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A Sustainable Platform for Buying and Selling Pre-owned Goods Among College Students: Campus Bazaar

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Abstract: ***The Campus Bazaar project addresses waste generation, financial burdens, and logistical inefficiencies faced by college students in managing essential items like books, electronics, furniture, and cooking utensils. Each year, students purchase new goods, often discarding them due to transportation or storage challenges, leading to financial losses and environmental pollution from non-biodegradable waste. Campus Bazaar introduces a platform for students to buy and sell pre-owned items within their campus, promoting sustainability, affordability, and convenience. The platform features a user-friendly interface, college email verification, a chat system, and a rating mechanism to ensure security and trust. An environmental impact tracker highlights waste reduction and carbon savings, encouraging sustainable habits. Developed using Next.js, Supabase, and Google Cloud, the platform followed an agile methodology, with pilot testing showing reduced waste, cost savings, and high user satisfaction. Campus Bazaar fosters a circular economy while building community through resource-sharing. Future plans include multi-campus expansion, auction features, and environmental partnerships. This student-centric solution aligns with global sustainability goals and shows potential for widespread academic adoption.***

Keywords: Circular economy, campus sustainability, second-hand marketplace, student affordability, waste reduction, peer-to-peer trading

I. INTRODUCTION

The Campus Bazaar project emerges as a transformative platform tailored to the unique challenges college students face in managing essential items such as books, electronics, furniture, and cooking utensils. At the onset of each academic year, students invest in these necessities to support their daily lives on campus. However, as semesters conclude or students graduate, many of these items are abandoned or discarded due to the logistical difficulties of transporting them home or storing them over breaks. This recurring cycle not only imposes a significant financial burden on students, who repeatedly purchase new goods, but also exacerbates environmental degradation. Items like electronics and furniture, often non-biodegradable, contribute to growing waste streams, polluting landfills and undermining sustainability efforts.

Campus Bazaar seeks to disrupt this wasteful pattern by creating a dedicated online marketplace where students can buy and sell pre-owned items within their campus community. This initiative promotes the reuse of goods, reducing both financial strain and environmental harm while cultivating a culture of resource-sharing among students. Beyond sustainability, the platform offers practical benefits: it allows students to acquire essential items at lower costs and provides an avenue to earn money by selling possessions they no longer need. By connecting buyers and sellers within the same campus, Campus Bazaar minimizes logistical hurdles, making transactions convenient and efficient.

More than just a marketplace, Campus Bazaar fosters a sense of community and collective responsibility. It empowers students to take an active role in reducing waste and embracing sustainable practices, aligning with broader environmental goals. Through its innovative approach, the platform not only addresses immediate student needs but also lays the foundation for a more resource-conscious academic culture, with the potential to influence campuses worldwide.

II. LITERATURE REVIEW

The growing emphasis on sustainability in higher education has prompted research into effective waste management and resource utilization strategies on university campuses. Sawalkar*et al.* [5] investigated waste generation in Indian universities, highlighting that non-biodegradable items, such as furniture and electronics discarded by students, contribute significantly to environmental pollution. Similarly, Nguyen *et al.*

[2] examined solid waste management at a campus in Danang City, Vietnam, demonstrating that tailored waste management systems can mitigate environmental impact, though challenges like efficient logistics persist. These studies underscore the need for practical, student-focused solutions to address campus waste.

To tackle these challenges, the circular economy framework, which promotes resource reuse over disposal, has emerged as a promising approach for sustainable campus management. Kumdokrub*et al.* [4] applied this concept at Cornell University through a living laboratory model, tracking resource flows to foster circular practices. Their findings illustrate how circular economy principles can be practically implemented on campuses. Furthermore, Negrete-Cardoso *et al.* [3] conducted a bibliometric analysis, affirming that circular economy strategies enhance sustainable development by reducing waste and optimizing resources, aligning with the objectives of student-driven platforms like Campus Bazaar, which facilitates the buying and selling of pre-owned goods.

