A

**MAJOR PROJECT REPORT**

On

**“KNIT KART – KNIT’s Arcade of Recycled Treasures”**

Submitted by

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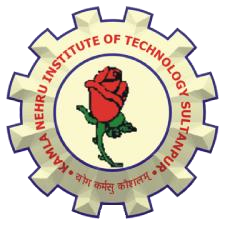
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**CERTIFICATE**

**T**his is to certify that **Arshil Amaan Ansari (22709), Rahul Saini (22742), Rakesh Kumar (22743), Shantanu Saini (22751)** have carried out the project work in this report entitled “KNIT KART – KNIT’s Arcade of Recycled Treasures” for the award of **Master of Computer Application** at **Kamla Nehru Institute of Technology**, affiliated to **Dr. A. P. J. Abdul Kalam Technical University**, Lucknow. This report is the record of the candidates’ own work carried out by them under our supervision and guidance. This project work is the part of their Master of Computer Application curriculum. Their performance was excellent and we wish them good luck for their future endeavours.

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**ABSTRACT**

**K**NIT KART is a platform designed to foster sustainable practices and community engagement among hostellers by facilitating item exchanges. This project aims to address the surplus of unused items in hostel environment by providing a platform where users can trade items they no longer need for items they require, thereby promoting a circular economy model within hostel communities. Through personalized surveys and comparative analysis with platforms like OLX.in, KNIT KART emerged as a solution to overcome the limitations of traditional ad-centric platforms. The platform prioritizes community engagement and direct item exchanges over monetary transactions. The implementation phase focused on collaborative development practices, iterative design iterations, and technology integration using modern tools like CSS Modules, Tailwind CSS, and ShadCN UI. Challenges in feature development, integration complexity, and scalability considerations were addressed through adaptive problem-solving and teamwork. As KNIT KART enters user adoption, strategies are aimed at enhancing community engagement and ensuring continuous improvement. The platform represents more than just a trading platform; it embodies a dynamic ecosystem committed to sustainability and positive user experiences. This report presents the development journey and key insights gained from the KNIT KART project, emphasizing its significance in promoting sustainability and fostering community interactions within hostel settings.

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**INTRODUCTION**

**I**n recent years, the rapid growth of e-commerce and online marketplaces has transformed the landscape of buying and selling goods, offering convenience and accessibility to consumers worldwide. However, within specific communities such as hostel environments, a distinct challenge arises concerning the surplus and underutilization of items among residents. Hostellers often accumulate various items during their stay, ranging from electronics and appliances to clothing and accessories. As their needs and preferences evolve, many of these items become redundant or unused, leading to a buildup of surplus goods within hostel rooms.

This project seeks to address the prevalent issue of surplus and underutilization of items in hostel communities by developing a novel platform called KNIT KART. Unlike traditional e-commerce platforms that primarily facilitate monetary transactions, KNIT KART is designed to foster item exchanges and promote a circular economy within hostel environments. The platform encourages hostellers to trade their unused items with others in exchange for things they need or value, thereby minimizing waste and promoting sustainable practices.

**Motivation**

The motivation behind KNIT KART stems from the observed surplus of unused yet valuable items in hostel rooms. Many hostellers possess items that they no longer need or use, which often end up being discarded, contributing to unnecessary waste. By creating a platform that facilitates item exchanges and encourages reuse, KNIT KART aims to reduce this wastage and promote a more sustainable lifestyle among hostel residents.

**Problem Statement**

Hostel environments present a distinct challenge when it comes to efficiently facilitating item exchanges among residents. Unlike traditional households, hostellers often face limitations in storage space and frequently transition between living arrangements, leading to a buildup of surplus and underutilized items. Existing classified platforms, such as general e-commerce websites or marketplaces like OLX.in, primarily focus on monetary transactions and individual ad listings, which do not cater effectively to the unique needs of hostel communities.

The inadequacy of current platforms in addressing the specific requirements of hostel residents highlights the necessity for a tailored solution. This project recognizes the demand for a platform that promotes direct item swaps, fosters community engagement, and encourages resourceful interactions among hostellers. By facilitating a dedicated platform for item exchanges within hostel communities, KNIT KART aims to bridge this gap and provide a more effective means of managing surplus items while promoting sustainable practices.

