



**DEPARTMENT OF INFORMATION SCIENCE AND ENGINEERING**

**DESIGN THINKING LABORATORY REPORT**

**IS237DL**

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**TITLE**

**AI DRIVEN DOCUMENT COLLABORATION PLATFORM**

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**RV College of Engineering®**

**2024-2025**

# **RV COLLEGE OF ENGINEERING<sup>®</sup>, BENGALURU-59**

**(Autonomous Institution Affiliated to VTU, Belagavi)**

## **DEPARTMENT OF INFORMATION SCIENCE AND ENGINEERING**



### **CERTIFICATE**

Certified that the Design thinking Laboratory work titled '***AI Powered Document Collaboration Platform***' is carried out by **Vansh Bhardwaj(1RV23IS134), Tanmay Bajpai(1RV23IS131), Pulkit Gupta(1RV23IS094), Yashwanth Rathi(1RV23IS142)** in partial fulfilment for the requirement of degree of **Bachelor of Engineering in Information Science and Engineering** of the Visvesvaraya Technological University, Belagavi during the year 2024-2025. It is certified that all corrections/suggestions indicated for the Internal Assessment have been incorporated in the report.

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# Chapter-1 INTRODUCTION

The modern workplace is characterized by increasing interconnectedness and collaboration, with teams often spread across geographical boundaries and time zones. This necessitates efficient and effective tools for collaborative document creation and management. Traditional document collaboration tools, while useful, often present challenges in handling complex tasks such as version control, real-time editing, and feedback integration<sup>1</sup>. These challenges can hinder productivity and create communication barriers, especially in remote or geographically dispersed teams.

Artificial intelligence (AI) is rapidly transforming various sectors<sup>2</sup>, and document collaboration is no exception. AI-driven document collaboration platforms are emerging as a solution to these challenges, offering intelligent features that streamline workflows, improve productivity, and enhance the quality of documents. These platforms leverage AI to automate tasks, provide insightful suggestions, and facilitate seamless communication among team members<sup>3</sup>. This includes features like real-time language translation, automated summaries of lengthy discussions, and noise cancellation in virtual meetings<sup>4</sup>.

This report examines the development of an AI-driven document collaboration platform, highlighting its key features, benefits, and potential impact. The platform addresses the growing need for efficient and effective collaboration tools in today's fast-paced work environment. It utilizes cutting-edge technologies like HTML, CSS, JavaScript, Quill.js for the front-end, Spring Boot for the back-end, WebSockets for real-time communication, and MongoDB for efficient data management. The development process followed Agile methodologies, emphasizing iterative development and incorporating user feedback throughout the design and implementation phases.

*The global market for AI in organizational collaboration is experiencing significant growth, with an estimated value of USD 36.0 Billion by 2033, growing at a CAGR of 23.1%<sup>10</sup>. This highlights the increasing demand for AI-powered collaboration tools and the potential for this platform to address a significant market need.*

# Abstract

The increasing adoption of artificial intelligence (AI) is revolutionizing various sectors, and document collaboration is no exception<sup>1</sup>. AI-driven document collaboration platforms are transforming how teams work together by streamlining workflows, improving productivity, and enhancing the quality of documents. This report examines the development of an AI-driven document collaboration platform, highlighting its key features, benefits, and potential impact. The platform addresses the growing need for efficient and effective collaboration tools in today's fast-paced work environment. It leverages AI to automate tasks, provide insightful suggestions, and facilitate seamless communication among team members<sup>2</sup>. One of the key advantages of this platform is its ability to improve accuracy and reduce errors associated with traditional document processing methods<sup>3</sup>.

Traditional document collaboration tools often face limitations in handling complex tasks such as version control, real-time editing, and feedback integration. These challenges can hinder productivity and create communication barriers, especially in remote or geographically dispersed teams. The AI-driven platform tackles these issues by providing intelligent features that automate tedious tasks, track changes effectively, and facilitate clear communication. This includes features like a smart editor that allows users to easily format text, embed rich media, and insert code blocks<sup>4</sup>. The platform also boasts AI-powered capabilities such as real-time language translation, automated summaries of lengthy discussions, and noise cancellation in virtual meetings<sup>5</sup>. This facilitates seamless collaboration in diverse teams and addresses the growing need for global collaboration and inclusivity. This platform utilizes cutting-edge technologies like HTML, CSS, JavaScript, Quill.js for the front-end, Spring Boot for the back-end, WebSockets for real-time communication, and MongoDB for efficient data management. The development process followed Agile methodologies, emphasizing iterative development and incorporating user feedback throughout the design and implementation phases.

