Project Proposal

SWE 4900 Spring 2026

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CHAPTER ONE: INTRODUCTION

1.1 Introduction and Background

Skill exchange has been hindered due to mismatching between academic, training and industry demands, outdated curricula and weak channel links from the experts and the ones seeking the skills. Challenges include lack of experience, inadequate finances, limited digital innovations and poor coordination in skill development. This has led to unemployment, underutilization, limited access to resources, exclusion of low-income groups and discouraging of collaborative learning (Laura et al., 2018).

With the few digital platforms, people have been able to connect and share knowledge however, they are focused on paid services that leaves on gap for community-based and non-monetary skill exchange (Calls for Collaborative Action to Bridge Kenya's Skills Gap Report – Kenya News Agency, 2025). The proposed system, Ex-change, seeks to bridge this gap by providing a structured, secure, and AI-assisted web application that enables skill exchange without the need for money.

1.2 Problem Statement

Many communities have individuals with diverse and valuable skills but experience high levels of unemployment and underemployment. These skills are left underutilized or wasted because of the absence of reliable platforms that implement a fair and structured system or platforms that emphasize on financial transactions, formal credentials and competition that fails to include informal workers, students and marginalized groups.

This leads to a community that suffers from weak social channels, financial strain and limited growth opportunities. Therefore, the need for creating a trust-worthy, peer-to-peer exchange system that does not have monetary barriers that promotes accountability, transparency and efficiency.

1.3 Main objective

To design and develop a web application platform that allows users to exchange skills without the need for cash transactions.

1.4 Specific objectives

1. To design and implement a user authentication and profile management system.
2. To develop a skill listing module for offered and requested skills.
3. To create an exchange request and messaging workflow.
4. To implement a rating and review system for accountability and trust.

1.5 Significance

This solution is important because it will affect social cohesion, economic resilience and sustainability from ground level. By encouraging this form of exchange, communities reduce dependency on cash transactions, minimize waste and strengthen social bonds. Ex-change will promote collaboration, efficiency and inclusion. In addition, it includes an AI-driven approach that helps in skill matching that improves fairness, accessibility and efficiency when connecting people with complementary skills.

CHAPTER TWO: LITERATURE REVIEW

2.1 Global Perspective

1. Skillshare/Udemy: (Skillshare: Teaching, Marketing & Promotions Sampler Course, 2024)

This is a platform that offers paid online courses by implementing structured learning, high-quality curated content and scalable global platforms. Its weaknesses are it requires payments; it is unidirectional learning hence lacks community-based exchange.

2. Upwork: (Upwork, 2024)

This is a platform that focuses on skill marketplaces as freelancing. It focuses clear skill categorization, reputation system and large talent pools. Its major drawbacks are it is entirely money-driven, competitive and lacks collaboration or community spirit.

3. TimeRepublik: (Timerepublik, n.d.)

This is based on time-based skill exchange. It is non-monetary model and emphasizes on fairness and equality. Its disadvantages are its poor UX in many cases, weak matching algorithms and low adoption due to complexity.

2.2 African Perspective

1. Jiji Africa: (https://Jiji.co.ke/, n.d.)

This focuses on classified ads and includes skills and services. Its advantages are having a strong African user base, mobile access and wide category coverage. However, it lacks a structured skill exchange, no trust scoring skills and no learning-oriented design.

2. Gebeya: (Gebeya | Best of African Freelance Talent, 2023)

This focuses on tech talent matching for companies. It focuses on African skills and professional vetting. Its drawbacks are it only targets corporations, it is paid and selective and is not peer-to-peer.

2.3 Kenyan Perspective

Ajira Digital: (Ajira, n.d.)

Its focus is online work and digital skills. It is supported by the government and promotes digital literacy. However, it is not employment-focused and its formal structure limits peer collaboration.

2.4 Research gap bridge by Ex-change

1. Non-monetary exchange.

2. AI-assisted and driven approach.

3. Peer-to-peer exchange at a community level.

4. General inclusivity and equal opportunity.

5. Collaboration over competition.

6. Simpler exchange workflow.

7. Modern web technology.

8. Diverse skill categories.

9. No institutional control.

CHAPTER THREE: METHODOLOGY

3.1 Approach

The project will follow the Agile Scrum methodology with iterative development cycles. Each sprint will deliver a functional module of the system.