Key challenges identified include:

* Limited avenues for hostellers to exchange items directly without involving monetary transactions.
* Lack of community-oriented features in existing platforms, resulting in missed opportunities for fostering trust and camaraderie among users.
* Inefficient use of resources and accumulation of unused items within hostel environments due to the absence of a specialized exchange platform.
* Addressing these challenges requires the development of a platform that not only facilitates item exchanges but also promotes a sense of community and encourages responsible consumption practices among hostel residents.

**Objectives**

The objectives of KNIT KART are aligned with promoting sustainability, community well-being, and responsible consumption within hostel environments. The project aims to achieve the following:

1. **Minimize Waste and Promote Reuse:**

* Facilitate the exchange and reuse of items among hostel residents, reducing the generation of waste and promoting a culture of resourcefulness and sustainability.
* Encourage users to repurpose and find new homes for their unused items, contributing to the reduction of environmental impact associated with manufacturing and disposal.

1. **Foster Community Engagement and Collaboration:**

* Create a vibrant and interconnected hostel community through meaningful interactions and shared experiences facilitated by KNIT KART.
* Foster a sense of camaraderie and trust among users, promoting social connections and mutual support within the community.

1. **Promote Eco-Friendly Practices:**

* Raise awareness about environmental conservation and sustainable living practices among hostel residents through the platform's educational resources and initiatives.
* Encourage users to make eco-conscious choices by actively participating in the circular economy and contributing to the reduction of their ecological footprint.

**Summary**

In summary, KNIT KART is envisioned as an innovative solution to tackle the surplus of unused items in hostel environments. By leveraging technology and community engagement, the platform aims to foster sustainable practices and collaborative living among hostellers.

**LITERATURE SURVEY**

**T**he literature survey conducted for the KNIT KART project involved a comprehensive analysis of existing platforms and methodologies related to item exchanges, circular economies, and community-driven initiatives. This section presents a summary of the methodologies and findings derived from the survey.

**Methodologies**

The literature survey encompassed the following methodologies:

1. **Review of Existing Platforms:**

* Analysis of popular online marketplaces and classified platforms such as OLX.in, eBay, and Craigslist to understand their approaches to item exchanges and user interactions.
* Evaluation of the strengths and limitations of these platforms in facilitating direct item swaps and fostering community engagement.

1. **Study of Circular Economy Models:**

* Investigation into circular economy principles and models that emphasize resource efficiency, waste reduction, and reuse of products.
* Exploration of case studies and research articles highlighting successful implementations of circular economy practices within diverse communities.

1. **Community Engagement Strategies:**

* Research on community-building strategies employed by online platforms and social networks to enhance user engagement and trust.
* Identification of key factors that contribute to successful community-driven initiatives and collaborative consumption models.

**Summary**

The literature survey revealed several insights and observations that informed the development of KNIT KART:

* Existing platforms predominantly focus on monetary transactions and overlook the potential of direct item exchanges for promoting sustainability.
* Circular economy principles offer a promising framework for reducing waste and encouraging resourceful interactions among users.
* Community engagement strategies play a crucial role in fostering trust and facilitating meaningful interactions within online platforms.
* By synthesizing the findings from the literature survey, KNIT KART was conceptualized to address the identified gaps and leverage best practices from existing platforms and circular economy models to create a tailored solution for hostel communities.

**SYSTEM REQUIREMENTS**

**T**he system requirements outline the necessary specifications and components for the successful development and deployment of the KNIT KART platform. This section provides detailed insights into the technical aspects required to support the functionalities of the application.

**Introduction**

The KNIT KART platform is designed to operate seamlessly within KNIT hostel environment, catering to the specific needs and constraints of hostel residents. The system requirements encompass both software and hardware specifications essential for the development and deployment of the platform.

