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ElectroMarket: A Web-Based Electronics Marketplace with Integrated Local Shop and Repair Services

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ABSTRACT

The rapid growth of e-commerce platforms has transformed the way consumers purchase products; however, existing systems often lack integration with local retail stores and do not provide flexible purchasing options. This limitation is particularly significant in the electronics domain, where customers frequently require product comparison, immediate availability, and after-sales repair services. To address these challenges, this paper presents ElectroMarket, a web-based electronics marketplace system that integrates customers, local shops, and administrators into a unified platform. The proposed system introduces a hybrid commerce model that supports both online purchasing and in-store buying through a token-based mechanism. It enables users to search for electronics products from a centralized database, compare prices across multiple local shops, and choose suitable purchasing options. Additionally, the system incorporates a repair service module that allows customers to raise repair requests and receive offers from nearby shops, enhancing service accessibility and convenience. Shop owners can manage inventory, process orders, and respond to repair requests, while administrators oversee product data, user management, and delivery operations. The system is implemented using Python Flask for backend development, SQLite for database management, and HTML, CSS, and JavaScript with Chart.js for frontend visualization. The proposed approach improves system efficiency, supports local businesses, and enhances user experience by bridging the gap between online marketplaces and traditional retail systems.

KEYWORDS: E-commerce Marketplace, Hyperlocal Commerce, Multi-Vendor System, Electronics Marketplace, Hybrid Buying System, Local Shop Integration

1. INTRODUCTION

The rapid growth of digital technologies has accelerated the development of e-commerce platforms, enabling efficient online transactions and structured interactions between buyers and sellers (Schmid & Lindemann, 1998). However, existing systems often rely on centralized models that lack local shop integration, offline purchasing options, and repair services. Although multi-vendor platforms improve product availability and competition (Lijin, 2023), they rarely support localized services. Hyperlocal commerce models attempt to address these issues by connecting customers with nearby sellers for faster delivery and improved convenience (Panda et al., 2017). To overcome these limitations, this paper proposes

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ElectroMarket, a web-based electronics marketplace that integrates customers, local shops, and administrators into a unified system supporting hybrid purchasing, product comparison, and repair services.

1.1 Growth of E-Commerce Systems

E-commerce has experienced exponential growth over the past decade due to increased internet penetration, smartphone usage, and digital payment systems. Online platforms have transformed consumer behavior by offering convenience, variety, and competitive pricing. Electronic marketplaces provide structured transaction environments that streamline interactions between buyers and sellers, making them a fundamental part of modern digital economies (Schmid & Lindemann, 1998).

1.2 Multi-Vendor and Hyperlocal Marketplace Integration

Multi-vendor platforms allow multiple sellers to operate within a single system, improving product diversity, competition, and customer choice while enabling small and medium enterprises to participate in digital commerce without maintaining independent platforms (Lijin, 2023). In addition, hyperlocal commerce integrates nearby sellers with online systems to improve delivery efficiency, reduce logistics costs, and enhance customer satisfaction. By utilizing local inventories and shop networks, hyperlocal models support local businesses and improve operational efficiency within e-commerce environments (Panda et al., 2017).

1.3 Proposed System and Contributions

The ElectroMarket system addresses the limitations of existing platforms by introducing a hybrid marketplace model that integrates online and offline purchasing options. The key contributions of this paper include:

- Development of a multi-user system integrating customers, shops, and administrators
- Implementation of a hybrid purchasing model (online delivery and buy-at-shop)
- Integration of a repair service module within the marketplace
- Centralized product database with decentralized shop inventory management
- Enhanced user experience through price comparison and flexible purchasing options

2. LITERATURE REVIEW

Electronic marketplace systems have evolved significantly over time, integrating advanced technologies to improve transaction efficiency, user interaction, and service delivery. Various studies have explored marketplace architectures, multi-vendor platforms, hyperlocal models, and workflow-based systems to address challenges in digital commerce. These research works provide a strong foundation for understanding how modern e-commerce platforms function and highlight the gaps that still exist in integrating local retail, hybrid purchasing, and service-oriented features (Schmid & Lindemann, 1998; Panda et al., 2017).

