

SkillSwap



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December 2025

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December, 2025

Abstract

The goal of this project is to develop a comprehensive platform that encompasses skill exchange and professional growth for people and small businesses. SkillSwap is unique in that it allows users to connect, collaborate, and share services in unconventional ways, while in some cases, refusing to enter into a typical monetary system completely. This platform is designed for users of a diverse background such as students, freelancers, job seekers, or professionals exchanging services. Users provide details about their skills, and with the skill match process enhanced through AI powered Smart Matching, the platform can identify a match between the skills being exchanged, with user preferences, needs, and capabilities. The features of SkillSwap also include dynamic, and context allowed skill certification and rating, fraud protection, and a platform design that ensures the user experience is positive, creating a secure, smooth, efficient and effective exchange, that can be used by users both online as well as in-person. SkillSwap's implemented system is based on time or credits, which can accommodate the limitations of a typical freelance or service marketplace based on budget. SkillSwap is intended to create a more complete way of acquiring, growing, and exchanging expertise as users, at all levels, completely unique from everyone's budget.

Acknowledgments

In the name of Allah, the Most Beneficent and the Most Merciful. We express our deepest gratitude to the Almighty for His countless blessings and for granting us the strength and opportunities to strive for our goals. We are profoundly thankful to our parents, who have been our unwavering pillars of support. Their teachings on hard work, dedication, and pursuing our goals with sincerity have been our guiding light.

We extend our heartfelt appreciation to our supervisor, Sir Jawwad Ijaz, for entrusting us with an opportunity to work on a project that holds potential for contributing positively to our beloved country. His expert guidance, time, and efforts have been invaluable and will always be cherished. Lastly, we are grateful to our friends for their encouragement and for making challenging times more bearable. May Allah (SWT) continue to guide us all toward the path of righteousness.

Aminah Nabeel & Qurat ul Ain
Islamabad, Pakistan

December, 2025

*“Whoever follows a path in pursuit of knowledge, Allah will make
easy for him a path to Paradise.”*

Prophet Muhammad (PBUH)
Sahih Muslim

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Acronyms and Abbreviations

AI	Artificial Intelligence
API	Application Programming Interface
UI	User Interface
UX	User Experience
ML	Machine Learning
UC	Use Case
TC	Test Case

Chapter 1

Introduction

1.1 Overview

Our project, Skill Swap, is an AI-powered skill exchange platform designed to revolutionize the way people connect, learn, and grow. Instead of relying on traditional monetary transactions, the platform allows users to exchange skills and services through a flexible credit- or time-based system. This innovative approach provides a cost-free and accessible solution for students, freelancers, professionals, and entrepreneurs alike.

Skill Swap stands apart from the competition by offering a comprehensive, one-stop platform equipped with features tailored to user needs. It integrates smart AI-powered matchmaking to connect users effectively based on their offered and required skills, enhancing convenience and efficiency. Community-driven engagement is at the heart of the platform, with tools like user reviews, user verification, and rating systems fostering trust and transparency.

The platform not only supports online skill exchanges but also accommodates physical collaborations through location-based features,

making it a versatile solution for diverse users. Additional functionalities include AI-curated recommendations, and fraud detection to ensure secure, seamless exchanges.

Skill Swap is designed to be user-friendly, ensuring intuitive navigation for users of all technical backgrounds. It creates a supportive environment where individuals can not only gain skills but also share their expertise to build meaningful connections. With these capabilities, Skill Swap offers a modern, personalized solution for addressing the challenges of skill sharing in the digital age [1].

1.2 Objective

The project’s objective is to address the challenges students, low-income individuals, and freelancers face in accessing quality skills and services by providing a user-friendly platform for skill exchange. Through a credit-based or time-based system, supported by AI-powered matchmaking, the platform ensures accurate and efficient connections [2]. It facilitates both online and location-based interactions, offering flexibility and seamless navigation for browsing skills, initiating exchanges, and forming secure connections. With features like fraud detection, rating and reviews, and skill validation, Skill Swap fosters a trustworthy and supportive environment for all users experience.

1.3 Problem Description

In Pakistan, a dedicated mobile application is designed to tackle prevalent challenges in skill exchange and service accessibility, particularly for students, freelancers, and low-income individuals. Without such

platform, individuals face hurdles in accessing reliable information, struggle with communication gaps, and encounter inconsistent quality when exchanging skills or services. The proposed application addresses these issues by offering a centralized hub where users can showcase their skills, explore opportunities, and connect seamlessly through AI-powered smart matchmaking. Features like direct communication channels, skill reviews, secure transactions, and a time-based or credit-based exchange system ensure efficient and reliable interactions. By streamlining the skill exchange process and offering a user-friendly interface, Skill Swap fosters a supportive and interactive community, making skill sharing accessible for everyone [3].

1.4 Methodology

1.4.1 Collecting Requirements

To develop the Skill Swap platform, we will conduct comprehensive research on existing skill exchange and freelancing platforms. This includes analyzing their functionalities, strengths, and limitations to understand best practices and potential gaps. Our goal is to integrate their most effective features while introducing innovative AI-based capabilities unique to Skill Swap.

1.4.2 Analysis

This project tackles the difficulties individuals face in finding affordable and reliable skill-sharing opportunities. Skill Swap offers an AI-powered solution, enabling students, freelancers, and job seekers to access trustworthy platforms tailored to their needs.

1.4.3 Design

The platform’s design will prioritize simplicity and ease of use. The user interface (UI) will feature intuitive navigation, ensuring that users can search for, offer and exchange skills effortlessly. Smart recommendations powered by AI will be seamlessly integrated into the design to personalize the user experience and maximize engagement.

1.4.4 Development

The development process will follow an Agile methodology [4], with work divided into iterative two-week sprints. Each sprint will include planning, feature development, testing, and deployment and each phase will be thoroughly tested.

1.4.5 Maintenance/testing

Before launch, the platform will undergo rigorous testing to ensure a seamless and bug-free experience. This includes functional testing of all features (e.g., AI matchmaking, credit management) and usability testing across diverse devices and platforms. Post-launch, the platform will undergo regular maintenance and updates based on user feedback to ensure long-term reliability and satisfaction.

1.5 Project Scope

Reimagining how people connect to share and learn, the Skill Swap project offers a mobile platform for exchanging skills through time-based or credit-based transactions. AI-driven tools like smart matching and fraud detection enhance the experience. Free features include unlimited skill exchanges, trust and safety tools, flexible exchanges,

Chatbot Assistance, calendar to add reminders, consistency badges, and profile flagging. Premium options add AI-based test and skill evaluation. Built with Flutter for cross-platform use and Firebase for real-time backend support, the platform integrates Google Maps API for location-based skill matching. Focused on security and usability, it excludes hardware integration, advanced AI, large-scale analytics, and multi-language support, focusing solely on English.

1.6 Feasibility Study

1. **Risks Involved:** No critical risks identified. Potential issues like AI integration, scalability, or user engagement will be managed through iterative testing, monitoring, and regular updates.
2. **Resource Requirement:** Proficiency in Flutter, Firebase, AI tools, various APIs, and secure payment systems is crucial. Additionally, expertise in cloud hosting and creating a user-friendly UI/UX is essential for developing a well-designed platform.

1.7 Solution Application Areas

Skill Swap offers impactful solutions across various domains:

1. **Education:** Enables students to exchange skills for completing assignments and projects collaboratively.
2. **Freelancing:** Supports service sharing without the need for monetary transactions.
3. **Empowering Growth Through Experience:** Skill Swap facilitates experience-based skill sharing, where professionals pass on their expertise helping others grow practically.

4. **Startups and Businesses:** Provides entrepreneurs with access to affordable, skill-based solutions to drive their ventures forward.

1.8 Tools and Technology

The core technology stack includes:

1.8.1 Software Tools

- **Frontend:** Flutter for cross-platform mobile app development.
- **Backend:** Firebase offering real-time database, authentication, and cloud functions.
- **AI Services:** Gemini API for AI-driven chatbots and skill evaluation, custom ML models for fraud detection and smart matching.
- **Geolocation:** Google Maps API for location-based skill matching.
- **Payment Integration:** The Stripe API is used for processing credit and debit card payments.
- **Version Control:** GitHub for seamless code collaboration and management.

1.8.2 Hardware

- Laptop
- Mobile Phone

1.9 Expertise of the Team Members

We both have expertise in Flutter, Firebase, AI/ML, database management, and IT Project Management, since we have already studied Mobile App Development, AI, IT Project Management and Database courses. We are determined to use the help of the internet and learn the necessary skills required to complete the project. The team however has the necessary knowledge to complete the task.

1.10 Milestones

Note: This is the approximate timeline.

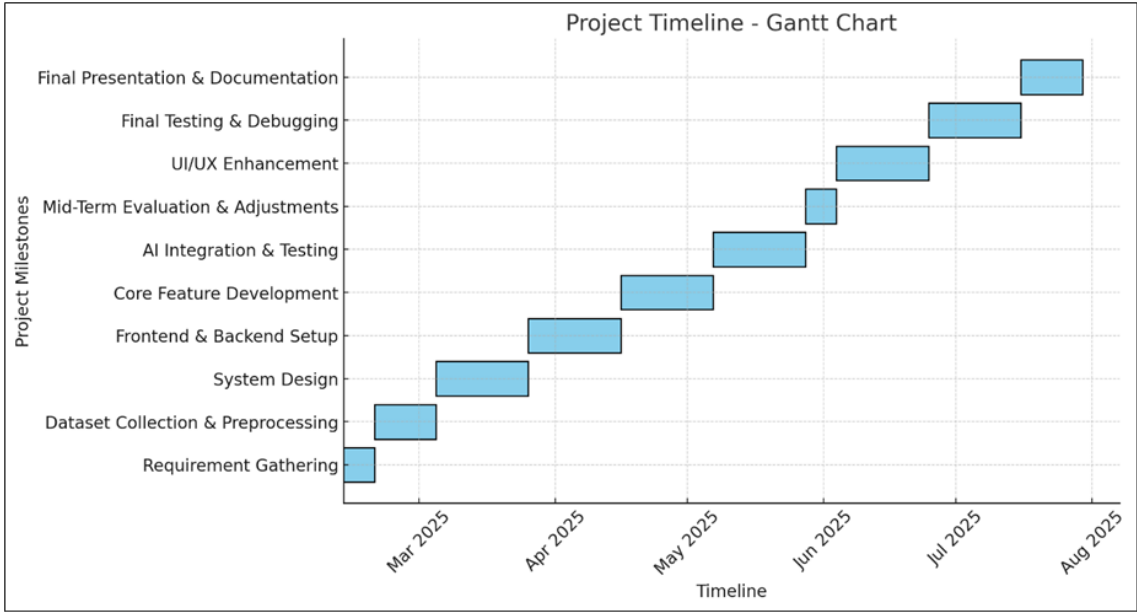


Figure 1.1: Project Timeline

Chapter 2

Literature Review

SkillSwap redefines skill-sharing by creating an inclusive platform where users can exchange expertise through time or credits, eliminating financial barriers for students, freelancers, and individuals on a budget. Designed for seamless user experiences, the platform features a Skill Gallery with detailed descriptions, ratings, and skill levels to help users explore and connect effortlessly. Its AI-powered matchmaking intelligently pairs users based on profiles, preferences, and availability, streamlining the process of finding the right collaborators. Prioritizing trust and security, it employs robust mechanisms such as secure logins, fraud detection, and a transparent rating system to build a dependable community. With additional tools for communication and responsive support, SkillSwap not only bridges skill gaps but fosters meaningful connections and personal growth, empowering users to teach, learn, and thrive within a supportive ecosystem.

2.1 Related Work

2.1.1 Upwork

Upwork is a prominent freelancing platform renowned for connecting clients with skilled professionals in fields like writing, design, marketing, and programming. With features such as time tracking, milestone-based payments, and performance reviews, it offers a reliable and structured environment for contract-based work [5]. However, Upwork’s exclusive reliance on monetary transactions can exclude users who lack financial resources, such as students or budget-conscious freelancers. It does not support alternative exchange methods like time or credits, making it less accessible. Beyond task completion, the platform offers limited opportunities for building long-term relationships, fostering community, or encouraging collaborative learning. Additionally, Upwork lacks AI-driven tools to facilitate intelligent matchmaking or nurture a sense of shared growth among its users [5].

2.1.2 Fiverr

Fiverr specializes in enabling freelancers to offer predefined, fixed-price services called "gigs." It is popular for quick, ready-to-purchase solutions in areas like graphic design, voiceovers, and website development [6]. The platform’s intuitive design and global reach make it user-friendly for freelancers and buyers alike. Despite these advantages, Fiverr mirrors Upwork in its reliance on monetary transactions, excluding those who could benefit from alternative systems like time- or credit-based exchanges. Its transactional nature focuses on one-time service delivery rather than fostering mentorship or shared learning [7]. Furthermore, while Fiverr does incorporate basic AI for search optimization, it lacks robust features like personalized recom-

mendations or advanced fraud prevention, leaving room for a more tailored and secure user experience [8].

2.1.3 Skillshare

Skillshare provides an online canvas for learning, offering a vast library of video-based classes on subjects like business, technology, and design [9]. Its subscription model grants unlimited access to a wide range of content, empowering users to learn at their own pace. However, Skillshare’s focus on education through pre-recorded classes limits its scope for interactive, two-way skill exchanges [10]. The platform doesn’t facilitate real-time collaborations, peer-to-peer partnerships, or systems for bartering skills through time or credits. AI-powered matchmaking and dynamic project collaboration tools are also missing, and user interaction is mostly confined to class discussions, providing minimal opportunities for deeper community engagement and mutual learning.

2.2 Comparative Analysis

The comparative analysis highlights the unique positioning of Skill-Swap by contrasting it with existing platforms, emphasizing how its AI-powered matchmaking, unlimited skill exchanges, and inclusive design set it apart.

Table 2.1: Comparative Analysis of SkillSwap with Existing Platforms

Feature	SkillSwap	Upwork	Fiverr	Skillshare
Geographical Reach	Launched in Pakistan, designed to connect a global audience via its cross-platform app.	Operates worldwide	Global free-lancer platform	International access for learners
Exchange Model	Non-monetary: time/credit based	Bid-based (monetary)	Fixed-price gigs (monetary)	Subscription-based access
Core Offerings	Skill exchange, AI matchmaking, mentorship, portfolios, community	Job bidding, secure contracts, free-lancer tools	Tiered services, gig packages	Expert-led video classes, projects
Non-Monetary Support	Fully supported; users trade skills	Not supported	Not supported	Not supported
Skill Matching	AI-driven personalized pairing	Manual search and filters	Basic keyword search	Manual browsing only
Review System	Post-exchange reviews, transparency	Contract completion ratings	Gig reviews, seller levels	Course reviews only
Collaboration	Real-time mentorship, networking, sharing	Limited contract-based collaboration	One-time service model	Passive, pre-recorded classes
Unique Tech	AI matching, credit system, fraud detection, badges	Dispute resolution, freelancer safety	Upselling, tiered visibility	Creative class-based learning
Vision	Inclusive, community-first, accessible skill sharing	Professional freelance contracts	Fast, transactional delivery	Creative, self-paced learning

Chapter 3

Requirements Specifications

3.1 Proposed System

Online platforms for skill sharing and exchange are becoming popular among users of all age groups. This market is expanding rapidly, leading to increased competition as more platforms emerge to cater to diverse needs [11]. People are now looking for efficient, cost-effective, and personalized ways to acquire new skills or share their expertise. SkillSwap is an innovative AI-powered platform designed to revolutionize skill sharing by offering a seamless, secure, and cost-effective experience for users of all backgrounds. By replacing traditional monetary transactions with a flexible credit-based or time-based system, Skill Swap creates an inclusive space where users can connect, learn, and grow. At its core lies the Skill Gallery, a curated hub featuring detailed skill listings, ensuring users can make informed decisions tailored to their personal and professional goals. The platform leverages advanced AI for smart matchmaking, skill validation, and fraud detection, fostering trust and providing a personalized experience. Supporting both online and physical exchanges, Skill Swap's location-based features help users discover skill-sharing opportunities nearby. With

intuitive design, a transparent review system for feedback and ratings, and robust support through easy inquiries, Skill Swap ensures a smooth, reliable, and enriching platform for meaningful collaboration and growth.

3.2 Existing System

We discovered that several platforms in the market already offer skill-based services. For instance, Skillshare and Udemy allow users to teach or learn various skills through online courses. Meanwhile, platforms like TaskRabbit help users find individuals to complete specific tasks or gigs. There are also apps like Swapp and TimeRepublik that focus on time-based or barter-style skill exchanges. While these platforms are helpful, most of them are quite similar—primarily focusing either on learning or hiring, not both. They don’t truly offer a complete, peer-to-peer skill-swapping experience [12].

3.3 Functional Requirements

While maintaining focus on all user requirements, functional requirements expand on all collected requirements. Listed below are a few of them.

1. **User Registration and Authentication:** People should be able to sign up, log in, and log out easily.
2. **Profile Creation and Management:** Users can set up and manage their profiles, adding pictures, listing the skills they’re offering, and mentioning the ones they’d like to learn.
3. **Skill Listing and Browsing:** Anyone can list their skills, in-

clude categories, select time and date according to their availability, and choose if they prefer online or in-person sessions. Browsing through available skills is just as easy, with options to search, filter by category, rating, or location.

4. **AI-Powered Skill Matching:** The platform intelligently suggests the best skill matches for users. It considers their profiles, preferences, and past activity to make learning and sharing smooth and personalized.
5. **Skill Request and Exchange Management:** Sending and receiving skill exchange requests is simple. Both parties can accept, decline, or schedule sessions, keeping everything organized.
6. **Chat and Messaging:** There's a built-in messaging system for users to chat in real-time, making communication effortless.
7. **Skill Validation and Feedback:** After a session, users can validate each other's skills. They can also leave reviews and rate their experiences to build trust within the community.
8. **AI-Powered Skill Assessment System:** Users take timed multiple-choice tests generated by Gemini AI for their selected skills. Based on performance, they earn a skill level (Beginner, Intermediate, or Expert) displayed as a badge on their skill card.
9. **Admin Panel:** Admins have the tools to manage users, moderate content, verify users, view reports, add categories and monitor how the system is performing to keep everything running smoothly.
10. **Notifications and Reminders:** Users get push or in-app notifications to stay updated about request status, session reminders, or even new milestones like earned credits, badge achievements.

3.4 Non-Functional Requirements

1. **Performance:** The app needs to be fast. It should load in under 2 seconds and easily handle at least 1,000 users at the same time.
2. **Scalability:** As the community grows, the system should be able to grow with it, seamlessly supporting more users and additional data without any hiccups.
3. **Reliability:** The platform should be up and running 99.9% of the time. It should also have automatic failover and data recovery mechanisms to ensure everything works even in the rare case of an issue.
4. **Security:** The app ensures user safety by utilizing Firebase's built-in SSL encryption, secure email/password authentication, and robust defenses against common vulnerabilities such as XSS, achieved through input validation and secure data management.
5. **Usability:** It's all about being user-friendly! The platform should have an intuitive design that works perfectly for both mobile and web users. At the same time, it will include accessibility features to accommodate users with different needs.
6. **Maintainability:** The codebase should be clean and modular, making it easy to update and add new features whenever needed.

7. **Portability:** Whether you're on Android, iOS, or using the web version, the app should work smoothly across all platforms without any lag or glitches.

3.5 Use Case Diagram

This use case diagram represents the properties of the Skill Swap System focusing on the different transactions for three main actors involved in the system, namely User, Admin, and AI System. Users are able to register or log in, complete their profiles, browse and search for skills, view profiles of other users, send or accept/reject a skill exchange request, schedule meetings, set reminders, report users, rate and review, request verified badges, and obtain skill certification. Administrator can log in, view list of users and reports, approve/reject verification requests, manage skill categories, track skill exchanges and change passwords. The AI System only adds functionality to the platform through performing AI skill tests, smartly matching users, and ban user profiles. The three users interact with each other on the Skill Swap System so that it functions efficiently in combining skill exchanges, building trust, and facilitating AI and targeted personalization.

