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CollegeBay: A Resale Marketplace for College Students

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Abstract - The increasing costs of educational materials and essential goods for students have led to a growing demand for affordable alternatives. CollegeBay is an online reselling platform designed specifically for college students to buy and sell used textbooks, electronics, furniture, and other necessities. This study explores the objectives, design methodology, and implementation of CollegeBay, highlighting its role in facilitating cost-effective and sustainable exchanges within college communities. The platform incorporates features such as user verification, post moderation, and real-time chat, ensuring a trustworthy and efficient marketplace. The research methodology includes a literature review, comparative analysis, and user-centric design principles, leading to a structured implementation strategy. The findings suggest that CollegeBay has the potential to improve affordability and reduce waste, aligning with broader trends in the sharing economy. This research contributes to the understanding of student-driven e-commerce and highlights best practices for designing niche online marketplaces.

***Key Words*:** Online reselling, secondhand marketplace, college students, sharing economy, platform

1. INTRODUCTION

The evolution of Consumer-to-Consumer (C2C) e-commerce has significantly transformed the way individuals buy and sell goods, providing a cost-effective and sustainable alternative to traditional retail. Among various user groups, college students have a distinct need for affordable and easily accessible second-hand goods, including textbooks, electronics, furniture, and other essentials. Due to high retail prices and limited budgets, students frequently turn to resale platforms to find budget-friendly alternatives. However, existing platforms often fail to cater specifically to student communities, leading to inefficiencies in communication, trust, and transaction processes. To address these challenges, CollegeBay has been developed as an online reselling platform designed specifically for college students, enabling them to connect, negotiate, and finalize transactions through real-time chat.

Unlike other marketplaces that facilitate direct transactions, CollegeBay does not process payments or enforce fixed pricing models. Instead, it provides a secure and interactive environment where buyers and sellers can directly communicate, negotiate, and arrange transactions based on mutual agreement. This approach reduces platform dependency on transaction fees and enhances flexibility for users. Additionally, CollegeBay incorporates user verification mechanisms, intuitive search filters, and a streamlined listing process to ensure a trusted and user-friendly marketplace.

This study explores the development, implementation, and impact of CollegeBay as a specialized C2C resale marketplace for students. By analysing existing research on e-commerce, user trust, and online second-hand marketplaces, this research provides insights into optimizing student-focused resale platforms. The study also examines challenges in transactions, including trust-building strategies, negotiation dynamics, and platform usability enhancements.

The remaining of this paper is structured as follows: Section 2 outlines the objectives of the study, Section 3 presents a literature survey discussing relevant research and existing platforms, Section 4 describes the methodology used in developing CollegeBay, and Section 5 details the algorithmic approach implemented in the platform. Section 7 discusses the conclusion and future implications of the study, followed by references in the end. Through this research, we aim to contribute to the growing field of student-oriented e-commerce and offer insights into the development of efficient, secure, and negotiation-based online resale platforms.

2. OBJECTIVES

Simplify College Essentials Buying and Selling Process: Create an online platform (CollegeBay) that streamlines the buying and selling of used college essentials, making it easier and more convenient for students to acquire the resources they need.
Promote Sustainability: Foster a culture of reuse and recycling among students by providing a marketplace where they can buy and sell second-hand college supplies, thereby reducing waste and minimizing environmental impact.

User-Friendly Marketplace: Develop an intuitive user interface that allows students to create posts for buying or selling used college essentials.
Real-Time Messaging: Implement a messaging system that enables buyers and sellers to communicate directly in real-time.
Admin Panel: Create a comprehensive admin panel that monitors all posts, allowing administrators to track and manage the platform's content. The panel will also empower administrators to manually review and remove any posts containing vulgar or inappropriate content, ensuring the platform remains safe and respectful for all users.
Request Item: Users can request for items that are not present on the page.
Create Listing: Users will be able to create listing for the resource they want to sell.

3. LITERATURE SURVEY

Platforms such as OLX [1], Facebook Marketplace [2], Letgo [3], Carousell [4], Unilodgers [5], and StudentBeans [6] served as primary references that guided our design, implementation, and strategic approach.

