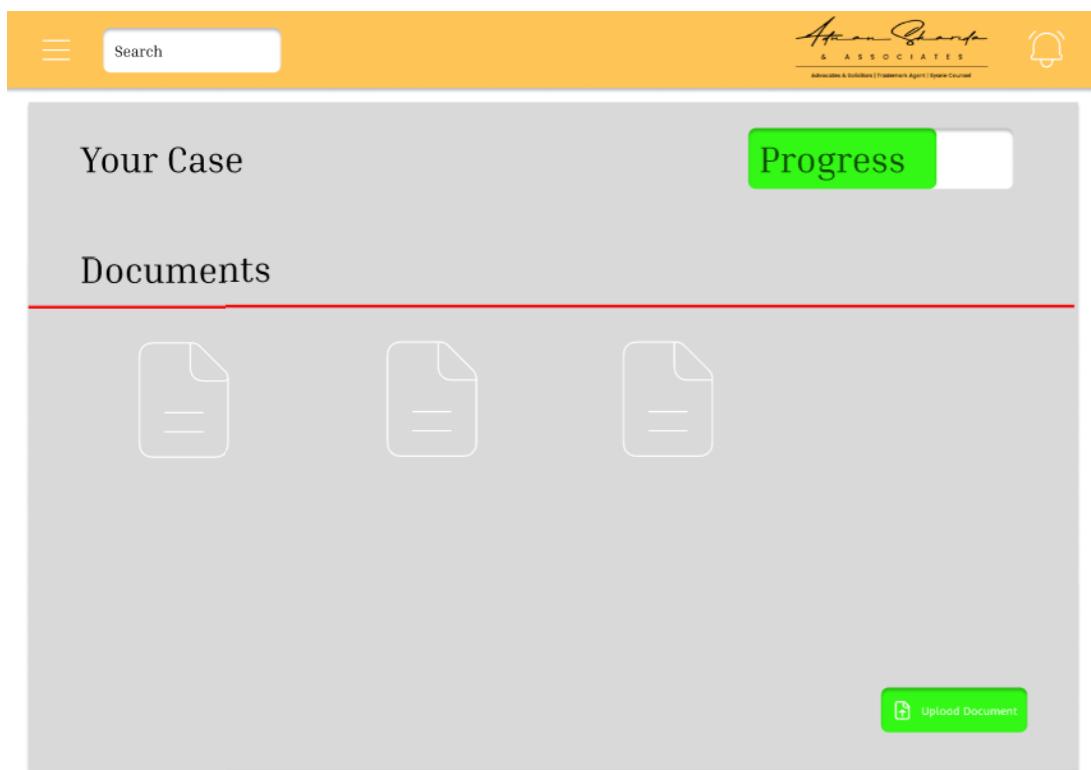


Figure H.24: UC03-03 Upload Document Interface Design

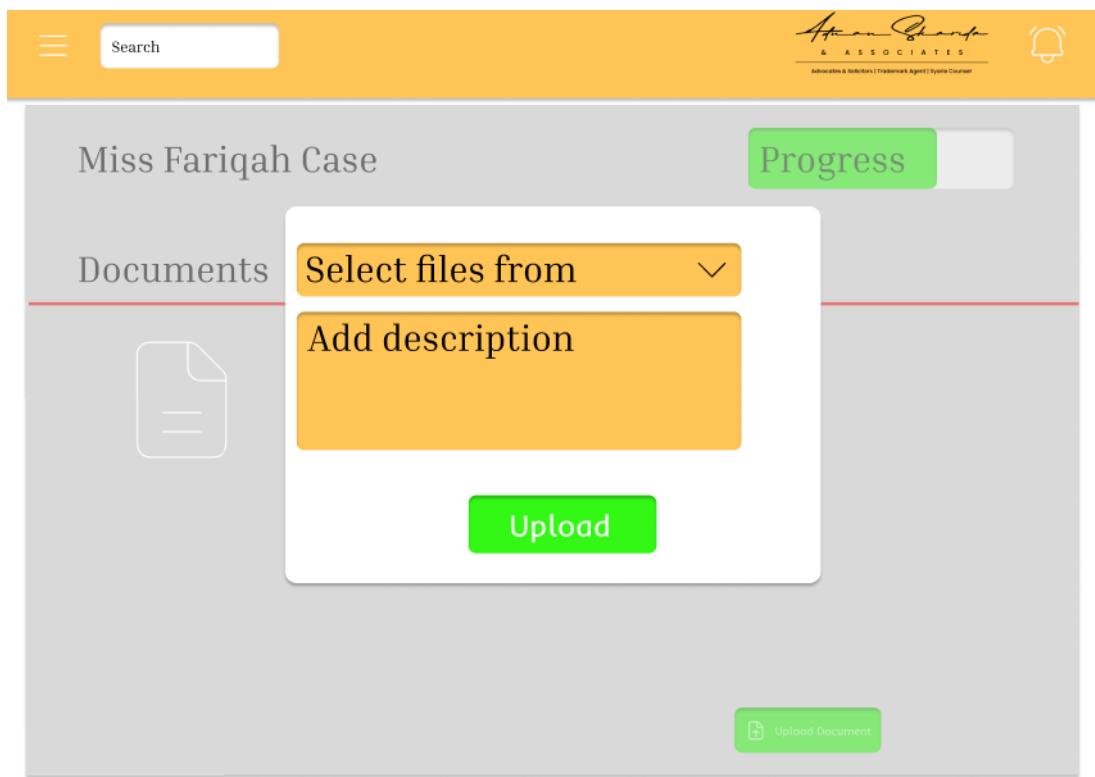


Figure H.25: UC03-03 Upload Document Interface Design