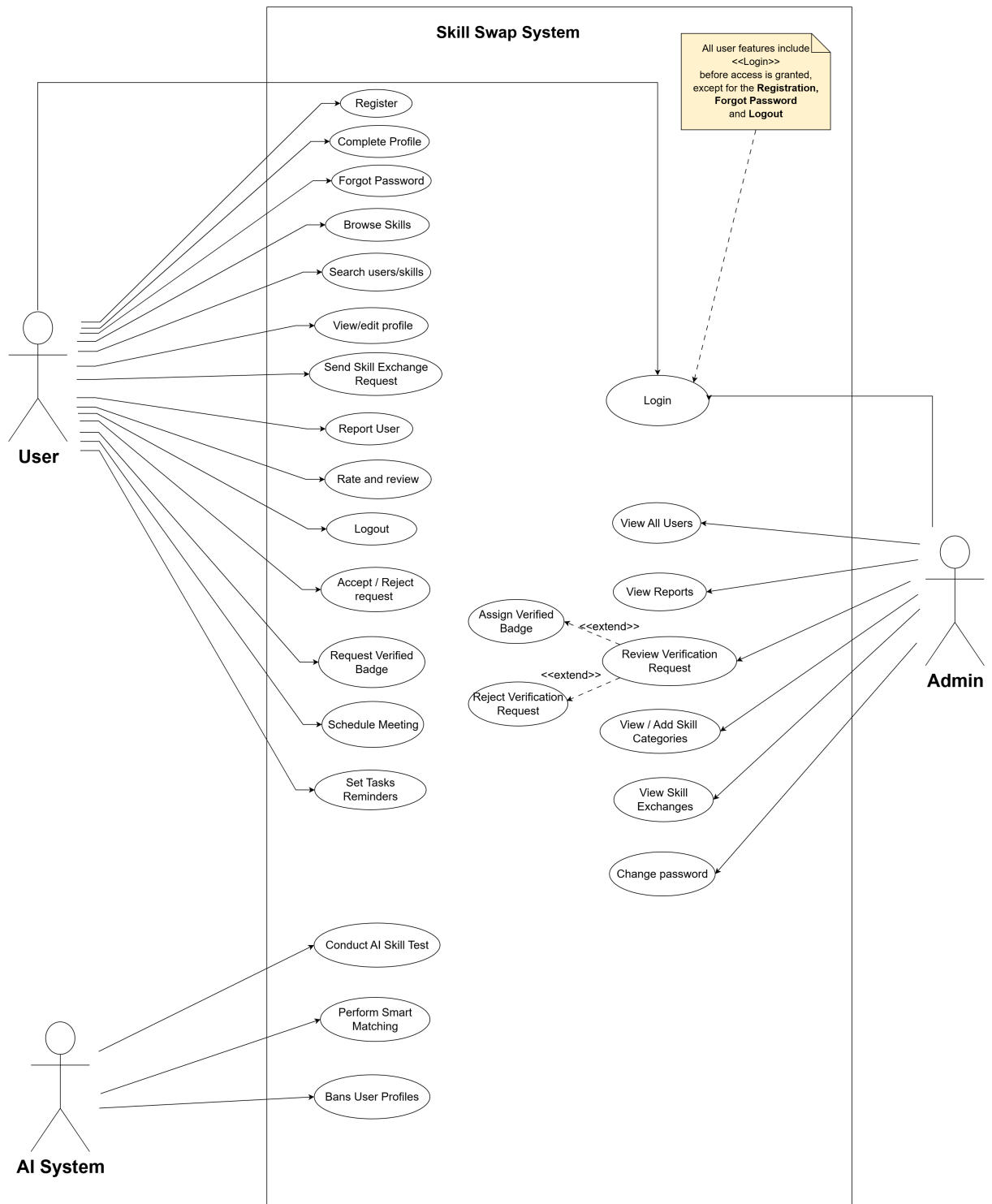


Figure 3.1: Use Case Diagram

3.5.1 Register

A new user can create an account on the platform by providing basic information such as username, email address, and password that will lead to a successful account creation and will allow the user to log in to the platform and use available features.

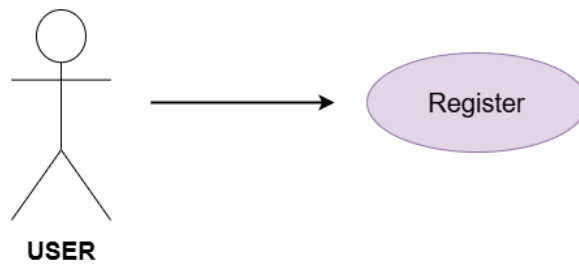


Figure 3.2: Register Use Case

Table 3.1: Use Case Description for Register

Use Case ID	UC01
Title	Register
Description	A user signs up for an account on the platform to access its features.
Actor	User
Pre-Condition	The registration page must be available and accessible.
Basic Flow	The user navigates to the registration page. The user fills out the required details, such as username, email, and password. The user submits the registration form. The system checks the provided information for validity. Once verified, the system creates the user account.
Alternate Flow	If the email is already registered, the system prompts the user to enter a different email. If any required information is missing or incorrect, the system highlights the errors and asks the user to fix them.
Post-Condition	The user successfully creates an account and can now explore and use the platform's features.

3.5.2 Complete Profile

The user finalizes their profile in six steps by providing personal details, skills, and preferences. This completes the user profile and gives the user access to all features of the platform.

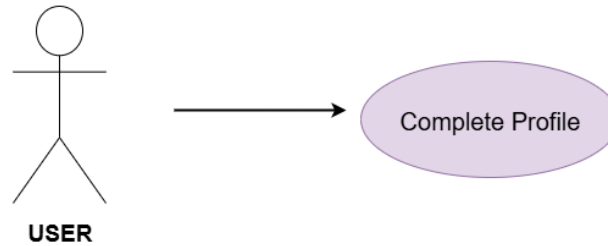


Figure 3.3: Complete Profile Use Case

Table 3.2: Use Case Description for Complete Profile

Use Case ID	UC02
Title	Complete Profile
Description	This use case outlines how a new user completes their profile in six steps to unlock full platform access.
Actor	User
Pre-Condition	The user must have a registered account.
Basic Flow	The user creates an account by providing a username, email, and password. They upload a profile picture, add their occupation, and write a short bio. The user specifies their required skill and its category. They also enter the skill they want to learn and its category. Once all details are completed, the user’s profile is finalized. The user is then granted access to the home page.
Alternate Flow	User can save progress and return later to complete pending steps. System marks the profile as “Incomplete” until all steps are done.
Post-Condition	User profile is 100% complete and stored in the system. User gains full access to platform features..

3.5.3 Login

The user logs into the platform by entering valid credentials such as email and password. Successful login grants secure access to the system and its features.

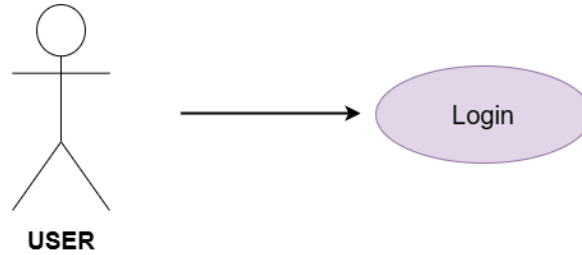


Figure 3.4: Login Use Case

Table 3.3: Use Case Description for Login

Use Case ID	UC03
Title	Login
Description	The user logs into their account on the platform.
Actor	User, Admin
Pre-Condition	The user must have a registered account.
Basic Flow	The user accesses the login page. The user enters their email and password. The user submits the login form. The system verifies the credentials. The system grants access to the user's account.
Alternate Flow	If the credentials are invalid, the system prompts the user to re-enter valid credentials. The system displays an error message for incorrect or missing information.
Post-Condition	The user successfully logs into their account and gains access to its features.

3.5.4 Forgot Password

The user retrieves their account by requesting a password reset from their registered email address. The system sends a reset link, a new password is set for the user to restore access to the account.

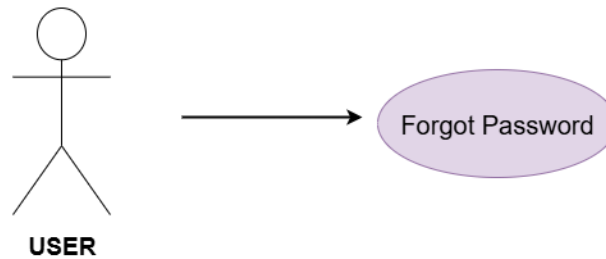


Figure 3.5: Forgot Password Use Case

Table 3.4: Use Case Description for Forgot Password

Use Case ID	UC04
Title	Forgot Password
Description	The user resets their password on the platform.
Actor	User
Pre-Condition	The user has forgotten their password.
Basic Flow	The user navigates to the "Forgot Password" page. The user enters their registered email address. The system sends a link to the user's email. The user uses link to create a new password. The system validates and updates the new password. The user logs in using the new password.
Alternate Flow	If the email entered is invalid, the system notifies the user to provide a valid email. If the link fails to send, the system prompts the user to try again later.
Post-Condition	The user successfully resets their password and gains access to their account.

3.5.5 Browse Skills

The user explores the platform to view a variety of available skills. This helps them discover skills of interest and connect with other users for learning or exchange.

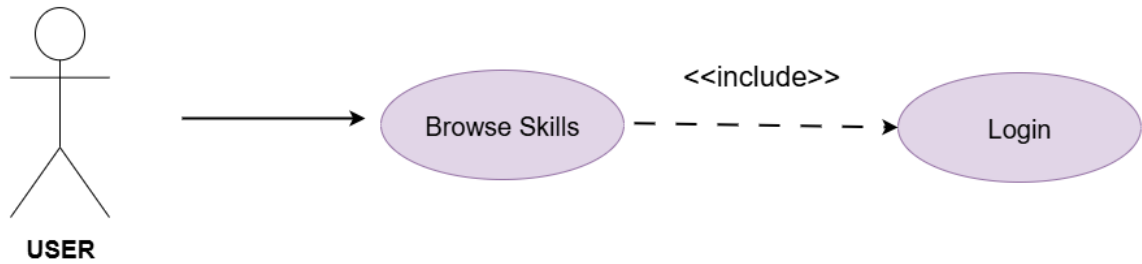


Figure 3.6: Browse Skills Use Case

Table 3.5: Use Case Description for Browse Skills

Use Case ID	UC05
Title	Browse Skills
Description	The user browses available skills on the platform.
Actor	User
Pre-Condition	The user must be logged into the platform.
Basic Flow	The user navigates to the Home page. The system displays a list of available skills. The user selects a skill to view more details
Alternate Flow	If no skills are available, the app shows: “No skills available.” If there’s a network issue, it shows: “Can’t load skills. Check your connection.”
Post-Condition	The user successfully views and explores available skills on the platform.

3.5.6 Search Users/Skills

The user searches for specific skills by entering keywords in the search bar. The system displays relevant results, helping the user quickly find desired skills or potential matches.

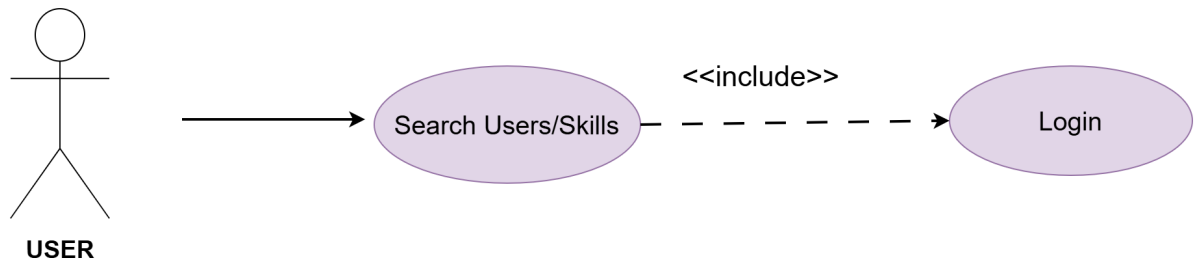


Figure 3.7: Search Users/Skills Use Case

Table 3.6: Use Case Description for Search Users/Skills

Use Case ID	UC06
Title	Search Users/Skills
Description	The user searches for other users or specific skills on the platform.
Actor	User
Pre-Condition	The user must be logged into the platform.
Basic Flow	The user logs into the platform. The user navigates to the "Search Users/Skills" section. The user enters search criteria (e.g., skill name, user name). The system displays a list of matching results. The user selects a result to view more details.
Alternate Flow	If no results match the search criteria, the system displays a message indicating no matches were found.
Post-Condition	The user successfully views the search results and explores relevant users or skills.

3.5.7 View/Edit Profile

The user views their profile to check personal and skill details. They can edit or update information to keep their profile accurate and up to date.

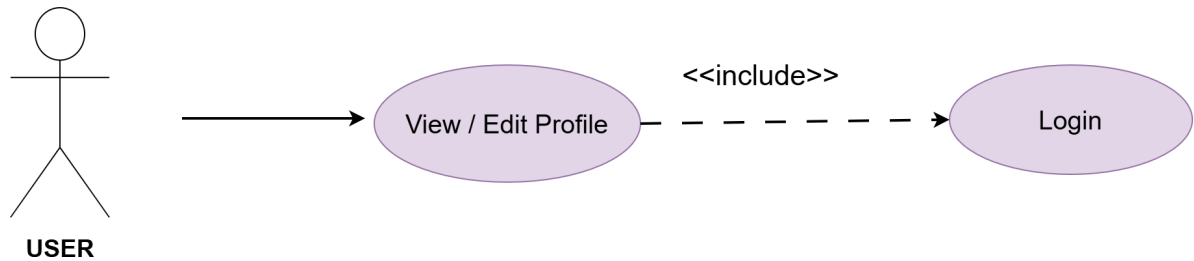


Figure 3.8: View / Edit Profile

Table 3.7: Use Case Description for View / Edit Profile

Use Case ID	UC07
Title	View / Edit Profile
Description	The user views or edits their profile information on the platform.
Actor	User, Admin
Pre-Condition	The user must be logged into the platform.
Basic Flow	The user logs into the platform. The user navigates to the "View / Edit Profile" section. The system displays the user's profile information. The user updates their profile details (if editing). The system saves the updated information.
Alternate Flow	If the user enters invalid data while editing, the system notifies them to correct the errors.
Post-Condition	The user successfully views or updates their profile information.

3.5.8 Send Skill Exchange Request

To exchange skills, the user sends a request to another user by selecting the skill they would like to exchange. The system sends the request to the recipient for review. This allows users to connect and collaborate with one another by exchanging skills.

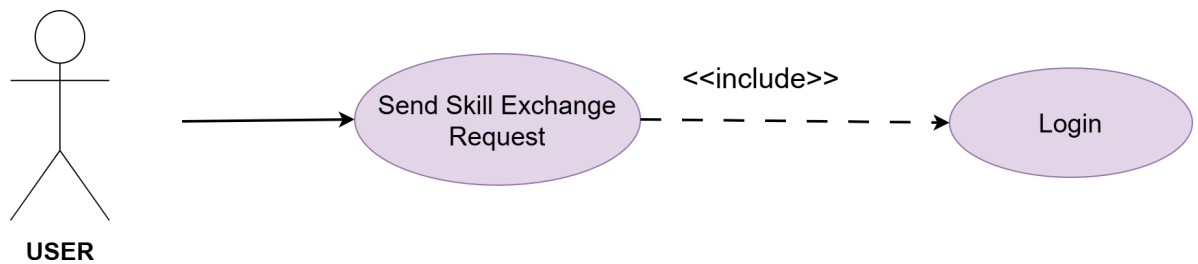


Figure 3.9: Send Skill Exchange Request Use Case

Table 3.8: Use Case Description for Send Skill Exchange Request

Use Case ID	UC08
Title	Send Skill Exchange Request
Description	The user sends a request to exchange skills with another user on the platform.
Actor	User
Pre-Condition	The user must be logged into the platform.
Basic Flow	The user logs into the platform. The user selects a skill they're interested in. The user taps "Request Skill Exchange." The user chooses a skill to offer in return. The user sends the request, and the system notifies the skill owner.
Alternate Flow	If no skill has been selected by the user, then the system prompts: "Add a skill to send an exchange request." If the request has already been sent, then it asks the user to wait until the receiver responds.
Post-Condition	The skill exchange request is successfully sent to the selected user.

3.5.9 Report User

The user submits a report against another user for misconduct or suspicious activity. The system captures the details and alerts the admin for necessary action. This ensures the platform remains secure, fair, and reliable for all users.

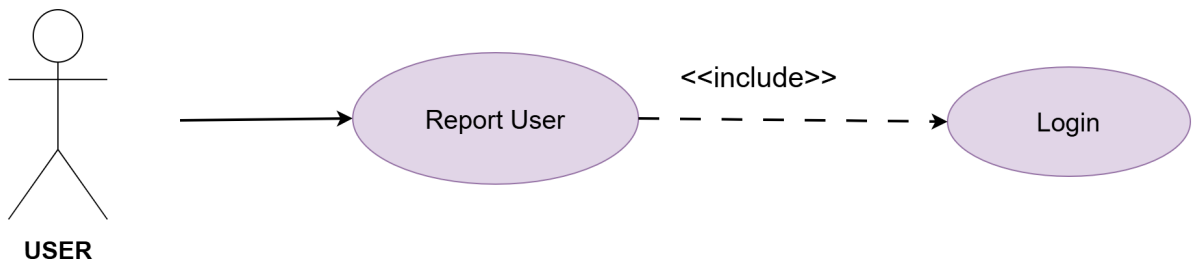


Figure 3.10: Report User Use Case

Table 3.9: Use Case Description for Report User

Use Case ID	UC09
Title	Report User
Description	The user reports another user for inappropriate behavior or violations on the platform.
Actor	User
Pre-Condition	The user must be logged into the platform.
Basic Flow	User opens the conversation screen. User selects "Report." System prompts: "Enter a reason for reporting." User provides a reason and submits. System confirms: "Report submitted for review."
Alternate Flow	If the report details are incomplete, the system asks the user to provide the required information.
Post-Condition	The report is successfully submitted and recorded in the system for further review.

3.5.10 Rate and Review

The user gives a rating and writes a review to reflect their experience after a skill exchange. The system saves this feedback and displays it on the other user’s profile.

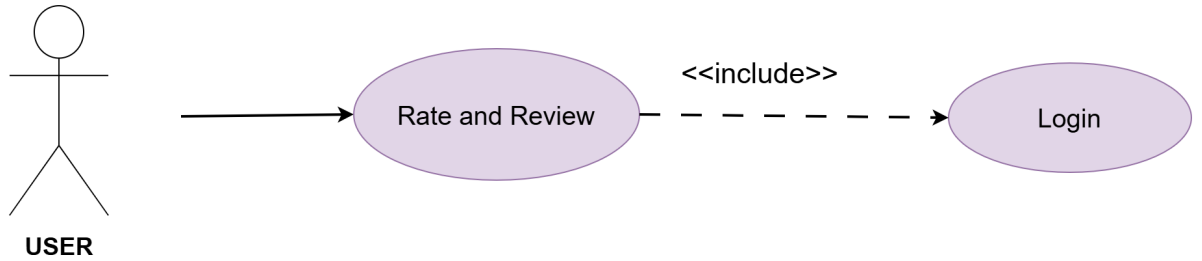


Figure 3.11: Rate and Review Use Case

Table 3.10: Use Case Description for Rate and Review

Use Case ID	UC10
Title	Rate and Review
Description	This use case describes how a user can rate and review a service or skill on the platform.
Actor	User
Pre-Condition	The user is logged in. A skill exchange session has successfully taken place. The user is currently on the conversation screen.
Basic Flow	After the skill exchange, the user is prompted to rate and review their experience with the other user. The user provides a star rating and writes a concise review. The system securely saves the review and waits for the other user to submit theirs. Once both users have shared their feedback, the system marks the skill deal as “Completed” and awards credits to both participants.
Alternate Flow	If the review details are incomplete, the user cannot submit the rating or review.
Post-Condition	The rating and review are successfully submitted and saved in the system.

3.5.11 Log Out

The user logs out of the platform to securely end their session. The system closes the active account access and returns the user to the login screen.

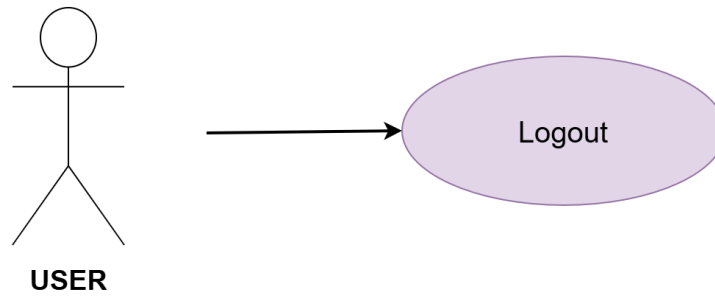


Figure 3.12: Log Out Use Case

Table 3.11: Use Case Description for Logout

Use Case ID	UC11
Title	Logout
Description	This use case describes how a user logs out of the platform to end their session.
Actor	User
Pre-Condition	The user must be logged into the platform.
Basic Flow	The user navigates to the logout option. The user selects the "Logout" option. The system ends the user session. The user is redirected to the login page.
Alternate Flow	If the logout process fails due to a system error, the user is notified and asked to try again.
Post-Condition	The user is successfully logged out, and their session is terminated.

3.5.12 Accept/Reject Request

The user reviews a received skill exchange request and chooses to either accept or reject it. If accepted, the system establishes a connection between both users for collaboration. If rejected, the system notifies the sender and closes the request.

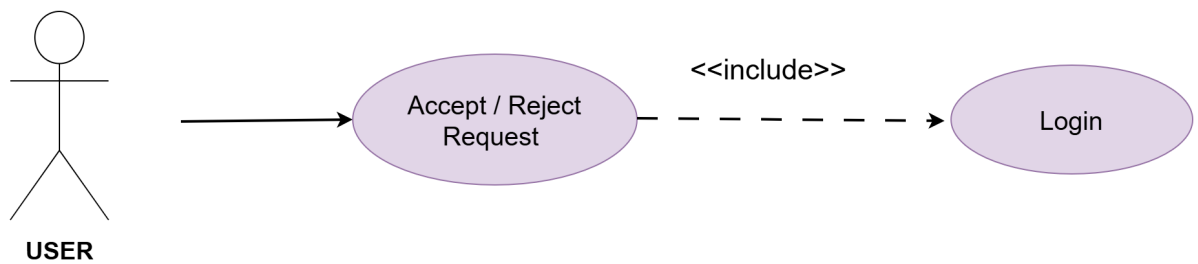


Figure 3.13: Accept/Reject Request Use Case

Table 3.12: Use Case Description for Accept/Reject Request

Use Case ID	UC12
Title	Accept/Reject Request
Description	This use case describes how a user can accept or reject a request made by another user on the platform.
Actor	User
Pre-Condition	The user must be logged into the system. The user has received a skill exchange request that appears in the chat.
Basic Flow	The user logs into the system and navigates to the chat screen, where the skill exchange request is displayed. The user is presented with two options: Accept or Reject. If the user accepts, the system updates the request status to “Accepted” and both users are granted access to communicate freely within the chat interface. If the user rejects, the system updates the request status to “Rejected” and the other user is notified that their request was declined.
Alternate Flow	If the sender cancels the request before a response, the system shows that the request has been cancelled by the sender.
Post-Condition	The request status is updated as accepted, rejected or withdrawn. System actions follow based on the updated status.

