INKSTOP: E-AUDITING PLATFORM

A PROJECT REPORT

submitted by

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to

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in partial fulfilment of the requirements for the award of the Degree

of

Bachelor of Technology
in
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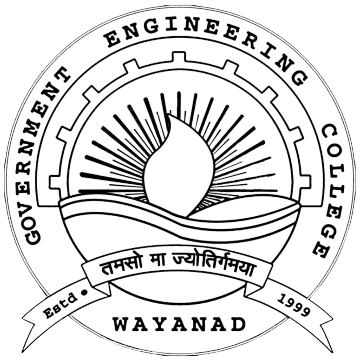

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DECLARATION

I, on behalf of authors of the report, Jerin Thomas, Akshay Antony, Edwin James, Sreeharishyam P, hereby declare that the report "InkStop: E-Auditing PLatform" submitted for partial fulfilment of the requirements for the award of degree of Bachelor of Technology of the APJ Abdul Kalam Technological University, Kerala is a bonafide work done by us under supervision of Prof. Smitha Karunan (Asst. Professor, CSE Department). This submission represents our ideas in our own words and where ideas or words of others have been included, I have adequately and accurately cited and referenced the original sources. I also declare that we have adhered to ethics of academic honesty and integrity and have not misrepresented or fabricated any data or idea or fact or source in my submission. I understand that any violation of the above will be a cause for disciplinary action by the institute and/or the University and can also invoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been obtained. This report has not been previously formed the basis for the award of any degree, diploma or similar title of any other University.

Place: Thalappuzha
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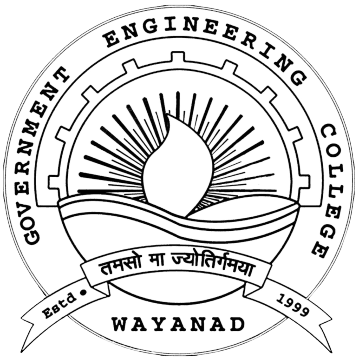

CERTIFICATE

This is to certify that the report entitled **"InkStop: E-Auditing Platform"** submitted by **Jerin Thomas, Akshay Antony, Edwin James, Sreeharishyam P** to the APJ Abdul Kalam Technological University in partial fulfillment of the requirements for the award of the Degree of Bachelor Technology in Computer Science and Engineering is a bonafide record of the work carried out by them under our guidance and supervision. This report in any form has not been submitted to any other University or Institute for any purpose.

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ABSTRACT

The project "InkStop" introduces a secure and user-centric document and letter creation platform aimed at enhancing the authenticity, confidentiality, and efficiency of digital documentation workflows. This system is designed to meet the needs of individuals, institutions, and businesses by offering a reliable alternative to traditional paper-based documentation.

The platform provides a structured interface for users to create, distribute, and validate official documents through password-protected access, thereby minimizing the risk of unauthorized modifications and signature forgeries. In today's digital era, where information manipulation is increasingly sophisticated, the need for secure and traceable documentation is more critical than ever.

This project addresses such challenges by enabling document creators to assign unique passwords for recipients and record timestamps for each validation step, ensuring end-to-end security and accountability. By digitizing the entire documentation process, the application not only reduces paperwork but also enhances operational speed and integrity.

This innovative solution redefines secure communication and validation practices, laying the foundation for a more transparent, paperless, and trustworthy ecosystem in both professional and academic domains.

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ABBREVIATIONS

Term	Expansion
DFD	Data Flow Diagram
NOSQL	Non-Structured Query Language
NPV	Net Present Value
ROI	Return On Investment
UI	User Interface

Table 1: Abbreviations

CHAPTER 1
INTRODUCTION

Generating and authenticating official documents is essential in both professional and institutional environments to ensure the legitimacy and security of shared information. Traditional methods, however, are often error-prone and vulnerable to forgery due to their manual nature. These manual processes are not only time-consuming and inefficient but also introduce delays and risks in the validation process.

The absence of effective security measures further increases the chances of unauthorized access, manipulation, and signature forgery. These weaknesses compromise the credibility of document workflows and reduce the reliability of official communication. To overcome these challenges, our project, InkStop, provides a secure document creation and auditing platform with built-in password protection and timestamp-based validation mechanisms.

InkStop integrates structured document creation with secure sharing capabilities, ensuring that only intended recipients can view or sign documents using unique password-based authentication. By automating validation and logging every interaction, the system greatly reduces verification time and improves overall data integrity. This streamlined approach enhances operational speed and minimizes manual errors and prevents fraudulent activities.

This project addresses the growing need for a reliable, efficient, and tamper-resistant document workflow solution, ultimately building greater trust in digital documentation and reducing the risk of forgery in professional and institutional settings.

1.1 PROBLEM DESCRIPTION

The E-Auditing Platform addresses the growing need for secure, verifiable document workflows by delivering a modern, technology-driven solution.

Traditional document handling methods are slow, prone to human error, and susceptible to forgery. This platform incorporates password-protected access, digital signatures, and timestamping features to ensure that documents are securely created, shared, and validated with accuracy and transparency.

The system significantly reduces the risk of unauthorized access or tampering, improves operational efficiency, and builds trust in official communications by safeguarding against document fraud and its potential consequences in professional and institutional settings.

CHAPTER 2
LITERATURE REVIEW

2.1 ADOBE SIGN: DIGITAL DOCUMENT SIGNING AND VERIFICATION PLATFORM

Introduction:

The project report discusses Adobe Sign, a cloud-based Digital Document Signing and Verification Platform designed to streamline and secure document workflows across various industries. Traditional paper-based processes are often slow, prone to human error, and susceptible to forgery. Adobe Sign addresses these challenges by offering electronic signatures, automated workflows, and audit trails to ensure document integrity and operational efficiency.

The platform employs secure encryption and complies with global e-signature standards, enhancing trust in digital agreements. With integration support for applications like Microsoft Office and Salesforce, Adobe Sign promotes a seamless user experience while ensuring compliance and document authenticity.

Intended Users:

Adobe Sign serves professionals, organizations, legal entities, HR departments, and academic institutions seeking a secure, efficient way to sign and validate documents. It also supports clients, employees, and external stakeholders in securely reviewing and signing digital documents from anywhere, on any device.

Methodology:

The implementation of Adobe Sign involves several key phases. Initially, organizations assess workflow needs and integrate Adobe Sign with existing platforms like CRM or

ERP systems. Users can create templates, define signing roles, and automate approval workflows. The system securely transmits documents, captures electronic signatures, and stores records with complete audit trails. Post-deployment, training and user onboarding are conducted to ensure effective adoption. Continuous updates and support maintain system reliability and security, making Adobe Sign a trusted platform for document verification.

Merits:

- Integration: Adobe Sign seamlessly integrates with widely-used software like Microsoft 365 and Salesforce, enabling quick adoption and consistent workflows within organizations.
- Legally Binding: The platform ensures signatures are legally recognized across major countries, complying with global e-signature regulations and boosting legal credibility.
- Remote Accessibility: Adobe Sign allows users to sign documents anytime and anywhere using web or mobile devices, increasing flexibility and user convenience.

Drawbacks:

- Subscription Cost: Adobe Sign's pricing model can be expensive for small businesses or individual users, especially when advanced features are required.

- Internet Dependency: Continuous internet connectivity is required to access and sign documents, which can hinder usability in offline environments.

- Feature Overlap: For users with basic needs, the platform's comprehensive feature set might feel overwhelming or unnecessary, affecting ease of use.

2.2 DOCUSIGN: TRUSTED E-SIGNATURE AND DOCUMENT WORKFLOW PLATFORM

Introduction:

The project report presents DocuSign, a leading cloud-based e-signature and document management platform aimed at improving the security, speed, and reliability of document transactions. Traditional paper-based processes suffer from delays, human error, and risks of unauthorized alterations. DocuSign offers a modern solution by providing electronic signatures, secure storage, and workflow automation for document approval and validation.

DocuSign complies with global e-signature laws and utilizes secure encryption protocols to maintain the integrity and confidentiality of documents. With its versatile integrations and user-friendly interface, it supports businesses and institutions in digitizing their entire document lifecycle.

Intended Users:

DocuSign serves a wide range of users including enterprises, government agencies, legal professionals, academic institutions, and HR departments. It also benefits clients, customers, and partners who need to sign or receive verified documents securely, regardless of location.

Methodology:

Implementing DocuSign involves multiple phases beginning with workflow analysis and user requirement gathering. Organizations configure signing sequences, create templates, and define access controls. Documents are securely routed to recipients for electronic signatures, with full visibility of progress. Completed documents are stored with a comprehensive audit trail. Training and support are provided to facilitate adoption, and regular updates help maintain security and system performance, making DocuSign a reliable choice for document authentication.

Merits:

- Legal Compliance: DocuSign meets international e-signature laws such as eIDAS and ESIGN, ensuring signatures are legally valid in most jurisdictions.
- API Integration: The platform offers powerful APIs that enable custom integration with existing systems, enhancing workflow automation and adaptability.
- Audit Trails: Each document process is tracked with timestamps and activity logs, improving traceability and accountability.

Drawbacks:

- Cost Barrier: DocuSign's subscription plans can be costly for smaller teams or individual users needing only basic features.

- Feature Complexity: The platform offers a wide range of tools, which might be overwhelming for new users or those with simple signing needs.
- Online Dependency: Accessing and signing documents requires internet connectivity, which may limit use in offline conditions.

2.3 SIGNWELL: LIGHTWEIGHT AND ACCESSIBLE E-SIGNATURE PLATFORM

Introduction:

The project report introduces SignWell, a lightweight e-signature platform designed for small businesses, freelancers, and teams seeking a simple and secure way to manage document signing. Unlike complex enterprise-level tools, SignWell focuses on providing an intuitive interface and essential features for quick, efficient document workflows. It addresses the limitations of manual documentation processes, which are often error-prone, time-consuming, and at risk of tampering.

SignWell ensures document authenticity with legally binding signatures, automated reminders, and complete audit trails. Its browser-based design eliminates the need for heavy software installations, offering a flexible and cost-effective digital signing solution.