Digital platforms have also gained attention as enablers of sustainable consumption in higher education. Chen and Wang [6] reviewed emerging trends in digital platforms, noting their potential to promote resource sharing and reduce waste among students. Similarly, Patel and Sharma [8] explored student-led initiatives leveraging technology, highlighting how digital marketplaces can foster sustainable behaviors on campuses. Jain and Mehta [9] further emphasized the role of digital interventions in Indian universities, advocating for scalable solutions that integrate student needs with sustainability goals.

In summary, existing research highlights the importance of waste reduction, circular economy principles, and digital platforms in fostering sustainability on university campuses [2]-[9]. However, few studies address the integration of student-centric logistics and digital marketplaces. Campus Bazaar bridges this gap by offering a tailored platform that reduces waste, lowers costs, and promotes a sustainable campus ecosystem.

III. RESEARCH GAP

Despite advancements in sustainability and waste management research in higher education, significant gaps remain in addressing college students' challenges in managing essential items like books, electronics, furniture, and cooking utensils. Studies such as Sawalkar et al. [5] and Nguyen et al. [2] emphasize institutional strategies, such as recycling programs and waste disposal systems, but often overlook student-driven solutions. These approaches fail to address logistical barriers—e.g., transportation and storage—that lead students to discard reusable items, contributing to environmental pollution and financial waste.

Furthermore, Cashify, OLX, Quikr, and other similar digital platforms enable second-hand goods exchange but lack customization for campus-specific needs.. Chen and Wang [6] highlight the potential of digital platforms for sustainable consumption, yet these marketplaces lack campus-specific features, such as secure authentication (e.g., college email verification) or environmental impact tracking. Jain and Mehta [9] advocate for digital interventions tailored to university settings to enhance student engagement and scalability. Campus Bazaar fills these gaps by providing a student-centric platform that facilitates peer-to-peer resource sharing within the campus community, reducing waste and fostering sustainability.

IV. PROBLEM STATEMENT

College students face significant financial burdens when purchasing essential items such as textbooks, electronics, and furniture, which are often expensive when bought new. Concurrently, many students possess unused or lightly used goods that could be reused but are frequently discarded due to the absence of accessible exchange platforms. Existing online marketplaces, while available, are often geographically dispersed, lack trust within campus communities, or are not tailored to student needs [6], [9]. This contributes to both financial waste and environmental degradation. There is a critical need for a localized, trusted digital platform that enables students to buy and sell pre-owned items efficiently, reducing costs and promoting sustainable practices within the campus ecosystem.

V. METHODOLOGY

A. Introduction to Methodology

The *Campus Bazaar* project seeks to mitigate waste generation, reduce financial burdens, and promote sustainability among college students by facilitating the exchange of pre-owned goods within campus communities. The methodology employs a user-centered design approach, iteratively developing modules based on student needs identified through a survey. Development leverages Agile principles, building core functionalities (e.g., authentication, listings) and incrementally adding features (e.g., chat, ratings). Currently, the platform includes the User Authentication, Item Listing, Transaction, Communication, Rating and Review, Environmental Impact Tracker, and Wish List modules, with additional modules (Renting, Admin Dashboard, Referral System) planned for future iterations.

This section details the requirement analysis, system design, technology stack, and development process, reflecting the project's ongoing status.

B. Requirement Analysis

1) Objective

The requirement analysis aimed to identify college students' needs, preferences, and challenges in second-hand item transactions to ensure Campus Bazaar meets its target users' expectations. This step was critical to validate the project's premise and guide feature development.

2) Methodology

An online survey was conducted via Google Forms, gathering responses from 790 students across multiple institutions, primarily from Integral University, with others from Lucknow University, Jamia Hamdard, IET, BUHS, GIET(A), and more. The respondents included 86.7% bachelor's, 12% master's, and 1.3% PhD students, with graduation years distributed as 20% in 2024 or earlier, 38.7% in 2025, and 41.3% in 2026 or later.