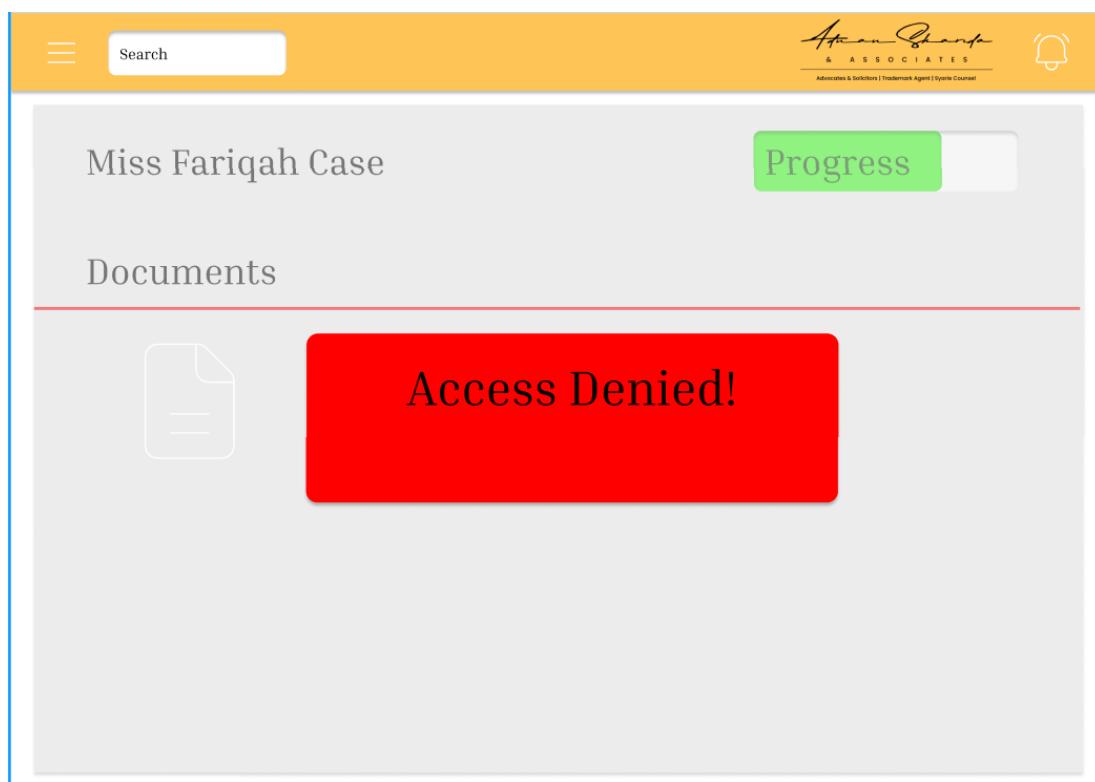


Figure H.26: UC03-05 Decrypt Document Interface Design

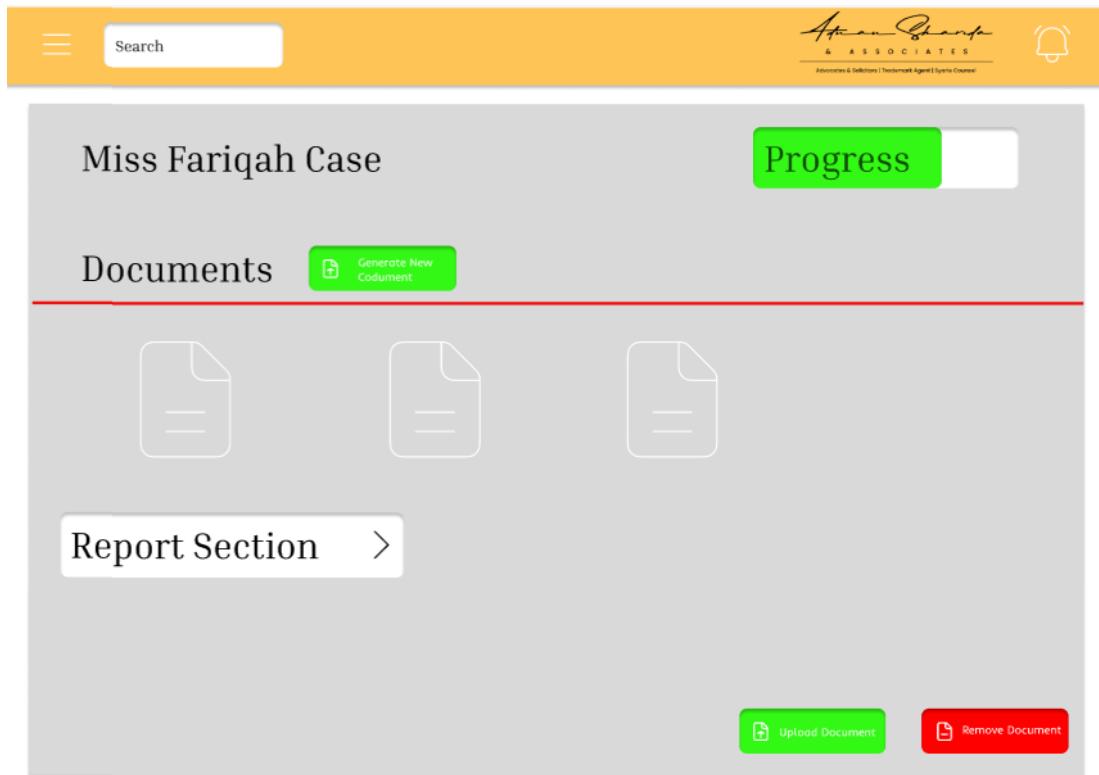


Figure H.27: UC04-01 Generate Report Interface Design

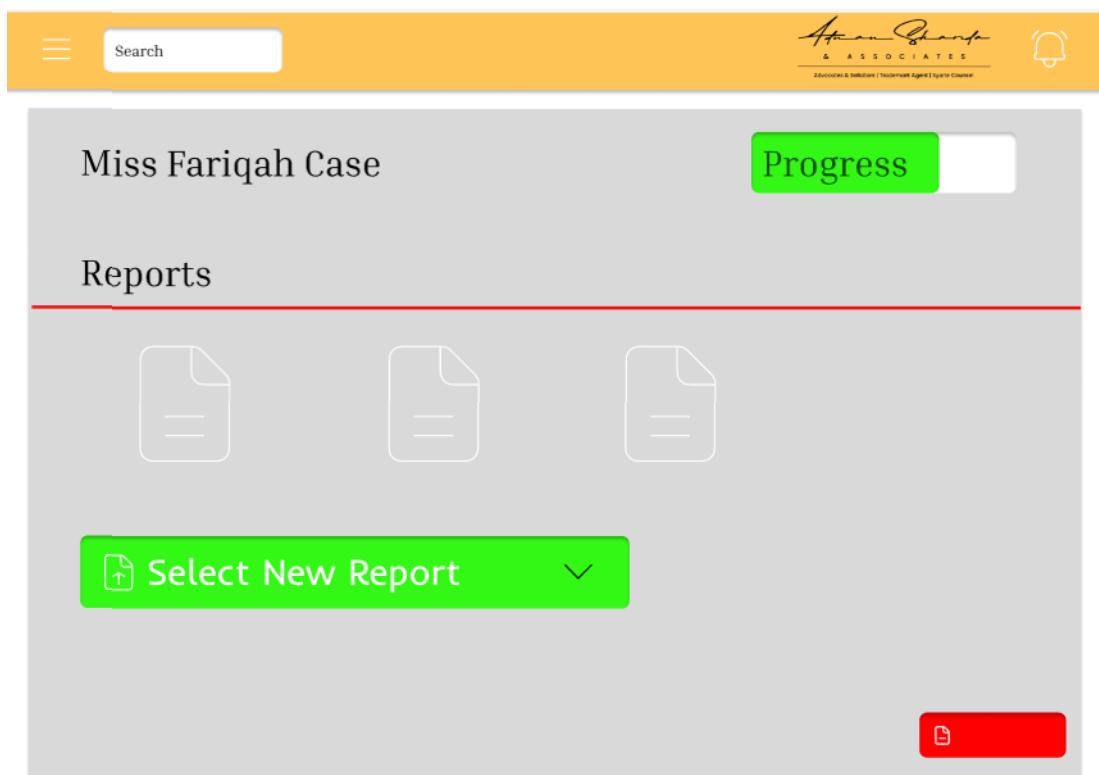