3.5.13 Request Verified Badge

The user requests a verified badge by submitting required identification. The system forwards it to the admin for approval, and once verified, the badge appears on the user's profile.

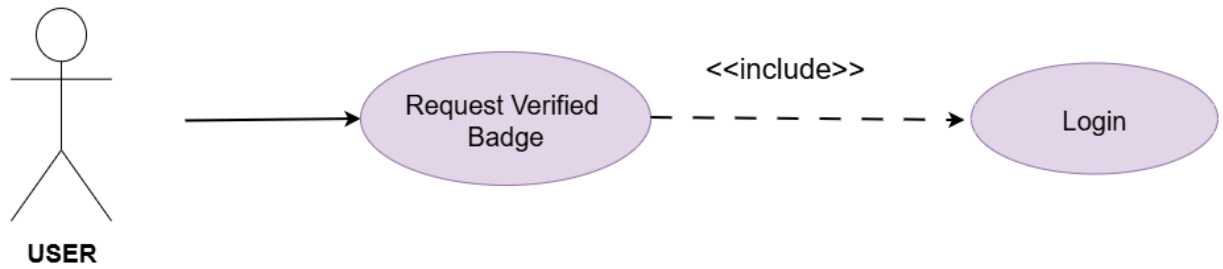


Figure 3.14: Request Verified Badge Use Case

Table 3.13: Use Case Description for Request Verified Badge

Use Case ID	UC13
Title	Request Verified Badge
Description	This use case describes how a user can request a verified badge to validate their profile on the platform.
Actor	User
Pre-Condition	The user must be logged into the system.
Basic Flow	The user logs into the system. The user navigates to the "Request Verification" section. The user uploads the necessary documents and submits a request. The user then waits for the admin review and decision.
Alternate Flow	If the user uploads incomplete documents, the system blocks submission until all required documents are uploaded.
Post-Condition	The system updates the user's profile with a verified badge upon successful evaluation.

3.5.14 Schedule Meeting

The user schedules a meeting by selecting date, time, duration, and mode of exchange. The system verifies both users' accounts and, once confirmed, creates the meeting and shares details in the chat.

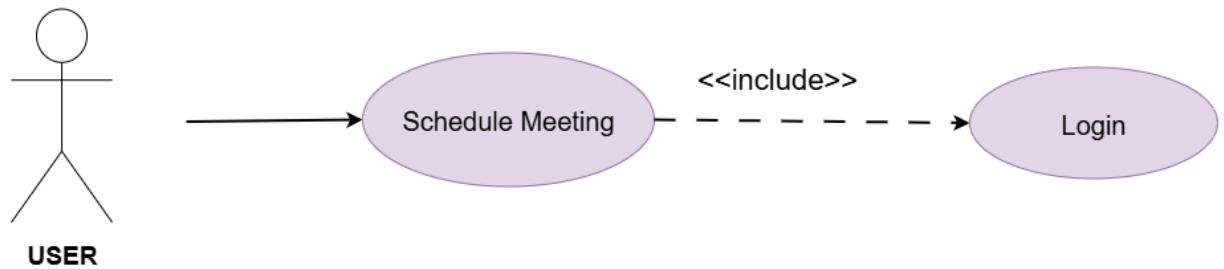


Figure 3.15: Schedule Meeting Use Case

Table 3.14: Use Case Description for Schedule Meeting

Use Case ID	UC14
Title	Schedule Meeting
Description	This use case describes how a user schedules a meeting by selecting date, time, and other details, so the meeting is created and shared with both attendees.
Actor	User
Pre-Condition	Both users must have verified accounts.
Basic Flow	The user goes to the Schedule Meeting page. User selects date, time, and duration. User chooses deal type (time-based or credit-based) and the mode of exchange. User clicks “Schedule”. System sends a confirmation message in the chat displaying all meeting information.
Alternate Flow	When a user tries to schedule a meeting, the system checks if both users have submitted verification documents. If either user is unverified, the “Schedule” option is disabled, and is only enabled when both users are verified.
Post-Condition	The meeting is successfully scheduled, and a banner appears in the chat showing the video call status.

3.5.15 Set Task Reminders

The user sets task reminders to manage their skill exchanges or meetings effectively. The system records the reminder and notifies the user at the scheduled time.

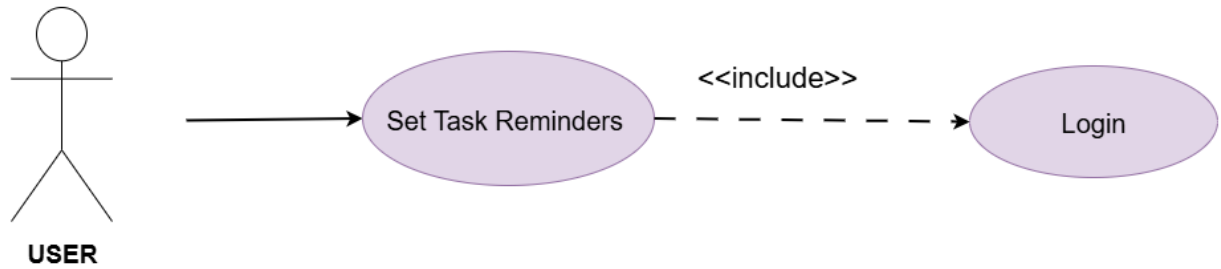


Figure 3.16: Set Task Reminders Use Case

Table 3.15: Use Case Description for Set Task Reminders

Use Case ID	UC15
Title	Set Task Reminders
Description	This use case describes how a user sets reminders for tasks to get notified at the right time.
Actor	User
Pre-Condition	The user must be logged into the system.
Basic Flow	The user logs into the system. The user navigates to the "Calendar" section. The user creates a task by entering the task title, description, and deadline. The system saves the task for the selected date. On that date, the system notifies the user about the task.
Alternate Flow	User enters incomplete or invalid info (e.g., missing title or past deadline), and the system shows an error asking for correction.
Post-Condition	Reminder is saved and scheduled successfully. The user receives notification at the set time. The user can mark it completed when the task is done.

3.5.16 View All Users

Admin views the complete list of registered users in the system. This helps the admin monitor user activities and manage the platform effectively.

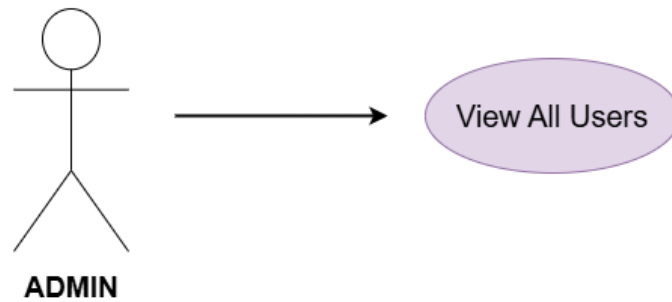


Figure 3.17: View All Users Use Case

Table 3.16: Use Case Description for View All Users

Use Case ID	UC17
Title	View All Users
Description	This use case describes how an admin can view the list of all users in the system.
Actor	Admin
Pre-Condition	Admin must be logged into the system.
Basic Flow	Admin accesses the "View All Users" page. The system retrieves and displays the list of all users.
Alternate Flow	If no users are found in the system, a message is displayed stating "No users available".
Post-Condition	Admin successfully views the list of all users.

3.5.17 View/Add Skill Categories

The admin views existing skill categories available on the platform. They can also add new categories to organize skills and improve user navigation.

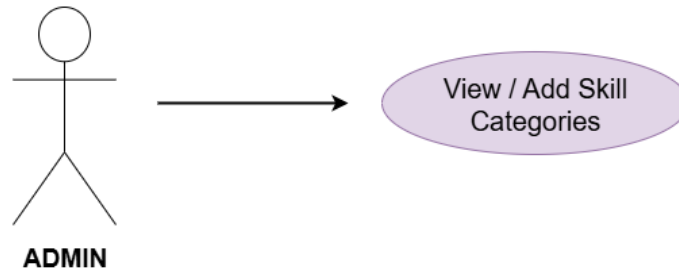


Figure 3.18: View/Add Skill Categories Use Case

Table 3.17: Use Case Description for View/Add Skill Categories

Use Case ID	UC18
Title	View/Add Skill Categories
Description	This use case describes how an admin can view and add new categories for the users if needed.
Actor	Admin
Pre-Condition	Admin must be logged into the system.
Basic Flow	Admin navigates to the "Skills" page. The system displays the list of categories with users who selected each category. If needed, admin selects the "Add New Category" option. Admin enters the category name, description, and selects an icon. The system saves the details and adds a new category for the users.
Alternate Flow	If the admin leaves the category name blank or enters invalid data, the system displays an error message and prompts the admin to correct the input.
Post-Condition	Admin can view all categories and related users. If required, a new skill category is saved and available for users.

3.5.18 View User Reports

The admin views reports submitted against users for misconduct or policy violations. This allows the admin to review issues and take necessary actions to maintain platform safety.

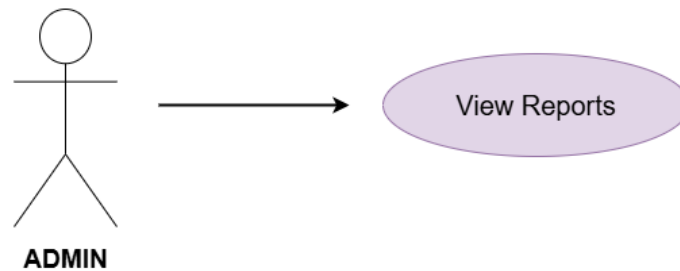


Figure 3.19: View User Reports Use Case

Table 3.18: Use Case Description for View User Reports

Use Case ID	UC19
Title	View User Reports
Description	Admin reviews user reports, views chat history, and takes appropriate action (e.g., warning).
Actor	Admin
Pre-Condition	User has reported another user and report is stored in the system.
Basic Flow	Admin accesses the "View Reports" page. The system retrieves and displays the available reports. Admin selects a specific report to view. The system shows the chat history and report details. Admin reviews the content and makes a decision. Admin sends a warning to the reported user(s).
Alternate Flow	If no reports exist, the system displays "No reports available." If the report is generated by the AI, no chat history is shown and the reported user's account is directly banned.
Post-Condition	Report is reviewed and appropriate action is taken (warning or ban if AI-reported).

3.5.19 Review Verification Request

The admin reviews user-submitted verification documents to ensure authenticity. Once validated, the system approves the request and grants the user a verified badge.

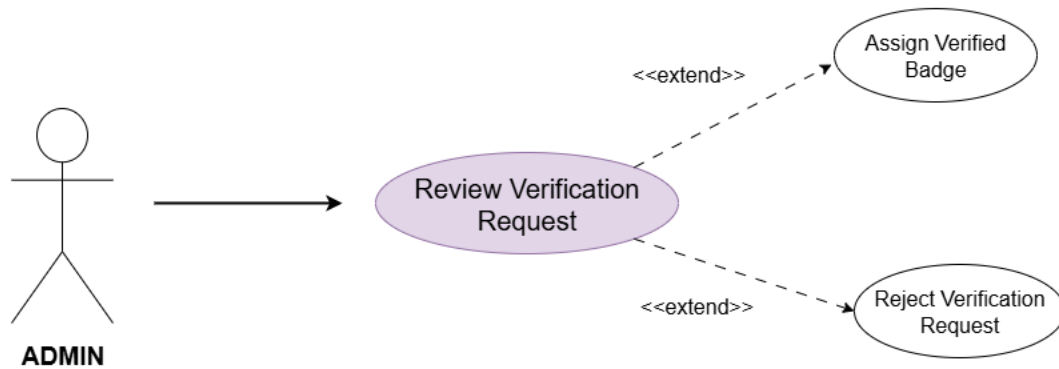


Figure 3.20: Review Verification Request Use Case

Table 3.19: Use Case Description for Review Verification Request

Use Case ID	UC20
Title	Review Verification Request
Description	This use case describes how the admin reviews and decides whether to assign the verified badge.
Actor	Admin
Pre-Condition	User has uploaded CNIC front side, back side, and a selfie with CNIC and a verification request is stored in the system.
Basic Flow	Admin opens Verification Requests. System shows pending requests with uploaded documents. Admin reviews documents. Admin assigns Verified Badge if valid.
Alternate Flow	If documents are invalid, Admin rejects the request and also enters the rejection reason.
Post-Condition	The user is either verified (badge assigned) or request is rejected.

3.5.20 View Skill Exchanges

The admin logs in and navigates to the Skill Exchanges page to monitor all exchanges. The system displays exchanges with color-coded statuses (Active, Rejected, Pending, Completed), and the admin can view detailed information for each.

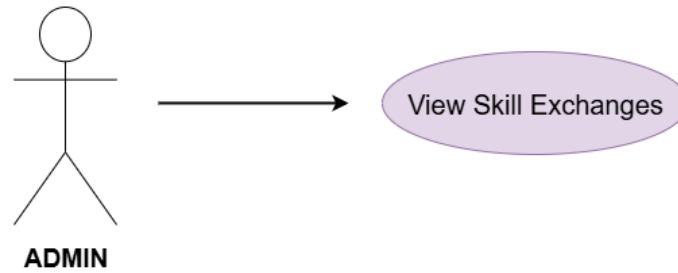


Figure 3.21: View Skill Exchanges Use Case

Table 3.20: Use Case Description for View Skill Exchanges

Use Case ID	UC21
Title	View Skill Exchanges
Description	Admin can view all the skill exchanges with the details.
Actor	Admin
Pre-Condition	Admin must be logged into the system.
Basic Flow	Admin navigates to Skill Exchanges page. System displays the list of all exchanges with status shown in colors: Green → Active Red → Rejected Orange → Pending Blue → Completed Admin selects an exchange to view details.
Alternate Flow	If no skill exchanges exist, system displays “No exchanges available.”.
Post-Condition	Admin successfully views the skill exchanges between the users.

3.5.21 Change Password

Admin changes their account password by entering the current password and setting a new one. The system verifies the old password and updates the account with the new credentials for secure access.

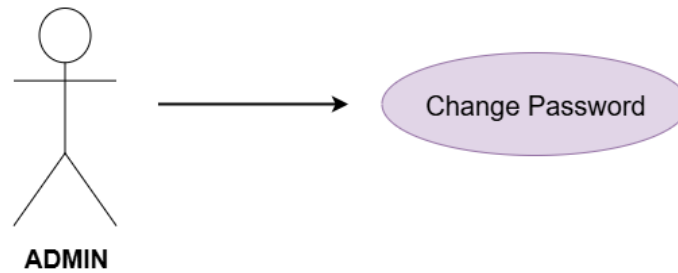


Figure 3.22: Change Password Use Case

Table 3.21: Use Case Description for Change Password

Use Case ID	UC22
Title	Change Password
Description	Admin updates their account password from the profile page.
Actor	Admin
Pre-Condition	Admin must be logged into the system.
Basic Flow	Admin goes to Profile page and selects Change Password. System asks for current password, new password, and confirm new password. Admin enters details. System validates and updates the password..
Alternate Flow	If current password is incorrect, system shows an error. If new password and confirm password do not match, system shows an error.
Post-Condition	Admin's password is updated and stored securely.

3.5.22 AI System Conducts AI Skill Test

The user takes an AI-powered skill test to assess their expertise in a chosen skill. The system analyzes the responses and provides a score, which determines the user's skill level.

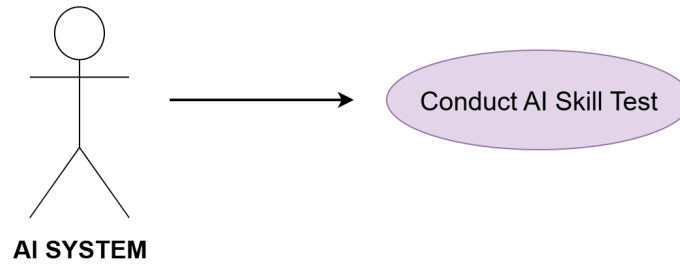


Figure 3.23: AI System Conducts AI Skill Test Use Case

Table 3.22: Use Case Description for AI System Conducts AI Skill Test

Use Case ID	UC23
Title	AI System Conducts AI Skill Test
Description	This use case describes how the AI system (Gemini API) evaluates the user's answers in a skill certification test and returns a score.
Actor	AI System
Pre-Condition	The AI system must be available and accessible.
Basic Flow	The AI system initiates the skill test process. The user attempts the test. The AI evaluates the answers, calculates a performance score, and shares the results. Finally, the system updates the user's certification status based on the score.
Alternate Flow	If the AI system is unavailable or times out, the system displays an error and asks the user to retry later.
Post-Condition	The AI system returns the evaluation score, which is stored and used to update the certification level.

3.5.23 AI Performs Smart Matching

The system uses AI to match users based on their required and offered skills. This ensures more accurate recommendations and helps users find the most suitable partners for skill exchange.

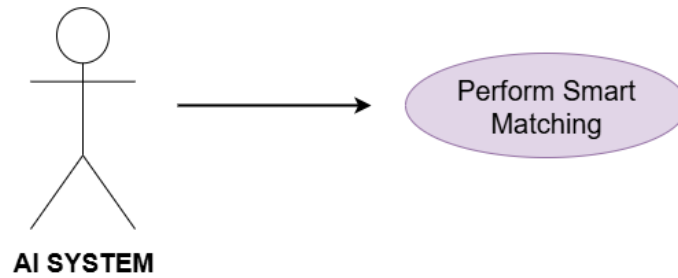


Figure 3.24: AI Performs Smart Matching Use Case

Table 3.23: Use Case Description for AI Performs Smart Matching

Use Case ID	UC24
Title	AI Performs Smart Matching
Description	This use case describes how the AI analyzes users' offered and wanted skills to find the most relevant matches
Actor	AI System
Pre-Condition	Users must have entered their offered skills and wanted skills in their profiles.
Basic Flow	User enters offered skills and wanted skills. AI Matching System calculates similarity scores between offered and wanted skills. System classifies results as Perfect Match, Related Match or Weak Match. The users are then displayed on the home page based on the scores.
Alternate Flow	If the AI service is unavailable, users are displayed randomly.
Post-Condition	Users are displayed on the home page based on AI matching scores

3.5.24 Bans User Profiles

AI scans user messaging activities, detects spam/abusive behavior, and bans violating accounts. Once banned, the user loses access to their account and platform features to ensure community safety.

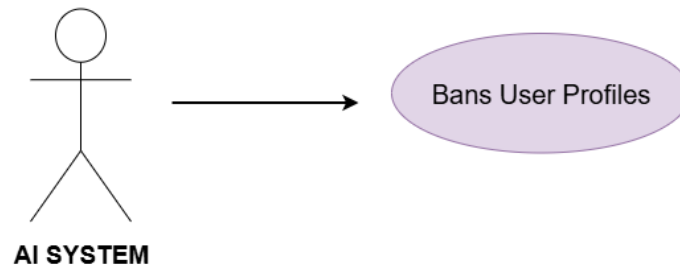


Figure 3.25: Bans User Profiles Use Case

Table 3.24: Use Case Description for Bans User Profiles

Use Case ID	UC25
Title	Bans User Profiles
Description	The AI scans user messages and bans accounts with spam or abusive content.
Actor	AI System
Pre-Condition	User must have an active account and be logged into the system. AI moderation service must be running.
Basic Flow	User sends a message. AI scans the message for spam or abusive words. On detecting a violation, AI bans the user account. System notifies the user about the ban.
Alternate Flow	Banned user appeals to the admin. Admin reviews the case. If valid, admin removes the ban and reactivates the account.
Post-Condition	Banned accounts remain inaccessible (user cannot log in). If the ban is removed, the account is restored and login is enabled.

Chapter 4

System Design

Here, we examine our application’s development stages in more detail in the system design chapter, which deals with defining components, interfaces, and data to match predetermined requirements. The system architecture, specifics of design techniques, limitations, models, and application-user interaction are covered in this chapter.

4.1 System Architecture

The SkillSwap platform is designed using a robust 3-tier application architecture [13], ensuring seamless functionality and scalability.

1. Presentation Layer

- The presentation layer serves as the user interface, enabling users to interact with the platform effortlessly.
- It includes the SkillSwap mobile application, developed using Flutter.
- Users can explore skill listings, create and manage profiles, view AI-driven skill matches, exchange services, and handle credit or time-based transactions through this layer.

2. Business Layer

- The business layer of SkillSwap houses the core logic and processes that power the platform.
- It is responsible for implementing essential processes such as AI-driven skill matching, fraud detection, and location-based filtering.
- This layer bridges the user interface and the data storage, ensuring that all business rules, workflows, and decision-making are consistently applied across the system.

3. Data Layer

- The data layer manages and stores all application data securely.
- Firebase Firestore is used to store user profiles, skill listings, transaction histories, ratings, and reviews.
- This layer plays a critical role in supporting the overall scalability, security, and efficiency of the platform.

4.2 System Architecture

This diagram illustrates a three-tier system architecture consisting of the Presentation Layer (Customer and Admin interface), the Business Layer (processing and functionalities), and the Data Layer (Firebase Firestore for data storage). It shows how user interactions flow through the business logic before accessing or updating the database.