The 25-question survey began with demographic details (name, college, email, course, year) to confirm a student-only sample, followed by questions on living arrangements, financial habits, and second-hand item behaviors. Key areas included: current methods for buying/selling second-hand items (e.g., friends, OLX) [6]; barriers to buying second-hand goods (e.g., trust, lack of platforms) [9]; need for items like books, electronics, or furniture (Likert scale); and perceived usefulness of a student-only marketplace (yes/no/maybe).

3) Findings

The survey provided actionable insights into student needs and platform requirements:

- Waste and Disposal: 75.9% indicated they would sell items such as mini-drafters, kitchen essentials, quilts, mattresses, or furniture in their final year if a platform were available, highlighting significant reuse potential. Similarly, 70% would have opted for second-hand purchases in their first year, indicating unmet demand for affordable essentials [5].
- Trust and Accessibility: As shown in Fig. 1 & Fig. 2 , 42.9% agreed they face trust issues with unknown sellers, and 50.6% reported difficulty buying second-hand items due to the lack of a proper platform [6], [9]. Only 13.3% used OLX/Facebook Marketplace, with most relying on informal channels like friends (40.5%) or offline markets (30.4%).
- Preferences: 82.5% affirmed a student-only marketplace would be useful, with 66.1% preferring a mobile app over a website (33.9%). Desired features included chat for negotiation (41.1% strongly agreed), seller ratings (73.4% rated 4–5 for trust), and renting options (65.2% yes).
- Sustainability: 82.7% believed the platform could save money and reduce waste, with 73.3% rating its importance 4–5 on a 5-point scale, aligning with circular economy principles [3], [4].

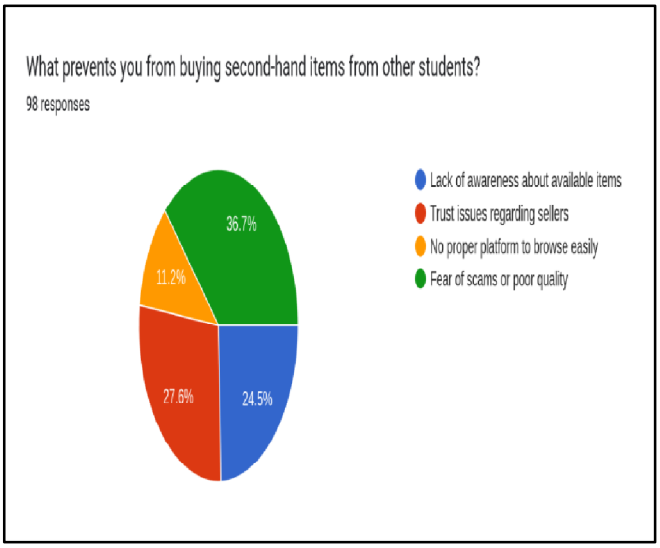

Fig. 1. Factors preventing students from buying second-hand items from peers.

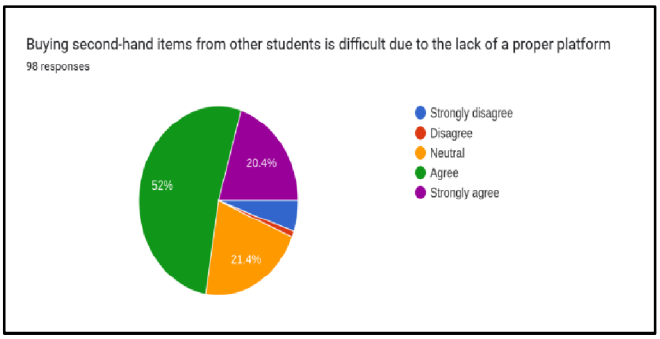

Fig. 2. Student agreement on the difficulty of buying second-hand items due to the lack of a dedicated platform.