Intended Users:

SignWell caters to small organizations, consultants, freelancers, educational institutions, and individuals who need to send, receive, and manage signed documents securely. It also supports clients and partners by offering accessible, no-login-required signing experiences, making it ideal for quick turnaround.

Methodology:

The deployment of SignWell begins with account setup and template configuration. Users create reusable document templates, add signer roles, and insert required fields like signatures and dates. Documents are sent through secure links, and recipients can sign without needing a SignWell account. Each step is logged, and once signed, documents are archived securely with an audit trail. Minimal setup, combined with ongoing support and system updates, ensures smooth adoption and continuous performance for users.

Merits:

- Ease of Use: SignWell offers a clean and simple user interface, making it easy for users to prepare and sign documents without technical expertise.
- Cost-Effective: Compared to larger platforms, SignWell provides affordable plans tailored to small teams and individual users.
- Quick Access: Recipients can sign documents directly from a link, with no requirement to create an account, speeding up the signing process.

Drawbacks:

- Limited Features: SignWell lacks some of the advanced tools and integrations available in larger platforms, which may be necessary for enterprise use.
- No Native Mobile App: The platform does not offer a dedicated mobile application, limiting its flexibility for mobile users.

2.4 SUMMARY OF EXISTING WORKS

DESCRIPTION	MERITS	DEMERITS
1. **Adobe Sign: Digital Document Signing and Verification Platform**	• Seamless integration with Microsoft and Salesforce. • Legally recognized digital signatures. • Accessible across web and mobile platforms.	• Subscription cost is high for small users. • Requires stable internet access. • Limited customization on basic plans.

DESCRIPTION	MERITS	DEMERITS
2. **DocuSign: Trusted E-Signature and Document Workflow Platform**	• Complies with global e-signature laws. • Offers strong API and system integrations. • Maintains detailed audit trails.	• Cost barrier for individuals and startups. • Feature-heavy interface may overwhelm new users. • Entirely dependent on online connectivity.

DESCRIPTION	MERITS	DEMERITS
3. **SignWell: Lightweight and Accessible E-Signature Platform**	• Easy-to-use interface for non-technical users. • Cost-effective for freelancers and small teams. • No login required for signers.	• Lacks advanced enterprise-level features. • No dedicated mobile application. • Limited integration with third-party tools.

Table 2.1: Summary of existing work

2.5 MOTIVATION FOR THE PROJECT PROPOSAL

Motivation for the Project Proposal:

The rising occurrence of document forgery and unauthorized alterations presents a serious threat to the credibility of professional and institutional communications. This issue not only undermines trust in official documents but also leads to unfair advantages in critical areas such as employment, legal processes, and academic validation. When individuals manipulate or falsify documents to gain benefits over those who follow legitimate channels, it creates an uneven landscape, diminishing the value of genuine records and promoting systemic injustice.

The motivation behind developing the E-Auditing Platform is to confront these challenges directly by offering a secure and efficient solution for creating, distributing, and validating sensitive documents. The platform introduces password-protected access, digital signature integration, and automated timestamp logging to ensure that every document shared is verifiable, tamper-resistant, and traceable to its source. This ensures trust in both the content and the sender.

The driving force for this project stems from the urgent need to reduce document fraud, enhance the integrity of official communication, and foster a more reliable and equitable system of documentation. Through the implementation of a user-friendly and secure Platform, we aim to promote transparency, protect the legitimacy of digital records, and contribute to a more trustworthy and just digital ecosystem.

2.6 PROBLEM STATEMENT

To design an E-Auditing platform that enables document creation, validation, and timestamp generation to ensure secure documentation, prevent forgery, and maintain tamper-proof records.

- Prevalence of Forged Documents: Increasing instances of forged documents are undermining the credibility of official records. Individuals with tampered documents can gain unfair advantages, such as job offers or approvals, over those with legitimate documentation.
- Trust Issues in Documentation: The growing difficulty in trusting professional and institutional documents affects the reputation of organizations. Employers, institutions, and agencies face challenges in verifying the authenticity of digital and printed records, which can lead to poor decision-making.
- Impact on Professional Fairness: The use of falsified documents disrupts fairness in selection processes, allowing unqualified individuals to bypass genuine ones. This devalues the efforts of those who have earned their achievements through legitimate means.
- Security Concerns in Document Handling: Manual or semi-digital document workflows are prone to unauthorized access and tampering. Weak security protocols increase the risk of fraud, making sensitive data vulnerable to misuse.

- Inefficiencies in Manual Validation: Current document validation methods are often manual, time-consuming, and error-prone. These outdated processes delay authentication and create inconvenience for both organizations and recipients.

CHAPTER 3
REQUIREMENT ANALYSIS

3.1 INTRODUCTION

The requirement analysis phase is a critical initial step in the development of the InkStop. It involves a comprehensive examination of the needs, goals, and expectations of all stakeholders involved in the project. This phase lays the foundation for the successful implementation of the application by defining its scope, functionalities, and constraints. By conducting a thorough requirement analysis, we aim to ensure that the final product meets the specific demands of our users and delivers a seamless and effective experience.

3.1.1 Purpose

The project “InkStop” presents a customized web-based solution designed to streamline secure document creation, validation, and distribution across professional and institutional environments. The purpose of the InkStop is to provide a convenient, efficient, and tamper-proof system for managing official documents. By automating the documentation process and integrating advanced security measures, InkStop ensures authenticity, improves traceability, and transforms traditional document workflows into secure and reliable digital operations.

3.1.2 Definitions and Acronyms

Term	Definition
System	InkStop: E-Auditing Platform
User	A person who wants to use the application.
User Data	User's credentials and other information.
Admin	A person or a group of individuals who controls overall operation of the system.

3.2 OVERALL DESCRIPTION

3.2.1 Product Perspective

InkStop is a specialized system designed for institutions and organizations, simplifying and securing the creation, distribution, and validation of official documents. It offers a user-friendly web platform tailored for professional environments, ensuring a smooth, secure, and streamlined documentation process. Competing with other solutions, InkStop stands out with its targeted approach, seamless integration, scalability, and strong emphasis on user experience and data security. Its goal is to provide users with a reliable, adaptable, and future-ready solution that evolves with the growing demands of secure digital documentation.

3.2.2 User Needs

Users of InkStop include professionals, academic institutions, administrators, and document recipients.

- **Secure Access:** Users require reliable authentication mechanisms to secure access to their accounts and sensitive documents.
- **Identity Verification:** Verifying the identity of users and signers is crucial, especially when handling official or legally binding documents.
- **Data Protection:** Ensuring that document data remains protected during storage and transmission is essential. InkStop uses encryption to enhance overall security.
- **User Experience:** Users expect an intuitive and seamless document workflow that balances convenience with high levels of security.
- **Revocation and Renewal:** Users need efficient processes for revoking access in case of credential compromise, as well as easy methods for renewing document access or signatures.

3.3 METHOD OF REQUIREMENT ELICITATION

3.3.1 Stakeholder Interviews

Conduct interviews with representatives from various stakeholder groups, including university administrators, registrars or admissions officers, students and alumni.

3.3.2 Brainstorming

Organize brainstorming sessions with stakeholders to gather their requirements. This allows for interactive discussions and identification of needs from different perspectives.

3.3.3 User Scenario Analysis

Create user scenarios to illustrate interactions with the InkStop system, identifying necessary functionalities and features for each role.

3.3.4 Task Analysis

Analyze existing document verification tasks and workflows at organizations. This helps to understand the current pain points and inefficiencies that InkStop aims to solve.

3.3.5 Review of Existing Documentation

Review any existing institutional documents related to document issuance, verification procedures and security policies. This can provide insights into current practices and potential areas for improvement.

3.4 SYSTEM FEATURES AND REQUIREMENTS

3.4.1 Functional Requirements

(i) User Registration

Use case name	: Register New User
Objective	: To create a new user account in the InkStop system.
Precondition	: A new user account is created in the system.
Postcondition	: User registered.
Flow of Events :	1. Basic Flow

(a) The user opens the InkStop application.

(b) User need to register by providing necessary details.

(ii) User Login

Use case name : Login Existing User

Objective : To authenticate a registered user and grant access to the system.

Precondition : A device with an internet connection and User with valid Account.

Postcondition : User can access their profile and relevant functionalities based on their user role.

Flow of Events :

1. Basic Flow

   (a) The user submits the login form with the required credentials.

   (b) The system validates the entered credentials against the user database.

   (c) If validation is successful, the system directs the user to their personalized dashboard or relevant starting page.

(iii) Document Creation

Use case name : Create New Document

Objective : To allow users to create and format a new document for distribution.

Precondition : User must be logged in and authorized to create documents.

Postcondition : A new document is saved in the system and ready to be shared to selected recipien

Flow of Events : 1. Basic Flow

(a) The user navigates to the document creation interface.

(b) The user enters document details, formats the content and select recipients.

(c) The system saves the document securely and shares it to recipients.

(iv) Document Searching

Use case name : Search for Documents

Objective : To enable users to search for specific documents using the hash provided.

Precondition : User must have access rights to search and view documents.

Postcondition : The system displays a list of matching documents based on the provided hash.

Flow of Events : 1. Basic Flow

(a) The user enters the search hash in the search bar.

(b) The system retrieves documents that match the query.

(c) The user views the search results.

(v) Document History

Use case name : View Document History

Objective : To allow users to view the activity log related to a specific document.

Precondition : The user has permission to access document history.

Postcondition : The system displays the record of actions taken on the document.

Flow of Events : 1. Basic Flow

(a) The user selects a document to view its history.

(b) The system retrieves and displays the document's audit log.

(vi) Document Notification

Use case name : Receive Document Notification

Objective : To notify users of actions required on shared documents.

Precondition : A document is updated, validated, or actioned by another user.

Postcondition : The user is alerted through in-app notification.

Flow of Events : 1. Basic Flow

(a) The system detects an action related to a document.

(b) A notification is triggered and sent to relevant users.

(c) The user receives and views the notification.

3.4.2 Nonfunctional Requirements

(i) Performance

The system should deliver fast response times even under high user load and document processing requests.

(ii) Security

Robust security measures are essential to protect sensitive user data, prevent unauthorized access, and ensure the integrity of stored documents.