Figure H.28: UC04-01 Generate Report Interface Design



Figure H.29: UC04-01 Generate Report Interface Design

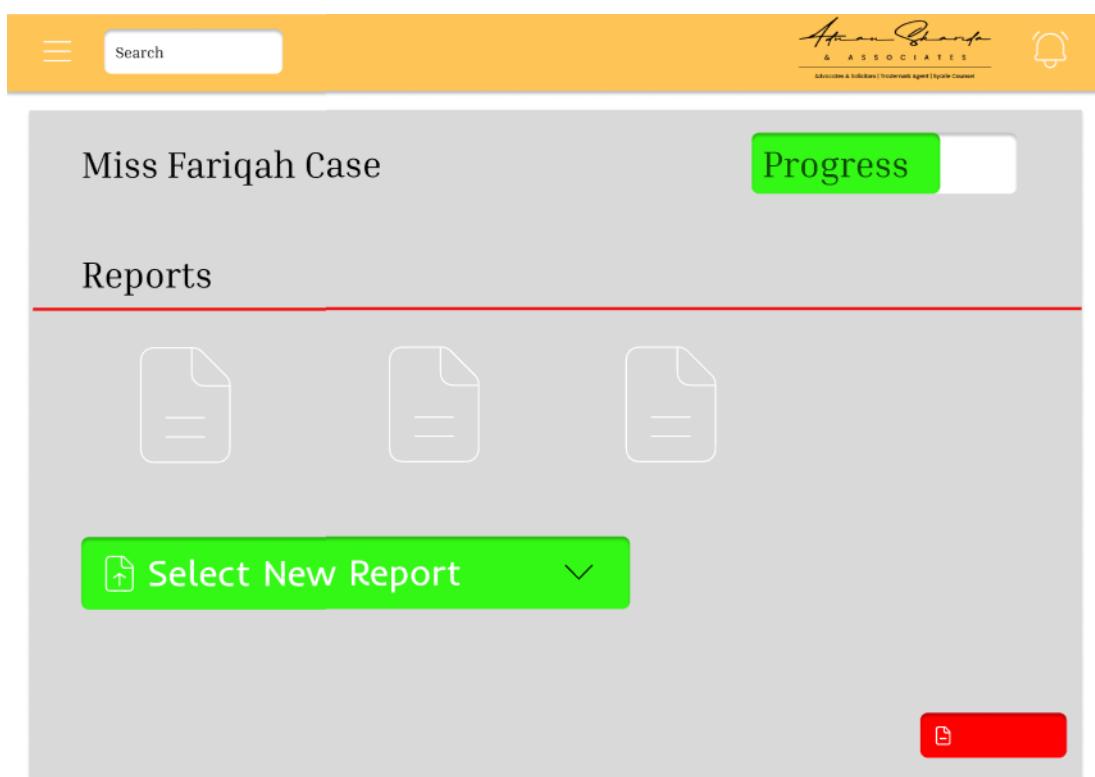


Figure H.30: UC04-02 Manage Report Interface Design