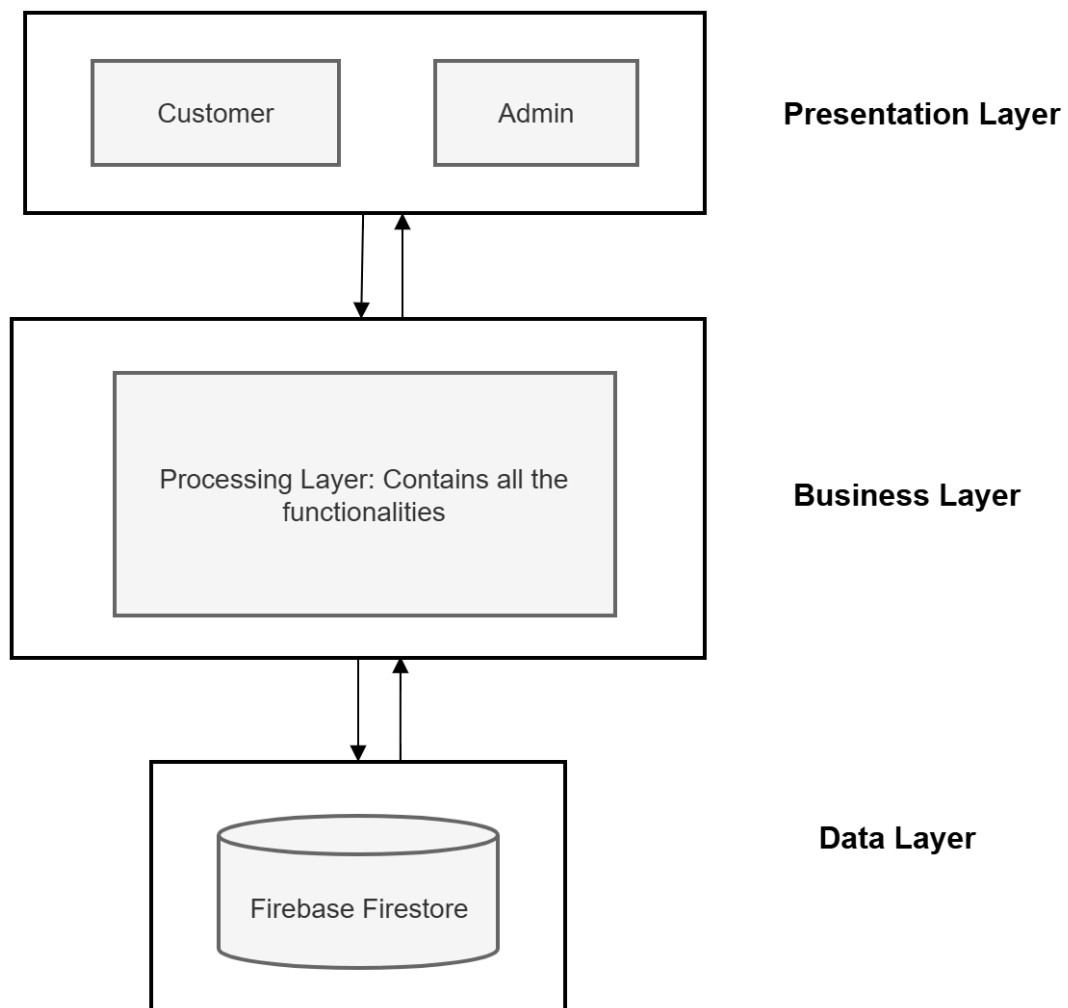


Figure 4.1: System Architecture Diagram

4.3 High Level Design

The high-level design provides a detailed overview of how various features and functionalities of the system coordinate and work together seamlessly. This section outlines the core workflow of the application and includes contingency plans to address potential issues. The following illustrations depict the operational flow of the system's features.

4.3.1 Sequence Diagram

A sequence diagram is a type of interaction diagram that visualizes the interactions between different components of the system and the sequence in which they occur. It demonstrates how various parts of the system collaborate to execute a specific task, highlighting the order of interactions required to complete a particular use case. This ensures a clear understanding of the system's behavior and interaction flow.

Register

The user initiates registration by providing basic details such as username, email, and password. The system verifies the information and, if valid, creates a new account and grants access to the platform.

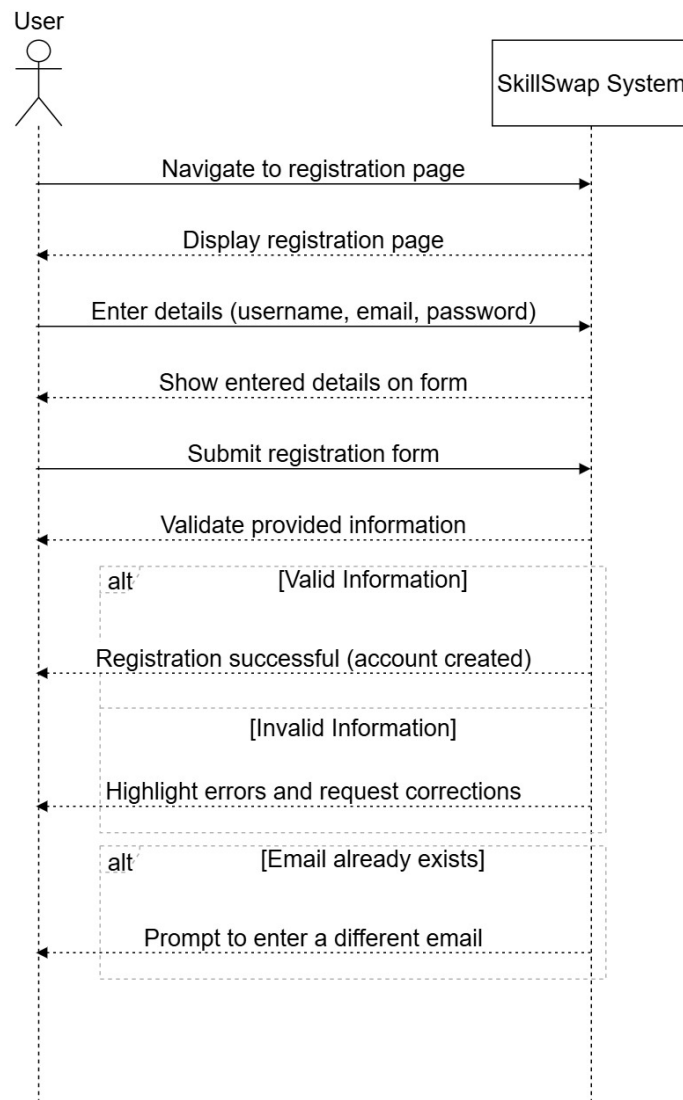


Figure 4.2: Register

Complete Profile

The user updates their profile by adding personal details, skills, and preferences in multiple steps. The system saves the information, ensuring the profile is complete and ready for better visibility and matching.

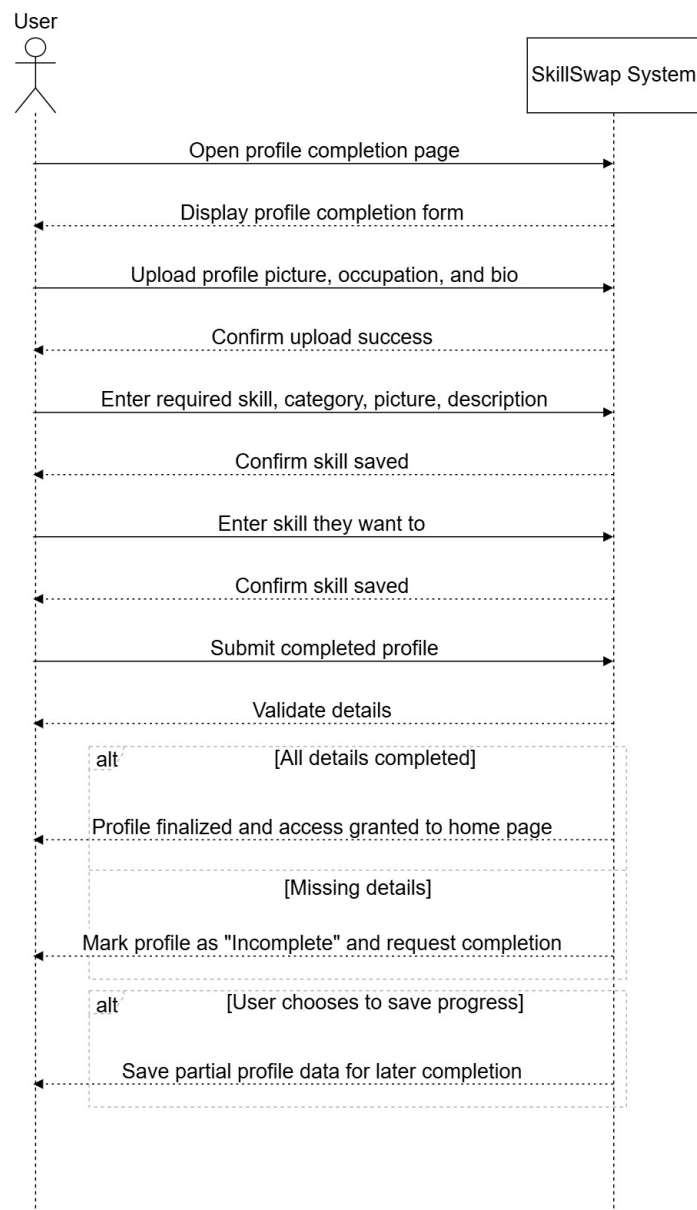


Figure 4.3: Complete Profile

Login

The user enters their registered email and password to access the system. The system verifies the credentials and, if correct, grants secure access to the platform.

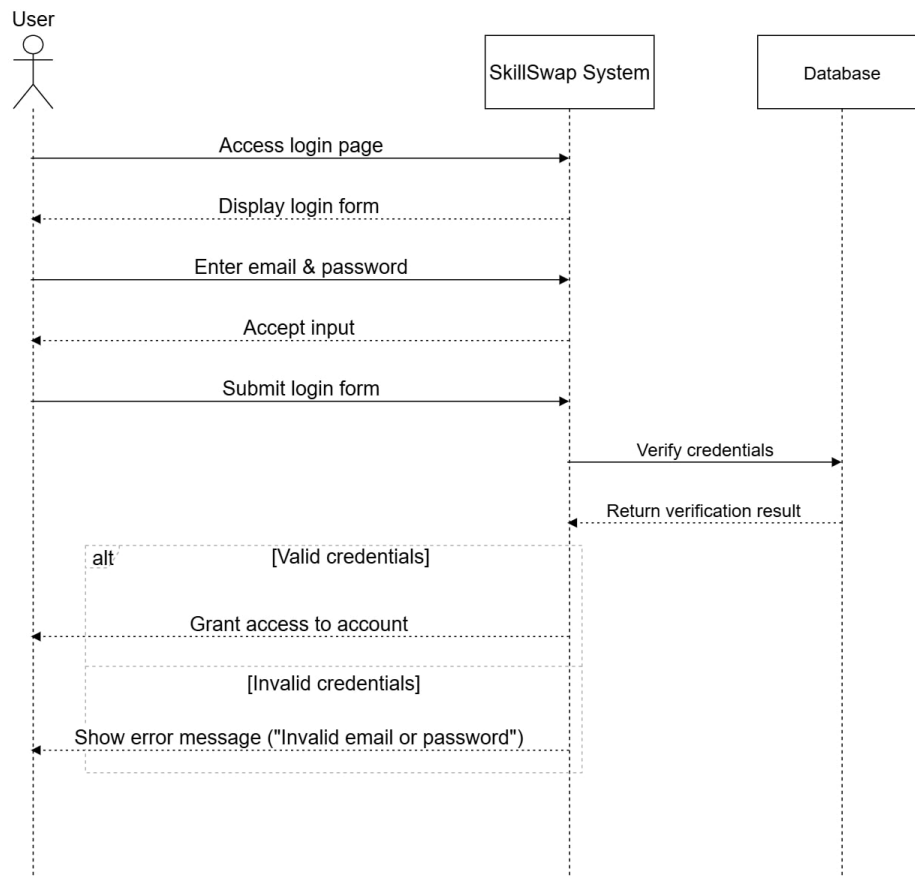


Figure 4.4: Login

User Forgot Password

The user requests a password reset by entering their registered email. The system verifies the email and sends a reset link, allowing the user to create a new password and regain access.

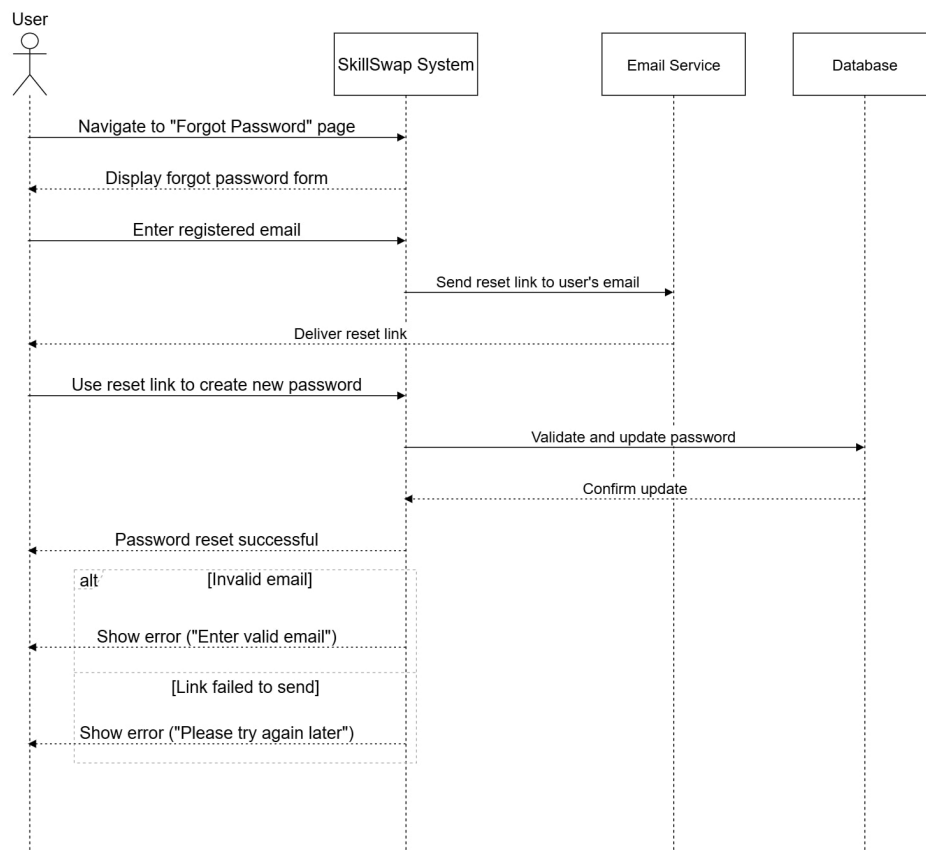


Figure 4.5: User Forgot Password

User Browse Skills

The user navigates to the home page, and the system fetches and displays the list of available skills from the database. When a skill is selected, its details are retrieved and shown. If no skills exist, the system displays a message.

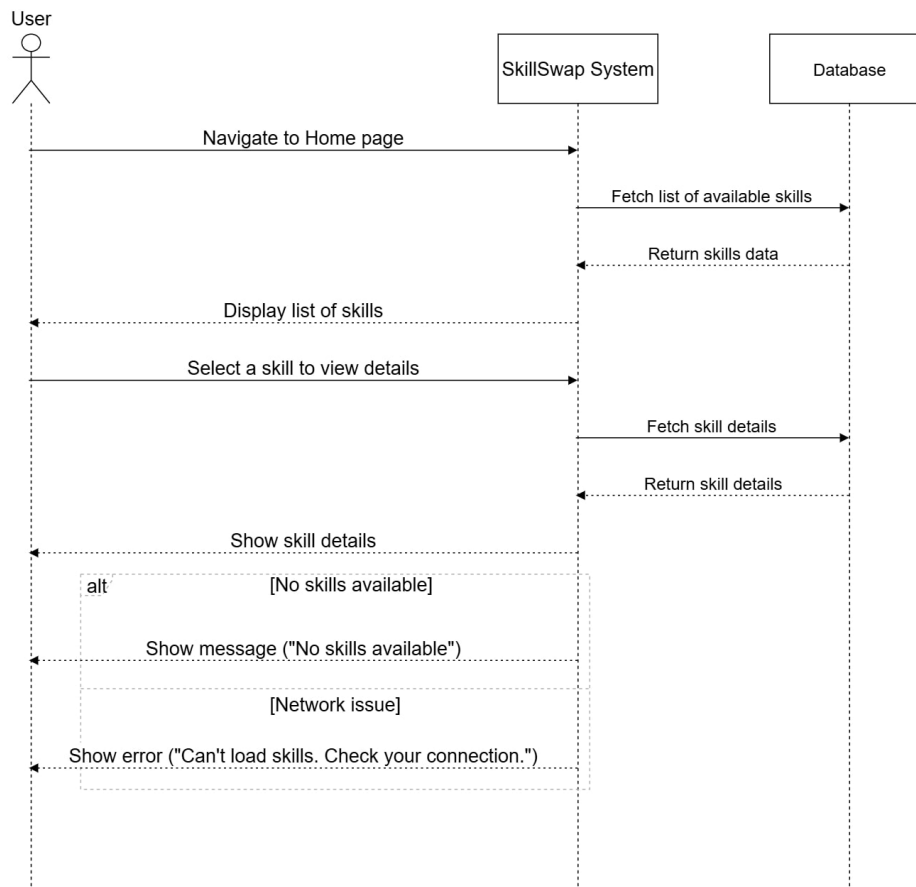


Figure 4.6: User Browse Skills

User Search Skills

The user enters keywords to search for skills, and the system retrieves matching results from the database. The results are displayed to the user, or an appropriate message is shown if no matches are found.

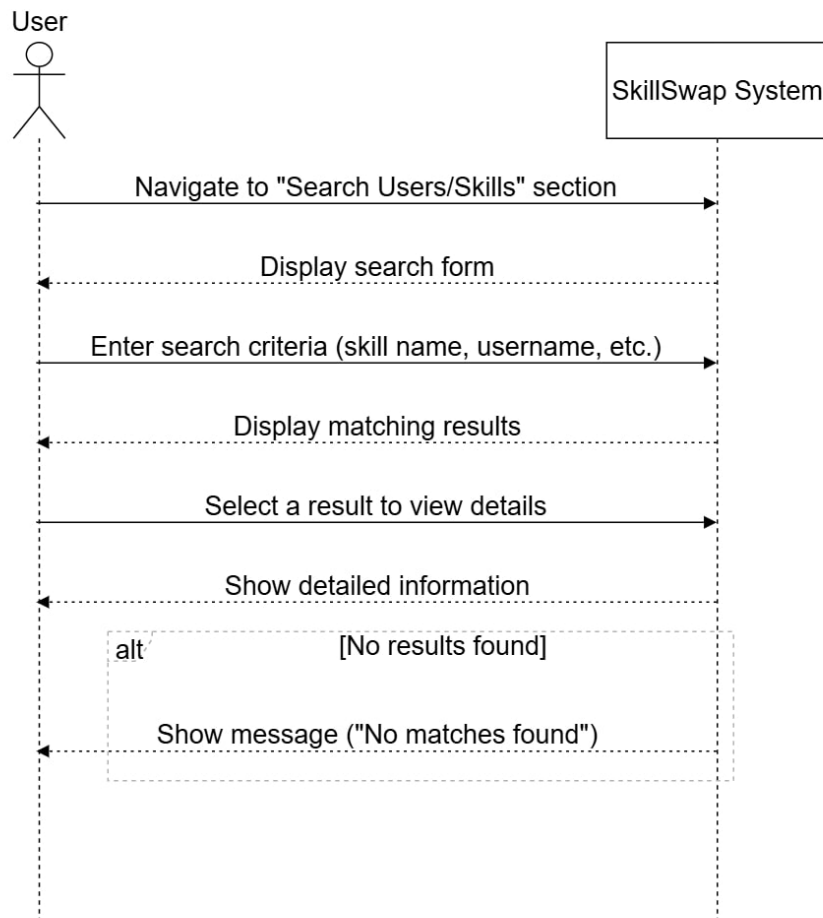


Figure 4.7: User Search Skills

User View/Edit profile

The user navigates to the profile section to view and update details. The system saves valid updates or shows an error message if invalid data is entered.

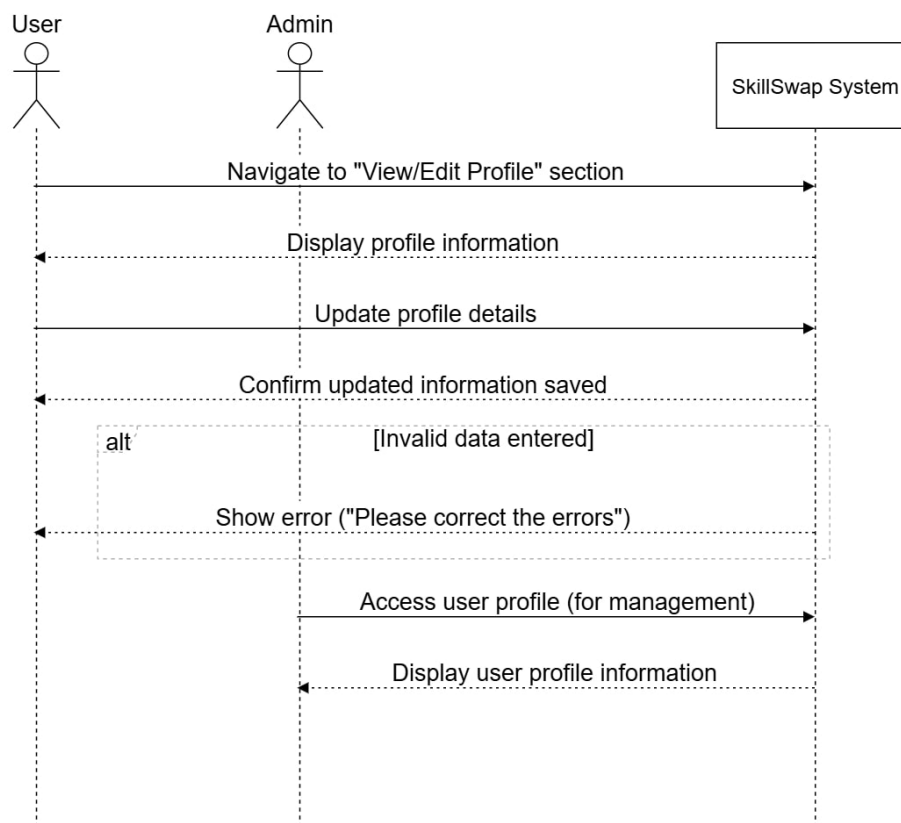


Figure 4.8: User View/Edit profile

User Send Skill Exchange Request

The user selects a skill of interest, offers one in return, and sends a skill exchange request. The system receives the request, notifies the skill owner, and manages errors or duplicates.