OLX is among the most widely used platforms for listing second-hand goods and offers a clear model for user-generated classifieds [1]. It inspired our listing and browsing structure due to its simplicity and proven effectiveness. However, OLX operates on a very broad scale and is not designed with student-specific needs in mind. There is no guarantee that listings are relevant to campus life, nor does the platform enforce community verification or moderation in a structured manner.

Similarly, Facebook Marketplace offered an example of social integration done well [2]. The trust factor generated through the visibility of user profiles and the ability to communicate instantly via Messenger helped us understand the value of real-time chat in fostering smoother transactions. However, the lack of strict moderation on Facebook Marketplace often results in irrelevant or inappropriate listings.

Letgo and Carousell, both mobile-first platforms, further emphasized the importance of visual presentation and intuitive user interfaces [3][4]. Their card-style designs, with prominent images and brief product descriptions, allow users to browse quickly and efficiently. These visual and usability features directly influenced our decision to prioritize image-centric listings and a minimal, clutter-free design for UI (both on the web and mobile apps). However, as with previous platforms, these applications cater to a wide range of users and not specifically students, thereby missing an opportunity for niche personalization.

In addition to general-purpose marketplaces, we explored more student-specific platforms such as Unilodgers [5]. While it focuses primarily on accommodation, Unilodgers effectively utilizes university affiliations to verify users and create a sense of community. This served as an inspiration for building student-only access system, where registrations are tied to verified student credentials, ensuring that the marketplace remains secure and relevant to campus life. Likewise, platforms like StudentBeans [6], though focused on providing student discounts rather than product exchanges, offered us insights into how branding and communication could be tailored to appeal to a younger academic audience. The friendly and engaging tone of StudentBeans helped us craft a similar user-friendly onboarding experience that resonates with students.

C2C E-Commerce Growth C2C e-commerce platforms, like eBay and Taobao, have grown due to their focus on trust, security, and usability. Financial Challenges for Students College students face rising educational costs, especially for textbooks and other resources. Promoting reuse and recycling is critical for sustainability. User Engagement and Trust Successful e-commerce platforms prioritize user engagement, feedback systems, and secure payments. Sustainability Impact Platforms that facilitate the reuse of goods contribute to the circular economy, extending product lifecycles and reducing the demand for new resources, which helps lower the carbon footprint[7]. E-Commerce and C2C Platforms E-commerce platforms help expand markets and improve sales for businesses. Financial Solutions Through Digital Platforms Digital platforms can help reduce financial burdens. User Engagement and Experience Optimizing user experience is key to the success of ecommerce platforms. Reducing Environmental Impact Platforms help reduce the environmental impact by extending the lifecycle of goods, thus lowering the need for new resources and minimizing waste[8].

4. METHODOLOGY

The methodology of CollegeBay revolves around its core functionalities, ensuring a seamless and intuitive experience for users. The platform begins with a secure authentication system, allowing users to log in or sign up. Upon successful authentication, users are directed to their respective dashboards—regular users access a personal dashboard where they can manage listings, while admins oversee marketplace content from a dedicated admin dashboard. The post creation feature enables users to list products by providing details such as title, description, category, and images. Once submitted, these posts are stored in the database and associated with the user's profile. Users can also manage their listings through an

interface that allows them to edit or delete posts as needed.

The admin dashboard plays a crucial role in maintaining the integrity of the marketplace. Admins have access to all user-generated content and can approve & reject to ensure compliance with platform guidelines. This moderation process helps in filtering inappropriate content and enhancing the quality of available listings. Additionally, CollegeBay offers profile management features, enabling users to update their personal details, such as usernames, email addresses, passwords, and profile pictures. Any modifications are securely processed and stored, ensuring data protection and user privacy.

A key functionality of CollegeBay is its real-time chat feature, which facilitates direct communication between buyers and sellers. Instead of relying on external platforms, users can engage in negotiations, discuss product details, and coordinate transactions within the marketplace itself. This feature enhances convenience and fosters a shopping experience while maintaining privacy and security. To further streamline operations, the platform includes a post approval system, where admins review listings before they are published. This ensures that all marketplace content meets quality standards and prevents spam or misleading posts. Through these integrated functionalities, CollegeBay provides a comprehensive and student-friendly online marketplace, simplifying the process of buying and selling used goods within college communities.