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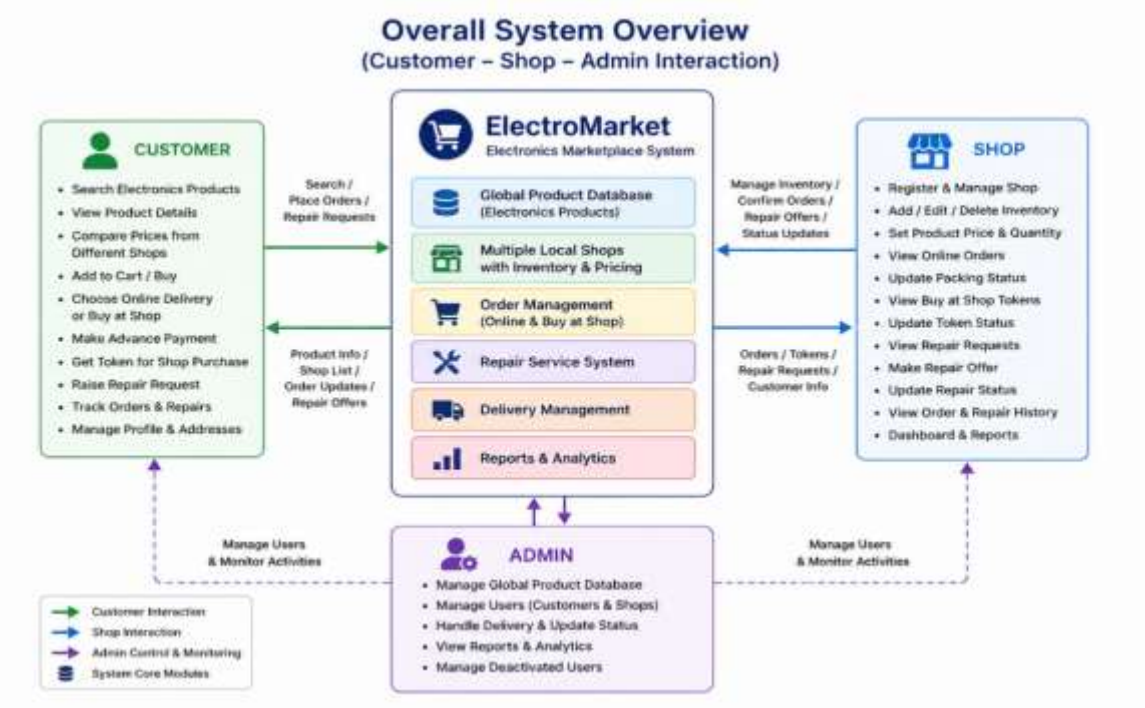

Figure 1: Overall System Overview (Customer–Shop–Admin Interaction)

Figure 1 illustrates the interaction between customers, shops, and administrators within the ElectroMarket system. Customers perform product search, ordering, and repair requests, while shops manage inventory and services. The admin oversees product, user, and delivery management, highlighting the flow of data and responsibilities across the system.

2.1 Electronic Marketplace Systems

Electronic marketplaces are digital platforms that enable structured interactions between buyers and sellers for the exchange of goods and services (Schmid & Lindemann, 1998). These systems support global transactions through phases such as information exchange, agreement, and settlement. Research also highlights the importance of secure and layered architectures in ensuring reliability, scalability, and efficient transaction processing within electronic marketplaces (Schunter & Waidner, 1998). Security features such as confidentiality, integrity, and authentication help maintain user trust. Although these systems provide a strong foundation for digital commerce, they often lack localized retail integration and service-oriented functionalities.