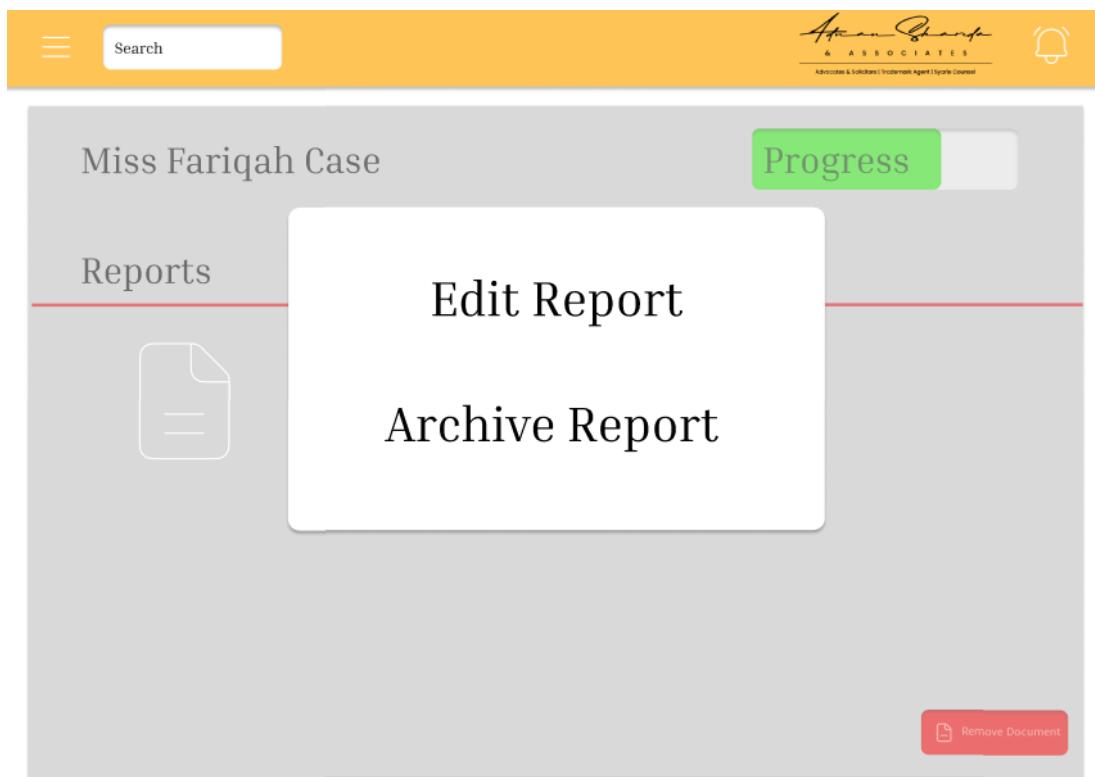


Figure H.31: UC04-02 Manage Report Interface Design



Figure H.32: UC04-02 Manage Report Interface Design



Figure H.33: UC04-02 Manage Report Interface Design