5.ALGORITHM & PROCESS DESIGN

The algorithm and process design of CollegeBay is structured to provide a streamlined user experience while maintaining platform integrity through moderation and communication features. The system begins with login authentication, where users provide their email and password, which are verified against the database. If the credentials match, users are redirected to their respective dashboards—regular users to the main dashboard and administrators to the admin panel. For new users, the sign-up process ensures data validation, password hashing for security, and successful registration before redirecting them to the login page.

Once logged in, users can create listings through the post creation module, where they input product details such as title, description, tags, and images. The admin validates the information before making the post available to the public, linking it to the user's profile. Users can later manage their listings by editing or deleting them. Simultaneously, admins oversee the marketplace through a post moderation system, where they review submitted listings and decide whether to approve or reject them based on platform guidelines. Approved posts become publicly visible, while rejected ones may require modifications by the user.

To enhance user engagement, CollegeBay incorporates a profile management system, allowing users to update their information, including email, password, and profile picture. Any password updates are securely hashed before being stored in the database. A crucial addition to the platform is the real-time chat feature, which facilitates direct communication between buyers and sellers. When a user expresses interest in a listing, they can initiate a chat, enabling negotiations, product inquiries, and transaction coordination—all within the platform. This feature eliminates the need for third-party communication tools while maintaining user privacy.

The admin moderation system plays a vital role in maintaining marketplace quality. Administrators can access and review posts, ensuring that content adheres to guidelines. They can approve a post, making it live on the platform, or reject it, prompting the seller to revise the details. This ensures that listings remain relevant and appropriate for the student community. By integrating these structured processes, CollegeBay creates a secure, user-friendly, and interactive marketplace tailored for college students looking to buy and sell used goods.

6.DIAGRAMS

Fig -1: Database Schema Diagram

This ER diagram represents the CollegeBay platform's relational database schema, featuring interconnected tables such as User, Post, Request, Chat, Message, Notification, and Upvote. Each entity is normalized and linked using foreign keys to ensure referential integrity, support user interactions, enable real-time messaging, track activity, and maintain a secure and scalable marketplace environment.

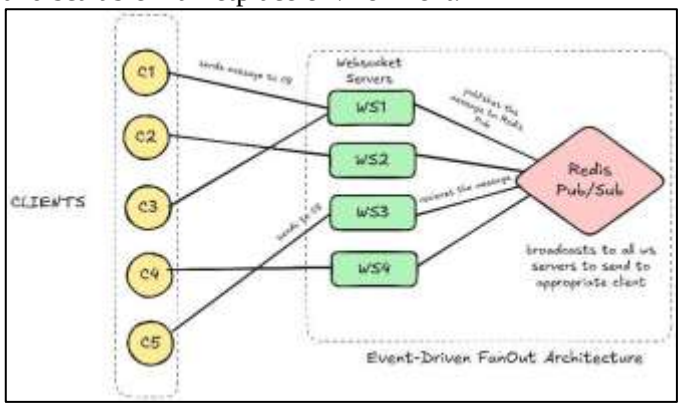

Fig -2: Real Time Chat Architecture Diagram

Architecture Summary:

The system is built for scalable, real-time communication with the following key components:

1. Client Layer:
   - Web (React.js) and mobile (React Native) apps.
   - Communicate via REST APIs; maintain WebSocket connections for real-time chat.
2. WebSocket Servers:
   - Cluster of servers (WS1–WS4) manage live connections.
   - Messages sent via WebSocket are published to Redis Pub/Sub.
3. Redis Pub/Sub:
   - Acts as a message broker, broadcasting messages across all WebSocket servers.
   - Ensures message delivery across server instances.
4. Backend & Database (PostgreSQL + Prisma ORM):
   - Manages business logic and persistent data (Users, Posts, Requests, Chats, etc.).
   - Prisma ensures secure, structured database access.