**SOFTWARE AND HARDWARE REQUIREMENTS**

**Software Requirements**

* **Front-end Development:**
* Node.js: Ensure the server environment supports Node.js for running the frontend build tools and server-side rendering (if applicable).
* React.js: The frontend is developed using React.js, requiring browser support for modern JavaScript frameworks.
* Dependencies: Ensure compatibility with the specified dependencies listed in the frontend package.json file, including React, React Router, styled-components, and others.
* **Back-end Development:**
* Node.js: The backend is developed using Node.js, requiring the server environment to support Node.js runtime for executing the backend code.
* Express.js: Ensure compatibility with the Express.js framework for building RESTful APIs and handling server requests.
* Database: MongoDB is used as the database backend, requiring support for MongoDB server and data storage.
* **Additional Tools and Libraries:**
* Version Control:
  + Git: The project utilizes Git as a version control system to enable collaborative development, track code changes, and manage multiple branches for feature development and bug fixes.
* Integrated Development Environment (IDE):
  + Visual Studio Code (VS Code): Developers use Visual Studio Code or a similar integrated development environment (IDE) for code editing, debugging, and project management.
* API Testing and Validation:
  + Postman: Postman is employed for API testing and validation during the development phase. It allows developers to create and send HTTP requests, inspect responses, and automate testing scenarios to ensure the correctness and reliability of backend APIs.

**Functional Requirements:**

Functional requirements specify the specific behaviors and features that KNIT KART must exhibit to meet the needs of hostel residents engaging in item exchanges and community interactions. These requirements define the core functionalities and interactions supported by the platform.

* **User Registration and Authentication:**
* Users should be able to create accounts with unique usernames and passwords.
* The platform must support authentication mechanisms to verify user identities securely.
* **Item Listing and Management:**
* Registered users should be able to list items they want to exchange or sell, providing details such as item description, category, condition, and photos.
* Users should be able to edit, update, or remove their listings as needed.
* **Item Search and Browsing:**
* Users should be able to search for items based on specific criteria (e.g., category, keywords) and view relevant listings.
* The platform must provide filters and sorting options to facilitate efficient item browsing.
* **Item Exchange and Transaction:**
* Users should be able to initiate item exchange requests with other users based on mutually agreed terms.
* The platform should facilitate communication between users to negotiate and finalize exchange details.
* **Notification and Messaging:**
* The platform should notify users about new messages, exchange requests, and updates related to their listings.
* Users should be able to communicate securely through a messaging system within the platform.
* **User Profile Management:**
* Users should be able to manage their profiles, including updating personal information, profile picture, and communication preferences.
* **Admin Dashboard:**
* An administrative dashboard should be available to moderators or administrators to manage user accounts, listings, and resolve disputes if necessary.
* **Reporting and Analytics:**
* The platform should generate reports and analytics on user activities, popular categories, and overall platform performance.
* **Accessibility and Responsiveness:**
* The platform should be accessible across different devices (desktops, laptops, and smartphones) and screen sizes.
* The user interface must be responsive and adaptable to provide a consistent experience.

**Non-functional Requirements:**

Non-functional requirements are essential for ensuring the reliability, security, scalability, and usability of the KNIT KART platform. These quality attributes contribute to the overall performance and user experience of the system.

* **Performance:**
* The system should be capable of handling a large volume of concurrent users and transactions without experiencing performance degradation.
* Response times for user interactions, such as browsing listings, posting items, and completing transactions, should be fast and consistent across different devices and network conditions.
* The platform should be optimized to manage peak usage periods, ensuring responsiveness during high-demand scenarios.
* **Security:**
* KNIT KART must implement robust security measures to protect user data and transactions.
* Data encryption should be employed to safeguard sensitive information both in transit and at rest.
* Access controls and authentication mechanisms should be in place to prevent unauthorized access to user accounts and sensitive data.
* Regular security audits and updates should be conducted to mitigate potential vulnerabilities and ensure compliance with industry standards.
* **Usability:**
* The platform should have an intuitive and user-friendly interface, enabling easy navigation and interaction for users of varying technical proficiency.
* Accessibility features should be implemented to accommodate users with disabilities, ensuring compliance with accessibility standards.
* **Scalability:**
* KNIT KART should be designed to scale seamlessly to accommodate growing user bases and increasing data volumes.
* The system architecture should support horizontal and vertical scaling strategies to handle fluctuations in demand without performance degradation.
* **Interoperability:**
* The platform should support integration with external systems or services, allowing seamless data exchange with third-party applications or platforms.
* Compliance with industry standards and protocols should be maintained to facilitate interoperability with future technologies and platforms.
* **Reliability:**
* KNIT KART should exhibit high availability and reliability, minimizing downtime and ensuring continuous service for users.
* Robust error handling mechanisms should be in place to prevent data loss and system failures.
* **Maintainability:**
* The system should be designed with modular components, clear documentation, and well-defined APIs to facilitate ease of maintenance and troubleshooting.
* Upgrades and migrations should be planned and executed smoothly, ensuring minimal disruption to users and operations.