2.2 Multi-Vendor E-Commerce Systems

Multi-vendor e-commerce platforms allow multiple sellers to operate within a single system, improving product diversity, market competition, and customer accessibility through centralized product comparison and management (Lijin, 2023). These platforms typically follow a zero-inventory model, where the system acts as an intermediary between vendors and

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customers, reducing operational costs and improving scalability. Modern multi-vendor systems also incorporate ranking and recommendation mechanisms to assist users in selecting suitable products (Goyal et al., 2021). However, most existing platforms primarily focus on online transactions and lack support for offline purchasing and localized services such as repair and maintenance.

2.3 Hyperlocal Marketplace Systems

Hyperlocal marketplace systems connect customers with nearby shops to improve delivery speed, reduce logistics costs, and enhance customer satisfaction through the use of local inventories and real-time interaction between buyers and sellers (Panda et al., 2017). These systems improve supply chain efficiency, support local businesses, and simplify returns and replacements by sourcing products from nearby locations. However, most hyperlocal platforms are limited to domains such as food delivery and grocery services and generally do not support complex categories like electronics or integrated repair services (Panda et al., 2017).

2.4 Repair & Workflow Systems

Repair and workflow management systems focus on automating maintenance processes to improve efficiency, tracking, and communication. Web-based workflow systems provide structured mechanisms for submitting, monitoring, and completing repair requests, reducing delays associated with manual processes (El-Mousa et al., 2008). Modern repair management systems also integrate features such as tracking, inventory control, and user interaction to improve transparency and service management (Umar & Ahnafi, 2025). However, these systems are generally standalone solutions and are not fully integrated with e-commerce or marketplace platforms.

2.5 Research Gap

Existing e-commerce systems provide marketplace functionality, product availability, and delivery support; however, no single platform effectively integrates all these features into a unified system. Current platforms still lack:

- Integration of local shops within a centralized marketplace
- Support for hybrid purchasing models (online and in-store)
- Built-in repair service systems
- Unified workflows connecting buying and service processes

These limitations highlight the need for a comprehensive system like ElectroMarket that combines marketplace, local retail, and service-oriented functionalities into a single platform.

Table 1: Comparison of Existing Systems vs ElectroMarket

Feature	Existing Systems (Amazon, Flipkart)	Proposed System (ElectroMarket)
Product Domain	General (All categories)	Electronics Only

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Local Shop Integration	Limited / Indirect	Fully Integrated
Price Comparison	Across sellers globally	Across local shops
Buy at Shop Option	Not Available	Available
Repair Services	Not Integrated	Fully Integrated
Inventory Control	Seller-based	Shop-specific
Delivery System	Platform-controlled	Admin-managed
Token-Based Purchase	Not Available	Available
Hybrid Model	No	Yes

Table 1: highlights the limitations of existing e-commerce platforms and demonstrates how the proposed ElectroMarket system addresses these challenges through the integration of local shops, repair services, and hybrid purchasing capabilities.

3. PROBLEM FORMULATION

Modern e-commerce platforms provide efficient online transactions but still face limitations in local shop integration and service-based functionalities. Most systems rely on centralized logistics, leading to delivery delays and limited interaction with nearby sellers. Multi-vendor platforms improve product availability but generally lack offline purchasing and integrated repair services. Hyperlocal commerce models improve delivery efficiency by connecting customers with local sellers; however, they are not widely integrated into mainstream e-commerce systems (Panda et al., 2017).

To clearly define the challenges addressed in this research, the key problems in existing systems are outlined as follows:

- **Delivery Delays** – Most e-commerce platforms rely on centralized warehouses, resulting in delayed deliveries and reduced customer satisfaction. Products are often transported from distant locations, increasing logistics time and cost. Hyperlocal studies highlight that faster delivery significantly improves user experience and operational efficiency (Panda et al., 2017).
- **No Local Integration** – Existing systems do not effectively connect local shops with digital marketplaces. This reduces the visibility of nearby sellers and limits customer access to locally available products. As a result, small businesses struggle to participate in online commerce environments.
- **No Repair System** – Traditional e-commerce platforms mainly focus on product sales and lack integrated repair services. For electronics products, maintenance and repair are important after-sales requirements. Workflow-based repair systems improve service efficiency and transparency by integrating repair management within the platform (El-Mousa et al., 2008).