## 2.

# Empathy

## 2.1 Client Details

This AI-driven document collaboration platform caters to a diverse range of users and organizations. The target audience includes businesses of all sizes, educational institutions, and research teams that require efficient and effective tools for collaborative document creation and management.

Specifically, the platform focuses on the needs of:

- **Project teams:** Streamlining workflows, improving communication, and enhancing version control for efficient project execution. The platform achieves this by offering features for task assignment, deadline tracking, progress monitoring, and centralized communication channels. This addresses the common challenges project teams face with traditional tools, such as difficulty in coordinating tasks, tracking progress, and maintaining clear communication among team members.
- **Content creators:** Facilitating real-time co-editing, providing intelligent suggestions, and simplifying content review processes. The platform offers features like real-time collaborative editing, AI-powered suggestions for grammar and style improvements, and streamlined feedback mechanisms. This helps content creators overcome challenges related to version control, inconsistent writing styles, and inefficient feedback integration.
- **Researchers:** Enabling seamless collaboration on research papers, reports, and other academic documents. The platform provides features for collaborative writing, citation management, and version control specifically tailored for research workflows. This addresses the challenges researchers face in managing large documents, ensuring accurate citations, and coordinating contributions from multiple authors.
- **Educators:** Providing a platform for collaborative learning, assignment sharing, and feedback provision. The platform offers features for creating and sharing assignments, facilitating group projects, and providing feedback to students. These users often face challenges with traditional document collaboration tools, such as difficulty in tracking changes, managing different versions, and ensuring clear communication among team members. The AI-driven platform addresses these pain points by providing intelligent features that automate tasks, enhance communication, and improve overall productivity. These features align with the platform's core focus on enhancing document collaboration through AI<sup>2</sup>.

## 2.2 Need Analysis with Evidence

### 2.2.1 Questionnaire and Analysis

To understand the specific needs and challenges of target users, we surveyed a diverse group of users from our target audience. The survey focused on gathering insights into their current document collaboration practices, pain points, and desired features. The analysis of the survey responses revealed the following key findings:

- **Inefficient version control:** Many users struggle with managing different versions of documents, leading to confusion and potential errors.
- **Time-consuming feedback integration:** Incorporating feedback from multiple collaborators can be a tedious and time-consuming process.
- **Communication barriers:** Lack of clear communication channels can hinder collaboration and lead to misunderstandings.
- **Limited automation:** Manual tasks such as formatting, proofreading, and citation management can significantly reduce productivity.

These findings highlight the need for an AI-driven platform that can address these challenges by providing intelligent features for version control, feedback management, communication, and task automation. This aligns with the observation that AI can improve team productivity through predictive task management and streamlined workflows<sup>6</sup>. By automating these processes, the platform allows users to focus on more strategic tasks and enhances overall efficiency.

## **Different questions were asked to the students from different background**

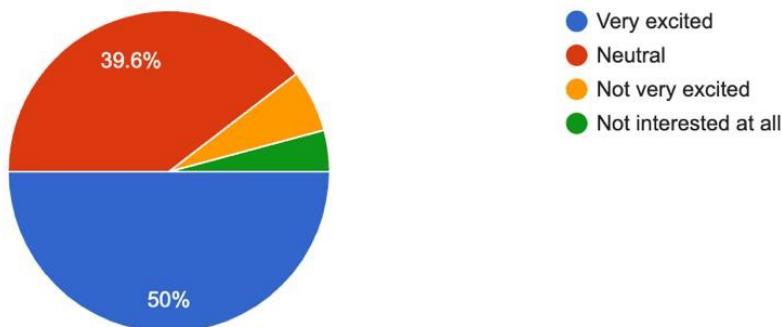
- How familiar are you with AI technology in general?
- How frequently do you use document collaboration tools (e.g., Google Docs, Microsoft Word Online)?
- Which AI features do you think would be most helpful in a document collaboration platform?
- On a scale of 1 to 5, how much do you trust AI in assisting with document editing and collaboration?
- If AI could help you brainstorm ideas or improve your writing style, how excited would you be to use it?
- Would you like an AI assistant that can predict what you need next while working on a document, such as suggesting references or related content?
- Are you concerned about the privacy and security of your data while using an AI-driven document collaboration platform

## **Responses From the students, through Microsoft Forms**

*If AI could help you brainstorm ideas or improve your writing style, how excited would you be to use it?*

 Copy chart

48 responses



*Imagine an AI feature that could automatically organize your notes and highlight key points. How useful would this be for your workflow?*