3.2 Preliminary investigation

User requirements were gathered through online research and observation from existing platforms.

1. Functional requirements
   a. User registration and login.
   b. Skill profile creation.
   c. Skill exchange request.
   d. Messaging.
   e. Rating and reviews.
   f. Admin moderation.
2. Non-functional requirements
   a. Security: JWT authentication.
   b. Usability: responsive UI.
   c. Performance: fast queries.
   d. Scalability.
   e. Availability.
   f. Data integrity.

3.3 Design phase

Tools and technology

1. Frontend: React.js and Tailwind CSS.
2. Backend: Node.js and Express.js.
3. Database: PostgreSQL.
4. Authentication: JWT-based authentication.
5. Data sources: User-entered skill data, exchange history and rating.

6. Tools: Git and GitHub, VS Code, Postman and pgAdmin.

CHAPTER FOUR: SYSTEM ANALYSIS AND DESIGN

4.1 System analysis and design

1. Models:

    a. User.

    b. Skills.

    c. Exchange request.

    d. Message.

    e. Rating and review.

2. Views:

    a. User dashboard.

    b. Skill listing page.

    c. Exchange request page.

    d. Messaging interface.

    e. Admin dashboard.

3. Database:

    a. Relation database schema using PostgreSQL.

    b. Normalized tables for users, skills, exchanges, messages and rating.

4. AI algorithms:

    a. Rule-based matching.

    b. Content-based matching.

    c. Future extensibility for ML-based matching.

4.2 Data flow diagram
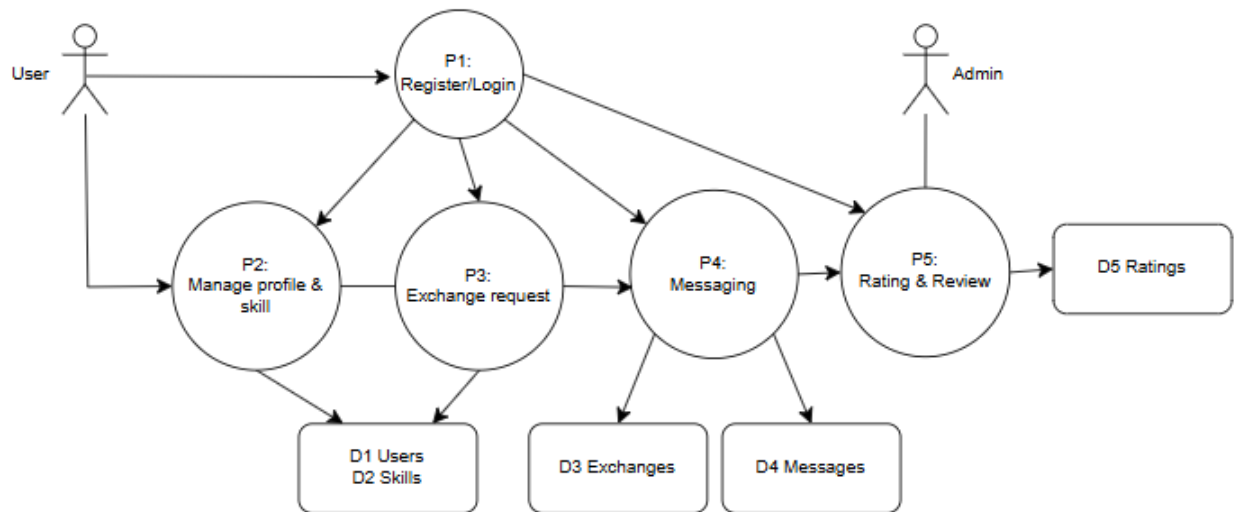
Diagram 1: Data Flow Diagram(DFD)
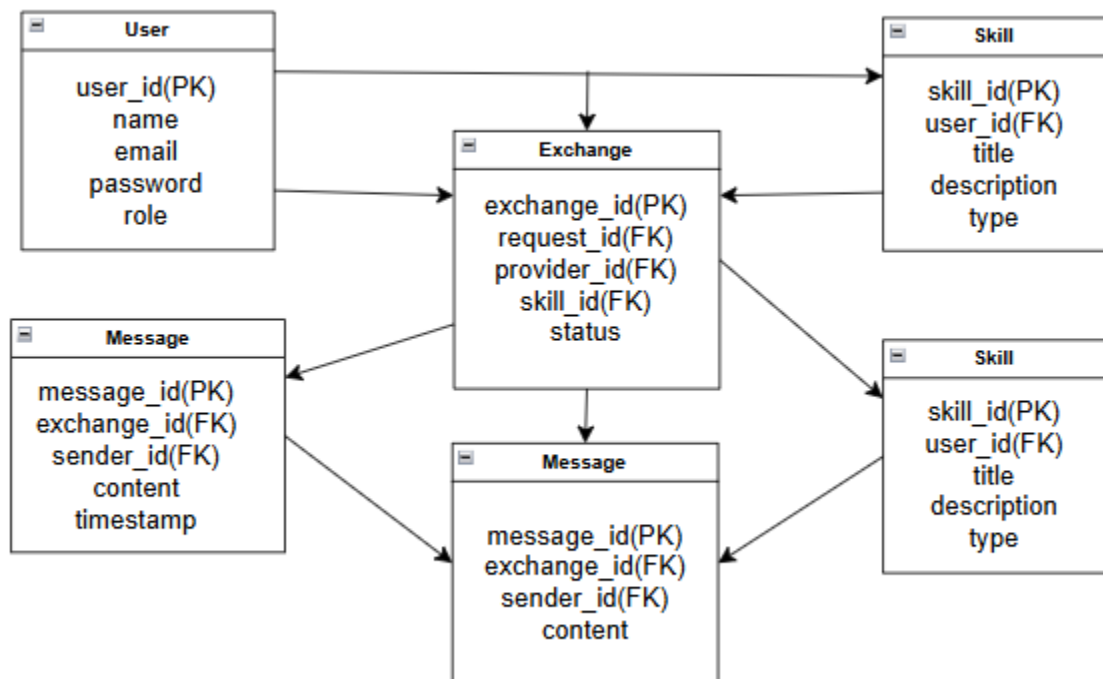
4.3 Entity relationship diagram