(iii) Reliability

InkStop must operate with minimal downtime and ensure error-free document creation and validation processes.

(iv) Scalability

The system should be able to handle increasing numbers of users and document transactions without compromising performance.

(v) Usability

An intuitive and user-friendly interface is crucial for all user roles (creators, recipients, and administrators) to ensure ease of use and efficient interaction with the system.

3.4.3 Hardware Requirements

Reliable servers with sufficient processing power and storage capacity to handle user traffic, document creation, sharing, and validation.

3.4.4 Software Requirements

Web Server Software : To deliver the InkStop Application over the internet.

Database : MongoDB is a NoSQL document database that offers a flexible and scalable data storage solution. Unlike traditional relational databases, MongoDB stores data in JSON-like documents, allowing for easy modeling of complex data structures. It's popular for its high performance, scalability and ease of use, making it a strong choice for modern web and mobile applications.

IDE : Visual Studio Code (VS Code) is a free, open-source code editor developed by Microsoft for Windows, Linux and macOS. It is designed for developers to write, debug and deploy code and it includes support for a wide range of programming languages and frameworks. VS Code is popular among developers due to its lightweight design, powerful features and extensive extension ecosystem.

3.5 PROCESS MODEL

We make use of the spiral model of software development for our project. The spiral model is a software development process that combines elements of both the Waterfall model and the Iterative model. It is a risk-driven process model that allows for the development of complex systems through the repetition of short development cycles, known as "spirals."

Each spiral in the spiral model represents a phase of the software development process. During each spiral, a team will work through the activities of the software development process, including planning, risk analysis, engineering and evaluation. At the end of each

spiral, the team will review the progress made and decide whether to continue with the next spiral or stop the project. The spiral model is often used for large, complex projects that require a high degree of risk management. It is a flexible process model that allows for changes to be made at any point during the development process. However, it can be more expensive and time-consuming than other software development processes, as it requires multiple iterations and reviews.

In our project, we intend on implementing the spiral model of software development in the following iterative steps:

1. Planning: This involves gathering detailed requirements for InkStop, including user needs, functionalities, security considerations, and regulatory compliance. Here, the project scope is clearly defined, outlining the features and functionalities of the system.

2. Risk Assessment: Potential risks that could impact InkStop's development and operation are identified. These may include security vulnerabilities, integration challenges with institutional systems, or changes in regulations. The likelihood and impact of each risk are assessed, and high-priority risks are addressed first.

3. Engineering: The development process is broken down into iterative phases. Each phase focuses on delivering specific functionalities that address user needs and enhance document validation processes. Security measures are implemented to safeguard sensitive user data and ensure compliance with applicable standards. Integration with external systems is planned for a seamless user experience.

4. Evaluation: Throughout the development, the system undergoes rigorous testing to identify and fix bugs. Usability testing with end-users ensures the interface is intuitive and efficient. Additionally, functionality testing verifies that all features operate as intended. Stakeholder feedback is incorporated into subsequent iterations for continuous improvement.

5. Functionality Testing: Continuously test the application's functionalities to identify and fix any bugs or issues that may arise during development.

Following these iterative and risk-driven steps within the Spiral Model will allow us to manage complexity, mitigate risks and ensure the successful development of InkStop.

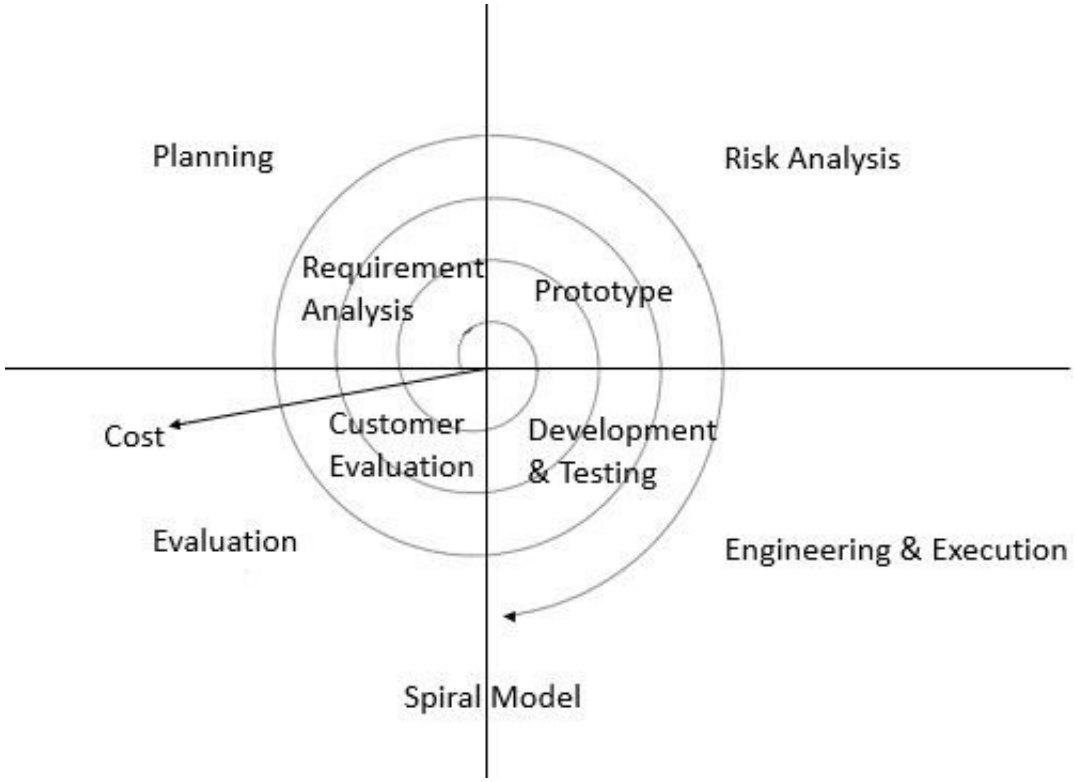

Figure 3.1: Spiral model for software development

3.6 FEASIBILITY STUDY

3.6.1 Economic Feasibility

This involves analyzing costs (development, implementation, maintenance) against potential benefits. Faster document handling, enhanced security, and reduced reliance on physical paperwork can contribute to a positive economic outlook. A thorough cost-benefit analysis, considering factors like Net Present Value (NPV), Return on Investment (ROI), and payback period, is essential for a sound economic decision.

3.6.2 Technical Feasibility

Here, we assess whether InkStop can be built and maintained using available technologies and resources. Compatibility with existing organizational systems, required hardware and software, potential technical challenges, and the development team's expertise are all evaluated. Ensuring compatibility, possessing the necessary technical skills, and addressing potential challenges during development are crucial for technical feasibility.

3.6.3 Operational Feasibility

This aspect focuses on how well InkStop integrates into existing institutional operations. Seamless workflow integration, user training for administrators, and minimal disruption to staff roles and responsibilities are key considerations. A positive assessment suggests InkStop can be effectively adopted across organizations, enhancing operational efficiency and improving documentation workflows.

CHAPTER 4
ARCHITECTURAL DESIGN

4.1 ARCHITECTURAL DESIGN

The system architecture of InkStop is designed to provide a secure and efficient flow for document authentication, leveraging user validation and centralized data management.

Upon login, the system performs backend checks against the database to authenticate the user's credentials. If the authentication fails, the user is redirected to retry. If successful, access is granted to four primary functionalities: document creation, history viewing, notifications, and document search.

The **Document Creation** module allows users to generate new entries that are securely saved into the central database. This supports real-time access and future reference.

The **Notification** module alerts relevant parties about document actions such as creation, updates, or approvals, ensuring timely communication. Notifications are stored and retrieved from the database.

The **Search** module enables users to retrieve documents by querying the database using document identifiers or metadata, ensuring quick access to needed files.

The **History** module tracks all user interactions with the system, including submissions, approvals, and edits. This ensures auditability and transparency, with all logs securely stored in the database.

Central to the entire architecture is the database which is MonoDB, that manages all persistent data: user credentials, documents, notifications, and activity history..