 Copy chart

48 responses

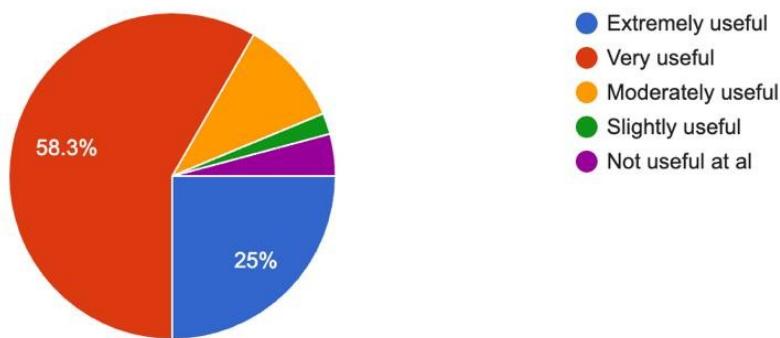


FIG 1.2

*Would you like an AI assistant that can predict what you need next while working on a document, such as suggesting references or related content?*

 Copy chart

48 responses

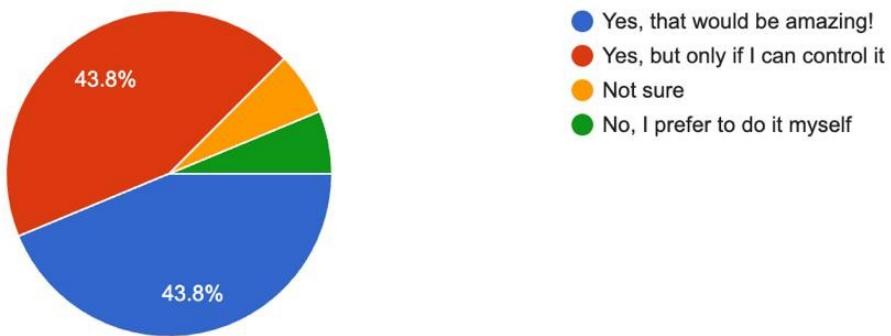


FIG 1.3

*Are you concerned about the privacy and security of your data while using an AI-driven document collaboration platform?*

 Copy chart

48 responses

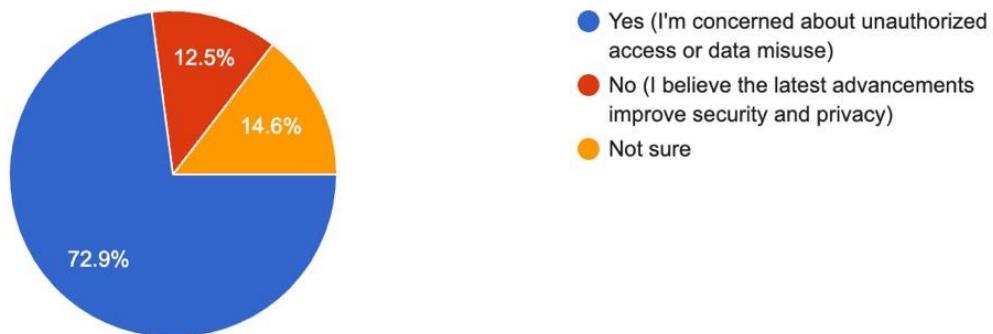


FIG 1.4

*How likely are you to recommend an AI-powered document collaboration tool to your friends or colleagues?*

 Copy chart

48 responses

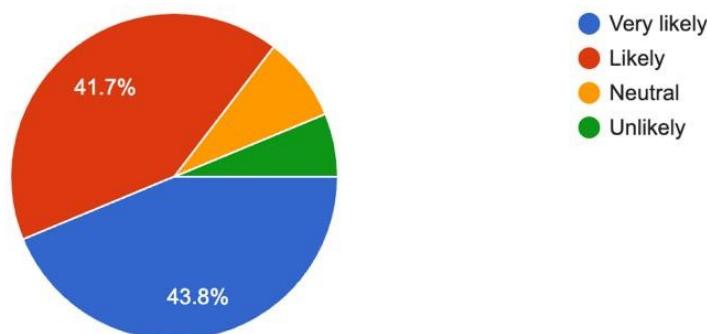


FIG 1.5

*On a scale of 1 to 5, how much do you trust AI in assisting with document editing and collaboration?*