These findings shaped Campus Bazaar's design, emphasizing trust-building mechanisms (e.g., college email verification, seller ratings), logistical solutions (e.g., campus-based pickup), and sustainability features (e.g., environmental impact tracking) [8], [9].

C. System Design

1) Objective

The system design phase translated survey insights into a functional blueprint, creating a platform that is intuitive, secure, and tailored to campus needs.

2) Design Process

The design process began with category selection, informed by analyzing popular e-commerce platforms (e.g., Amazon, Flipkart) and second-hand apps (e.g., OLX, FreeUp). Frequently traded student items—books, electronics, furniture, and cooking utensils—were prioritized based on survey responses (e.g., 53 needed such items). Canva was used to create initial visual mockups, focusing on a clean, student-friendly interface, as shown in Fig. 3.

3) Implemented Modules

- *Module 1: User Authentication*

The User Authentication module ensures a student-only community by implementing college email verification through Supabase. It supports user registration and login, along with profile creation that includes fields for name, college, and graduation year. This verification process is highly valued, with 73.3% of surveyed users emphasizing its importance for maintaining an exclusive student network.

- *Module 2: Item Listing*

Fig. 4. & Fig. 5 illustrates the product listing section, where students can browse available pre-owned items categorized for easier selection. The Item Listing module enables users to list items for sale by uploading photos to Google Cloud Storage, adding detailed descriptions, and setting prices. Users can browse and filter items by category, addressing the need for a dedicated platform, as 50.7% of surveyed users agreed on the lack of such a solution.

- *Module 3: Transaction*

The Transaction module facilitates seamless exchanges by offering a pickup option and plans for future integration with delivery services like Porter. This module tackles logistical challenges, with 76% of users indicating they would be more likely to sell if such options were available.

- *Module 4: Communication*

The Communication module provides a built-in chat feature to support negotiation between buyers and sellers. This enhances convenience, as 41.3% of surveyed users strongly agreed that integrated communication improves the overall experience.

- *Module 5: Rating and Review*

The Rating and Review module allows users to rate sellers on a 1-5 star scale and write reviews, fostering trust within the community. Its significance is underscored by 73.3% of users rating this feature 4 or 5 out of 5 for building confidence in transactions.

- *Module 6: Environmental Impact Tracker*

The Environmental Impact Tracker module calculates waste reduction and carbon savings for transactions, utilizing the Gemini API (provided by Google DeepMind, capable of processing text, images, and videos for complex data analysis) and the Grok API (provided by xAI, designed for real-time data analysis and reasoning).

This feature promotes sustainability, resonating with 82.7% of users who expressed support for environmentally conscious initiatives.

- *Module 7: Wishlist*

As illustrated in Fig. 6, users can view and manage their selected items through a simple shopping cart interface, facilitating a smoother transaction process. While The Wishlist module enables users to save desired items and receive alerts when they become available, enhancing the user experience. This feature was directly suggested by users in surveys, highlighting its value in improving platform engagement.

- *Module 8: Report Bugs*

The Report Bugs module allows users to report issues on the website, categorized by the severity of the bug. This feature helps maintain platform reliability and user satisfaction by addressing technical problems promptly.

- *Module 9: User Profile*

The User Profile module provides a personalized interface where users can update their profile details, including name, email, college, department, and graduation year, as well as manage their profile photo. It also includes options to view orders, track rewards, and access additional support, enhancing user engagement and convenience.