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- **Fragmented Systems** – Customers often use separate platforms for purchasing products, managing orders, and accessing repair services. This fragmented approach leads to inefficient workflows and poor user experience. A unified system integrating shopping, repair, and local shop interaction is therefore necessary.

These limitations highlight the need for a comprehensive system like ElectroMarket that integrates marketplace functionality, local shop connectivity, and service-oriented features into a single platform.

4. PROPOSED METHODOLOGY

The proposed ElectroMarket system integrates marketplace functionality, local shop connectivity, and service-based features into a unified platform. The methodology combines concepts of electronic marketplaces, multi-vendor systems, and hyperlocal commerce to improve product availability, delivery efficiency, and user experience (Schmid & Lindemann, 1998; Lijin, 2023; Panda et al., 2017). It also incorporates workflow-based management for efficient order processing and repair handling through a modular multi-user architecture supporting customers, shops, and administrators (El-Mousa et al., 2008).

4.1 System Model

The ElectroMarket system is developed as a multi-user platform integrating customers, shops, and administrators into a single environment with role-based functionalities and efficient interaction between system components (Lijin, 2023).

- **Customer Module** – Allows users to search and compare products, place online or in-store orders, and access repair services.
- **Shop Module** – Enables shop owners to manage inventory, process orders, and handle repair requests efficiently.
- **Admin Module** – Provides centralized control for managing products, users, delivery operations, and overall system activities.

4.2 Functional Design

The functional design of ElectroMarket integrates major e-commerce and service-based features into a single platform to improve user convenience and operational efficiency while combining marketplace and service-oriented functionalities (Panda et al., 2017).

- **Product Search** – Enables users to search products from a centralized database and access details from multiple shops.
- **Product Comparison** – Allows comparison of product prices and availability across local shops for better purchasing decisions.
- **Hybrid Buying System** – Supports both online purchasing with delivery tracking and token-based in-store purchasing.
- **Repair System** – Allows customers to raise repair requests and receive service offers from shops with estimated cost and time details.

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4.3 Workflow Model

The ElectroMarket system follows a structured workflow model to ensure efficient execution of purchasing, inventory, and repair operations with smooth coordination between all system components (El-Mousa et al., 2008).

- **Customer Workflow** – Customers search products, compare shops, select purchase options, and raise repair requests when required.
- **Shop Workflow** – Shop owners manage inventory, process orders, and respond to repair requests with service updates.
- **Admin Workflow** – Administrators monitor orders, manage delivery status, maintain product data, and handle user management.