 Copy chart

48 responses

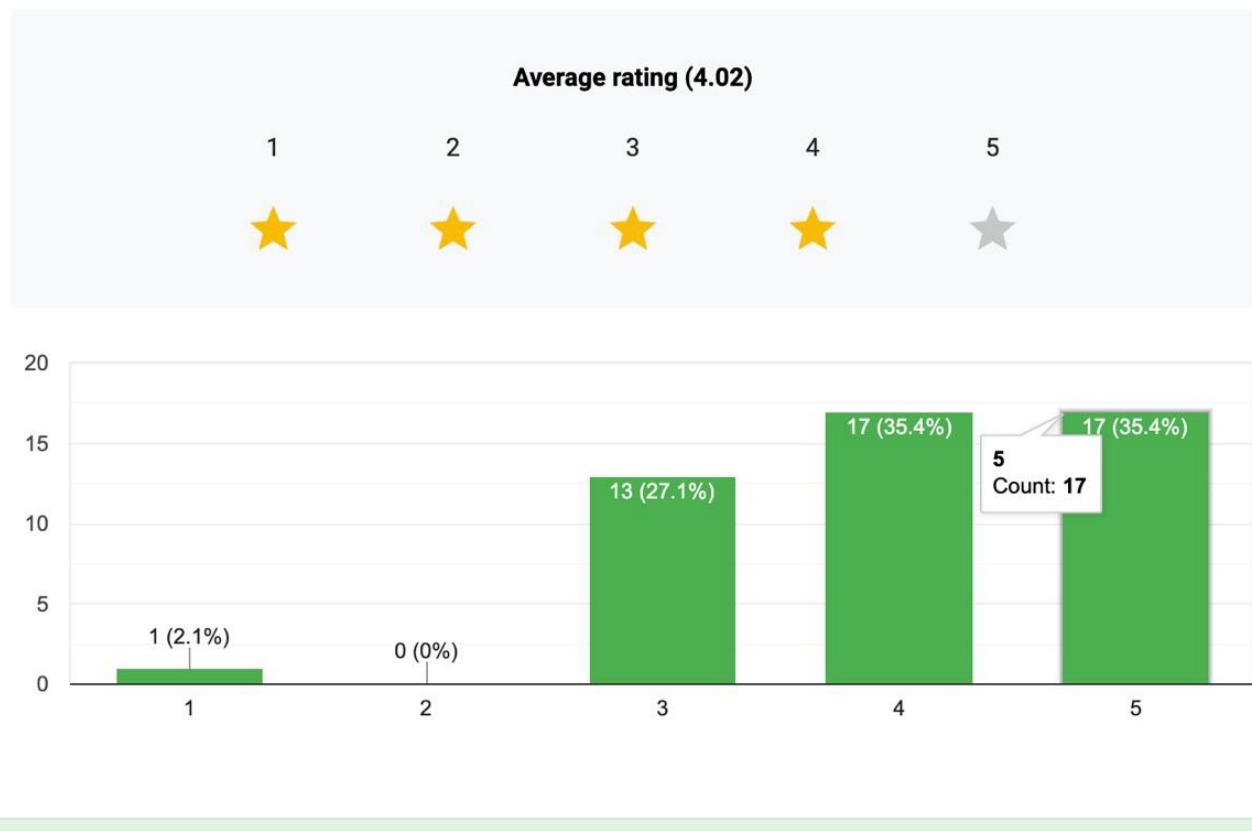


FIG 1.6

## Other Materials

In addition to the survey, the need analysis involved examining various other materials, including:

- **Market research reports:** Analyzing industry trends and identifying the growing demand for AI-powered collaboration tools.
- **Competitor analysis:** Evaluating existing document collaboration platforms and their limitations in addressing user needs.
- **User feedback from existing platforms:** Gathering insights from online reviews and forums to understand user experiences and identify areas for improvement.

These materials provided valuable context and further validated the need for an AI-driven document collaboration platform that can effectively address the challenges faced by users in various domains.

3.

## DEFINE

### 3.1 Problem Statement

In the modern era of digital workspaces, efficient document collaboration is critical for productivity and teamwork. However, traditional methods of document collaboration are riddled with inefficiencies and complexities that pose significant challenges for users. Individuals and teams frequently struggle with managing multiple versions of the same document, integrating diverse feedback from collaborators, and maintaining clarity in communication. These challenges often lead to confusion, errors, and wasted time, which ultimately hinder productivity and disrupt the flow of effective teamwork.

Moreover, knowledge workers face the additional burden of spending a substantial amount of time searching for relevant information within documents. Studies have shown that workers can lose countless hours navigating through fragmented content or poorly organized documents to locate the data or context they need. This inefficiency not only drains valuable time but also creates barriers to seamless collaboration and decision-making.

The increasing reliance on digital tools for collaboration, coupled with the growing complexity of modern workflows, amplifies the need for an innovative solution. A platform that not only streamlines the document collaboration process but also enhances information accessibility and retrieval would address these pressing challenges. By integrating intuitive features and leveraging cutting-edge technologies, such a platform could empower users to collaborate more effectively, reduce wasted time, and foster a culture of productivity and clarity in teamwork.