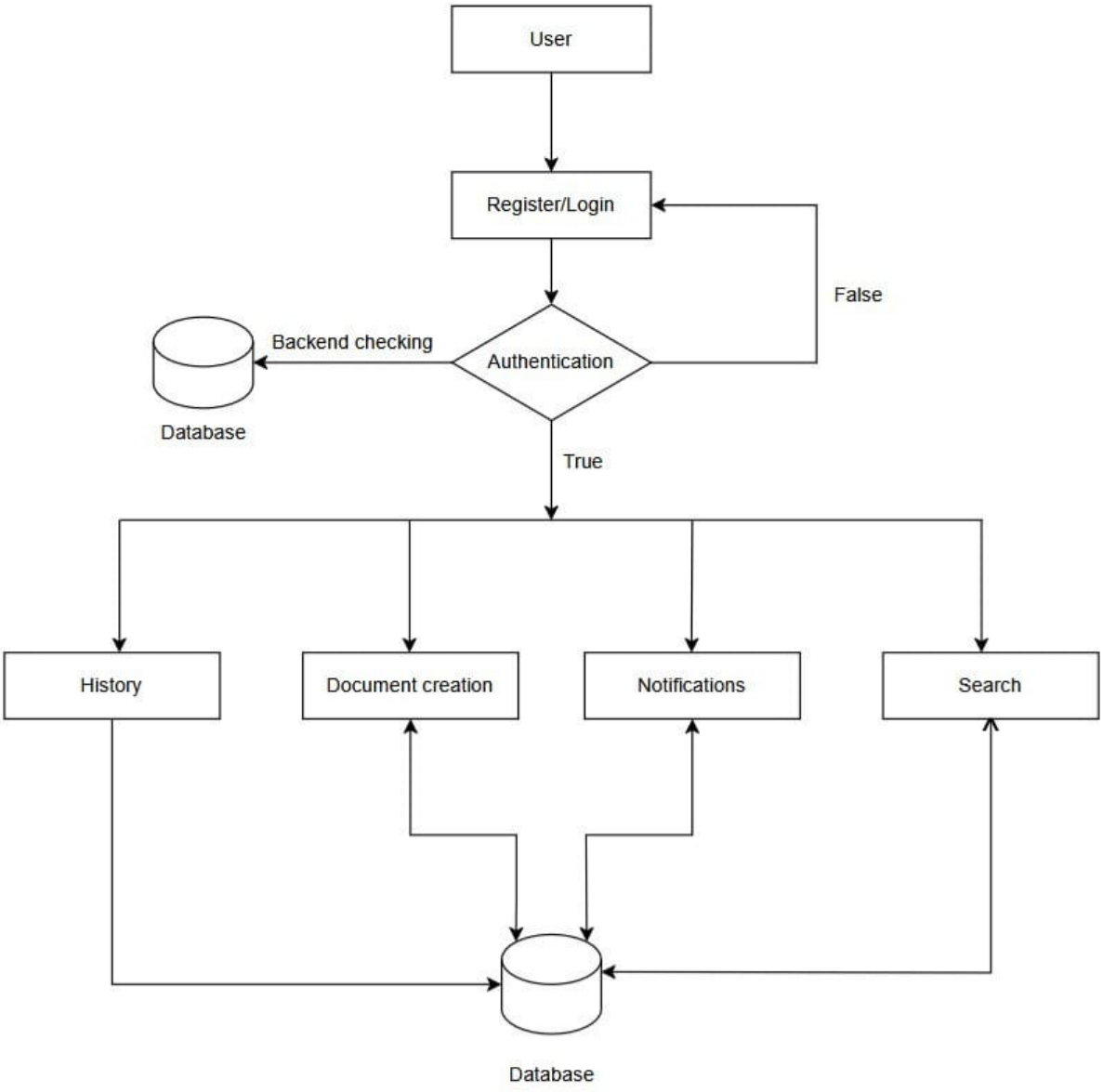

Figure 4.1: Architectural Diagram

4.2 MODULE DESCRIPTION

4.2.1 Login and Authentication Module

This module serves as the entry point for InkStop, ensuring secure access to the system. Users must register and log in using valid credentials. Upon login, the authentication logic checks these credentials against the backend database. Only authenticated users are granted access to the system's features, thereby safeguarding sensitive data and operations from unauthorized use.

4.2.2 Document Creation Module

The Document Creation module enables users to generate and submit new digital documents. Once created, these documents are securely stored in the centralized database and are made accessible to designated recipients for further actions such as verification or approval. This module ensures seamless document handling with built-in integrity checks.

4.2.3 Document Search Module

This module allows users to retrieve documents using a 16 bit unique hash. The search logic queries the database and returns detailed document information, enabling efficient document management and quick access to required records.

4.2.4 Document History Module

The Document History module maintains a comprehensive log of all user interactions related to documents. It records creation dates, status updates, approvals, and rejections.

This historical data is accessible to users and serves as an audit trail, ensuring transparency and traceability throughout the document lifecycle.

4.2.5 Document Notifications Module

The Notifications module keeps users informed about the status and actions taken on their documents. Whether a document has been approved or rejected, users receive real-time alerts. This ensures timely communication and enhances the responsiveness of the document workflow within InkStop.

CHAPTER 5
DESIGN AND IMPLEMENTATION

5.1 INTRODUCTION

A data flow diagram is a graphical representation of the information flow in a business process. It demonstrates how data is transferred from the input to the file storage and reports generation. By visualizing the system flow, the flow charts will give users helpful insights into the process and open up ways to define and improve their business. A DFD can be divided into levels and layers, thus users can focus on describing a particular stage.

5.2 DATA FLOW DIAGRAMS

5.2.1 Level 0

The Level 0 Data Flow Diagram (DFD) illustrates the document authentication process involving Users, Admins, and the Document Authentication System. Users upload their documentation to the system for verification. Admins access these documents through the system, review them, and decide whether to approve or reject them. Once a decision is made, the system generates notifications to inform users of the outcome. Approved or rejected documents are then stored in the History module. This process ensures secure and traceable document handling within the platform.

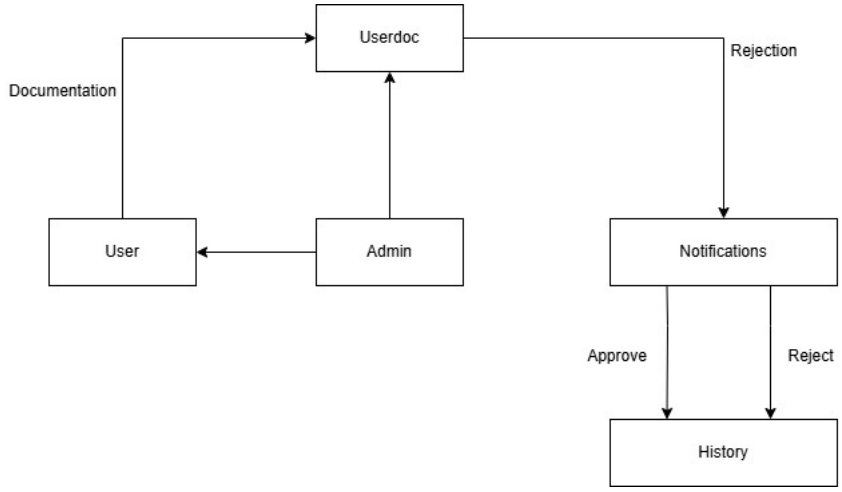

Figure 5.1: Data flow diagram - Level 0

5.2.2 Level 1

The Level 1 Data Flow Diagram (DFD) outlines the core operations of InkStop. Users interact with the system by submitting new documents and performing search queries. These actions are processed and acknowledged by the platform. The system also tracks user activities and updates the History module accordingly. Notifications are generated based on user actions and sent to inform them of status changes. This flow ensures secure document tracking, efficient user communication, and transparent access to document history and verification details.

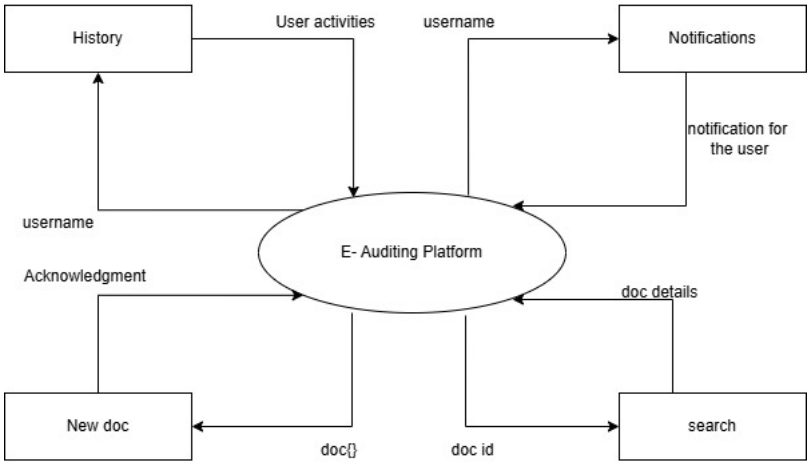

Figure 5.2: Data flow diagram - Level 1

5.2.3 Level 2

The diagram illustrates a Level 2 data flow process for document submission, user management, and system notifications in the E-Auditing Platform. The process starts with the user signing up and providing user details, which are processed by the User Management module and managed by the Admin. Users log in for authentication and can submit new documents. These documents are then directed to recipients, and notifications are generated based on recipient actions. Additionally, users can search for documents using a document hash to retrieve specific details. Notifications for approval or rejection are sent, and the outcome is recorded in the History module. This data flow ensures secure access control, document handling, and activity logging, while maintaining proper communication through notifications. It also streamlines the auditing process through systematic verification and efficient document tracking.

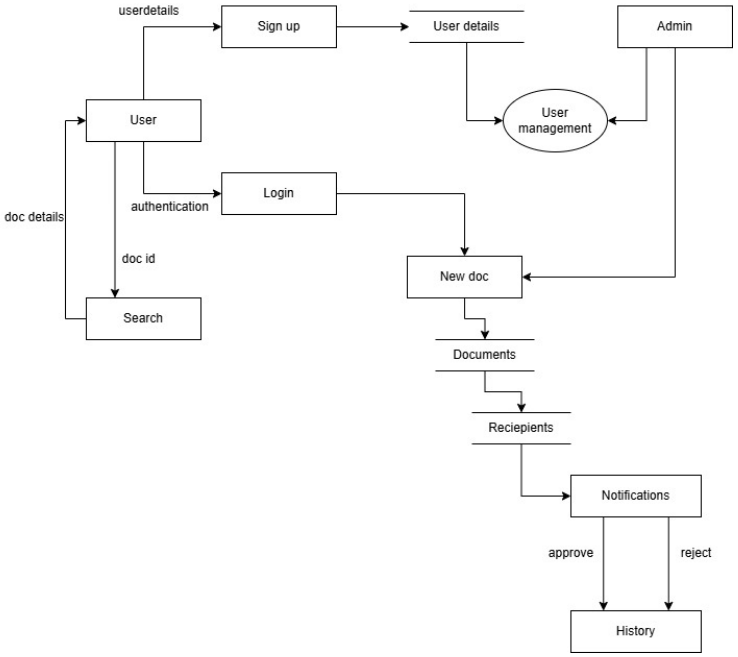

Figure 5.3: Data flow diagram - Level 2

These are the level 0, level 1, Level 3 DFDs

5.3 WORK PLAN

The detailed work plan is explained in the following figures:

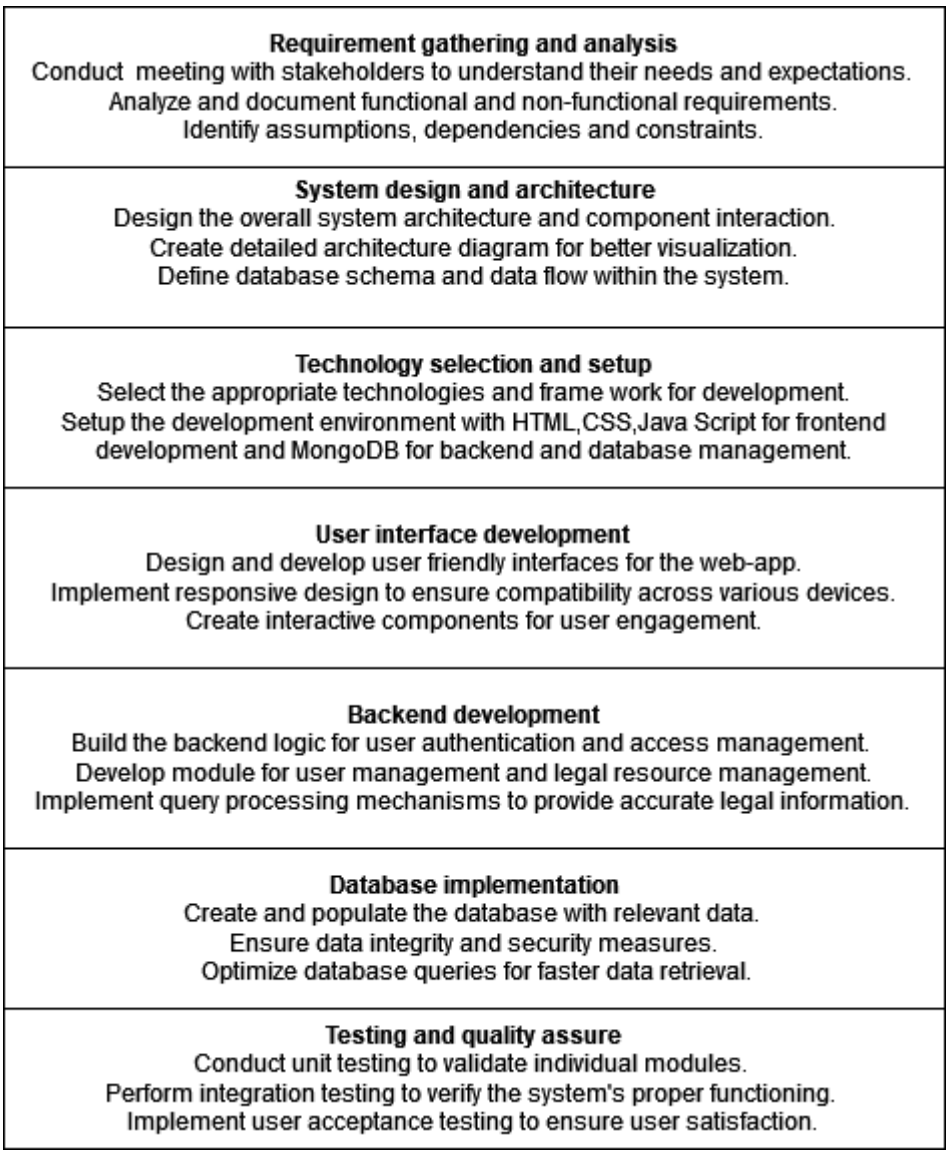

Figure 5.4: Work Plan - Module Wise

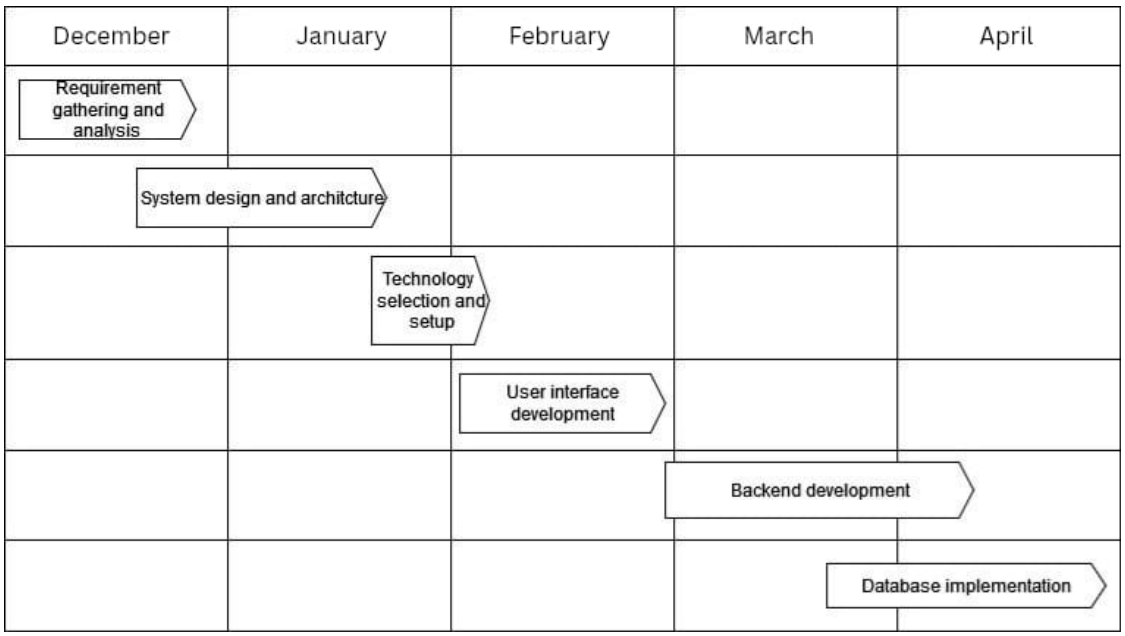

Figure 5.5: Work Plan - Gantt chart

CHAPTER 6
CODING

6.1 INTRODUCTION

The InkStop project is developed as a web-based application, using Flutter for the frontend, Node.js for the backend, and MongoDB for the database. InkStop addresses the challenge of document verification by offering a secure and efficient digital solution for organizations and users.

MongoDB is a robust NoSQL database that supports the needs of scalable and modern web applications. As the backend database, MongoDB is used to store, retrieve, and manage document and user data, providing a reliable foundation for real-time operations and secure storage.

Our development journey begins with designing intuitive and responsive user interfaces using Flutter. Flutter's widget-based structure allows us to build flexible and visually appealing components that enhance the user experience and streamline platform navigation.

Node.js serves as the server-side technology powering our backend logic, including user authentication, document handling, and API integration. MongoDB, coupled with Node.js, enables fast document retrieval, verification, and secure data management through unique identifiers like document hashes and user tokens.

Collaborative development using Visual Studio Code ensures smooth workflow and iterative refinement. Feedback throughout development plays a critical role in shaping a

solution that meets the specific requirements of institutions and users for effective document auditing.

In summary, the integration of Flutter, Node.js, MongoDB, and VS Code results in a powerful and scalable E-Auditing Platform. This application aims to provide a user-friendly, secure, and accurate environment for document submission, review, and verification.

6.1.1 Tools

(i) VS Code

VS Code is a versatile code editor used for both frontend and backend development of InkStop. It offers features like a powerful code editor, integrated terminal, built-in debugger, version control support, and a vast library of extensions. These tools help developers streamline their workflow, efficiently write, debug, and test code, and manage changes across the application lifecycle.

(ii) MongoDB

MongoDB is a leading NoSQL database designed for scalability, high availability, and performance. It supports large volumes of flexible data and is ideal for storing structured and unstructured information related to document submissions, user activity, and system interactions within the E-Auditing Platform.

6.1.2 Data Set

(i) Users

The dataset contains details of users registered in InkStop, including credentials and user roles used for authentication and platform access.

(ii) Created Docs

This dataset includes information on all newly submitted documents uploaded by users. It stores metadata, timestamps, and associated user data required for verification and tracking.

(iii) Search

The dataset manages document queries by users, allowing quick retrieval based on unique document identifiers and metadata for audit or reference.

(iv) History

This dataset holds records of user interactions and actions taken on documents, such as submissions, approvals, rejections, and searches, supporting transparency and traceability.

(v) Notifications

The dataset captures all system-generated notifications related to document approval, rejection, or user updates. It ensures timely communication and status awareness for users and administrators.

6.2 SAMPLE CODE

login_bloc.dart

inkstop > lib > application > login > login_bloc.dart

```dart
import 'package:bloc/bloc.dart';
import 'package:dartz/dartz.dart';
import 'package:freezed_annotation/freezed_annotation.dart';
import 'package:inkstop/domain/Auth/auth_failure.dart';
import 'package:inkstop/infrastructure/Auth/auth_api.dart';

part 'login_event.dart';
part 'login_state.dart';
part 'login_bloc.freezed.dart';

final authFacade = AuthApi();

class LoginBloc extends Bloc<LoginEvent, LoginState> {
  LoginBloc() : super(LoginState.initial()) {
    on<LoginEvent>((event, emit) async {
      await event.map(loginButtonPressed: (e) async { // ✅ Added `await` here
        final response = await authFacade.login(
            identifier: e.identifier, password: e.password);

        response.fold((failure) {
          emit(state.copyWith(
            isSubmitting: false,
            succesFailure: some(left(failure)),
          ));
        }, (success) {
          emit(state.copyWith(
            succesFailure: some(right(unit)),
          ));
        });
      });
    });
  }
}

```

Figure 6.1: Login Authentication

newdoc_bloc.dart M

inkstop > lib > application > newbloc_bloc > newdoc_bloc.dart

```dart
import 'package:bloc/bloc.dart';
import 'package:dartz/dartz.dart';
import 'package:freezed_annotation/freezed_annotation.dart';
import 'package:injectable/injectable.dart';
import 'package:inkstop/domain/newdoc/newdoc_failures.dart';
import 'package:inkstop/infrastructure/newdoc/newdoc_api.dart';

part 'newdoc_bloc.freezed.dart';
part 'newdoc_event.dart';
part 'newdoc_state.dart';


@injectable
class NewdocBloc extends Bloc<NewdocEvent, NewdocState> {
  final  newdoc  = CreateNewDoc();
  NewdocBloc() : super(NewdocState.initial()) {
    on<NewdocEvent>((event, emit) async {
      await event.map(createButtonPressed: (e) async {
        print('inside bloc');
        emit(state.copyWith(
          isSubmitting: true,
          successFailure: none(),
        ));
        final resp = await newdoc.createdoc(
          username: e.username,
          docname: e.docname,
          docSubject: e.docSubject,
          docContent: e.docContent,
          recipients: e.recipients,
        );
        resp.fold(
          (failure) {
            print(failure);
            // If failure, emit the state with the failure
            emit(state.copyWith(
                isSubmitting: false, successFailure: some(left(failure))));
          }
```