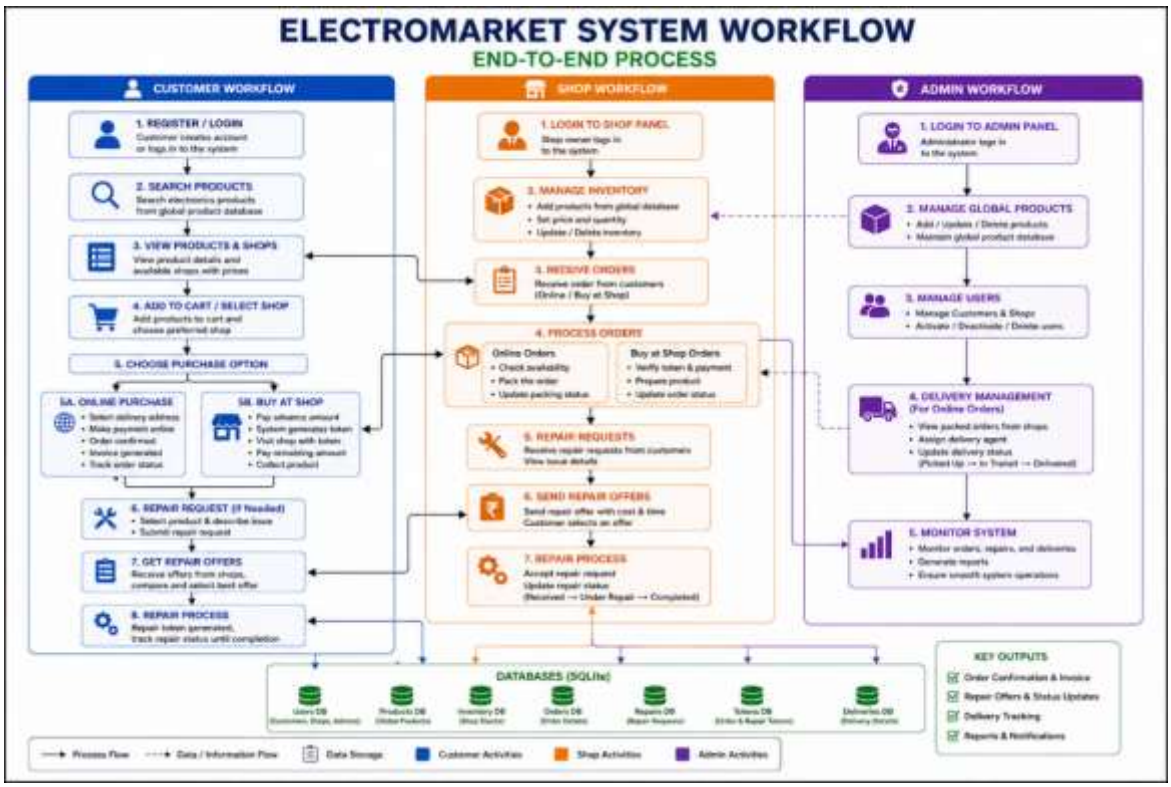

Figure 2: System Workflow of ElectroMarket

Figure 2 illustrates the workflow of the ElectroMarket system, showing the interaction between customers, shops, and administrators. It represents the process of product searching, order placement, repair handling, and delivery management while ensuring coordinated system operations.

5. SYSTEM ARCHITECTURE AND DESIGN

The ElectroMarket system uses a structured and modular architecture to ensure scalability, flexibility, and efficient interaction between system components. Based on layered electronic marketplace architectures, the system separates frontend, backend, and database functionalities to improve maintainability, performance, and real-time data processing (Schunter & Waidner, 1998). The architecture also incorporates concepts from multi-vendor and workflow-based

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systems to support efficient product management, order processing, repair services, and communication between different modules.

5.1 System Architecture Overview

The ElectroMarket system follows a three-tier layered architecture consisting of presentation, application, and data layers to improve scalability, maintainability, and efficient system operation (Schunter & Waidner, 1998).

- **Presentation Layer (Frontend)** – Built using HTML, CSS, and JavaScript to provide interactive interfaces for customers, shops, and administrators.
- **Application Layer (Backend)** – Developed using Python Flask to manage business logic, workflows, user interactions, and request processing.
- **Data Layer (Database)** – Implemented using SQLite to store and manage structured data related to users, products, inventory, orders, and repair services.