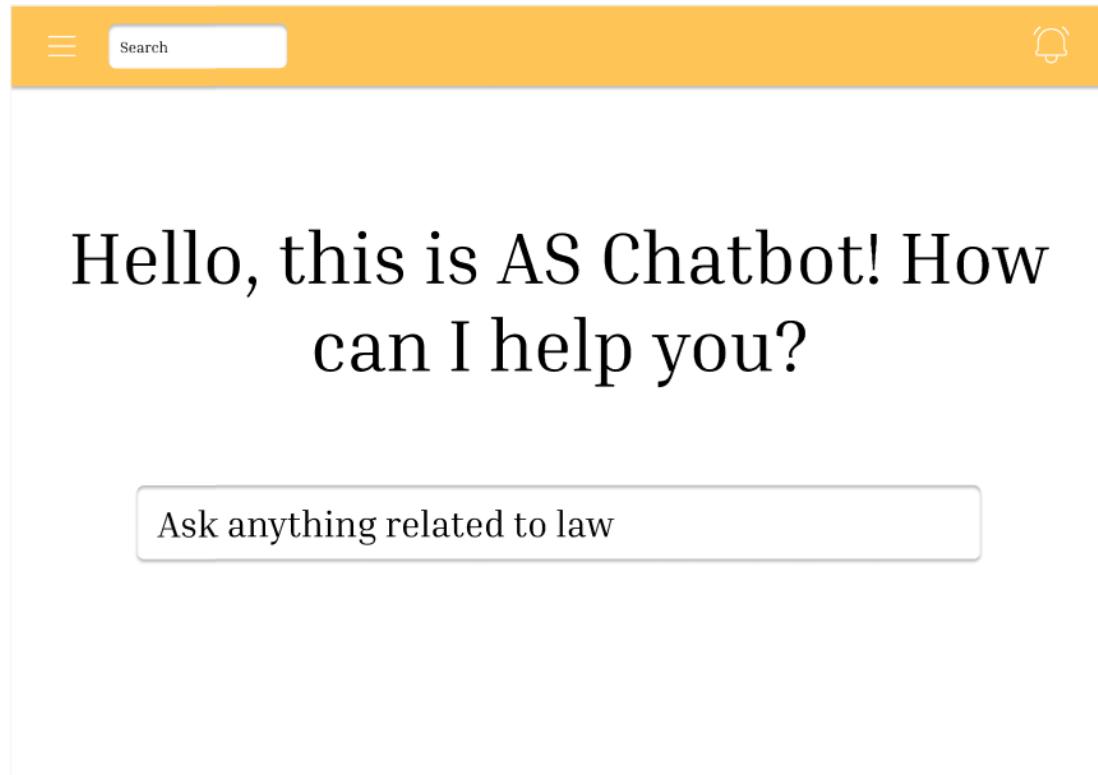


Figure H.34: UC05-01 Chatbot Interaction Interface Design



Figure H.35: UC05-01 Chatbot Interaction Interface Design

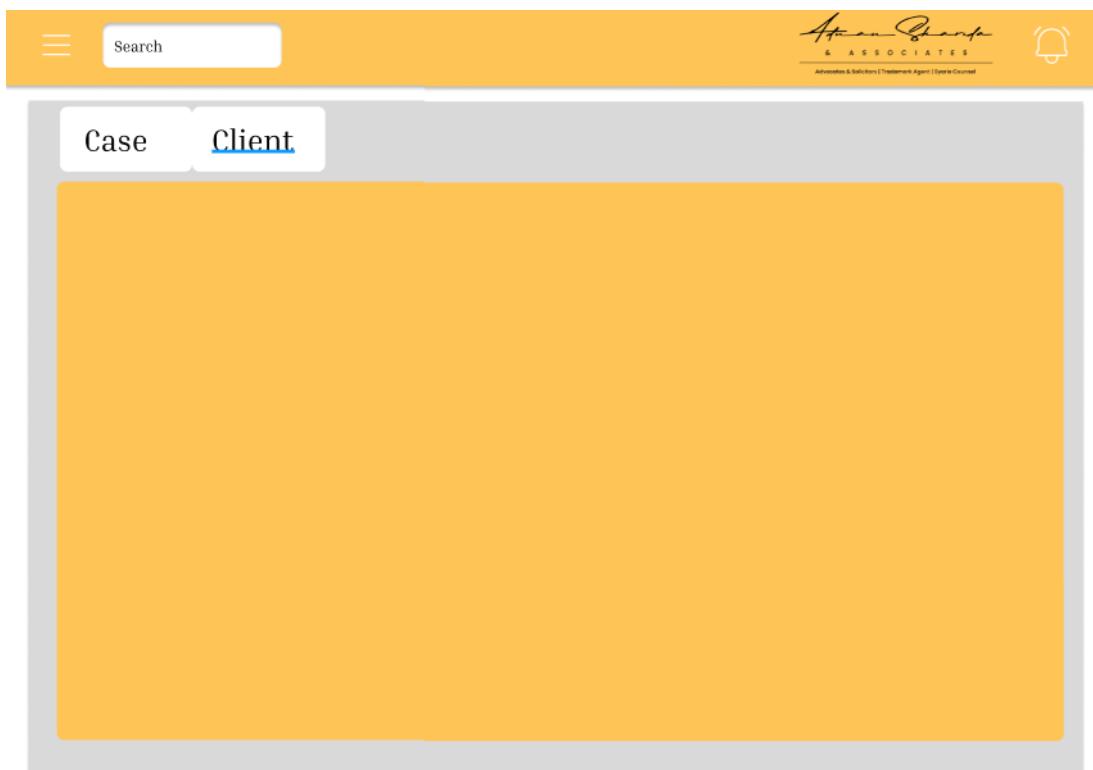