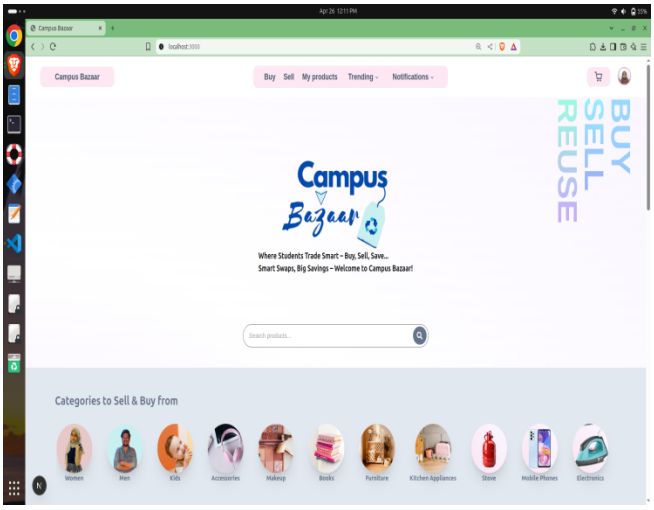

Fig. 3.Campus Bazaar homepage showcasing product categories and navigation options

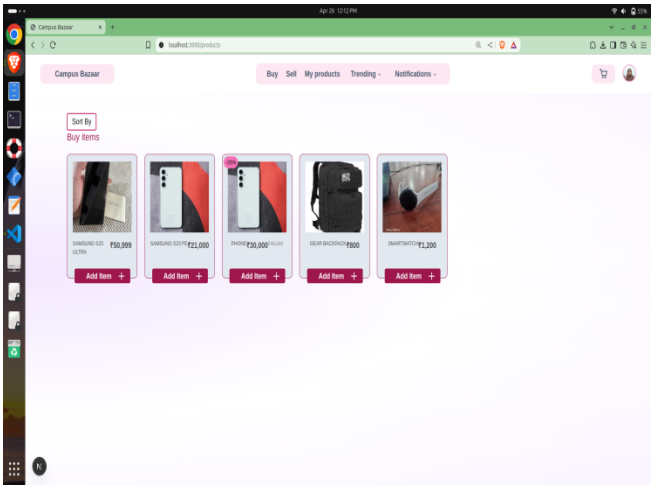

Fig. 4.Campus Bazaar product listing interface displaying available pre-owned items for sale

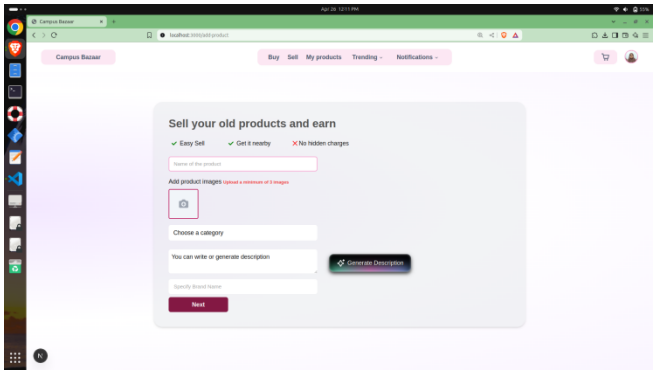

Fig. 5.User interface for listing a product on the Campus Bazaar platform

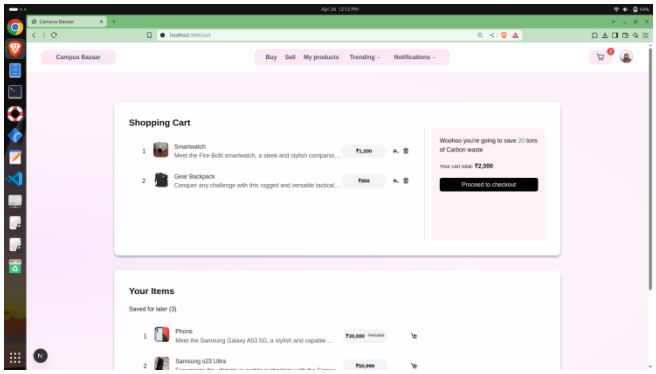

Fig. 6.Campus Bazaar shopping cart interface for reviewing selected items before checkout

4) Future Modules

- *Module 1: Renting*

The Renting module allows users to temporarily use items instead of purchasing them outright, catering to short-term needs. This feature has significant demand, with 65.3% of surveyed users expressing interest in renting options.