Real-Time Data Flow:

User C1 (on WS1) sends a message → WS1 publishes to Redis → Redis broadcasts → WS3 (connected to C5) delivers the message instantly.

This setup ensures real-time, low-latency communication, high reliability, and horizontal scalability.

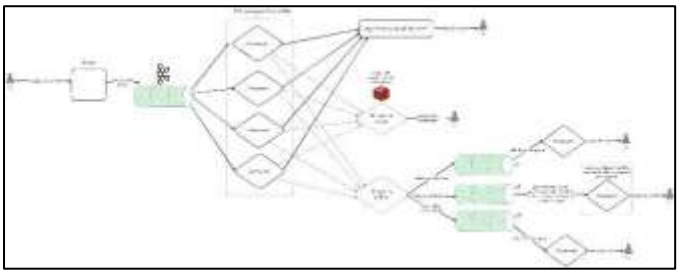

Fig -3: Notifications System Design

Notification System Summary:

The platform uses an event-driven architecture with Apache Kafka for handling notifications triggered by user actions (e.g., new listings, upvotes, messages).

System Flow Overview:

1. Event Trigger & Kafka Publishing
   - User actions (e.g., upvote, message) are captured.
   - Backend publishes events to relevant Kafka topics.
2. Kafka Consumers for Processing
   - Multiple consumers pull events concurrently for scalable processing.
   - Events are classified by type and user status (online/offline).
3. Notification Routing
   - High-Priority (e.g., OTPs): Instantly sent via email (Nodemailer).
   - Online Users: Receive real-time in-app notifications via WebSocket.
   - Offline Users: Events are routed into priority queues:
     - p0: Admin notifications
     - p1: Digest notifications
     - p2: New listing alerts
4. Queued Processing & Email Delivery
   - p0 → One-to-one emails
   - p1 → Batched digest emails (with cooldown & aggregation)
   - p2 → Email alerts for new listings

This setup ensures real-time feedback, scalability, and organized asynchronous notification delivery.

The UML Sequence Diagram outlines the interactions between users, the application, the database, and the admin. It starts with authentication, where users sign up or log in, and credentials are verified and stored. In post actions, users can create, edit, delete, or mark posts as sold, with each new post sent to the admin for review and approval or rejection. Similarly, request actions involve users creating item requests, which are reviewed by the admin. Profile management lets users view or update their profiles, while chat and communication enables user-seller messaging and notification viewing. The flow ends with a secure logout process, completing the user journey.