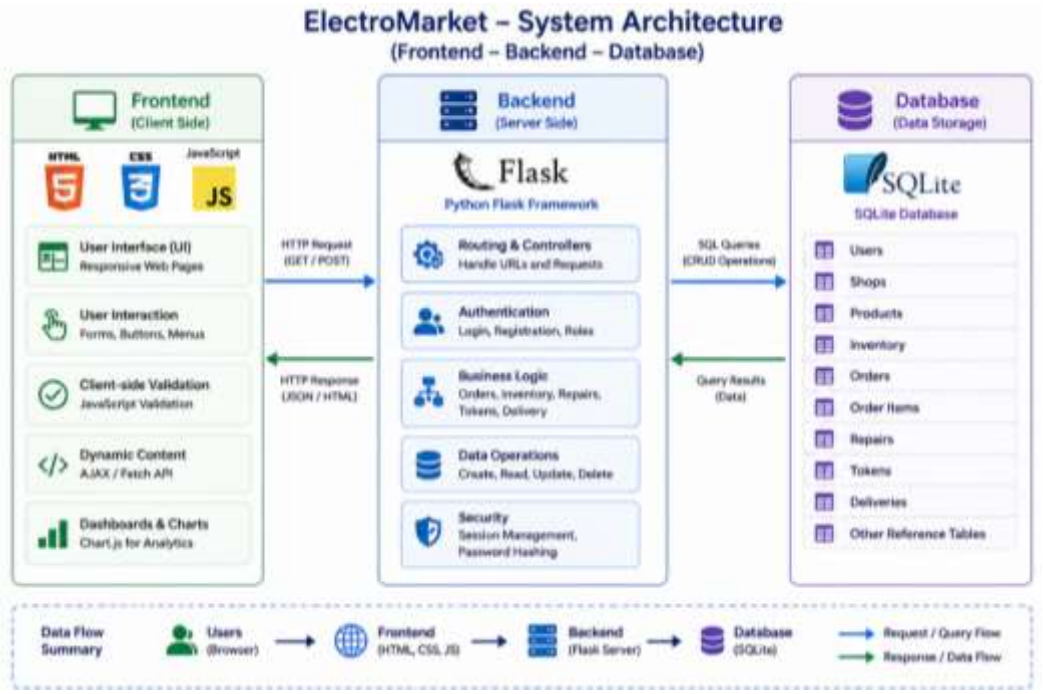

Figure 3: System Architecture of ElectroMarket

Figure 3 illustrates the layered architecture of the system, where the frontend communicates with the backend through HTTP requests, and the backend interacts with the SQLite database for data storage and retrieval. This design ensures efficient data flow, improved system organization, and enhanced performance. It also enables independent development and maintenance of each component.

5.2 Data Model

The data model of ElectroMarket represents the relationships between different marketplace entities and ensures efficient data storage, retrieval, and workflow management (El-Mousa et al., 2008).

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- **User Entity** – Stores authentication and profile information for customers, shops, and administrators.
- **Product Entity** – Maintains the centralized product database with product specifications and details.
- **Inventory Entity** – Stores shop-specific product quantity, availability, and pricing information.
- **Order Entity** – Manages online and in-store transactions along with order status details.
- **Repair Entity** – Handles repair requests, service details, and repair status updates between users and shops.