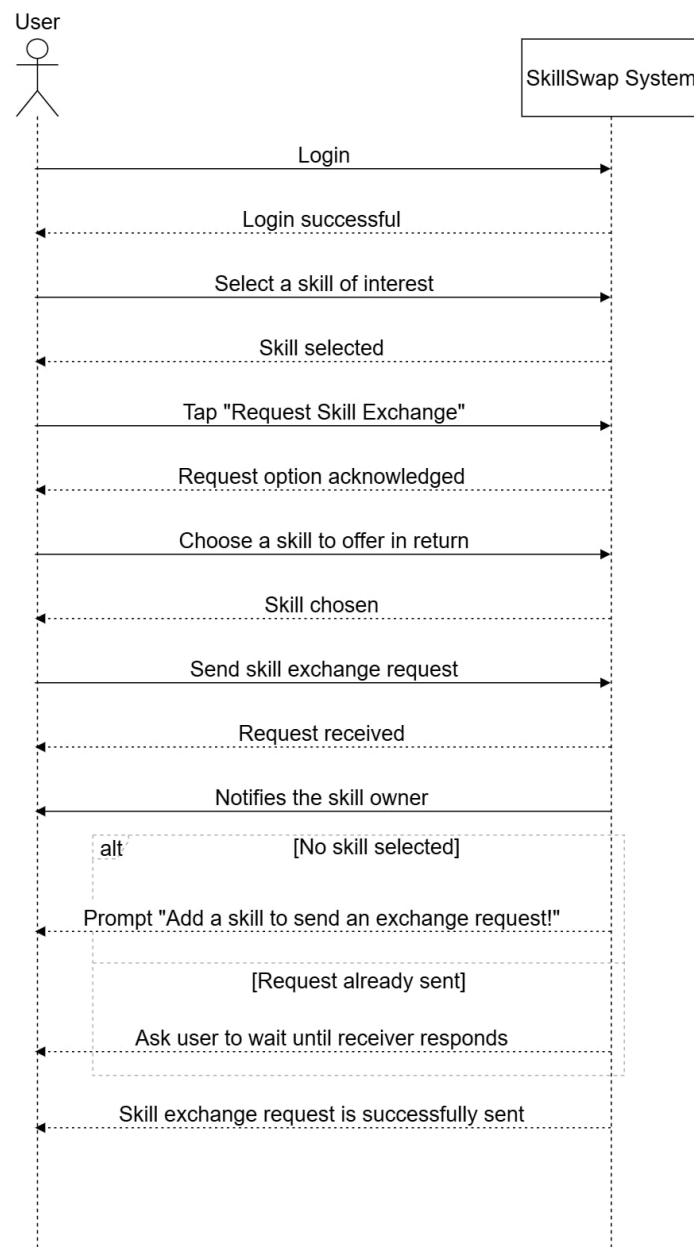


Figure 4.9: User Send Skill Exchange Request

User Report Another User

The user reports another user by submitting details of misconduct or violation. The system records the report and forwards it to the admin for review and action.

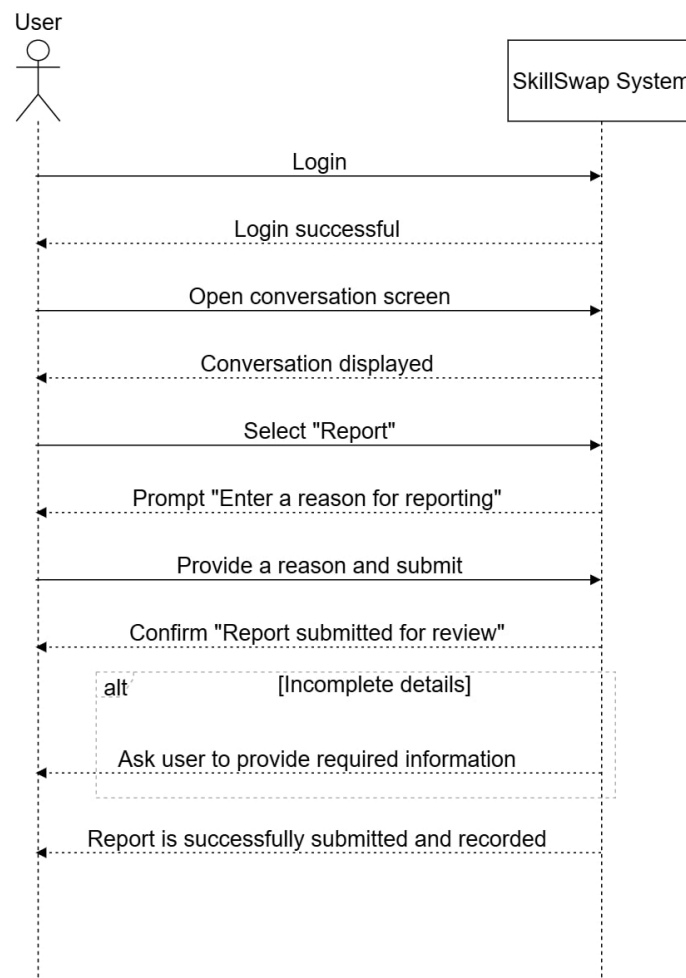


Figure 4.10: User Report Another User

User Rate and Review

The user provides a rating along with a review after an exchange. The system records the feedback and updates the recipient's profile accordingly.

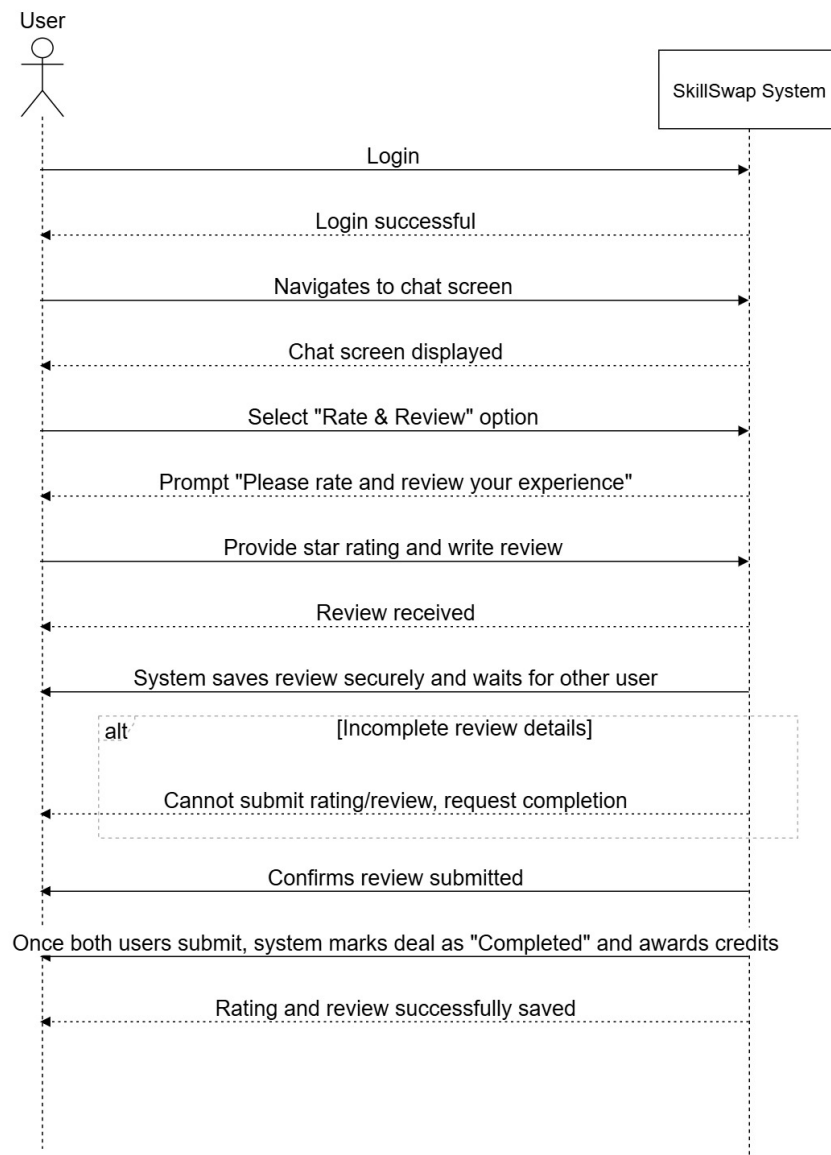


Figure 4.11: User Rate and Review

User Logout

The user chooses the logout option to end their session. The system terminates access and redirects the user to the login screen.

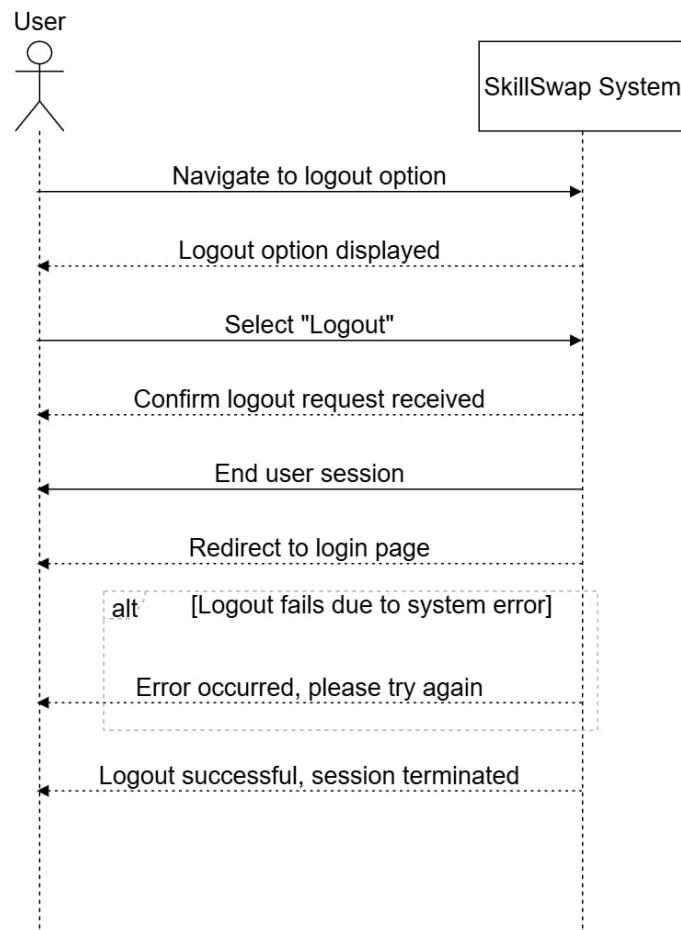


Figure 4.12: User Logout

User Accept and Reject Request

The user reviews a received skill exchange request and decides to accept or reject it. The system updates the request status and notifies the sender about the decision.

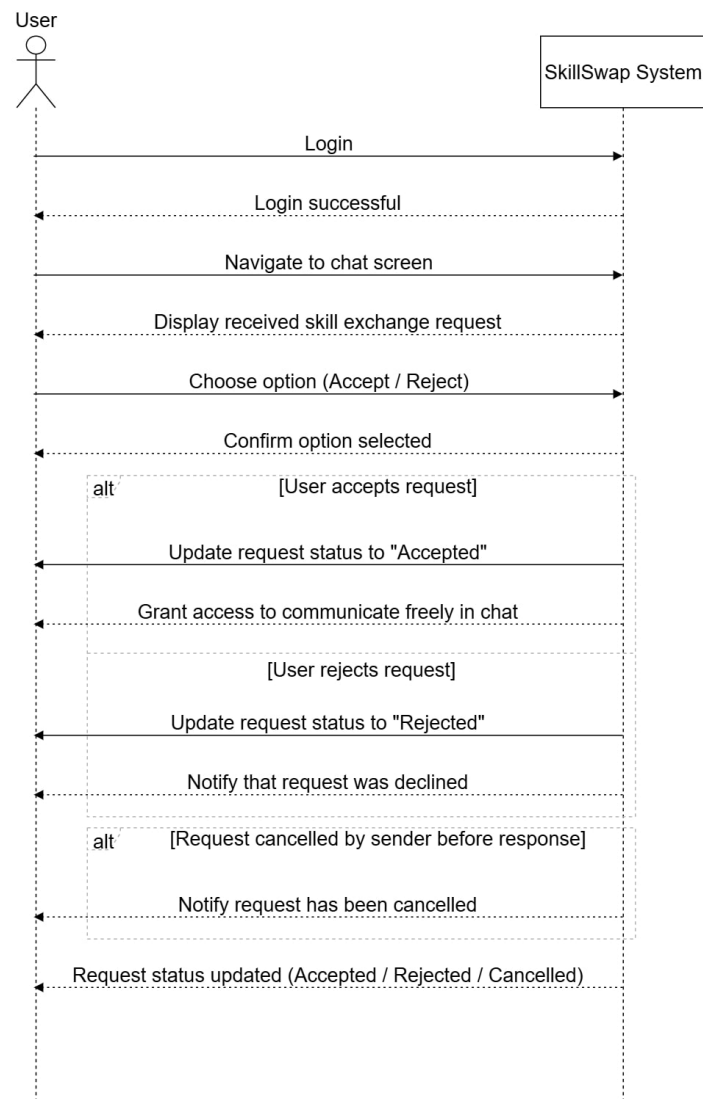


Figure 4.13: User Accept and Reject Request

User Request Verification Badge

The user submits a verification request by providing required identification documents. The system forwards the request to the admin for review and updates the profile once approved.

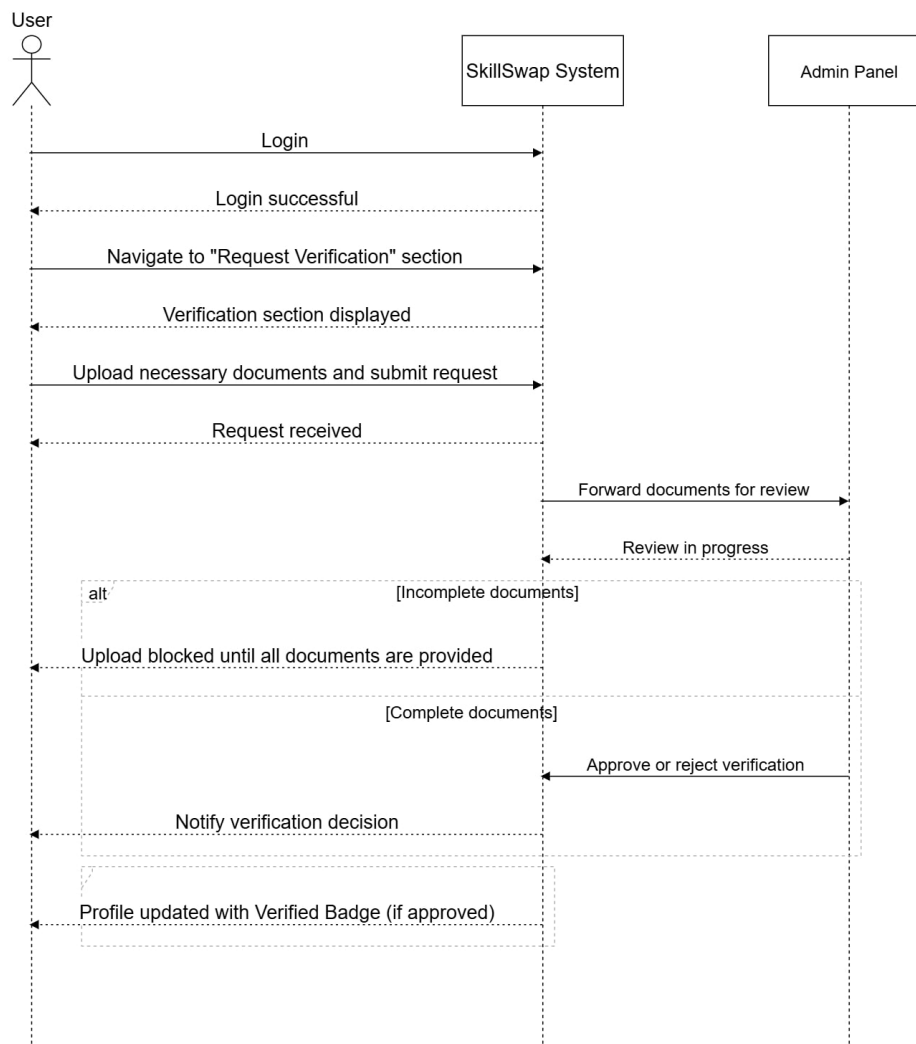


Figure 4.14: User Request Verification Badge

Schedule Meeting

The user selects date, time, duration, and exchange type to schedule a meeting. The system verifies both users' accounts and then creates the meeting, sharing details in the chat.

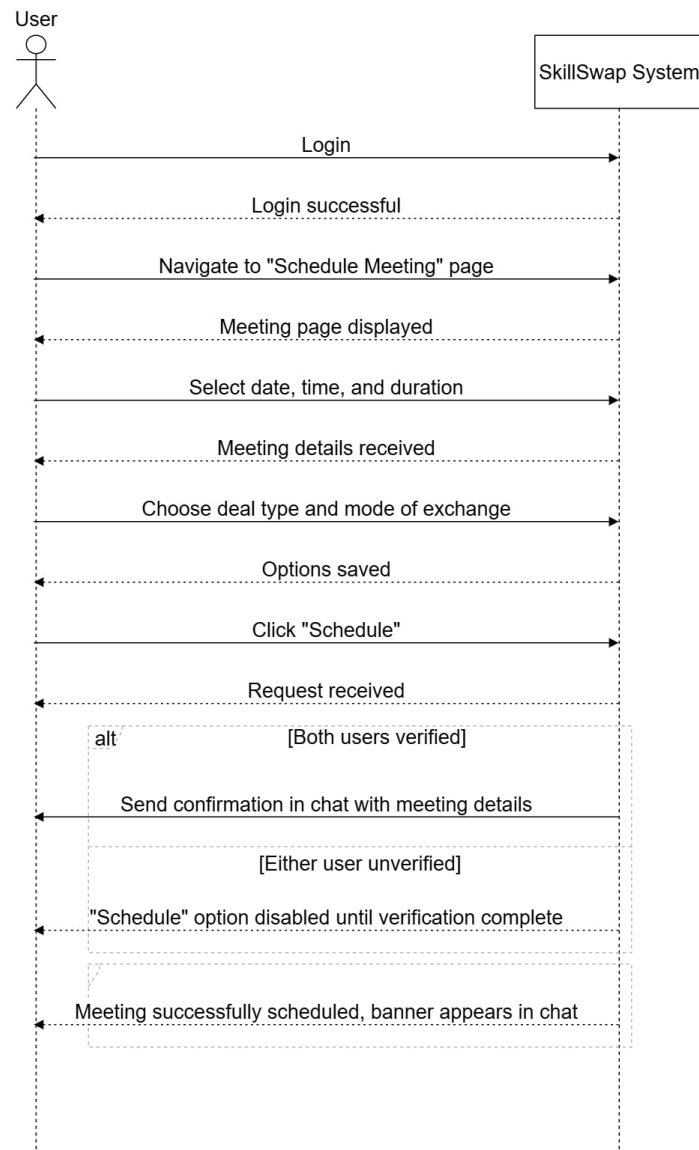


Figure 4.15: Schedule Meeting

Set Task Reminders

The user sets a reminder by selecting the task, date, and time. The system saves the reminder and notifies the user at the scheduled time.

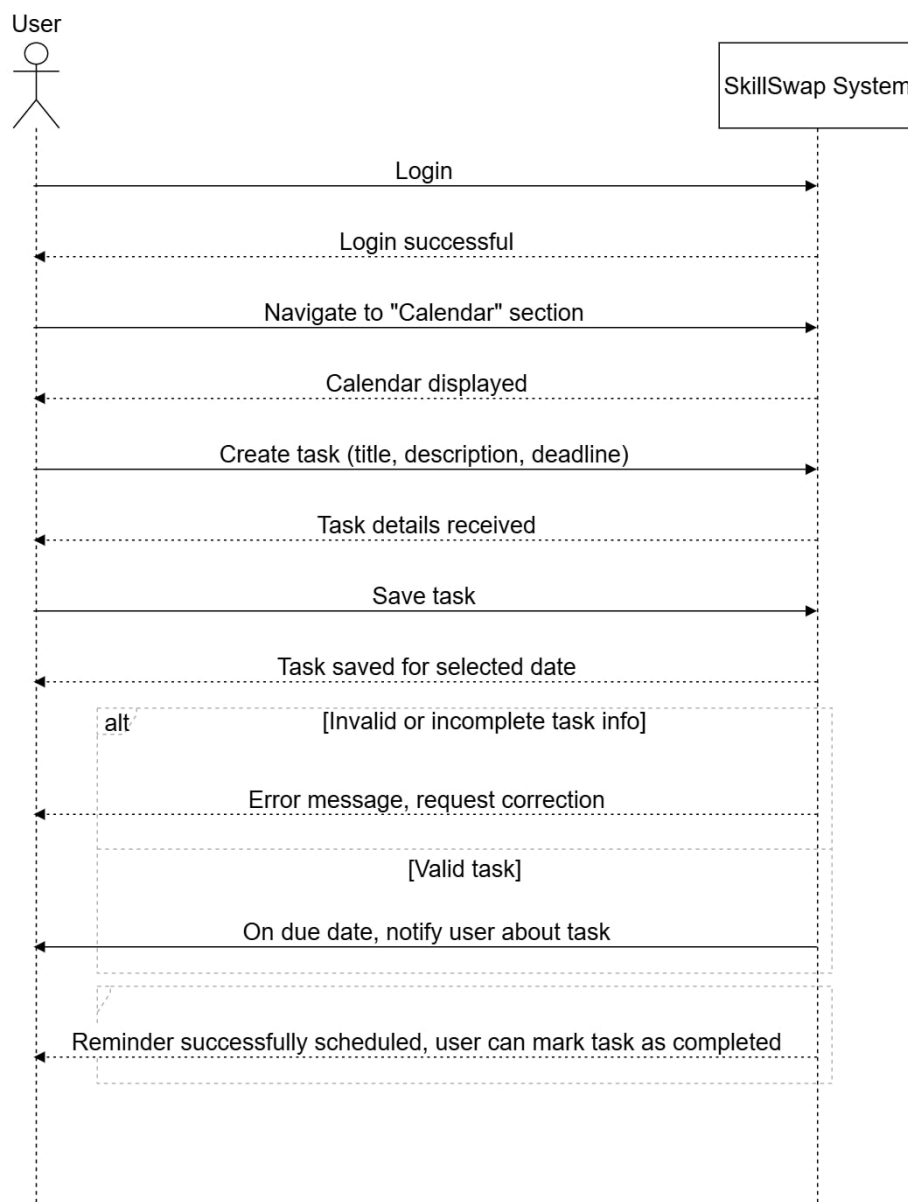


Figure 4.16: Set Task Reminders

Admin View All Users

The admin navigates to the user section to view all registered users. The system retrieves and displays user details, including status, for monitoring and management.