Figure H.36: UC06-01 Upload Cheque Interface Design

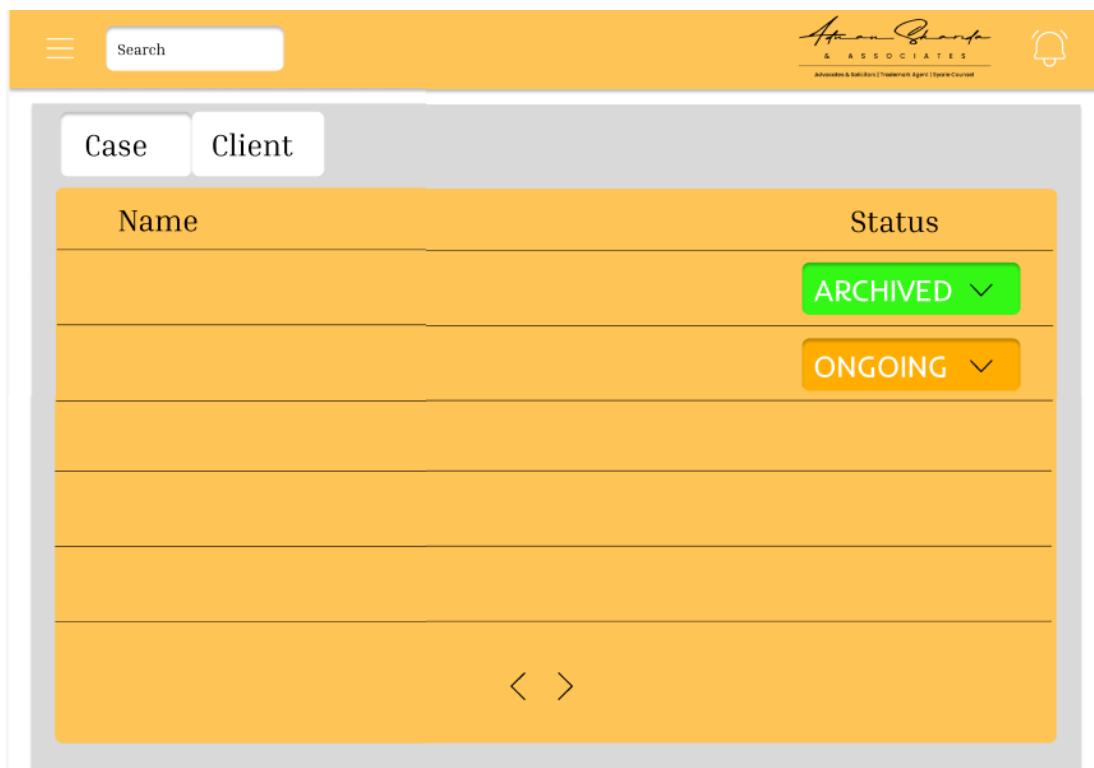


Figure H.37: UC06-01 Upload Cheque Interface Design

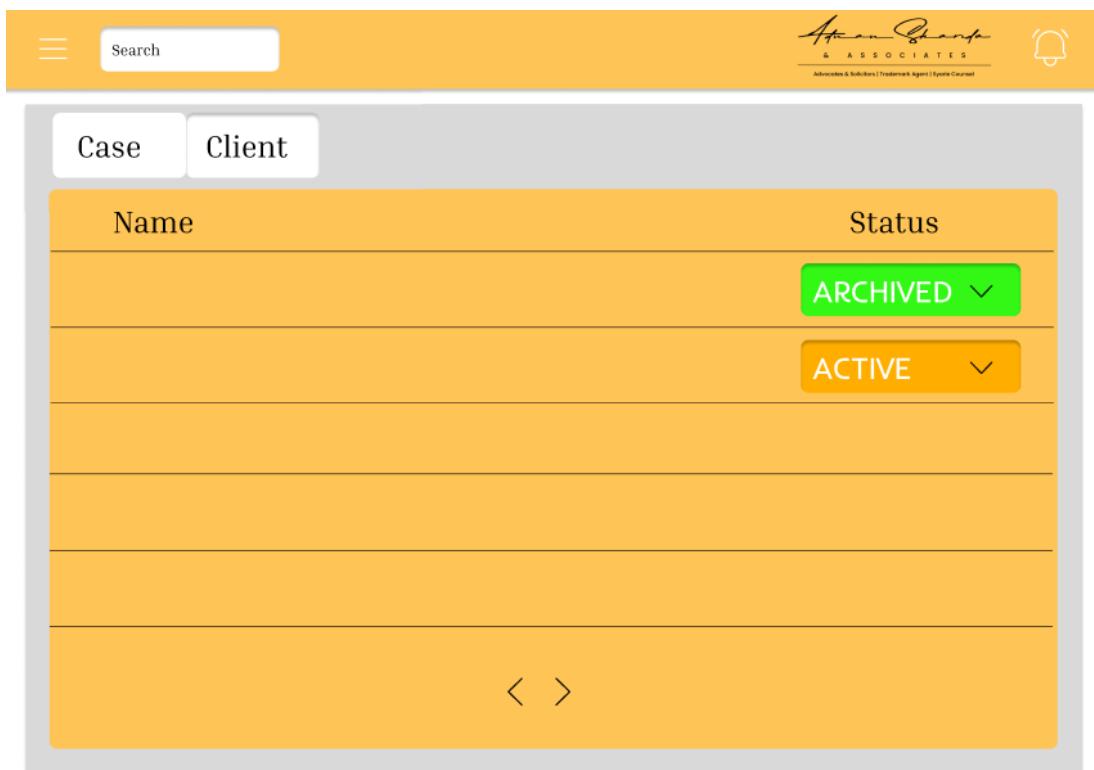