## 3.2 Empathy Map

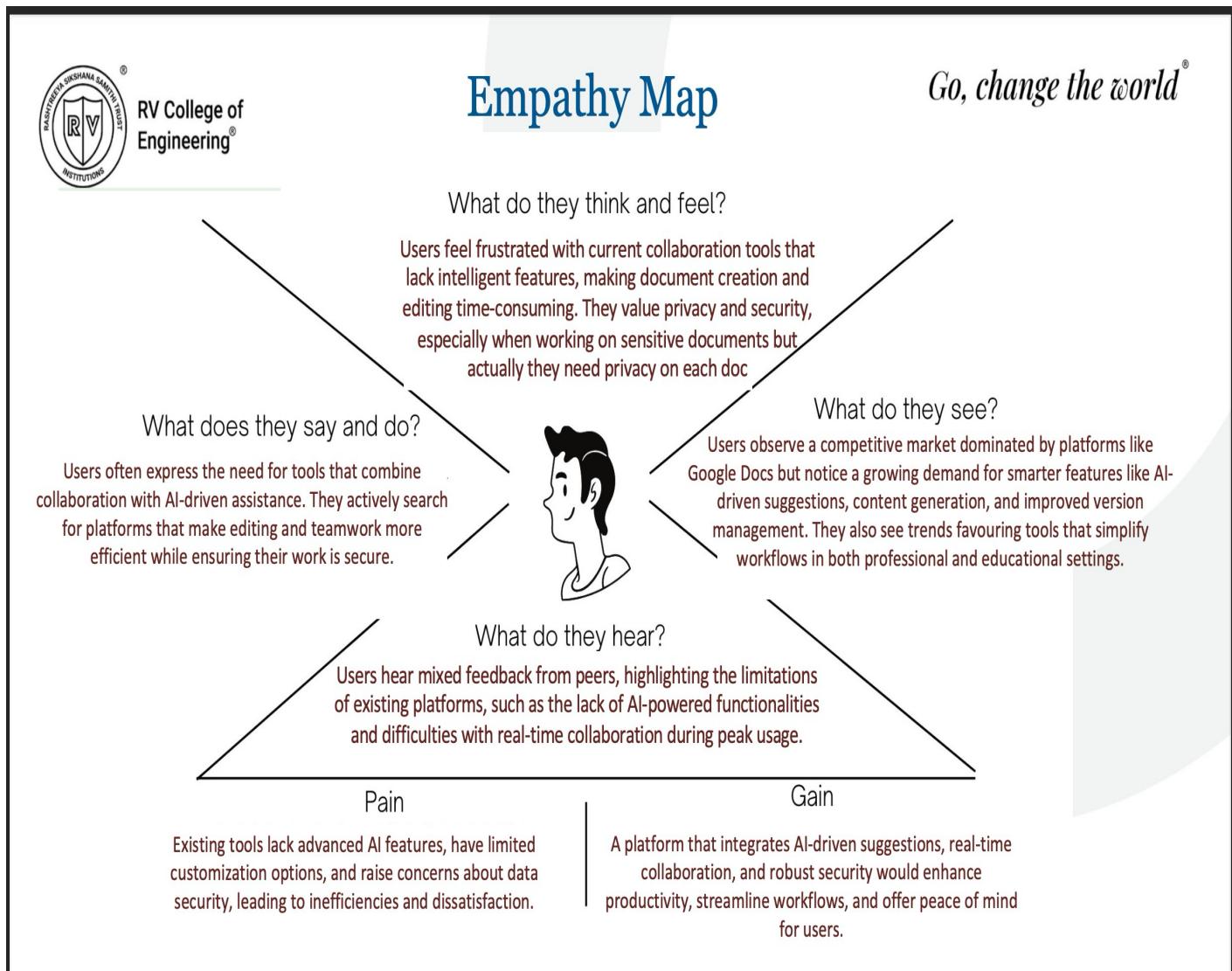


FIG 3.1

## 4.

## Ideate Phase

The ideation phase was a critical step in designing the AI-driven document collaboration platform, as it involved extensive brainstorming and conceptualization to ensure the platform would meet the diverse needs of its target users. A variety of structured and unstructured techniques were employed during this phase to generate innovative ideas and explore potential solutions. These techniques included brainstorming sessions, SWOT (Strengths, Weaknesses, Opportunities, Threats) analysis, and user story mapping. The brainstorming sessions encouraged free-flowing ideas from all team members, fostering a creative environment where even the most unconventional concepts were explored. The SWOT analysis helped evaluate the feasibility and impact of proposed ideas by identifying key strengths, addressing potential weaknesses, leveraging opportunities, and mitigating threats.