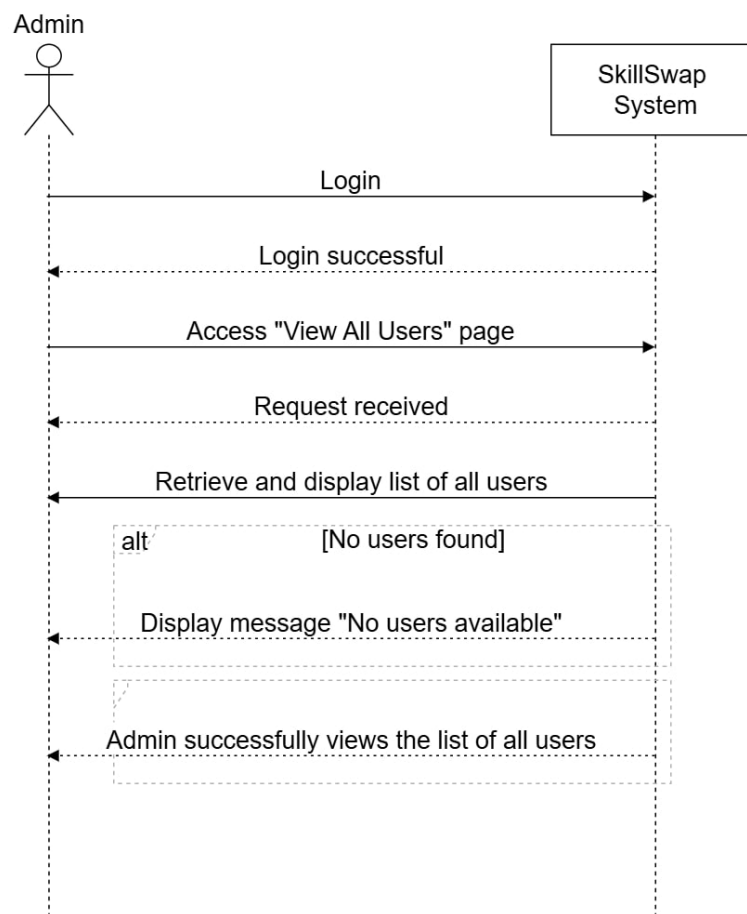


Figure 4.17: Admin View All Users

Admin View/Add Skill Categories

The admin views the existing skill categories available on the platform. They can also add new categories, and the system updates the database to reflect the changes.

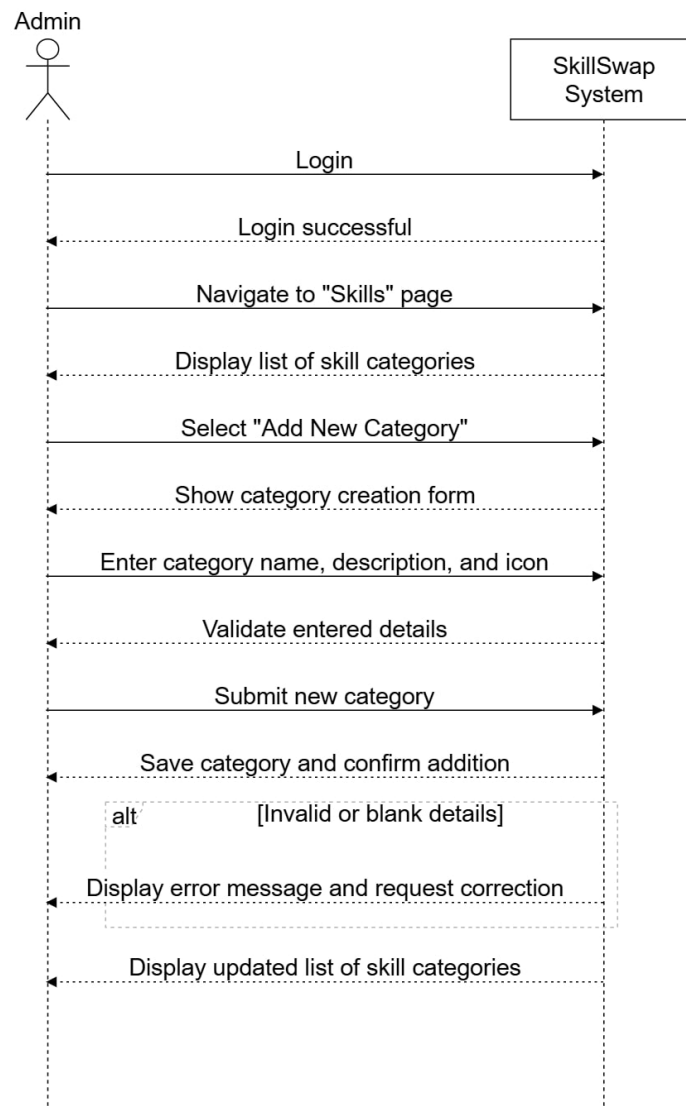


Figure 4.18: Admin View/Add Skill Categories

Admin View Reports

The admin accesses the reports section to review complaints submitted against users. The system retrieves the reports from the database and displays them for further action.

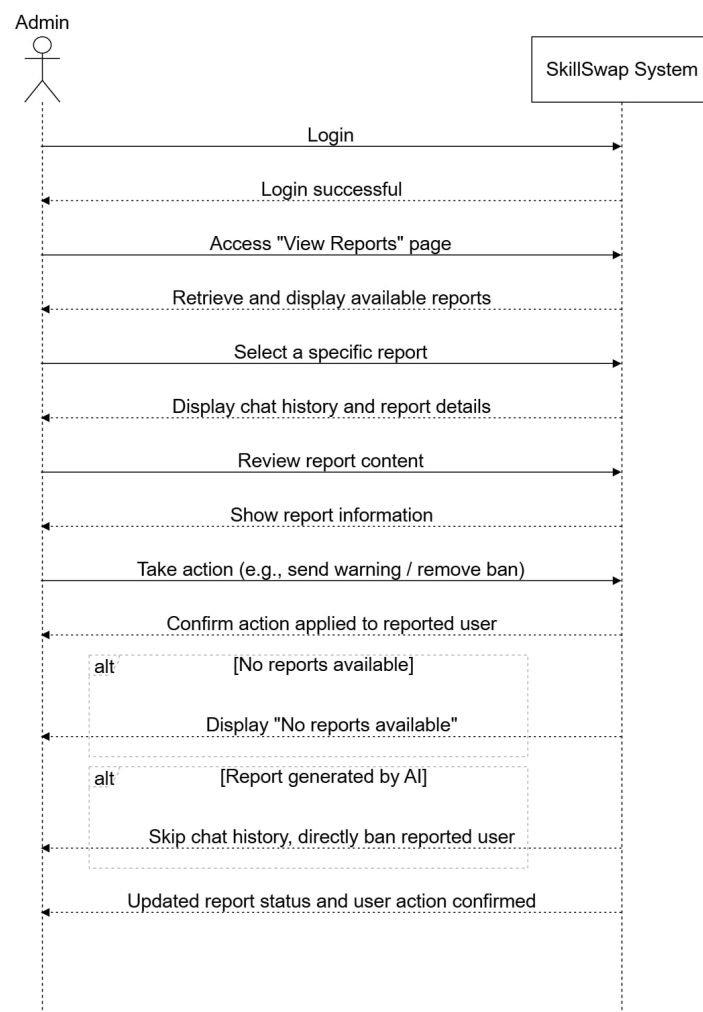


Figure 4.19: Admin View Reports

Review Verification Request

The admin reviews the verification documents submitted by a user. The system validates the documents, and upon approval, updates the user's profile with a verified badge.

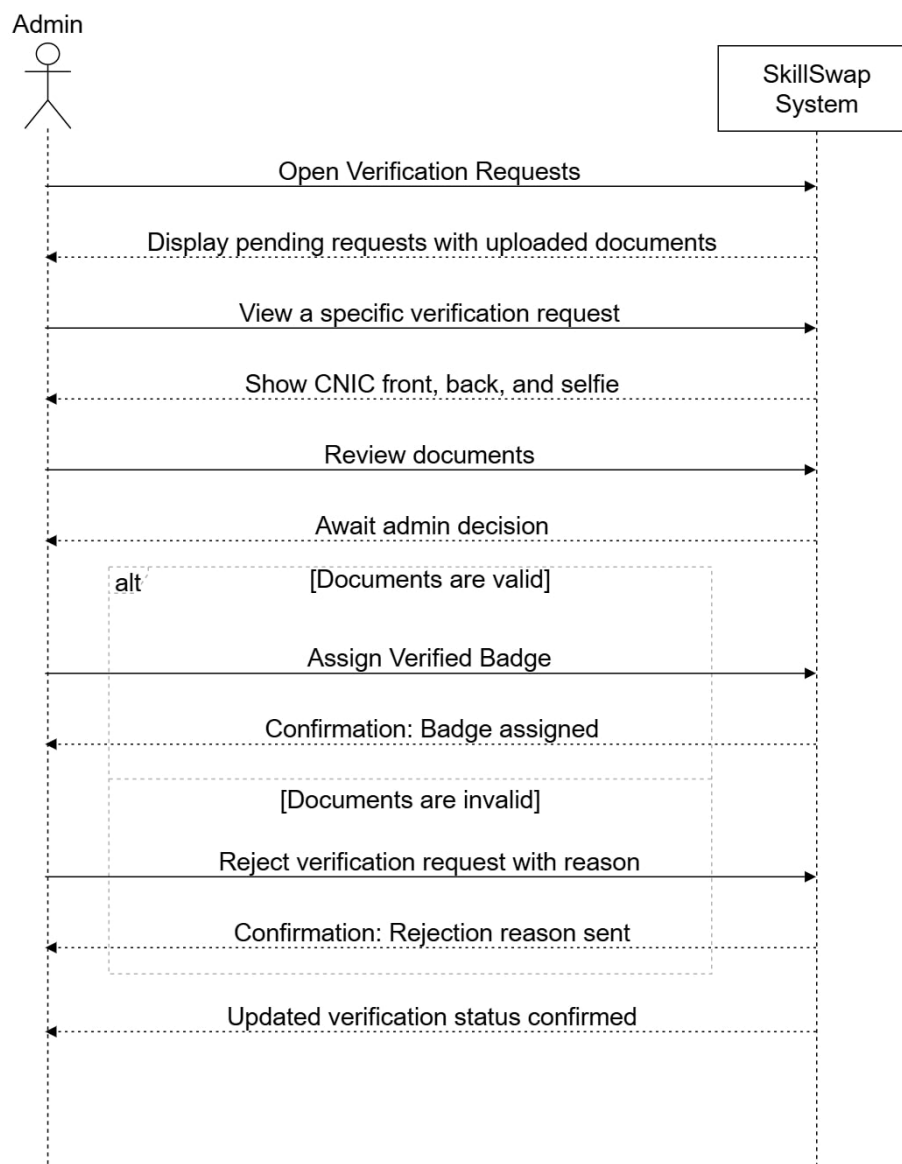


Figure 4.20: Review Verification Request

View Skill Exchanges

The admin navigates to the Skill Exchanges section to monitor user exchanges. The system displays all exchanges with color-coded statuses and allows the admin to view detailed information.

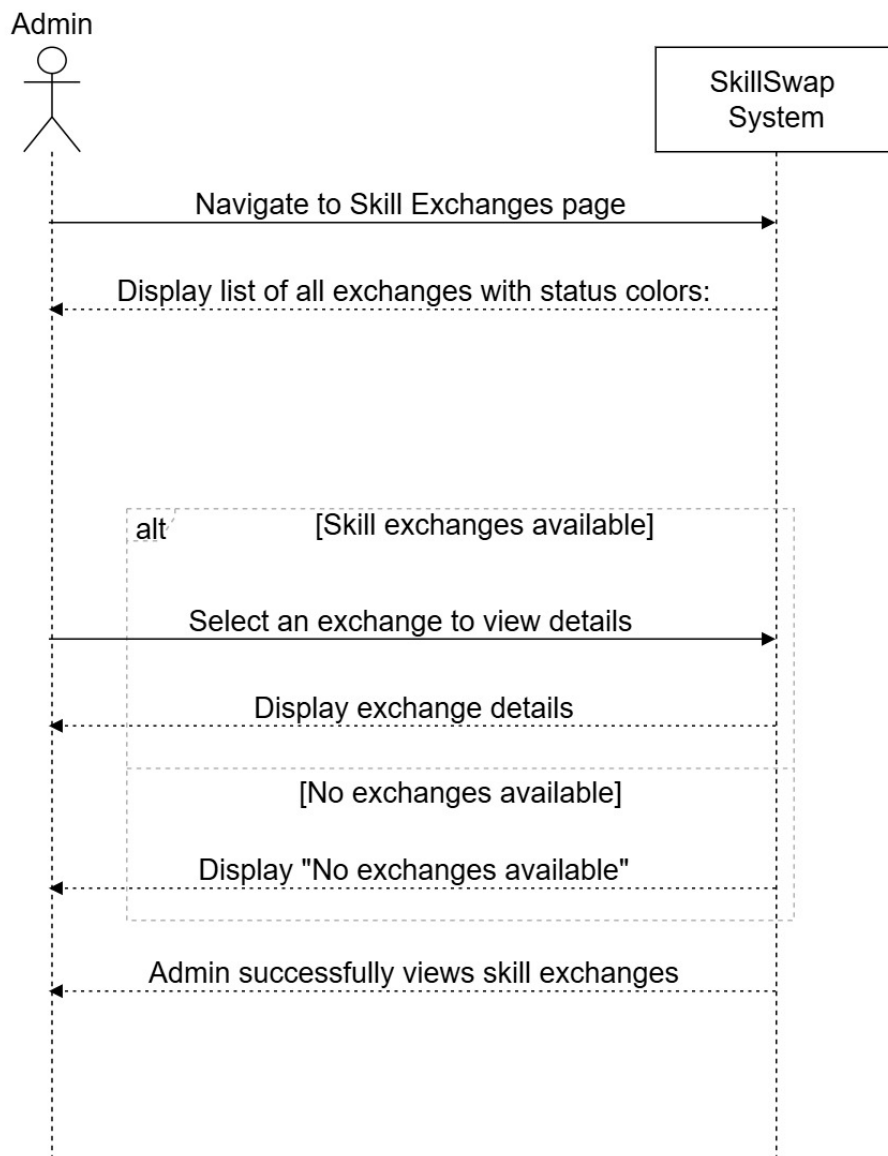


Figure 4.21: View Skill Exchanges

Change Password

The admin enters the current password along with a new password to update credentials. The system verifies the old password and, if valid, saves the new one securely.

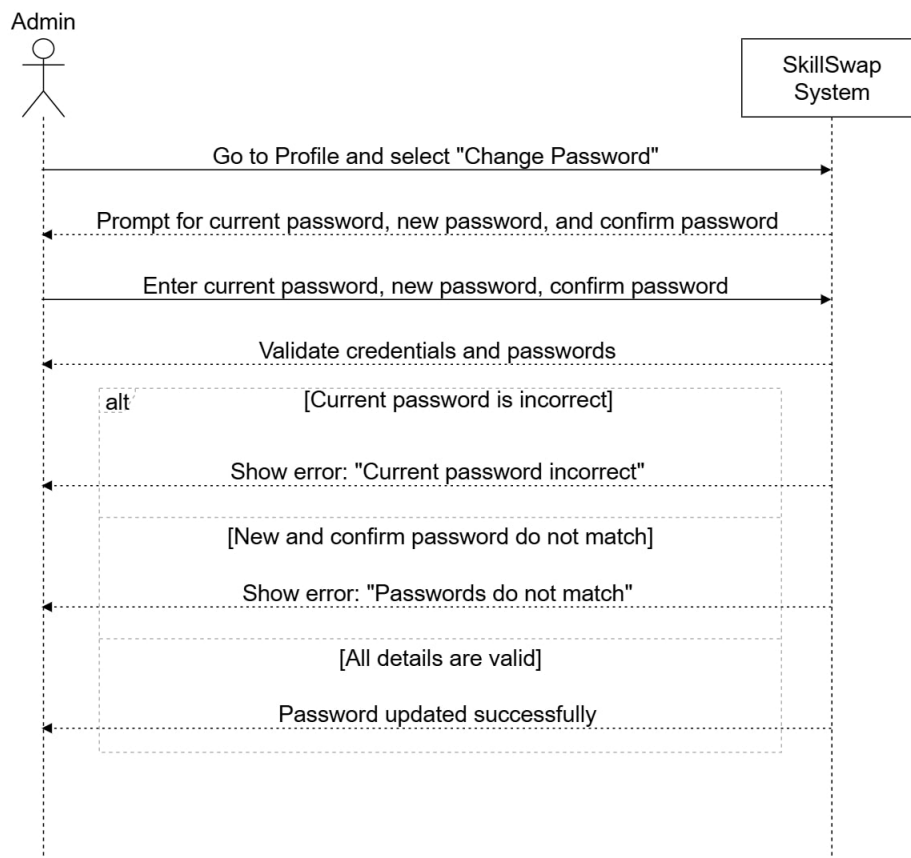


Figure 4.22: Change Password

AI System Conduct AI Skill Test

The user starts an AI-based skill test after meeting the credit requirement. AI evaluates the answers, calculates the score, and assigns a skill level to the user.

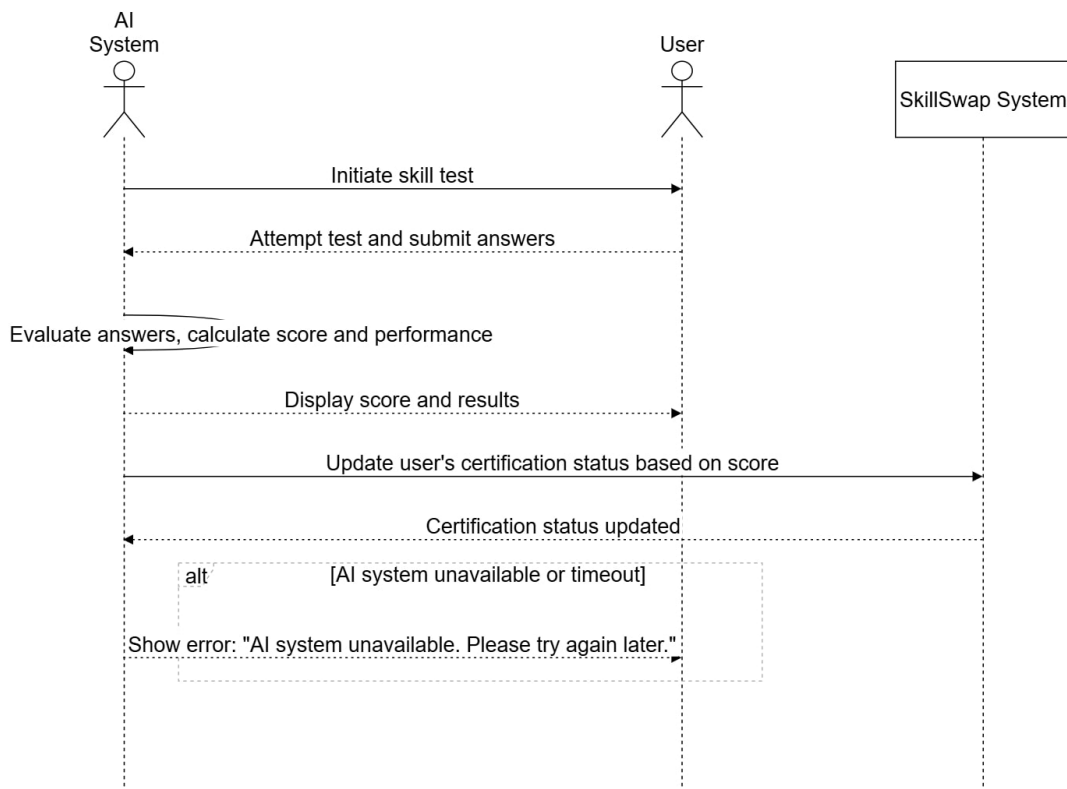


Figure 4.23: AI System Conduct AI Skill Test

AI Performs Smart Matching

The user enters their offered and wanted skills, the AI system analyzes similarity scores, and then classifies results as Perfect, Related, or Weak Match. If the AI service is unavailable, users are displayed randomly.