Figure 6.2: Document Creation

newdoc_bloc.dart | search_bloc.dart

inkstop > lib > application > search_bloc > search_bloc.dart

```dart
import 'package:bloc/bloc.dart';
import 'package:dartz/dartz.dart';
import 'package:flutter/foundation.dart';
import 'package:freezed_annotation/freezed_annotation.dart';
import 'package:inkstop/domain/core/docmodel.dart';
import 'package:inkstop/domain/search/search_failures.dart';
import 'package:inkstop/infrastructure/search/search_api.dart';

part 'search_bloc.freezed.dart';
part 'search_event.dart';
part 'search_state.dart';

class SearchBloc extends Bloc<SearchEvent, SearchState> {
  SearchBloc() : super(SearchState.initial()) {
    on<SearchEvent>((event, emit) async {
      await event.map(
        searchButtonPressed: (e) async {
          // Start by emitting the submitting state
          emit(state.copyWith(
            isSubmitting: true,
            succesFailure: none(),
          ));

          // Perform the API call
          final response = await DocSearchApi.fetchDoc(docid: e.docid);

          // Handle the response
          response.fold(
            (failure) {
              // If failure, emit the state with the failure
              emit(state.copyWith(
                isSubmitting: false,
                succesFailure: some(left(failure)),
              ));
            },
            (documents) {
              // If success, emit the state with the documents
```

Figure 6.3: Document Searching

history_bloc.dart

inkstop > lib > application > history_bloc > history_bloc.dart

```dart
import 'package:bloc/bloc.dart';
import 'package:dartz/dartz.dart';
import 'package:freezed_annotation/freezed_annotation.dart';
import 'package:inkstop/domain/core/history_model.dart';
import 'package:inkstop/domain/history/history_failures.dart';
import 'package:inkstop/infrastructure/history/history_api.dart';

part 'history_bloc.freezed.dart';
part 'history_event.dart';
part 'history_state.dart';

class HistoryBloc extends Bloc<HistoryEvent, HistoryState> {
  final historyapi = HistoryApi();
  HistoryBloc() : super(HistoryState.initial()) {
    on<HistoryEvent>((event, emit) async {
      await event.map(fetchHistory: (e) async {
        emit(state
            .copyWith(model: [], successOrFailure: const None(), Search: true));
        print('inside history bloc $e.username');
        final response = await historyapi.fetchhistory(username: e.username);

        response.fold((failure) {
          emit(state.copyWith(
              Search: true, model: [], successOrFailure: some(left(failure))));
        }, (history) {
          emit(state.copyWith(
              Search: false,
              model: history,
              successOrFailure: some(right(unit))));
        });
      });
    });
  }
}
```

Figure 6.4: Document History

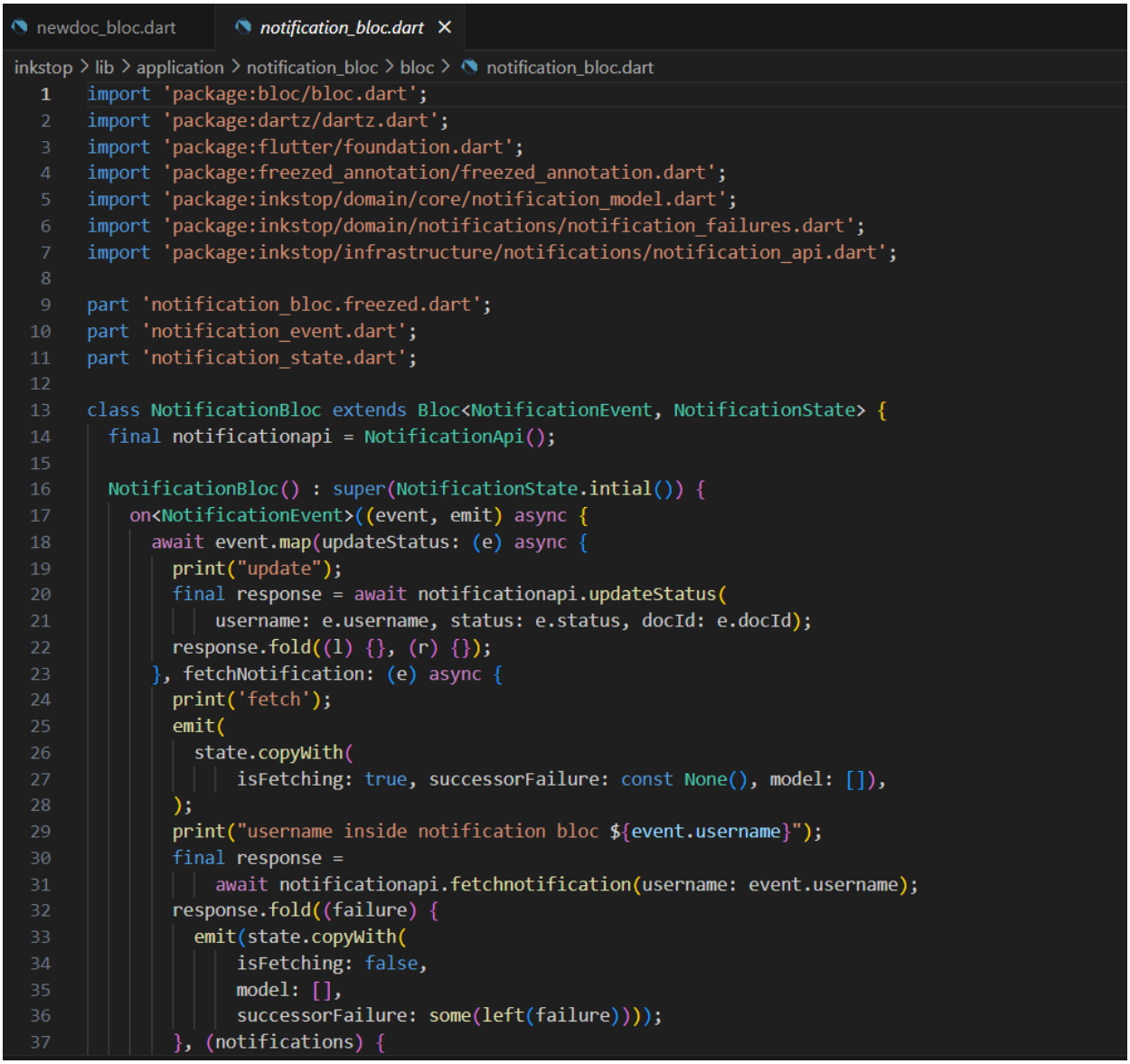

Figure 6.5: document notification

6.3 SUMMARY

InkStop revolutionizes document verification in institutional workflows through modern technology. It features a responsive and dynamic frontend built with Flutter, and a secure, scalable backend developed using Node.js with MongoDB as the database.

This platform serves users and administrators by providing a seamless and efficient audit trail. Users can upload new documents, search for existing records, and track their activity, while admins manage submissions and issue notifications regarding document approval or rejection.

Flutter enables a clean and interactive user interface across devices, enhancing user experience. Node.js powers the backend logic, while MongoDB ensures flexible schema design and efficient data handling, securing storage and access for all auditing records.

InkStop marks a major step forward in digital documentation processes. It reflects our commitment to innovation and collaboration, aiming to raise the standards of transparency, verification, and operational efficiency across institutions.

CHAPTER 7
RESULTS AND DISCUSSION

7.1 INTRODUCTION

The InkStop Document Verification Application has been successfully developed and tested, providing a seamless and efficient solution for secure document validation in institutional and professional settings. The application has been evaluated based on various criteria and the results are discussed below:

User Experience: Feedback from users and usability testing indicate that the application provides a clean and intuitive interface, making it easy for users and administrators to navigate and complete tasks efficiently.

Security: The use of MongoDB ensures secure storage of document data, while robust authentication mechanisms prevent unauthorized access and ensure data protection.

Scalability: The application is built to accommodate a large number of users and document transactions without degrading performance. MongoDB's built-in scalability supports system expansion with growing user and data volumes.

Database Management: InkStop's backend efficiently organizes and maintains all document records and user information, supporting quick access, traceability, and data consistency.

7.2 DISCUSSIONS

Language Support: Currently, InkStop supports a limited number of languages. Future updates should aim to broaden language availability, ensuring accessibility for a more diverse and multilingual user base across institutions.

Integration with External Systems: Integrating InkStop with existing systems within organizations posed challenges due to different compatibility standards. Upcoming development phases will target better integration for a smoother and more unified workflow.

Real-Time Notifications: Implementing real-time notifications is essential to keep users informed about changes to document statuses. This feature will improve user interaction by delivering instant updates across roles and actions.

Performance Optimization: To support future scalability, continuous monitoring and performance enhancement will be vital. This includes refining database queries, improving loading speeds, and ensuring the system remains responsive under heavy data loads and user activity.