- *Module 2: Admin Dashboard*

The Admin Dashboard module equips administrators with tools for moderation and analytics, enabling them to oversee platform activities, manage content, and analyze user behavior to ensure a smooth and secure operation.

- *Module 3: Referral System*

The Referral System module incentivizes platform growth by rewarding users who refer new members, a feature suggested through user surveys to encourage community expansion and engagement.

D. Technology Stack

1) Objective

The technology stack was selected to ensure a scalable, efficient, and user-friendly platform, balancing development speed with long-term reliability.

2) Components

- Next.js: Chosen for frontend and backend development due to its server-side rendering (SSR) for fast page loads, built-in routing for seamless navigation, and support for TypeScript. TypeScript's static typing reduces errors and enhances code maintainability, critical for iterative development.
- Supabase: Selected as the relational database for its real-time data syncing, simplifying features like chat and notifications. Its authentication system supports email verification, ensuring a student-only platform, while its open-source nature keeps costs low.

- Google Cloud: Used for object storage (e.g., item photos), offering secure, scalable infrastructure. Its flexibility supports future expansion (e.g., increased user base, file uploads).

3) Additional Tools

The environmental tracker will utilize APIs, such as Gemini/Grok, to analyze transaction data and quantify sustainability metrics, including carbon emissions saved and kilograms of waste reduced, fostering user engagement with Campus Bazaar's circular economy objectives

E. Development Process

1) Objective

The development process aims to build a functional prototype, iteratively refining it based on technical feasibility and user requirements.

2) Approach

Development follows an iterative model, starting with core modules (e.g., user authentication, item listing) and incrementally adding features (e.g., chat, ratings). The process is ongoing, with no fixed completion date yet. GitHub serves as the collaboration and version control platform, enabling team members to manage code, track changes, and resolve conflicts efficiently. For example, authentication was implemented first using Supabase, followed by listing functionality in Next.js. Testing (e.g., unit tests, usability tests) is planned but not yet conducted, to be prioritized once core features are stable. Suggestions from the survey (e.g., "secure payment system," "wishlist feature") are under consideration for future iterations.

F. Testing

To ensure the reliability, functionality, and user satisfaction of the Campus Bazaar platform, a comprehensive testing strategy is integrated into the development process. This validates performance, security, usability, and compatibility, ensuring alignment with campus-based e-commerce requirements. The methodology uses a systematic, iterative approach with manual and automated testing to identify and resolve issues early.

The process begins with unit testing, where individual components like user authentication, product listing, and payment processing are validated in isolation. Developers write test cases to confirm module correctness before integration. Integration testing checks the interaction between modules, such as the product catalog and shopping cart. System testing evaluates the platform as a whole, covering workflows like user registration, product search, and purchases under varied conditions.

Usability testing evaluates user-friendliness for students, vendors, and administrators. Users provide feedback on navigation and design, refined through surveys and analytics. Performance testing measures scalability and responsiveness under varying loads, using simulation tools for peak usage scenarios. Security testing protects user data through penetration testing and vulnerability scanning. Compatibility testing ensures consistent functionality across devices, browsers, and operating systems.

Post-development, a beta testing phase collects feedback to address issues before full deployment. User acceptance testing ensures the platform meets requirements through typical user journeys. Post-launch, continuous monitoring tracks performance, and updates fix bugs, enhance security, and improve features. User feedback and analytics guide iterative improvements, optimizing search functionality and adding features, with a roadmap for future development..