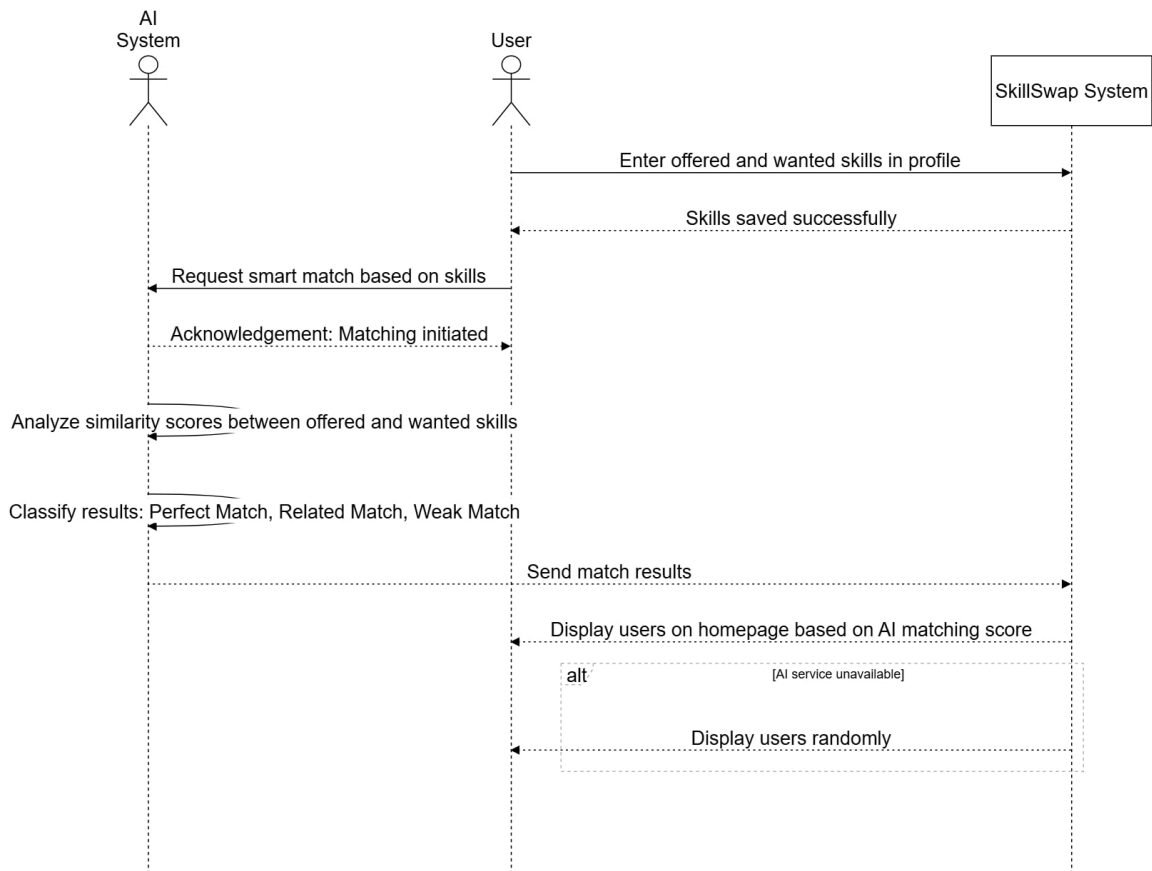


Figure 4.24: AI Performs Smart Matching

AI Ban User

AI scans messages sent by users for spam or abusive content, and if violations are detected, the user account is banned. The admin reviews appeals and may either reactivate the account or uphold the ban.

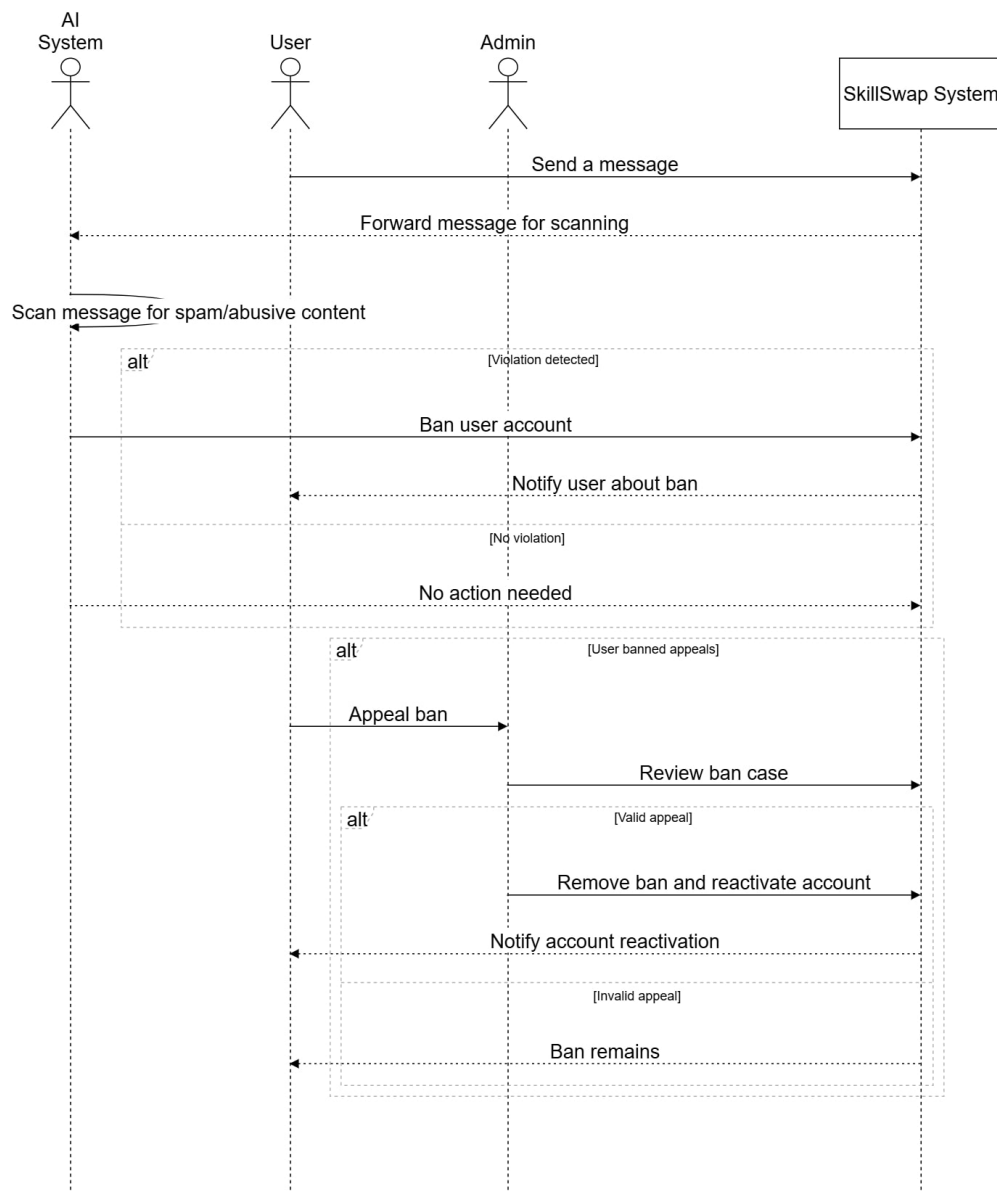


Figure 4.25: AI Ban User

4.3.2 Activity Diagram

The activity diagram, presented as a flowchart, shows the overall behavior of the system from start to end. It shows an orderly, step-by-step representation of the interactions, actions, and decisions made in the system. By representing these interactions, the diagram shows how the other objects or components interact with each other to perform the intended functions.

This representation provides clarity about the order of the functions, as well as the decision points in those functions, alternatives in the sequence of functions, and parallel functions. The image below depicts these images as they occur to present a view of how the system behaves from the point at which the system is started, through the various points of enactment, until its final conclusion.

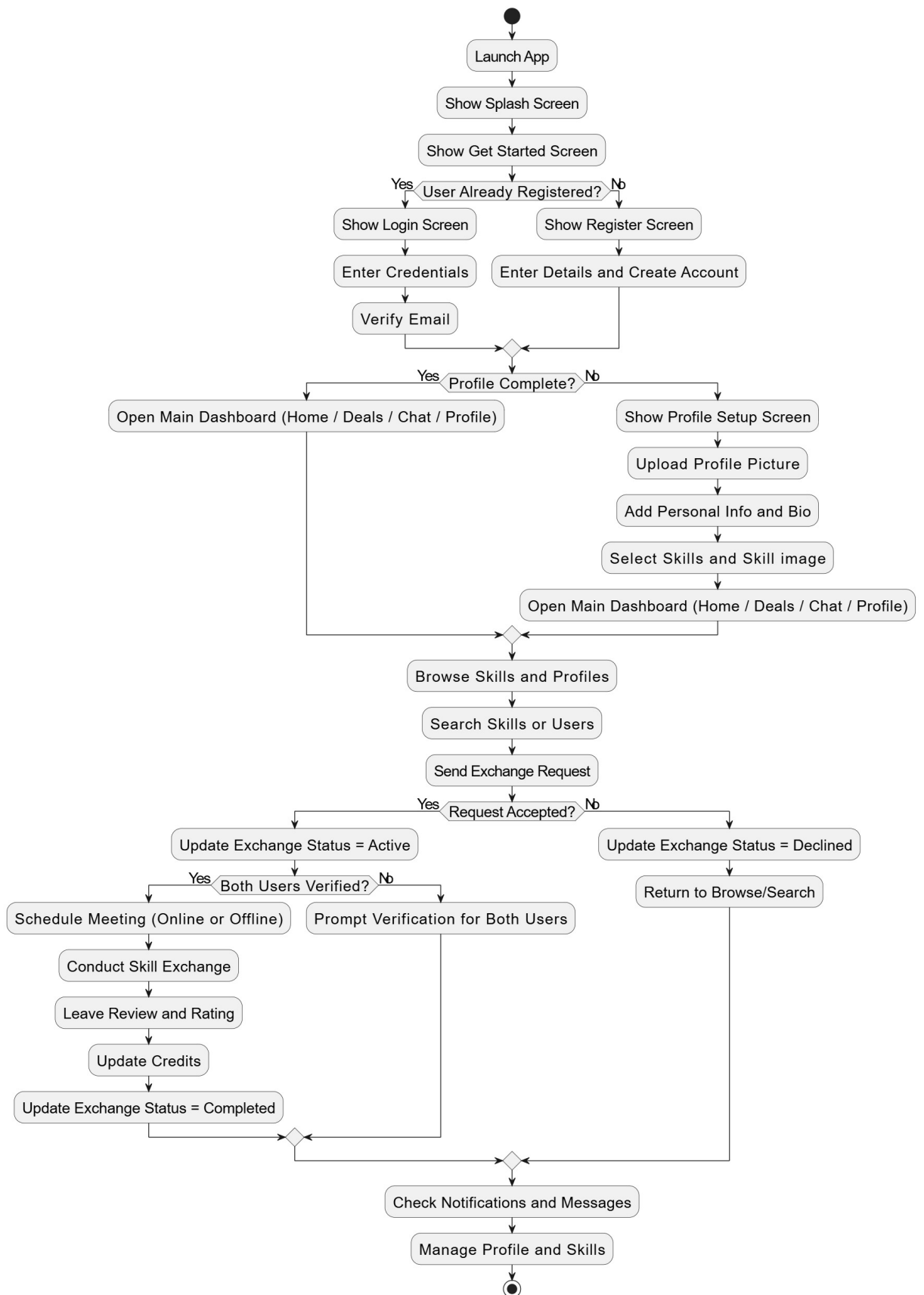


Figure 4.26: User Activity Diagram

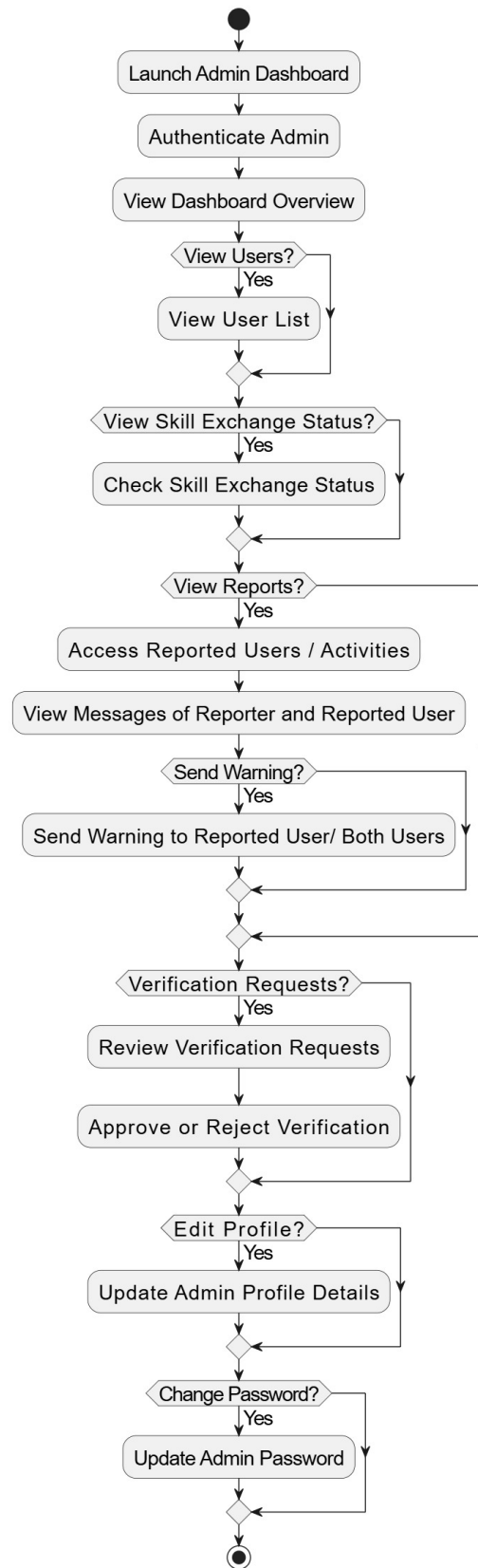


Figure 4.27: Admin Activity Diagram

4.4 GUI Design

4.4.1 Splash Screen

The splash screen provides the first visual impression of the SkillSwap app, featuring the logo.

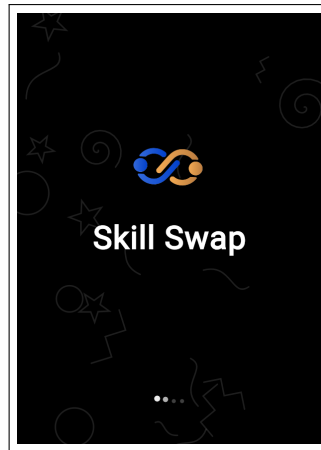


Figure 4.28: Splash Screen

4.4.2 Onboarding Page

The onboarding page introduces new users to the app's purpose, guiding them to find skill matches.

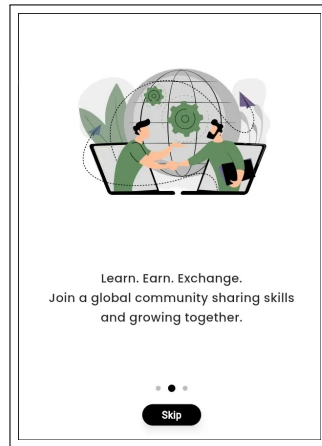


Figure 4.29: Onboarding Screen 1

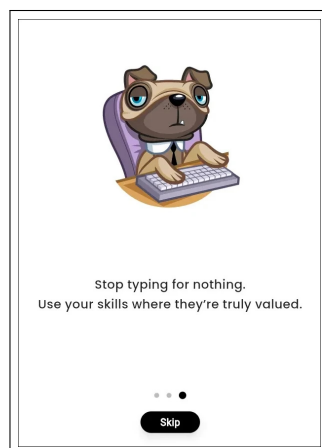


Figure 4.30: Onboarding Screen 2

4.4.3 Sign in/Sign up Screen

This screen allows users to either create a new account or log in to an existing one.

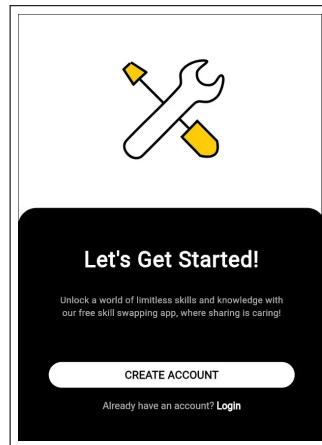


Figure 4.31: Sign in/Sign up Screen

4.4.4 Create Account Screen

The create account screen enables new users to register by providing basic details such as name, email, and password.

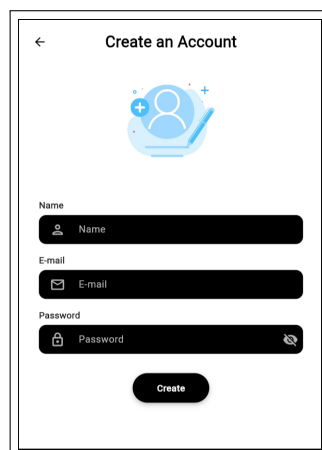


Figure 4.32: Create Account Screen

4.4.5 Login Screen

The login screen allows registered users to securely access their accounts.

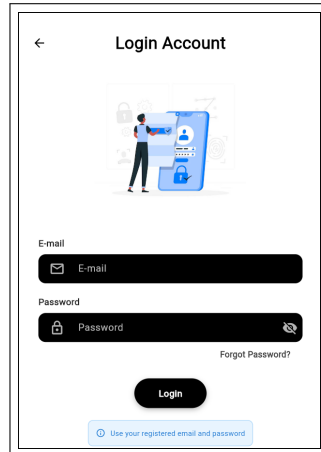


Figure 4.33: Login Screen

4.4.6 Skill Card Completion Screen

The Skill Card Completion Screen congratulates the user for successfully completing a skill card and provides navigation options to proceed.

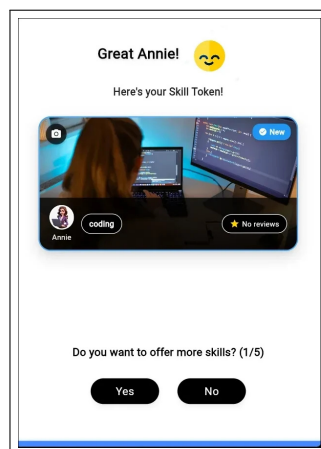


Figure 4.34: Skill Card Completion Screen

4.4.7 Home Page Screen

The Home Page Screen displays recommended skills, tutors, and featured content to help users explore learning opportunities.

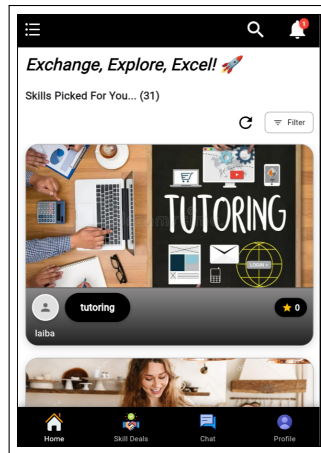


Figure 4.35: Home Page Screen

4.4.8 Profile Screen

The Profile Screen presents the user's personal details, skills, and profile information for better visibility and interaction.

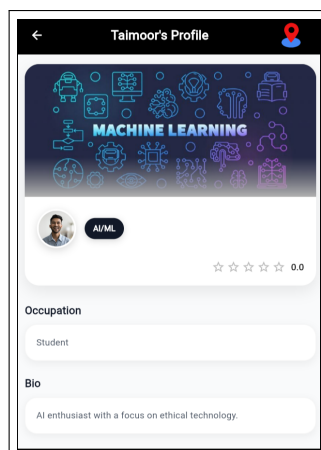


Figure 4.36: Profile Screen

4.4.9 Send Exchange Request Screen

The Send Exchange Request Screen allows users to send a skill exchange request to connect and collaborate with others.

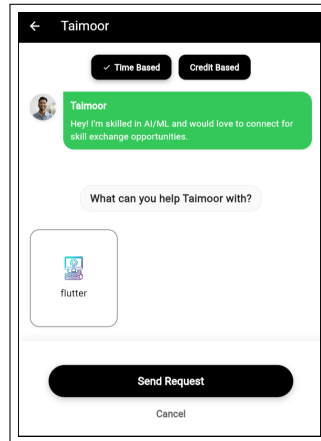


Figure 4.37: Send Exchange Request Screen

4.4.10 Report User Screen

The Report User Screen enables users to report inappropriate behavior or issues by providing a reason and necessary details.

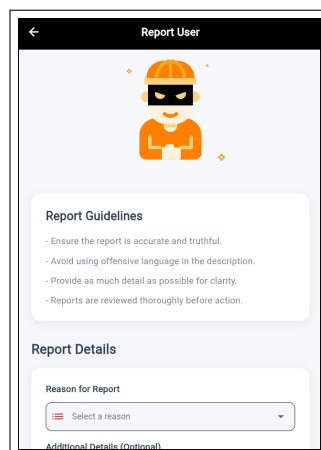


Figure 4.38: Report User Screen

4.4.11 Admin Dashboard Screen

This screen provides the admin with a summarized view of key statistics, including users, reports, and activities.