Additionally, user story mapping was used to understand the user's journey and map out functionalities that would cater to their needs effectively. Mind maps were created to visually organize and interconnect these ideas, providing a holistic view of the platform's envisioned features and user interactions. These visual tools facilitated discussions and helped the team identify gaps, redundancies, and areas for improvement.

During the ideation phase, several challenges were identified. One prominent challenge was the platform's potential reliance on manual processes for certain aspects of development, which could hinder efficiency and scalability. To address this, the team focused on integrating advanced AI and automation technologies into the platform. This effort aimed to streamline the development process, reduce dependency on manual tasks, and enhance the platform's overall capabilities. By prioritizing innovation and usability, the ideation phase laid the groundwork for a robust and user-centric platform.

## MIND MAP

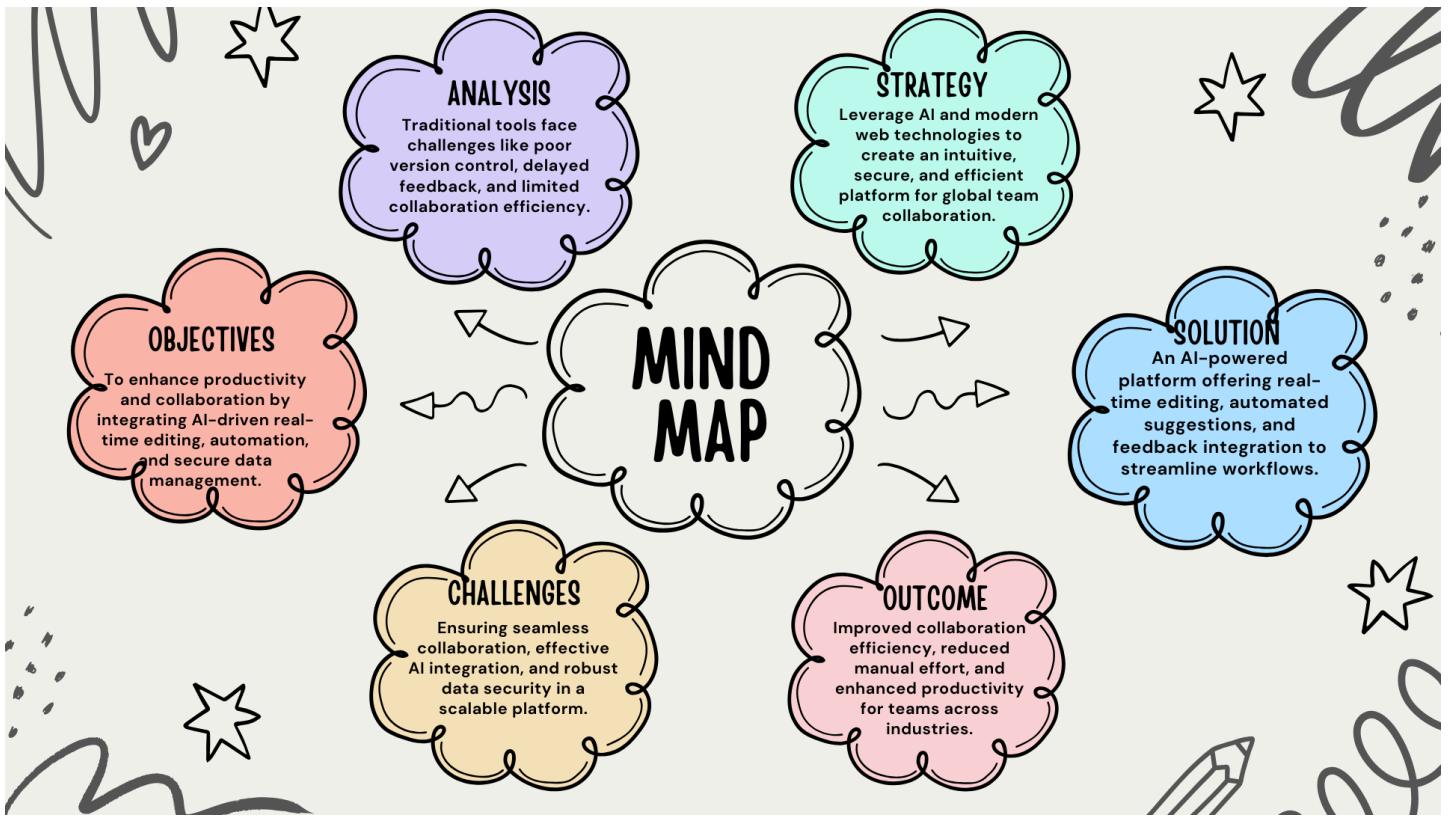


FIG 4.1

## 5. Prototype

The development of the prototype marked a pivotal step in transforming the conceptual ideas from the ideation phase into a tangible product. The AI-driven document collaboration platform prototype was built using a well-considered technology stack that balanced flexibility, scalability, and the needs of real-time collaboration. The front-end was developed using HTML, CSS, and JavaScript, chosen for their versatility and ability to create a responsive and user-friendly interface. The back-end was implemented with Spring Boot, a framework renowned for its scalability, robustness, and seamless integration capabilities, making it an ideal choice for handling the demands of collaborative applications.