In conclusion, adherence to these non-functional requirements is crucial for ensuring the success and sustainability of KNIT KART. By prioritizing reliability, security, scalability, and usability, the platform can deliver a seamless and enjoyable experience for hostel residents engaging in item exchanges and community interactions.

**Hardware Requirements**

* **Server Requirements:**
* CPU: 64-bit, quad-core processor with a minimum clock speed of 2.5 GHz per core.
* RAM: 4 GB or more.
* Storage: Minimum 20 GB of available space or more for hosting application files and data.
* **Cloud Hosting:**
* The platform should be hosted on a cloud platform such as AWS (Amazon Web Services) or Vercel for scalability and accessibility.
* Ensure sufficient CPU, memory, and storage capacity on the cloud servers to handle concurrent user requests and database operations efficiently.
* **Client-side Requirements:**
* Display: Dual XGA (1024×768) resolution or higher for optimal viewing experience.
* Web Browsers:

KNIT KART should be compatible with the latest versions of popular web browsers, including but not limited to:

* + Google Chrome
  + Mozilla Firefox
  + Microsoft Edge
  + Apple Safari
* Specific browser versions supported may vary but should generally align with browsers that support modern web standards and technologies used in the frontend application (React.js).

**Summary**

* 64-bit quad-core processor (2.5 GHz minimum per core)
* 4 GB RAM or more
* Minimum 20 GB storage space
* Dual XGA (1024×768) resolution display or higher
* Modern web browser compatibility (Chrome, Firefox, Edge, Safari)
* Backend powered by Node.js, Express.js, MongoDB
* Development tools include Git, Visual Studio Code (VS Code), Postman
* Hosted on Vercel for scalability and deployment

**SYSTEM DESIGN**

**T**he system design phase of KNIT KART involves outlining the architecture and components of the proposed platform. This section provides an overview of the design approach and key considerations for implementing KNIT KART effectively.

**Introduction**

The design process encompasses various aspects, including frontend and backend architecture, database structure, user interface design, and system integration. By carefully planning the system design, we aim to ensure scalability, maintainability, and optimal performance of KNIT KART.

**Proposed System**

The proposed system for KNIT KART comprises a modern and scalable architecture aimed at delivering a seamless user experience for hostel residents engaging in item exchanges. The system is designed to address the specific challenges identified in traditional classified platforms and foster a sustainable and collaborative living environment.

**Key Components:**

* **Frontend Architecture:**
* Utilizes React.js with styled-components for the frontend user interface, ensuring responsiveness and flexibility in design.
* Implements framer-motion for animated interactions, enhancing user engagement and visual appeal.
* **Backend Infrastructure:**
* Powered by Node.js and Express.js for server-side logic and API development.
* Uses MongoDB as the database to store user data, item listings, and transaction history efficiently.
* **Authentication and Security:**
* Implements JSON Web Tokens (JWT) for secure authentication and authorization of users.
* Incorporates bcrypt for password hashing and security measures to protect user data.

**System Features:**

* **User Profiles and Listings:**
* Enables users to create profiles, list items for exchange, and browse available listings.
* **Item Exchanges and Transactions:**
* Facilitates direct item exchanges between users, promoting a circulareconomy within hostel communities.
* **Community Interaction:**
* Integrates features for user reviews, ratings, and communication to foster trust and engagement among users.