Figure H.38: UC06-01 Upload Cheque Interface Design

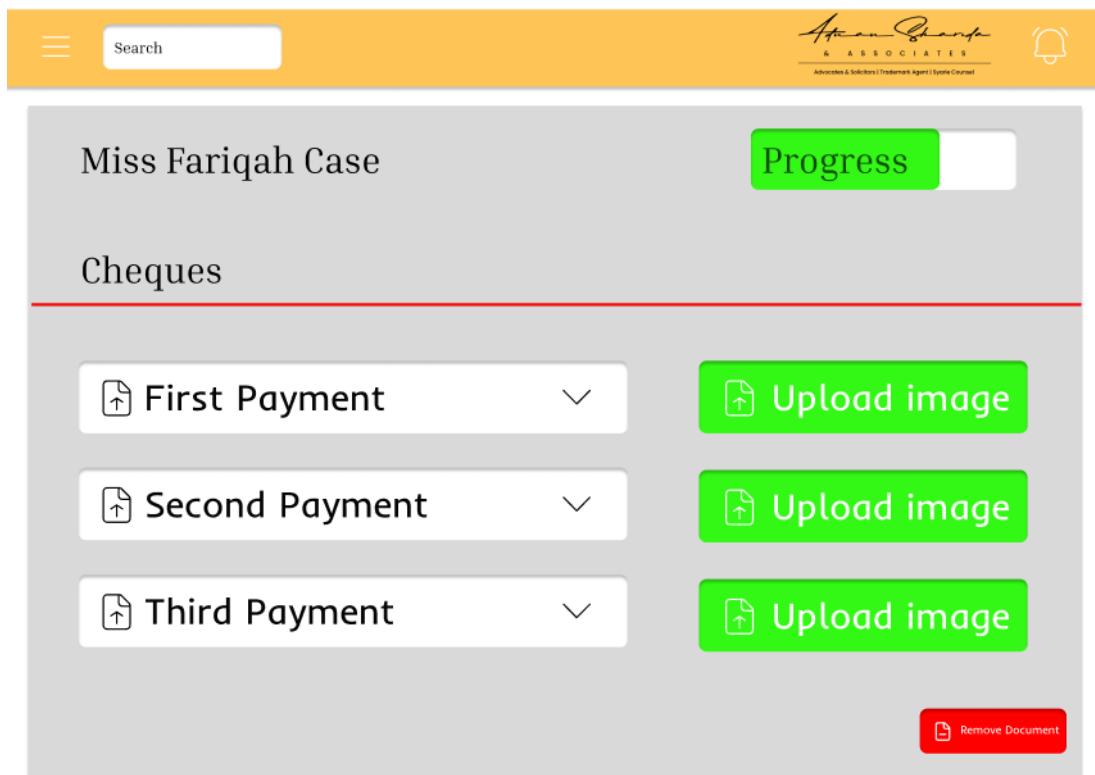


Figure H.39: UC06-01 Upload Cheque Interface Design

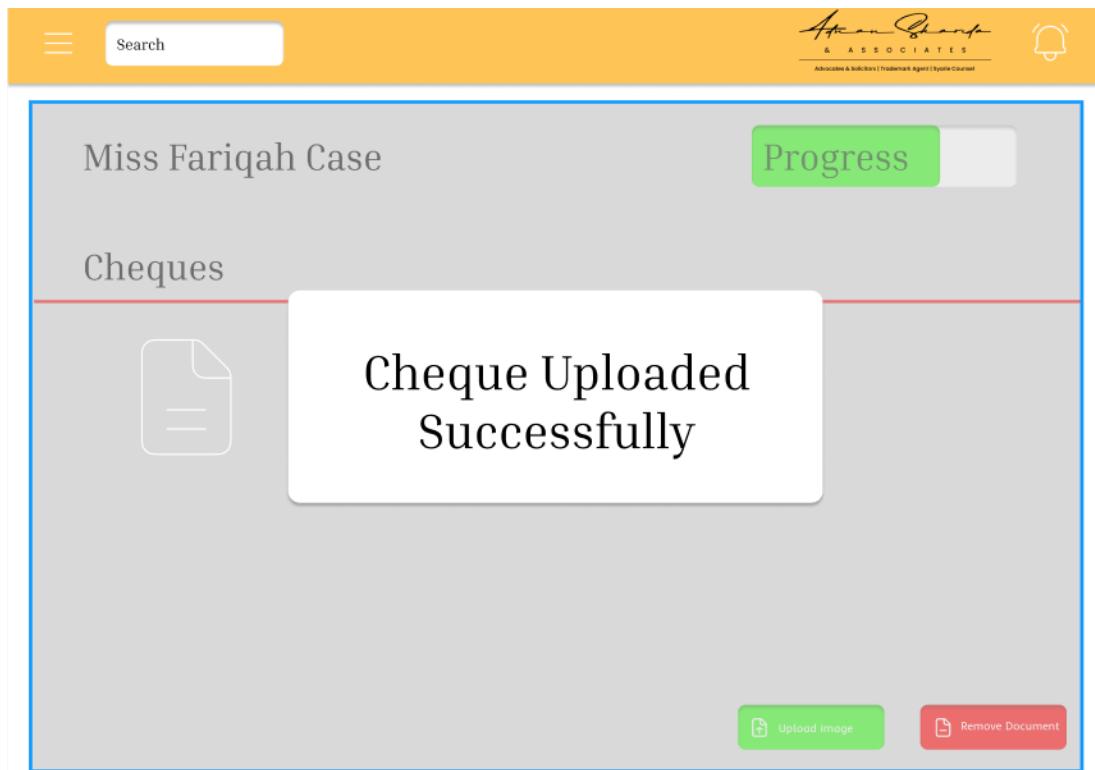


Figure H.40: UC06-01 Upload Cheque Interface Design