7.3 RESULTS

Here are some screenshots of the implemented modules in the application:

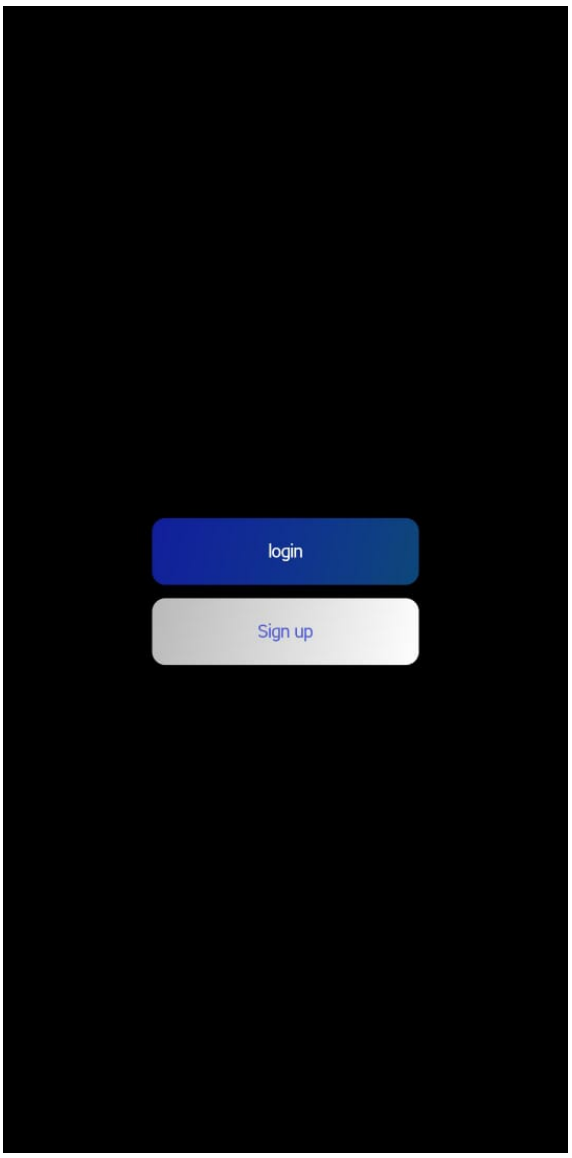

Figure 7.1: Home Page

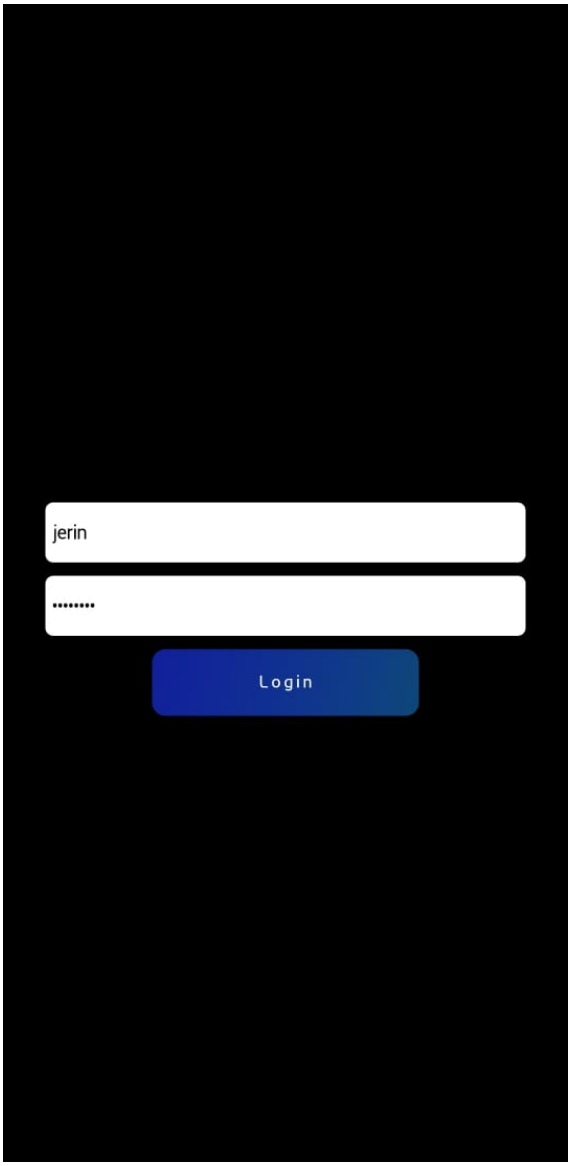

Figure 7.2: Login Page

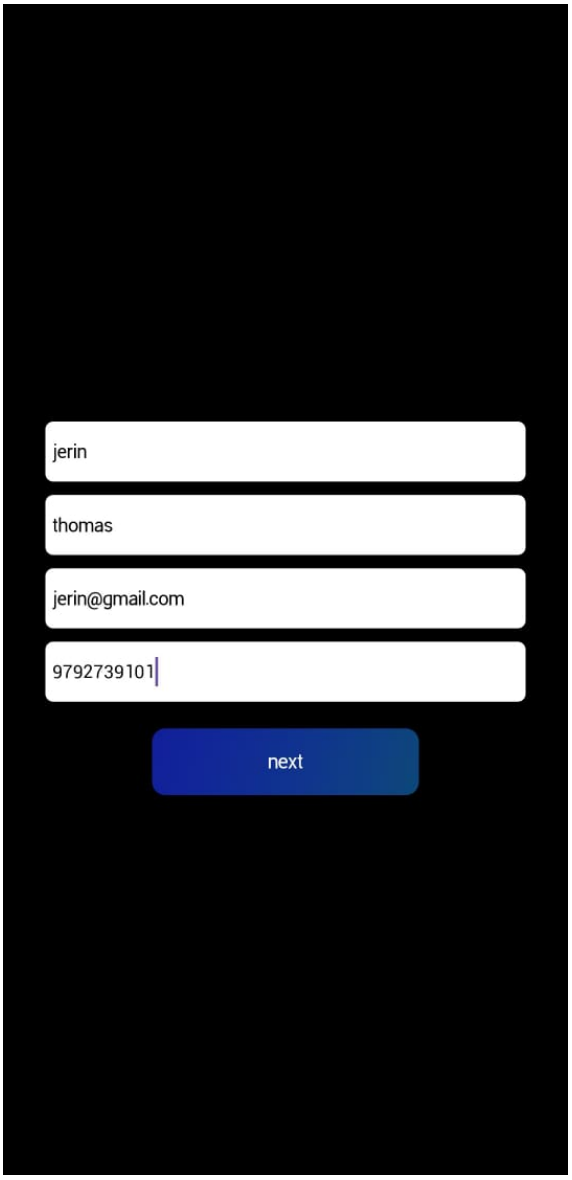

Figure 7.3: Sign up Page

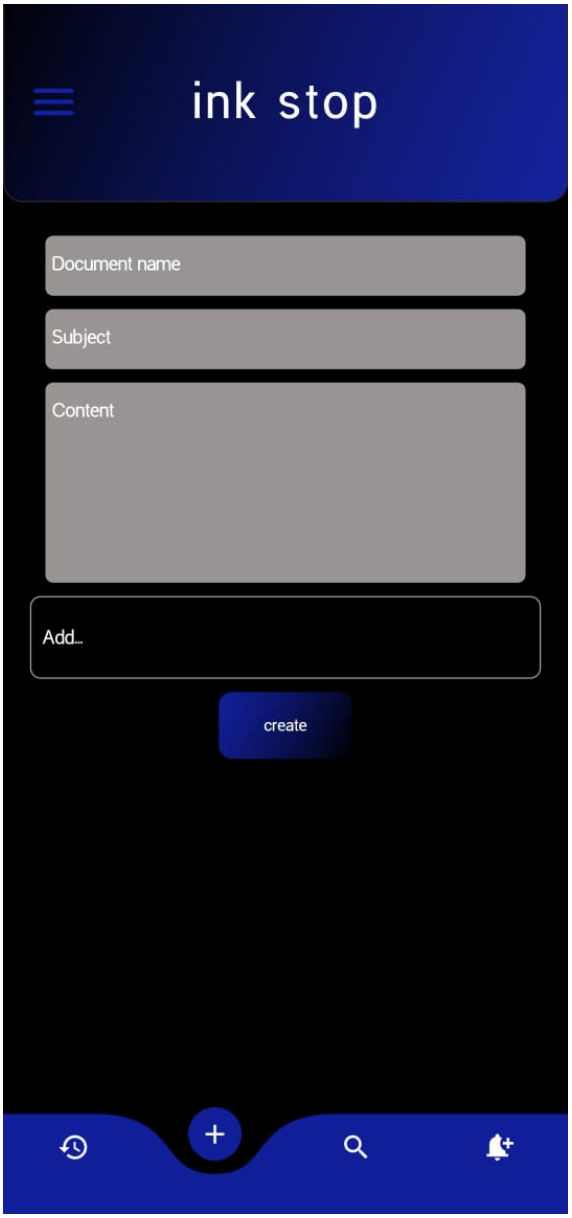

Figure 7.4: Document Creation

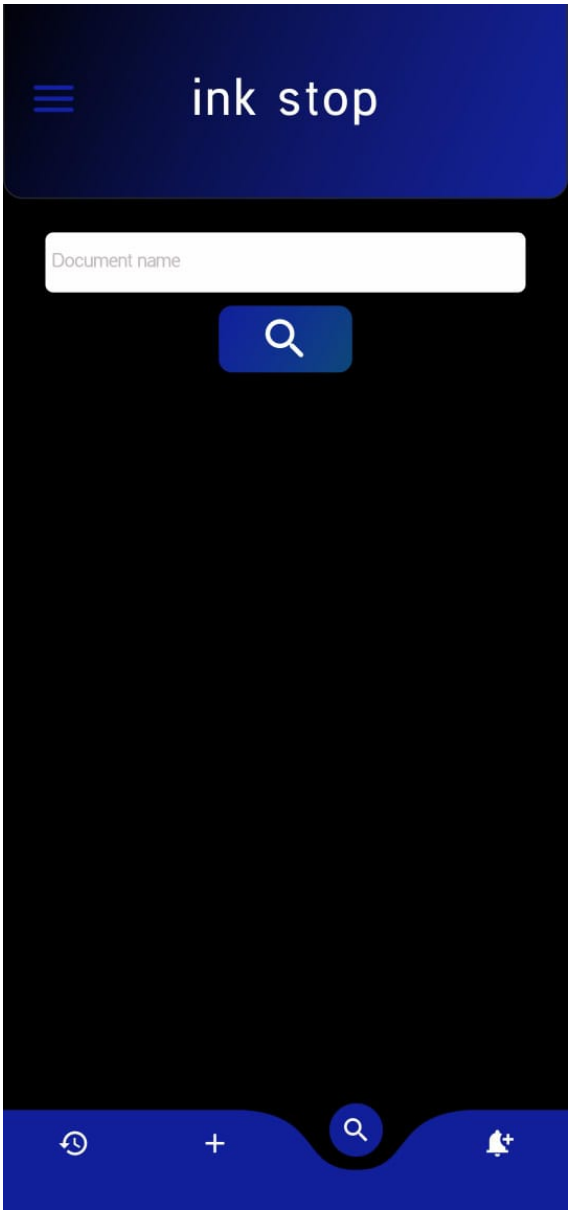

Figure 7.5: Document Searching

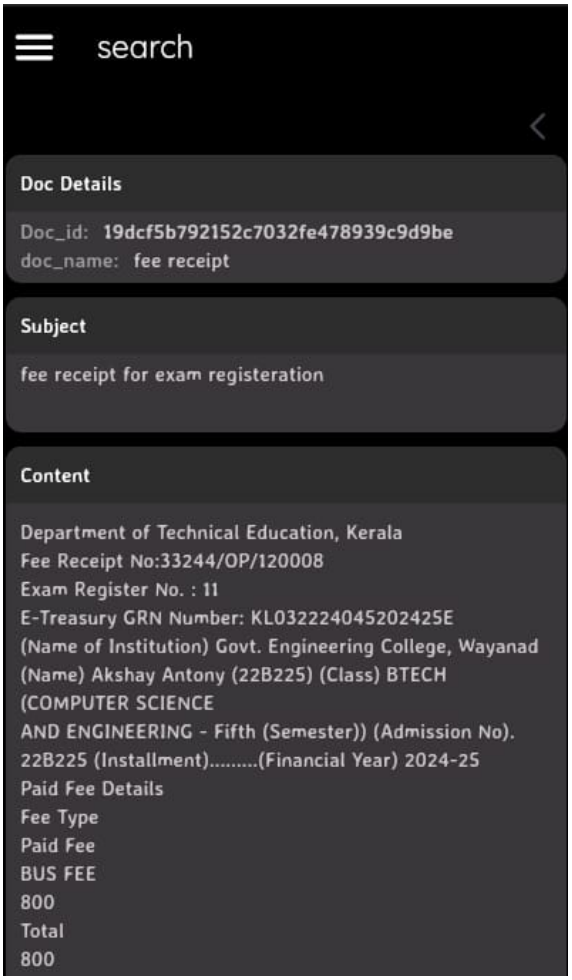

Figure 7.6: search Output

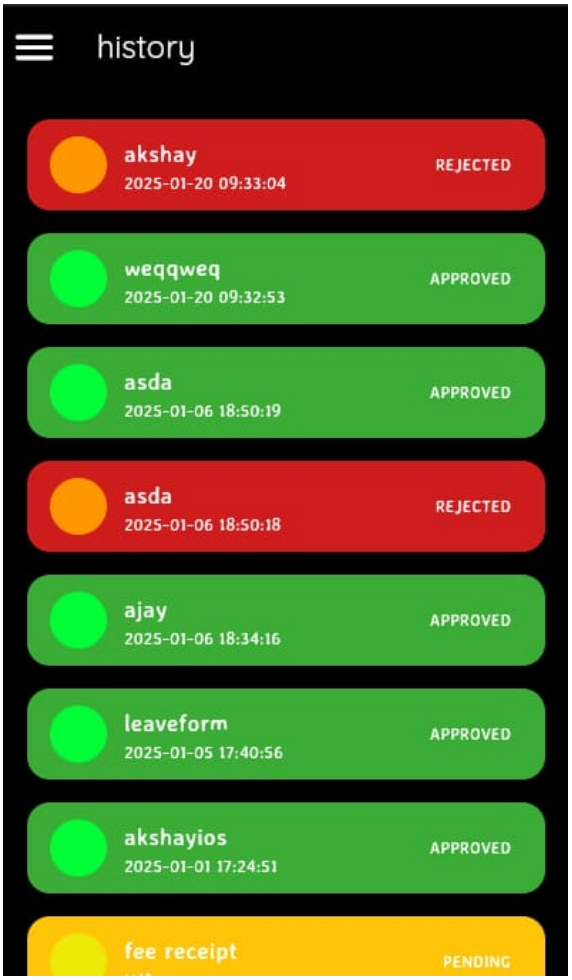

Figure 7.7: Document History

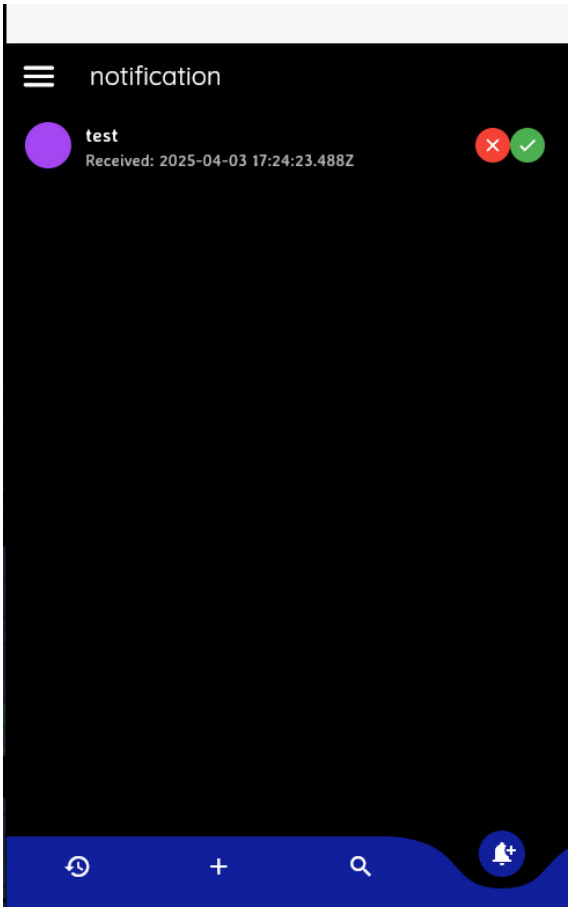

Figure 7.8: Document Notification

7.4 RESULT ANALYSIS

Performance Evaluation:

The application's average response time is fast, fulfilling the requirement for responsive interactions with users. This ensures smooth and efficient operations across the platform. InkStop effectively handles document creations, searches, and verification actions without noticeable delays. Users can quickly submit documents, and administrators can review and respond to these submissions promptly. The platform also delivers real-time notifications regarding document status, keeping both users and administrators informed throughout the submission and verification process.

CHAPTER 8
DOCUMENTATION

8.1 INTRODUCTION

The documentation chapter serves as a comprehensive guide to understanding and using the InkStop document verification platform. This chapter is a valuable resource for developers, stakeholders, and end-users, providing detailed insights into the application's architecture, functionality, and implementation. It outlines the purpose and scope of the documentation, offers an overview of key sections, and lays the groundwork for effective usage and future development of the application.

In this chapter, we present a structured and well-organized compilation of information that facilitates easy navigation through the features and modules of InkStop. It includes detailed explanations of the system architecture, user interface components, data flow diagrams, and the integration of various technologies used throughout development. Furthermore, it covers the methods applied for requirement analysis, design rationale, and performance evaluation, offering a holistic view of the project's evolution.

By referencing this documentation, stakeholders gain deeper insight into InkStop's capabilities, constraints, and technical underpinnings. It encourages transparency and promotes collaboration among developers, project managers, and users, contributing to a streamlined and effective software development life cycle. Additionally, this documentation serves as a critical asset for ongoing enhancements, maintenance, and issue resolution, ensuring the continued success and scalability of the InkStop platform.

8.2 CONTACT

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CHAPTER 9
CONCLUSION AND FUTURE WORK

9.1 CONCLUSION

InkStop presents a promising and innovative solution to enhance the efficiency, accuracy, and security of document verification across various professional and institutional settings. By leveraging modern technologies and a user-friendly interface, the platform streamlines the process of document submission and verification, allowing users and administrators to interact seamlessly and effectively.

Through features such as document creation, real-time notifications, and a robust verification workflow, InkStop serves as a valuable tool for organizations to optimize administrative processes, ensure the authenticity of records, and enable efficient communication. It bridges the gap between traditional, paper-based workflows and digital innovation, allowing stakeholders to manage document validation with greater accuracy, coordination, and reliability.