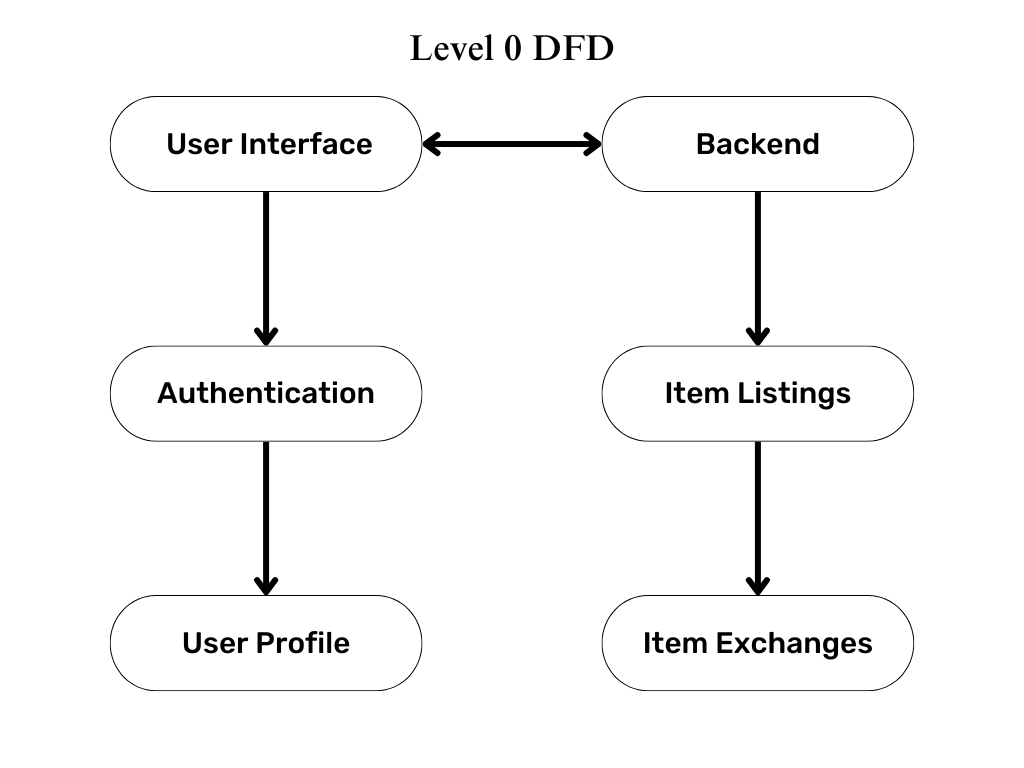
**Scalability and Deployment:**

* Hosted on Vercel for seamless deployment, scalability, and efficient delivery of frontend assets.
* Utilizes cloud-based MongoDB Atlas for database hosting, ensuring data persistence and scalability.

**Design Considerations:**

* Adheres to responsive design principles to ensure optimal user experience across devices and screen sizes.

Implements a modular and maintainable codebase, allowing for future enhancements and feature additions.

**Data Flow Diagram**

**Summary**

The system design phase of the KNIT KART project focused on creating a robust and scalable architecture to support the platform's functionalities and user interactions. Key elements of the system design include:

* **Modular Architecture:** The proposed system architecture follows a modular design approach, allowing for flexibility and ease of maintenance. Components such as user authentication, item management, and transaction processing are designed as independent modules for better scalability.
* **Scalability and Performance:** The system design prioritizes scalability to accommodate a growing user base and increasing transaction volumes. Utilizing technologies like MongoDB for data storage and Vercel for hosting ensures optimal performance and scalability.
* **User Experience (UX) Design:** The system design incorporates UX principles to create an intuitive and user-friendly interface. Features such as item listing, browsing, and exchange management are designed to enhance user engagement and satisfaction.
* **Security and Data Integrity:** Emphasis is placed on security measures to protect user data and ensure transactional integrity. Techniques such as user authentication, data encryption, and secure API endpoints are implemented to safeguard sensitive information.
* **Technological Stack:** The system design leverages modern technologies and frameworks, including React for the frontend, Node.js and Express for the backend, MongoDB for data storage, and Vercel for deployment. This tech stack enables efficient development, deployment, and maintenance of the KNIT KART platform.

**IMPLEMENTATION**

**Introduction**

The implementation phase of the KNIT KART project marks the transition from design concepts to tangible development, where the envisioned features and functionalities are realized. This section provides an overview of the implementation approach and key considerations.

During the implementation phase, the focus was on translating the system design into a functional web application that meets the project objectives. The development process involved collaborative efforts, iterative improvements, and adherence to industry best practices.

**System Design**

The system design of KNIT KART encompasses the architectural components and technical framework that form the foundation of the platform. This subsection outlines the key elements of the system design implemented during the development phase.

**Architectural Overview:**

* **Frontend:** The frontend of KNIT KART is built using React, a popular JavaScript library for building user interfaces. Components are structured using modular design principles to facilitate reusability and maintainability. State management is handled efficiently using Redux toolkit, enabling centralized data management across components.
* **Backend:**

The backend of KNIT KART is powered by Node.js and Express, providing a robust and scalable server-side environment. RESTful APIs are designed to handle user authentication, item management, and exchange operations. MongoDB serves as the database for storing user profiles, item listings, and transaction data.