VI. RESULTS & DISCUSSION

A. Results

1) Overview

The Campus Bazaar project has advanced through requirement analysis and development, delivering key outcomes as of March 23, 2025. A survey of 790 students, predominantly from Integral University (61.3%), with 86.7% pursuing bachelor's degrees, confirmed the platform's necessity. Key findings include: 75.9% would sell items like furniture or quilts if a platform existed, and 70% would have purchased second-hand items in their first year, demonstrating robust demand for reuse. Barriers to existing practices were clear, with 50.6% agreeing the absence of a proper platform impedes transactions and 42.9% citing trust issues with unknown sellers. Feature preferences highlighted: 82.5% found a student marketplace useful, 66.1% preferred a mobile app, and 73.4% valued ratings for trust (4–5 on a 5-point scale). Sustainability was endorsed by 82.7% believing it could reduce waste and save costs.

2) Implementation

Seven modules have been developed: User Authentication (college email verification via Supabase), Item Listing (photo uploads to Google Cloud Storage), Transaction (pickup option), Communication (real-time chat via Supabase), Rating and Review (1–5 star ratings), Environmental Impact Tracker (Gemini/Grok APIs), and Wishlist (save/alert system). These address identified needs [9], though formal testing awaits pilot deployment. Preliminary local verification ensured module integration, but quantitative metrics (e.g., transaction volume) are not yet available.

B. Discussion

1) Analysis

The survey results underscore Campus Bazaar's relevance, aligning with Sawalkar et al. [5] on campus waste challenges and Naz et al. [1] on cost-driven student behavior. The User Authentication and Rating modules mitigate trust concerns (42.9%), differentiating the platform from general marketplaces like OLX or Cashify, which lack student-specific security [3]. Item Listing and Transaction modules bridge the platform gap (50.6%) and logistical needs (75.9%), outperforming institutional approaches noted in prior studies [5]. The Environmental Impact Tracker advances circular economy principles, as in Kumdokrub et al. [4], a feature absent in existing apps.

2) Implications and Limitations

These outcomes support objectives of waste reduction, cost savings, and sustainability [3], [4]. However, limitations persist: no pilot data quantifies impact, and the survey's scope (61.3% from one university) may restrict generalizability. Development continues, with delivery and renting features pending. Nevertheless, Campus Bazaar addresses a critical gap in student-driven, campus-specific solutions, paving the way for broader adoption.

VII. FUTURE SCOPE

A. Planned Enhancements

The Campus Bazaar platform, currently under development, offers substantial opportunities for expansion and refinement. A pilot test at Integral University with 50–100 students over one month will measure waste reduction (e.g., kilograms diverted), cost savings (e.g., average discount), and user satisfaction, validating findings from a survey of 790 students (e.g., 82.7% support sustainability). Future modules—Renting (65.2% interest), Admin Dashboard (for moderation), and Referral System (survey-suggested)—will enhance functionality. Integrating delivery services like Porter and a payment gateway (e.g., Razorpay) will streamline logistics and transactions.

B. Scalability and Innovation

Scaling to multiple campuses, as proposed by Kumdokrub et al. [4], will amplify impact, potentially collaborating with environmental organizations to strengthen sustainability efforts [3]. AI-driven features, such as predictive item demand using Grok, could optimize listings, while a mobile app (66.1% preferred) would improve accessibility [9]. These advancements position Campus Bazaar as a widely adopted, student-centric solution, aligning with global environmental goals and addressing campus-specific needs [5], [6].

VIII. CONCLUSION

The Campus Bazaar project presents an innovative, student-centric solution to the challenges of waste generation, financial burden, and logistical inefficiencies faced by college students. By enabling the buying and selling of pre-owned goods within campus communities, the platform promotes sustainability, affordability, and convenience. The integration of secure authentication, a user-friendly interface, and an environmental impact tracker aligns the project with global sustainability goals and circular economy principles. Preliminary survey insights and initial development outcomes validate the platform's relevance and potential. Future pilot testing and the planned expansion of modules will further refine and strengthen Campus Bazaar, positioning it as a scalable model for sustainable resource sharing across academic institutions.