The prototype incorporated several key features designed to address the challenges identified during the ideation phase. Real-time co-editing allowed multiple users to edit documents simultaneously, enabling seamless collaboration and reducing workflow bottlenecks. AI-powered features, such as grammar and style suggestions, provided real-time assistance to enhance the quality of the content, making the platform more intuitive and supportive. Automated version control eliminated the need for manual tracking of changes, ensuring that users always had access to the most up-to-date document versions. Integrated communication channels facilitated effective collaboration by allowing team members to discuss and share feedback directly within the platform.

To showcase the prototype's user interface and functionalities, detailed screenshots and diagrams were created. These visuals played a crucial role in communicating the platform's features and usability to stakeholders, helping them understand its potential impact. The prototype served as a proof of concept, demonstrating the feasibility of the ideas generated during the ideation phase and providing a solid foundation for further development.

The screenshot shows a Java IDE interface with the following details:

- Project View:** On the left, the project structure is displayed under "Project". It includes a "main" package containing "java", "resources", and "static" folders. "java" contains "com.docs1.ggldocs" which has "controllers", "models", "repositories", "services", and "GglDocsApplication" classes. "resources" contains "static" with "scripts33.js" and "styles33.css", and "templates" with "index33.html".
- Code Editor:** The central area shows the content of `GglDocsApplication.java`. The code defines a class `DocumentService33` with various imports and methods.
- Status Bar:** At the bottom, the status bar shows the path `gglDocs > src > main > java > com > docs1 > ggldocs > services > DocumentService33`, the line number `19:35`, and encoding information `CRLF UTF-8 4 spaces`.

```
import com.docs1.ggldocs.repositories.DocumentRepository33;
import org.springframework.beans.factory.annotation.Autowired;
import org.springframework.beans.factory.annotation.Value;
import org.springframework.http.*;
import org.springframework.stereotype.Service;
import org.springframework.web.client.RestTemplate;

import java.util.Optional;

@Service 2 usages
public class DocumentService33 {

    @Autowired
    private DocumentRepository33 documentRepository33;

    @Value("${openai.api.key}") //OpenAI API key from application.properties
    private String openaiApiKey;

    private final String openaiUrl = "https://api.openai.com/v1/completions"; // OpenAI endpoint for completions

    private final RestTemplate restTemplate = new RestTemplate(); 1 usage

    // Save a document
    public Document33 saveDocument(Document33 document) { 1 usage
        return documentRepository33.save(document);
    }
}
```

## 6. Testing

The testing phase was a comprehensive evaluation process aimed at assessing the usability, functionality, and overall effectiveness of the AI-driven document collaboration platform. This phase involved conducting user testing sessions with a carefully selected group of target users who represented the platform's intended audience. The testing sessions were designed to simulate real-world use cases, enabling the team to gather valuable insights into the platform's performance and user experience.

Participants were tasked with performing a variety of activities using the prototype, such as creating and editing documents, collaborating with other users in real time, and providing feedback on shared content. These tasks were designed to test the platform's core features and identify any usability issues or areas for improvement. During the sessions, detailed data was collected on user interactions, task completion times, error rates, and overall satisfaction with the platform's functionalities.

The feedback received from participants was overwhelmingly positive. Users highlighted the platform's ease of use, intuitive interface, and the utility of its AI-powered features, such as grammar and style suggestions. Many participants noted that the real-time co-editing and automated version control features significantly enhanced their productivity and collaboration experience. However, the testing also revealed opportunities for improvement. For example, some users suggested enhancing the platform's search functionality to make it easier to locate specific content within documents. Others recommended adding more customization options to allow users to tailor the platform to their unique preferences and workflows.

This feedback proved invaluable in guiding the next steps of development. By addressing the identified issues and incorporating user suggestions, the team was able to refine the platform and ensure that it met the needs and expectations of its users. The testing phase not only validated the core features of the platform but also provided actionable insights for enhancing its functionality and user experience.