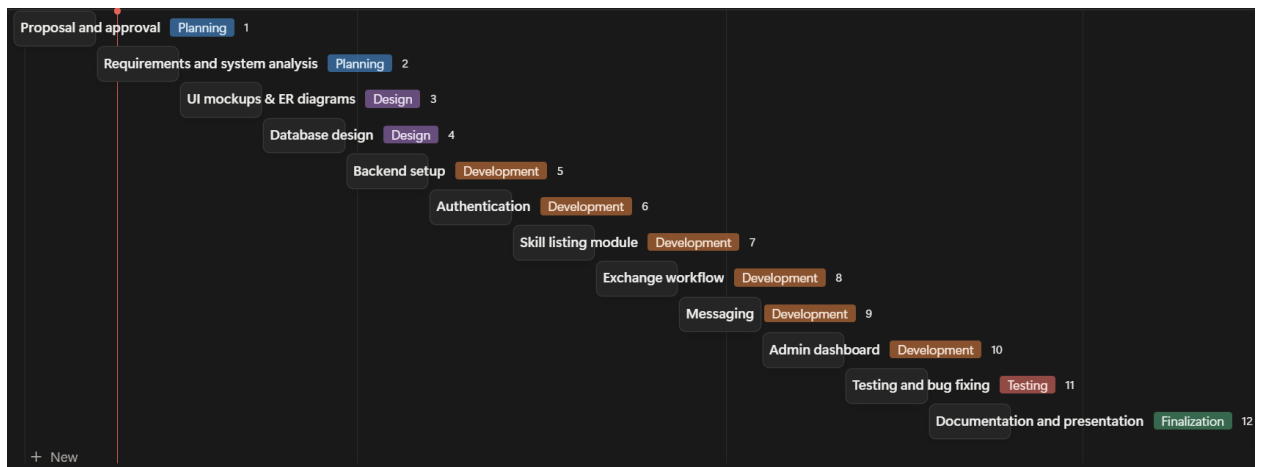Diagram 2: Entity Relationship Diagram(ERD)

4.4 Proposed timeline

Diagram 3: Gantt chart

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Appendix:

GitHub repo: https://github.com/Chantal-Marissa-Pande/Ex-change