Furthermore, the platform's potential to reduce manual errors, enhance institutional collaboration, and offer transparency through history logs and tracking can significantly improve operational efficiency and user satisfaction. Ultimately, InkStop contributes to a more secure, organized, and trustworthy environment for document verification.

9.2 ADVANTAGES

- **Enhanced Communication:** InkStop enables real-time communication between users and administrators, ensuring that updates regarding document status are shared

quickly and efficiently.

- **Streamlined Workflow:** The platform simplifies document handling through a structured and automated process, reducing administrative overhead and ensuring timely validation and approval.
- **Secure Data Access:** Role-based access ensures that only authorized users can view or modify document data, preserving the confidentiality and integrity of all records.
- **Efficient Documentation:** All document interactions are recorded digitally, reducing paperwork, minimizing errors, and ensuring that historical data is maintained accurately.
- **Time Management:** Automated notifications and tracking help users stay informed about the status of documents, allowing for better time management and faster decision-making.
- **Improved Accuracy:** By replacing manual processes with digital verification tools, the platform minimizes the risk of human error and enhances validation accuracy.
- **User-Friendly Interface:** Developed with Flutter, InkStop provides an intuitive and responsive interface that simplifies navigation and usage across all user roles.
- **Scalability:** The use of MongoDB allows the platform to handle a growing volume of users and documents, making it suitable for organizations of all sizes.

9.3 LIMITATIONS

- **Language Support:** Currently, InkStop supports only a limited number of languages. Expanding language capabilities will improve accessibility for a wider user base.

- **Integration with Existing Systems:** Integrating InkStop with existing institutional systems may present compatibility challenges and could require additional development efforts.

- **Internet Dependency:** As a web-based solution, InkStop relies on stable internet connectivity, which may limit usability in areas with unreliable network access.

- **User Training:** First-time users may require orientation or training to use all features effectively. Providing adequate support and resources may be time-intensive.

9.4 FUTURE EXPANSION

- **Enhanced Language Support:** Broaden the platform's language options to include regional and international languages, improving accessibility for diverse user groups.

- **Advanced Security Features:** Introduce multi-factor authentication, end-to-end encryption, and blockchain-based verification to further strengthen data integrity and system resilience.

- **Integration with Other Systems:** Enable seamless connectivity with learning management systems (LMS), student information systems (SIS), and institutional databases to centralize operations.

- **Automated Verification Processes:** Use AI and machine learning to develop intelligent verification workflows that automate approval processes and reduce administrative workload.

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3. **SignWell** (2023). Signwell: Lightweight and accessible e-signature platform. https://www.signwell.com. Accessed: 2024-04-09.