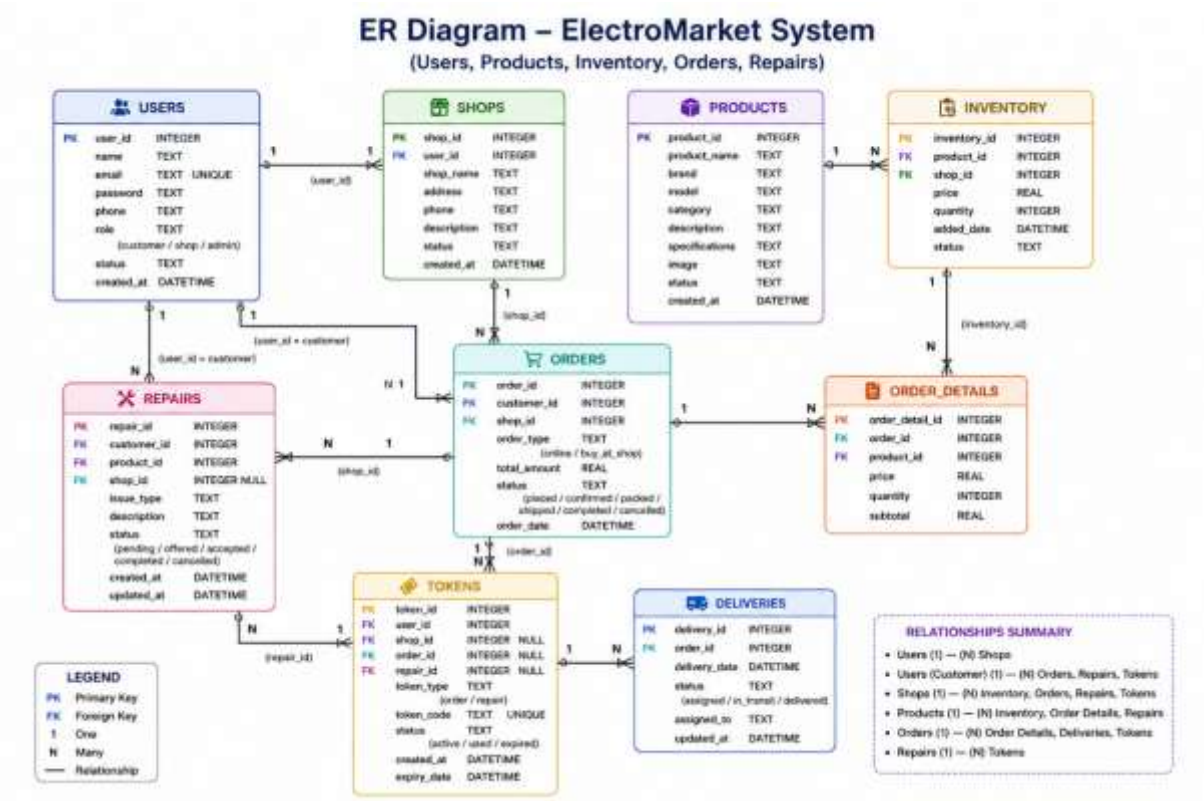

Figure 4: Entity-Relationship Diagram of ElectroMarket System

Figure 4 represents the Entity-Relationship diagram of the ElectroMarket system, showing the relationships between users, products, inventory, orders, and repair entities for efficient data management and system functionality.

5.3 Data Flow

The data flow of ElectroMarket represents the movement of information between users, the backend, and the database to ensure efficient system operations and real-time updates (El-Mousa et al., 2008).

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- **Customer Interaction Flow** – Customer requests such as product search, ordering, and repair submission are processed by the backend and displayed through the frontend.
- **Shop Interaction Flow** – Shop owners update inventory, manage orders, and respond to repair requests through backend processing and database updates.
- **Admin Interaction Flow** – Administrators manage products, users, and delivery operations through centralized system control and monitored data flow.