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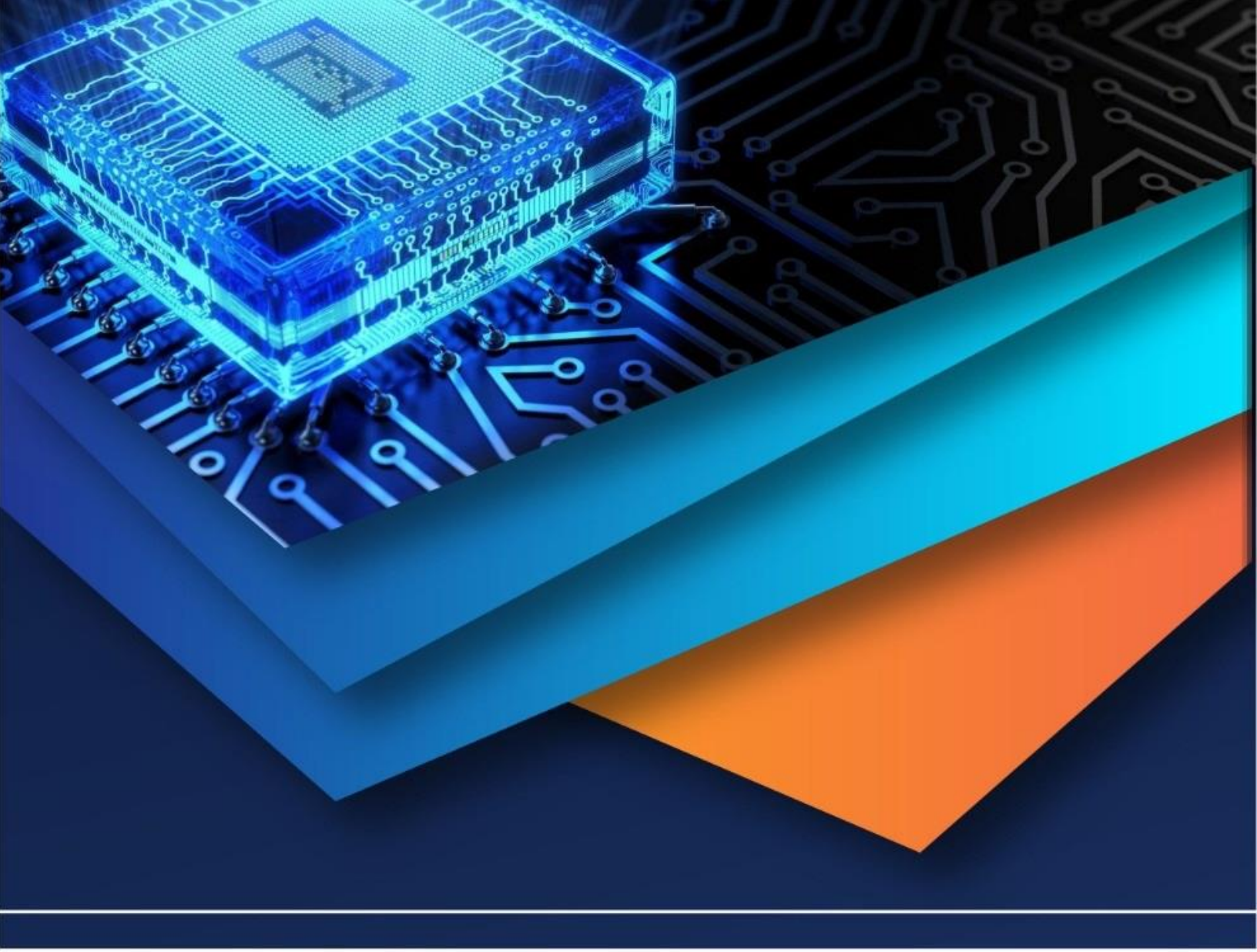

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