**Technical Components:**

* **User Authentication:**

Implemented using JSON Web Tokens (JWT) for secure user authentication and authorization. Users are authenticated upon login and receive access tokens to interact with protected resources.

* **Item Management:**

Features for item listing, browsing, and exchange are integrated using RESTful APIs. CRUD (Create, Read, Update, Delete) operations enable users to add, view, edit, and delete items within the platform.

* **Database Integration:**

MongoDB is utilized as the NoSQL database to store and manage data persistently. Schemas are defined for user profiles, item listings, and transaction records to ensure data consistency and integrity.

**Scalability and Performance:**

The system architecture is designed to be scalable, allowing for future expansion and increased user demand. Deployment on Vercel ensures efficient resource utilization and optimized performance.

The system design of KNIT KART prioritizes modularity, scalability, and security to deliver a seamless user experience while supporting collaborative item exchange within hostel communities.

**Algorithm**

The algorithmic components of KNIT KART play a pivotal role in facilitating core functionalities such as item matching, user interactions, and transaction processing. This subsection outlines the key algorithms and computational processes implemented within the platform.

* **Item Matching Algorithm:**

KNIT KART utilizes a matching algorithm to recommend relevant items to users based on their preferences and previous interactions. This algorithm considers factors such as item categories, user ratings, and historical exchange patterns to provide personalized item suggestions.

* **Search and Filtering Algorithms:**

Efficient search and filtering algorithms are implemented to enable users to browse and discover items of interest. Techniques such as keyword-based search, category filtering, and sorting enable users to quickly locate desired items within the platform.

* **Transaction Processing:**

Algorithms for transaction processing manage the exchange workflow between users, ensuring secure and reliable item exchanges. Processes include item reservation, approval workflows, and transaction status updates to facilitate smooth interactions between users.

* **Optimization Algorithms:**

Optimization algorithms are employed to enhance system performance and resource utilization. Techniques such as caching, lazy loading of data, and asynchronous processing optimize the platform's responsiveness and scalability.

* **Security Algorithms:**

Cryptographic algorithms such as SHA-256 hashing and RSA encryption are utilized for securing user data and authentication processes. These algorithms ensure data integrity, confidentiality, and protection against unauthorized access.

* **Performance Optimization:**

Algorithms for performance optimization focus on minimizing response times, reducing database queries, and optimizing resource utilization. Techniques such as indexing, query optimization, and caching strategies contribute to enhanced system performance.

The algorithmic components of KNIT KART are designed to support efficient item matching, user interactions, and system operations, ensuring a seamless and engaging experience for users within hostel communities.

**Architectural Components**

**T**he architectural components of KNIT KART define the structural framework and modular design principles that govern the platform's development. This subsection highlights the key architectural components and their roles within the system.

**Component-Based Architecture:**

KNIT KART adopts a component-based architecture, where each functional module is encapsulated as a reusable component. This approach promotes modularity, reusability, and maintainability of code.

**Frontend Components:**

* The frontend architecture comprises various components such as:
* User Interface (UI) Components: Responsible for rendering the user interface elements and managing user interactions.
* Container Components: Higher-level components that orchestrate the composition of UI components and handle state management.
* Reusable UI Libraries: Utilized for consistent styling and functionality across different parts of the platform.

**Backend Components:**

* The backend architecture consists of:
* API Controllers: Responsible for handling incoming requests, routing to appropriate handlers, and coordinating data retrieval and manipulation.
* Data Access Layers: Interfaces with the database to perform CRUD operations and ensure data integrity.
* Authentication Middleware: Implements security measures such as user authentication and authorization checks.

**Integration and Interoperability:**

Architectural components are designed to facilitate integration with external services and APIs. This includes third-party authentication providers, payment gateways, and communication services.

**Scalability and Resilience:**

The architecture is designed to be scalable and resilient, capable of handling increased user traffic and data volume. Load balancing, caching strategies, and fault-tolerant components ensure optimal performance and reliability.

**Technological Stack:**

The architectural components leverage a modern technological stack, including React for the frontend, Node.js and Express for the backend, MongoDB for data storage, and Vercel for deployment.

The architectural components of KNIT KART form a cohesive and scalable system that supports the platform's functionalities and ensures optimal performance and user experience within hostel communities.