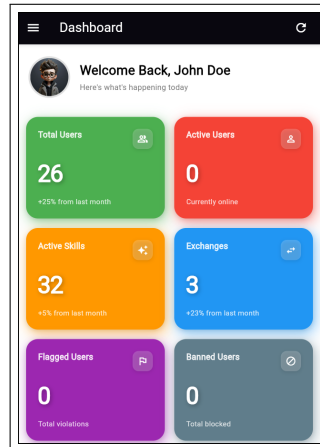


Figure 4.39: Admin Dashboard Screen

4.4.12 View Reports Screen

This screen allows the admin to review detailed user reports and take appropriate actions.

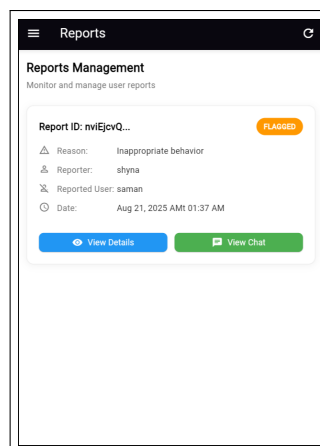


Figure 4.40: View Reports Screen

Chapter 5

System Implementation

5.1 Introduction

The implementation stage facilitates the transformation of a system design into a complete functioning application. In case of SkillSwap, it involves building a simple, safe, and engaging platform that operates smoothly on both Android and iOS devices. To accomplish this, a modern tech stack is used to achieve real time interaction, scalability and data security. The main technology used in SkillSwap, Flutter/Dart is used to build a cross-platform mobile application and Firebase is used for supporting backend services such as authentication, real-time database, and push notifications, AI services are used to enable high-level applications for spam detection, chatbots, and smart skill-matching. Ultimately, the entire system is tested from end to end to meet all the functional and non-functional requirements and offer a reliable, usable experience.

5.2 System Architecture

SkillSwap follows a client-server architecture where the mobile frontend communicates with Firebase as the backend. This architecture ensures high responsiveness, security, and real-time synchronization across devices. The frontend is built using Flutter for a consistent user interface on Android and iOS. The backend leverages Firebase Authentication and Firestore for database management. External integrations further extend the system’s functionality. Geolocation APIs (Google Maps) allow location-based filtering, while AI APIs support intelligent features like chatbot assistance and custom ML models for spam detection and smart skill matching. Real-time updates such as instant messaging, push notifications, and skill exchange status are managed through Firebase Realtime Database and Firestore. The Stripe and Paymob APIs ensure secure, fast, and reliable payments, while GitHub maintains version control for smooth collaboration and code tracking.

5.3 System Internal Components

5.3.1 Registration Module

The user registration module oversees the user registration process. This module collects specific data pertaining to the user, such as email, password, and general profile details, applying validation checks to ensure completeness and accuracy. Hereafter, once verified, the data is secured within the Firebase database, usable for all future access and authentication assertions.

5.3.2 Authentication Module

The authentication module includes secure login and identity verification. Authentications methods include emails and passwords. Secure authentication mechanisms are validation methods, token-based authentication, and encryption that protect user credentials and maintain interaction and session integrity.

5.3.3 Profile Management Module

SkillSwap's Profile Management allows you to share your skills through a profile. You can add your occupation, a short bio, a profile photo (optional), skill cards with images and descriptions to highlight your skills. You can update your profile at any point in time, which keeps your profile current and builds trust in the community and provides better matches for skill exchange.

5.3.4 Skill Exchange Module

The Skill Exchange is the centerpiece of SkillSwap, allowing anyone wishing to share their skills/knowledge an easy and meaningful way to do so. This module does the complete job of facilitating the skill exchange process. SkillSwap members can send a request, accept or decline a request, and fulfill the exchange, with straightforward communication and transparency in each step of the exchange. After completing the exchange, both parties can leave ratings and reviews to help establish trust, and accountability while creating opportunities for member to connect with one another across the community. This module keeps things structured while offering flexibility, which encourages members to learn, teach, and grow together.

5.3.5 Chat Module

The Chat Module powers real-time interaction on SkillSwap, providing a seamless and secure space for skill exchange discussions. It supports instant messaging with file sharing, system updates, and AI-powered spam detection for safe communication. Beyond chat, the module enables deal coordination through status tracking, approval workflows, and completion updates. Built-in session features like video calls, scheduling, and credit management make collaboration smooth and transparent. With profile integration, verification indicators, and reporting tools, the Communication Module ensures trust and accountability while delivering an intuitive, responsive user experience.

5.3.6 Notification Module

The notification module ensures that users remain informed of important updates. Push notifications and in-app alerts notify users about new matches, messages, skill exchanges, and credits updates in real time.

5.3.7 Location Services Module

The location services module leverages Google Maps API to provide geolocation features. It enables discovery of nearby users, calculates distances for in-person swaps, and integrates maps for improved navigation and user experience.

5.3.8 Calendar Module

The Calendar Module allows users to manage their schedule easily. It includes conflict detection and reminders for all upcoming activities,

allowing users to better manage their time through coordination. It also sends smart notifications on task dates, keeping users informed and on track.

5.3.9 Report Users Module

The report users module allows users to report inappropriate behavior or violations within the platform. Reported cases are logged and forwarded to administrators for review, ensuring timely action and maintaining a safe and trustworthy environment.

5.3.10 Verification Module

The verification module manages user verification. The verification module allows users to submit required documents for verification. The admin has to review the documents to approve the verification status. Once verified, users will have a badge attached to their profile image indicating trust and credibility on the platform.

5.3.11 Credit Management Module

The credit management module handles the virtual credit system within the platform. Users can purchase credits through integrated payment gateways, spend them on premium features or skill exchanges, and track their balance and transaction history. This ensures smooth financial operations and transparent usage of credits.

5.3.12 Meeting Scheduling Module

The meeting scheduling module allows users to schedule skill exchange sessions by selecting the preferred date, time, and mode of interaction, such as online or in-person. The system assigns credits based on the

type and duration of the meeting, ensuring fair usage of the credit system.

5.3.13 Admin Module

With the admin module, all the modules' functionalities are controlled by administrators. In addition, it allows for functionalities such as user administration, content moderation, skills administration, users verification and access to handling reports. Plus, administrators have access to configure settings, keep track of performance, and to manage the health of the platform.

5.3.14 AI Integration Module

The AI Integration Module drives SkillSwap's smart features. It enables chatbot help for fast assistance, spam detection in chats, and smart skill matching using machine learning models. Plus, AI-powered skill tests allow users to demonstrate expertise and receive certifications.

Chapter 6

Testing

6.1 System Testing

System testing is significant for validating the system operation and intended use while providing assurance that the system meets standards [14]. Each module is tested separately in the system testing of software or hardware to guarantee its correctness. The main purpose of system testing is to understand if the system we developed meets our requirements and adhered to the standards defined. The testing process and criteria involve testing each completed function, determining if the system still has something to work on, and qualitative analysis wherever needed. System's performance is tested by applying a number of defined test cases to the application. Several testing strategies are commonly employed to achieve these objectives.

1. Graphical user interface testing
2. Usability testing
3. Software performance testing
4. Compatibility testing

5. Exception handling
6. Load testing
7. Security testing
8. Installation testing

6.2 Graphical user interface testing

6.2.1 Register

Validates user registration by testing screen access, data entry, and form submission.

Table 6.1: Test Case for Register

<i>TC_01</i>			
Register			
<i>UC_01</i>			
System should have a visual studio.			
Steps	Tasks	Expected Output	Result (Pass/Fail)
1	Open register screen.	Pass or Fail	Pass
2	Enter required fields.	Pass or Fail	Pass
3	Press register button.	Pass or Fail	Pass
4	Check button is submitting data.	Pass or Fail	Pass

6.2.2 Login

This test case verifies that the user can successfully log in by entering valid credentials. It ensures all steps from opening the login screen to submitting data work correctly.

Table 6.2: Test Case for Login

<i>TC_02</i>			
Login			
<i>UC_02</i>			
System should have a visual studio.			
Steps	Tasks	Expected Output	Result (Pass/Fail)
1	Open login screen.	Pass or Fail	Pass
2	Enter email and password.	Pass or Fail	Pass
3	Press login button.	Pass or Fail	Pass
4	Check button is submitting data.	Pass or Fail	Pass

6.2.3 Forgot Password

Verifies the forgot password process, ensuring users can reset their password successfully.

Table 6.3: Test Case for Forgot Password

<i>TC_03</i>			
Forgot Password			
<i>UC_03</i>			
System should have a visual studio.			
Steps	Tasks	Expected Output	Result (Pass/Fail)
1	Open forgot password screen.	Pass or Fail	Pass
2	Enter email.	Pass or Fail	Pass
3	Press the button.	Pass or Fail	Pass
4	Check button is submitting data.	Pass or Fail	Pass

6.2.4 Logout

Verifying the logout process, ensuring users can successfully end their session and return to the login screen.

Table 6.4: Test Case for Logout

<i>TC_04</i>			
Logout			
<i>UC_04</i>			
System should have a visual studio.			
Steps	Tasks	Expected Output	Result (Pass/Fail)
1	The user is logged in.	Pass or Fail	Pass
2	Press logout button.	Pass or Fail	Pass
3	Redirects to login screen.	Pass or Fail	Pass

6.3 Usability Testing

6.3.1 Register

Verifying the register process, ensuring users can enter required details and successfully create an account.

Table 6.5: Test Case for Register

<i>TC_01</i>			
Register			
<i>UC_01</i>			
System should have a visual studio.			
Steps	Tasks	Expected Output	Result
1	Open register screen.	Pass or Fail	Pass
2	Enter required fields.	Pass or Fail	Pass
3	Press register button.	Pass or Fail	Pass
4	Check button is submitting data.	Pass or Fail	Pass

6.3.2 Login

Verifying the login process, ensuring users can log in with valid credentials and appropriate error messages appear for empty fields.

Table 6.6: Test Case for Login

<i>TC_02</i>			
Login			
<i>UC_02</i>			
System should have a visual studio.			
Steps	Tasks	Expected Output	Result
1	Open login screen.	Pass or Fail	Pass
2	Enter email and password.	Pass or Fail	Pass
3	Press login button.	Pass or Fail	Pass
4	Check button is submitting data.	Pass or Fail	Pass
5	Do not enter data and press the button.	Pass or Fail	Pass
6	Check that empty field error is showing.	Pass or Fail	Pass

6.3.3 Forgot Password

The Forgot Password test case verifies that users can recover account access by submitting a valid email.

Table 6.7: Test Case for Forgot Password

<i>TC_03</i>			
Forgot Password			
<i>UC_03</i>			
System should have a visual studio.			
Steps	Tasks	Expected Output	Result
1	Open forgot password screen.	Pass or Fail	Pass
2	Enter email.	Pass or Fail	Pass
3	Press the button.	Pass or Fail	Pass
4	Check button is submitting data.	Pass or Fail	Pass
5	Do not enter data and press the button.	Pass or Fail	Pass
6	Check that empty field error is showing.	Pass or Fail	Pass

6.3.4 Logout

The Logout test case confirms that a logged-in user can safely exit the system using the logout button.

Table 6.8: Test Case for Logout

<i>TC_04</i>			
Logout			
<i>UC_04</i>			
System should have a visual studio.			
Steps	Tasks	Expected Output	Result
1	The user is logged in.	Pass or Fail	Pass
2	Press logout button.	Pass or Fail	Pass
3	Redirects to login screen.	Pass or Fail	Pass

6.3.5 View Skills

Verifying the view skills process, ensuring users can browse skill cards of other users and view detailed profiles.

Table 6.9: Test Case for View Skills

<i>TC_05</i>			
View Skills			
<i>UC_05</i>			
System should have a visual studio.			
Steps	Tasks	Expected Output	Result
1	User logs in.	Pass or Fail	Pass
2	Go to the Home Page.	Pass or Fail	Pass
3	View skill cards of different users.	Pass or Fail	Pass
4	Select any user's skill card.	Pass or Fail	Pass
5	User profile opens displaying the user's information.	Pass or Fail	Pass

6.3.6 Profile Management

Verifying the profile management process, ensuring users can update and save their personal information successfully.

Table 6.10: Test Case for Profile Management

<i>TC_06</i>			
Profile Management			
<i>UC_06</i>			
System should have a visual studio.			
Steps	Tasks	Expected Output	Result
1	User logs in.	Pass or Fail	Pass
2	Navigates to Profile Page.	Pass or Fail	Pass
3	Edit User info (user-name, image, bio etc.)	Pass or Fail	Pass
4	Press the Save button.	Pass or Fail	Pass
5	User info updated successfully.	Pass or Fail	Pass

6.3.7 Skill Searching

Verifying the skill searching process, ensuring users can search for specific skills and view relevant results accurately.

Table 6.11: Test Case for Skill Searching

<i>TC_07</i>			
Skill Searching			
<i>UC_07</i>			
System should have a visual studio.			
Steps	Tasks	Expected Output	Result
1	User logs in.	Pass or Fail	Pass
2	Navigates to the search skill section.	Pass or Fail	Pass
3	Enter “Python” in search bar.	Pass or Fail	Pass
4	Clicks on Search button.	Pass or Fail	Pass
5	Relevant skills displayed.	Pass or Fail	Pass
6	If no matching skills exist, system shows message “No skills found.	Pass or Fail	Pass

6.3.8 Request Skill Exchange

This table tests the process of sending a skill exchange request, verifying successful request initiation and notification.

Table 6.12: Test Case for Request Skill Exchange

<i>TC_08</i>			
Request Skill Exchange			
<i>UC_08</i>			
System should have a visual studio.			
Steps	Tasks	Expected Output	Result
1	User logs in.	Pass or Fail	Pass
2	Navigates to the Home page.	Pass or Fail	Pass
3	Selects a skill card.	Pass or Fail	Pass
4	Clicks on Send Request.	Pass or Fail	Pass
5	Check button sends request successfully	Pass or Fail	Pass

6.3.9 Accept/Reject Request

This table validates the process of accepting or rejecting a received skill exchange request, ensuring proper status updates.

Table 6.13: Test Case for Accept/Reject Request

<i>TC_09</i>			
Accept/Reject Request			
<i>UC_09</i>			
System should have a visual studio.			
Steps	Tasks	Expected Output	Result
1	User logs in.	Pass or Fail	Pass
2	Navigates to the Chat page.	Pass or Fail	Pass
3	Open received request.	Pass or Fail	Pass
4	Accept/Reject request.	Pass or Fail	Pass
5	Status updates accordingly.	Pass or Fail	Pass

6.3.10 Exchange Status

This table checks whether users can view and verify the status of all skill exchanges correctly.

Table 6.14: Test Case for Exchange Status

<i>TC_10</i>			
Exchange Status			
<i>UC_10</i>			
System should have a visual studio.			
Steps	Tasks	Expected Output	Result
1	User logs in.	Pass or Fail	Pass
1	Navigates to the Skill Deal page.	Pass or Fail	Pass
2	All the exchanges are displayed.	Pass or Fail	Pass
3	Verify exchange status updates.	Pass or Fail	Pass

6.3.11 Admin User Management

This table validates that the admin can access the dashboard and view all registered users successfully.

Table 6.15: Test Case for Admin User Management

<i>TC_11</i>			
Admin User Management			
<i>UC_11</i>			
System should have a visual studio.			
Steps	Tasks	Expected Output	Result
1	Admin logs in.	Pass or Fail	Pass
2	Admin navigates to the Dashboard.	Pass or Fail	Pass
3	Selects View All Users from the menu.	Pass or Fail	Pass
4	All registered users displayed.	Pass or Fail	Pass

6.3.12 Admin View Reports

This table verifies that the admin can access and view system reports with accurate data.

Table 6.16: Test Case for Admin View Reports

<i>TC_12</i>			
Admin View Reports			
<i>UC_12</i>			
System should have a visual studio.			
Steps	Tasks	Expected Output	Result
1	Admin logs in.	Pass or Fail	Pass
2	Admin navigates to the Dashboard.	Pass or Fail	Pass
3	Selects View Reports from the menu.	Pass or Fail	Pass
4	The reports are displayed correctly with accurate data.	Pass or Fail	Pass

6.3.13 Admin Sends Warning

This test case verifies that the admin can review user reports and issue warnings through the system. It also ensures that the warning is properly displayed to both the admin and the user.

Table 6.17: Test Case for Admin Sends Warning

<i>TC_13</i>			
Admin Sends Warning			
<i>UC_13</i>			
System should have a visual studio.			
Steps	Tasks	Expected Output	Result
1	Admin logs in.	Pass or Fail	Pass
2	Selects View Reports from the menu.	Pass or Fail	Pass
3	Navigates to the chat of the reported user.	Pass or Fail	Pass
4	Views messages and selects a user to send warning.	Pass or Fail	Pass
5	Sends warning and the warning is displayed both on the admin side and the user side.	Pass or Fail	Pass

6.3.14 AI Bans Account

This table verifies that the AI system can detect violations and automatically ban user accounts, ensuring platform security.

Table 6.18: Test Case for AI Bans Account

<i>TC_14</i>			
AI Bans Account			
<i>UC_14</i>			
System should have a visual studio.			
Steps	Tasks	Expected Output	Result
1	User logs in.	Pass or Fail	Pass
2	User sends spam/abusive message in chat.	Pass or Fail	Pass
3	AI moderation engine analyzes the message.	Pass or Fail	Pass
4	If spam/abusive content is detected, the user account is banned automatically and login is restricted.	Pass or Fail	Pass

6.3.15 AI Smart Matching

This test case verifies that the AI suggests users based on matching or related skills. It also checks that random users are shown when no relevant matches are found.

Table 6.19: Test Case for AI Smart Matching

<i>TC_15</i>			
AI Smart Matching			
<i>UC_15</i>			
System should have a visual studio.			
Steps	Tasks	Expected Output	Result
1	User logs in.	Pass or Fail	Pass
2	Navigates to Home Page.	Pass or Fail	Pass
3	AI recommends users with matching or related skills.	Pass or Fail	Pass
4	If no related matches exist, random users are displayed.	Pass or Fail	Pass

6.4 Exception Testing

6.4.1 Login Screen

To check if login screen is working properly.

Table 6.20: Test Case for Login Screen

<i>TC_01</i>			
Login Screen			
<i>UC_01</i>			
System should have a visual studio.			
Steps	Tasks	Expected Output	Result
1	Open login screen.	Pass or Fail	Pass
2	Press login button.	Pass or Fail	Pass
3	Check if empty fields error is showing.	Pass or Fail	Pass

6.4.2 Register Screen

To check if register screen is working properly.

Table 6.21: Test Case for Register Screen

<i>TC_02</i>			
Register			
<i>UC_02</i>			
System should have a visual studio.			
Steps	Tasks	Expected Output	Result
1	Open Register screen.	Pass or Fail	Pass
2	Press register button.	Pass or Fail	Pass
3	Check if empty fields error is showing.	Pass or Fail	Pass

6.4.3 Forgot Password

To check if forgot password is working properly.

Table 6.22: Test Case for Forgot Password

<i>TC_03</i>			
Forgot Password			
<i>UC_03</i>			
System should have a visual studio.			
Steps	Tasks	Expected Output	Result
1	Open forgot password screen	Pass or Fail	Pass
2	Press submit button without entering email.	Pass or Fail	Pass
3	Check if empty field error is showing.	Pass or Fail	Pass

6.4.4 Skill Searching

To check if Skill Searching is working properly.

Table 6.23: Test Case for Skill Searching

<i>TC_04</i>			
Skill Searching			
<i>UC_04</i>			
System should have a visual studio.			
Steps	Tasks	Expected Output	Result
1	The skill search screen is open.	Pass or Fail	Pass
2	User searches for a skill that doesn't exist.	Pass or Fail	Pass
3	System shows "No skills found" instead of freezing.	Pass or Fail	Pass

6.5 Performance Testing

6.5.1 System performance testing

To evaluate the performance of our system.

Table 6.24: Test Case for System Performance

<i>TC_01</i>			
System Performance			
<i>UC_01</i>			
System should have a visual studio.			
Steps	Tasks	Expected Output	Result
1	Run the system.	Pass or Fail	Pass
2	Login to the system.	Pass or Fail	Pass
3	Navigate using navigation bar.	Pass or Fail	Pass
4	Select any skill card.	Pass or Fail	Pass
5	View the selected user's profile.	Pass or Fail	Pass
6	Send skill exchange request.	Pass or Fail	Pass
7	Logout from the system.	Pass or Fail	Pass

Chapter 7

Conclusion

As technology continues to grow, digital platforms to swap skills have quickly become an important resource for individuals and communities. SkillSwap captures this growing trend by providing a platform for users to share knowledge, learn new skills, and make new connections without a financial barrier. SkillSwap is not a traditional learning platform or freelance platform but a means to connect users using a time and credit based skill swap process that enhances affordability and inclusion. Building SkillSwap has been an incredible experience filled with learning opportunities in designing, developing, and implementing AI-powered features into great user experience. We have had our share of challenges, but we have worked through issues with modern tools, innovative frameworks, and an agile process. The whole development experience followed a thorough understanding of user and administrator requirements, and resulted in a secure, intuitive, and prescriptive platform.

7.1 Future Enhancements

Although we have made all efforts to create an app that satisfies the needs of the user and complies with our criteria, we realize that there is always space for development and that certain adjustments could be done in the future to further improve the user experience [15].

7.1.1 SkillSwap Website

In the future, a dedicated website can be developed to provide users with an alternative platform for accessing the system. This will ensure greater accessibility, allow usage on larger screens, and improve convenience for those who prefer web-based interaction.

7.1.2 Biometric Login Options

For added security and convenience, users may use their fingerprint or facial recognition to log in, which does not require a password and enforces only authorized access to the platform.

7.1.3 Offline Mode

Users can view their saved content even when not connected to the internet! That way, regardless of connectivity issues, users do not miss out on learning and communicating.

7.1.4 Multilingual Support

Implementing multilingual functionality will allow the application to support multiple languages, enabling users from different regions to interact seamlessly. This feature will enhance accessibility and improve user experience for a global audience.

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