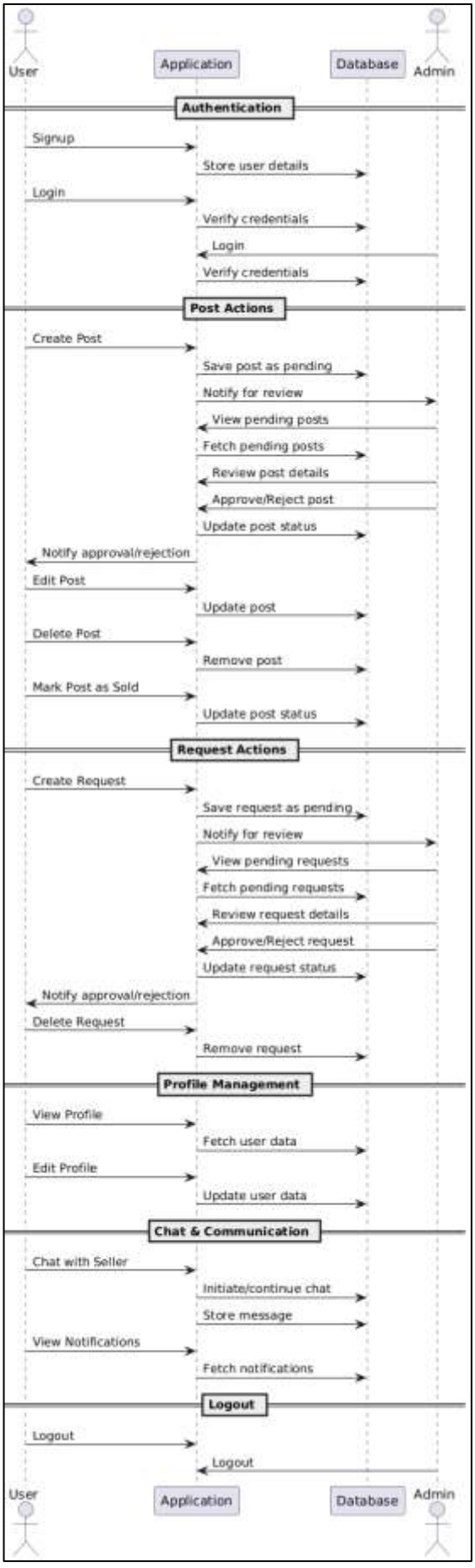

Fig -5: UML Sequence Diagram

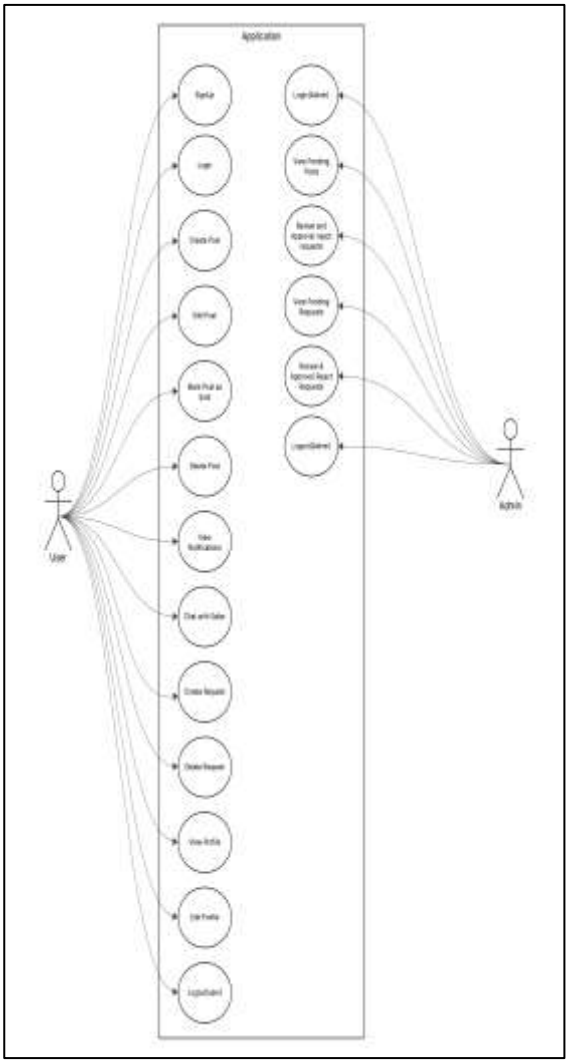

Fig -4: UML Use Case Diagram

The UML Use Case Diagram illustrates the interaction between two primary actors—User and Admin—with the system application. Users can perform actions such as signing up, logging in, creating and managing posts (including editing, deleting, or marking them as sold), viewing notifications, chatting with sellers, managing requests (creating and deleting), and handling profile functions (viewing and editing profile), as well as logging out. On the other hand, the Admin interacts with the application by logging in, viewing pending posts and requests, and reviewing and approving or rejecting them accordingly. Admins also have a logout functionality. This diagram highlights the complete functional scope of both users and administrators in maintaining and moderating the platform efficiently.

7.CONCLUSION

CollegeBay provides a cost-effective and sustainable marketplace tailored for students, enabling them to buy and sell essential items with ease. By integrating real-time chat for direct negotiations, a streamlined post management system, and an admin moderation process, the platform ensures a secure and

user-friendly experience. Unlike traditional e-commerce platforms, CollegeBay fosters a community that promotes affordability and sustainability by encouraging the reuse of goods. As it continues to evolve, the platform aims to enhance user engagement, strengthen trust mechanisms, and expand its features to better serve the student community. Ultimately, CollegeBay envisions a more accessible, budget-friendly, and eco-conscious college marketplace where students can efficiently acquire and exchange resources without financial burden.

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