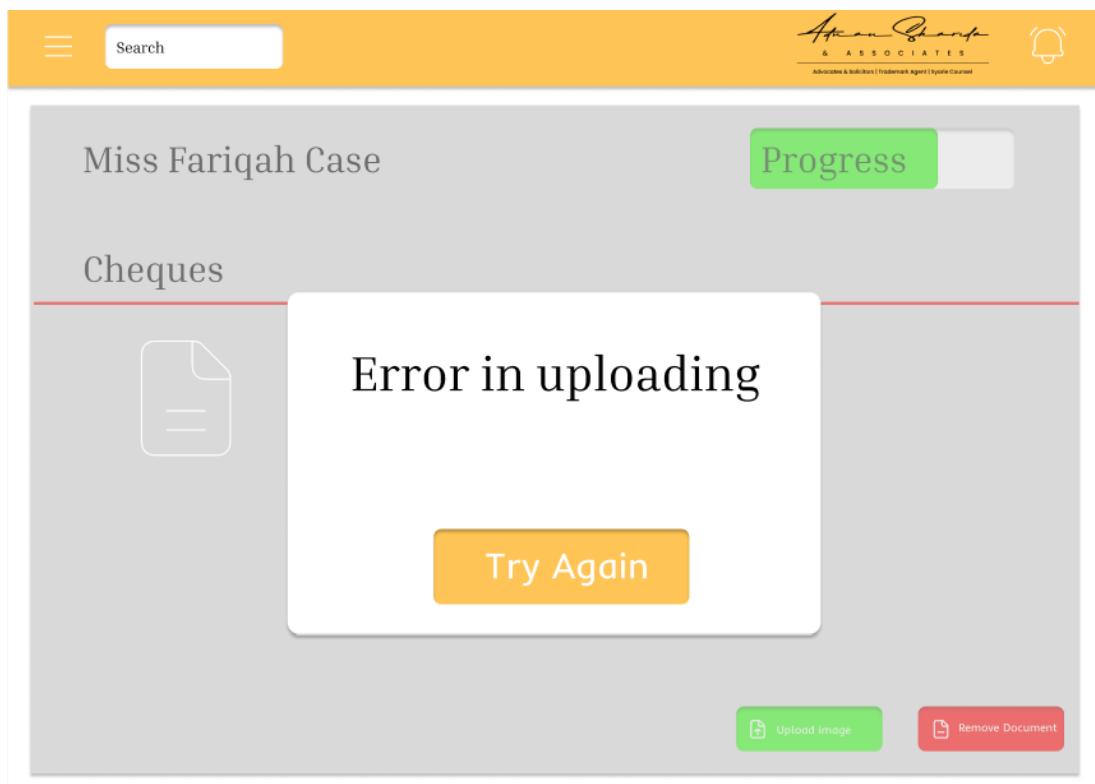


Figure H.41: UC06-01 Upload Cheque Interface Design

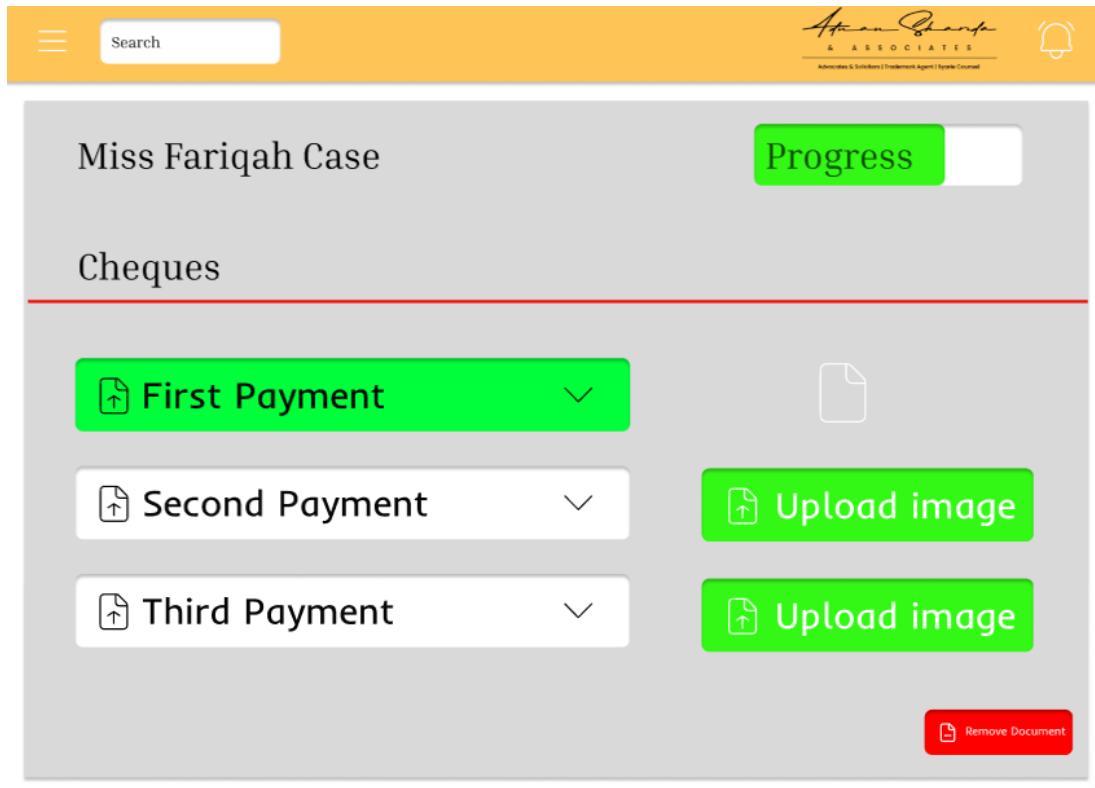


Figure H.42: UC06-02 Manage Cheque Interface Design