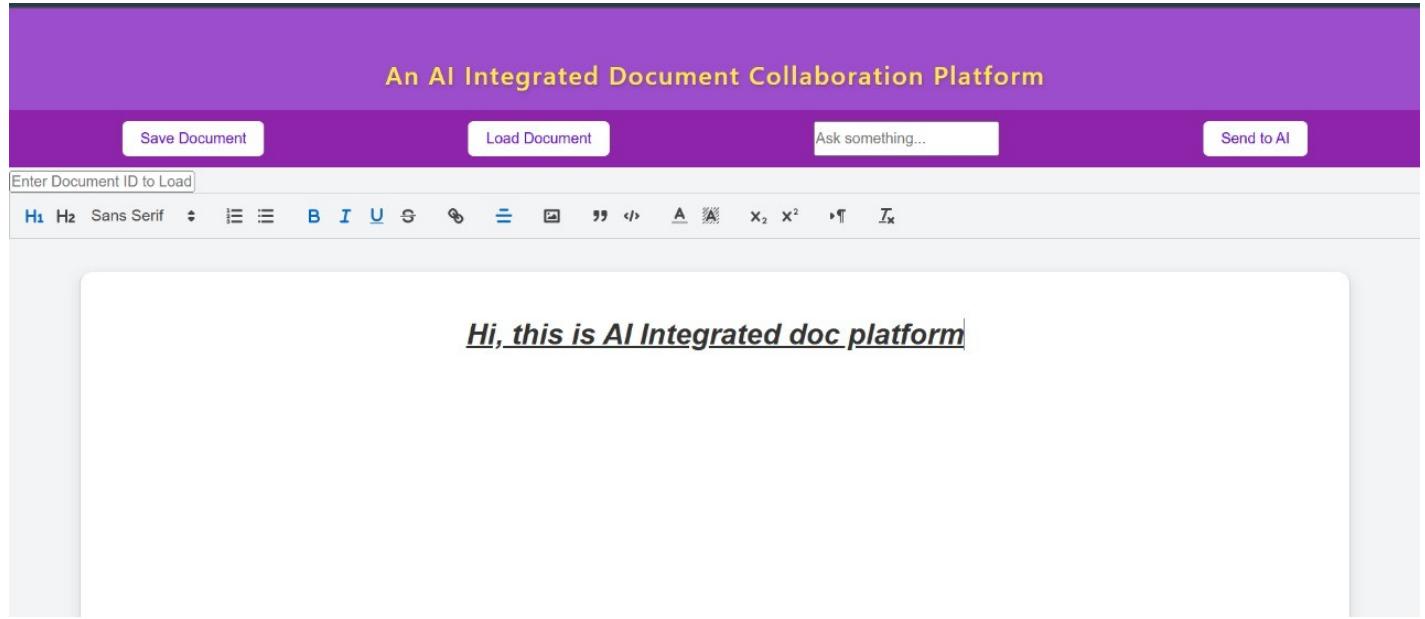


FIG6.1



FIG6.2

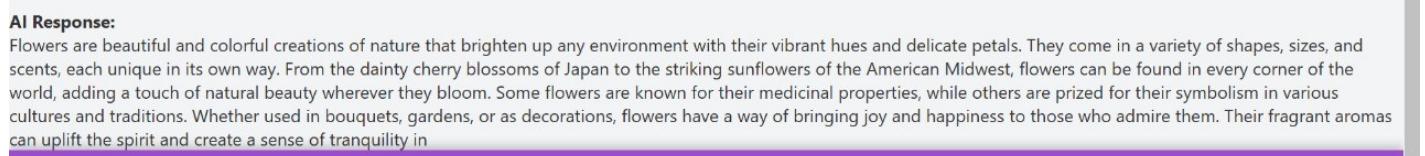


FIG6.3

## 7.

# Conclusions and Future Scope

This report has outlined the development of an AI-driven document collaboration platform designed to address the challenges of traditional collaboration processes. By leveraging AI for tasks such as real-time translation, automated summaries, and intelligent suggestions, the platform streamlines workflows, enhances communication, and improves overall productivity. The research conducted, including user surveys and analysis of existing materials, has validated the need for such a platform and highlighted its potential impact on various user groups, including project teams, content creators, researchers, and educators.

The platform's ability to foster teamwork and provide a seamless collaboration experience<sup>2</sup> aligns with the growing trend of AI shifting organizational practices to be more adaptive and creative<sup>9</sup>. This suggests that AI- driven collaboration tools like this platform will play a crucial role in shaping the future of work and enabling teams to be more efficient, innovative, and productive.

Future development of the platform will focus on incorporating user feedback, enhancing existing features, and exploring new AI-powered capabilities. This includes improving search functionality, providing more customization options, and integrating with other tools and platforms. The goal is to continuously evolve the platform to meet the changing needs of users and remain at the forefront of AI-driven document collaboration.

## 8.

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