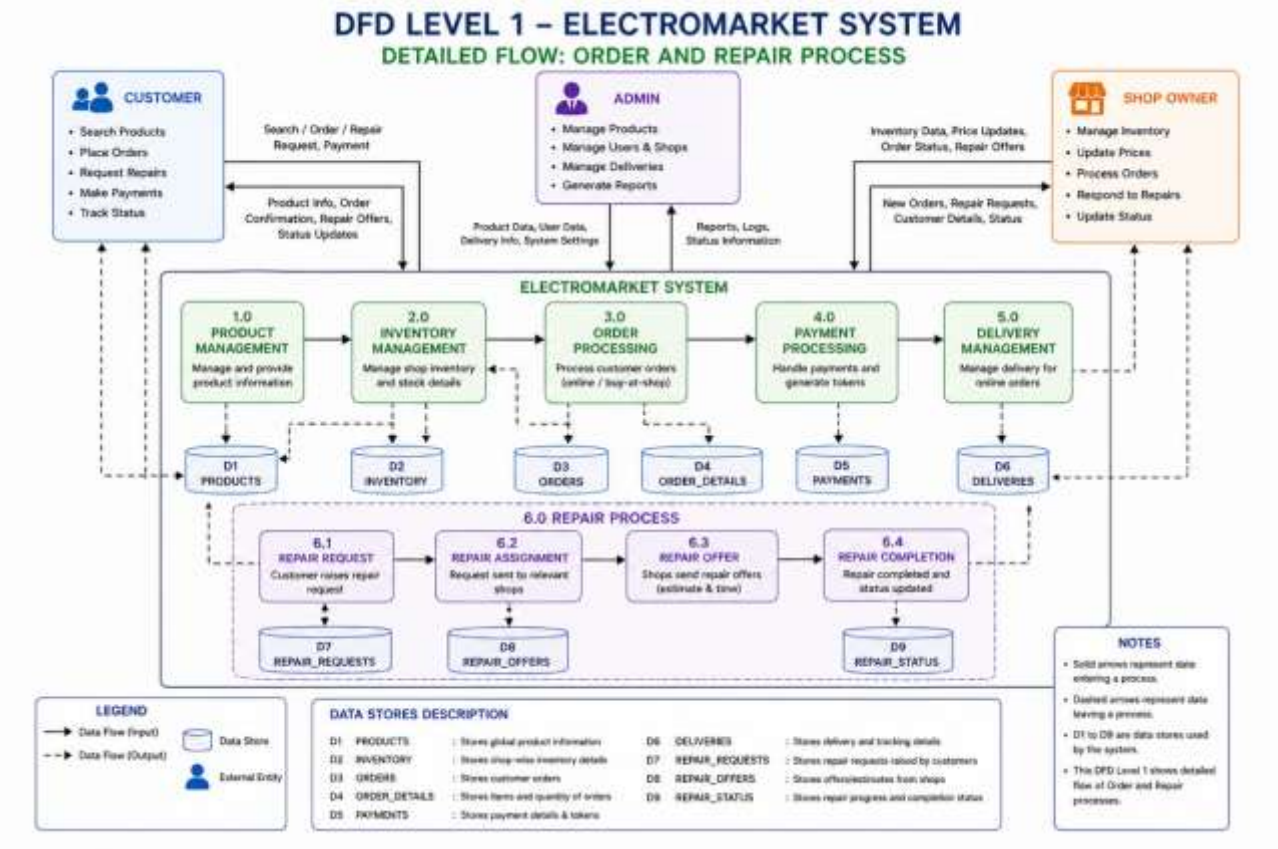

Figure 5: Data Flow Diagram Level 1 of ElectroMarket System

Figure 5 illustrates the detailed data flow within the system processes through the Level 1 Data Flow Diagram. The system is divided into multiple processes, including product handling, inventory management, order processing, and repair services. The diagram highlights how data is transferred between these processes and the database, ensuring efficient execution of system functionalities and proper coordination among different modules.

6. SYSTEM IMPLEMENTATION

The ElectroMarket system is implemented as a web-based application that integrates multiple modules to support marketplace operations, local shop interaction, and repair services. The implementation follows a modular and layered approach, ensuring efficient communication between system components and scalability for future enhancements. The design is influenced by modern multi-vendor systems and workflow-based applications, where each module

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performs specific tasks while maintaining coordination with other components (Lijin, 2023; El-Mousa et al., 2008). The system emphasizes simplicity, usability, and real-time interaction, making it suitable for both customers and local shop owners.

6.1 Technology Stack

The ElectroMarket system uses lightweight web technologies to ensure efficient performance, scalability, and ease of development (Goyal et al., 2021).

- **Flask (Backend Framework)** – Handles server-side logic, routing, authentication, order processing, and repair workflows.
- **SQLite (Database)** – Stores structured data related to users, products, inventory, orders, and repair records.
- **HTML, CSS, JavaScript (Frontend)** – Used to create responsive and interactive user interfaces.
- **Chart.js (Visualization Library)** – Displays graphical insights such as inventory statistics and order-related data for dashboards.

6.2 Module Implementation

The ElectroMarket system is divided into three primary modules, each designed to handle specific functionalities and user interactions.

Customer Module

The customer module provides users with an interface to search, compare, and purchase products, as well as access repair services.

- Search products from the global database
- Compare prices across multiple shops
- Choose between online purchase and buy-at-shop options
- Manage cart and order history
- Raise repair requests and track status

This module enhances user convenience by integrating multiple functionalities into a single interface, aligning with modern e-commerce user experience requirements (Lijin, 2023). The customer dashboard, as illustrated in Figure 6, provides a centralized interface for accessing all customer-related functionalities, including product browsing, order management, and repair services.

Shop Module

The shop module enables local shop owners to manage their inventory, process orders, and handle repair requests.

- Add, update, and delete inventory products
- Set product price and quantity

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- Manage online orders and buy-at-shop requests
- Respond to repair requests with cost and time estimates
- Update order and repair status

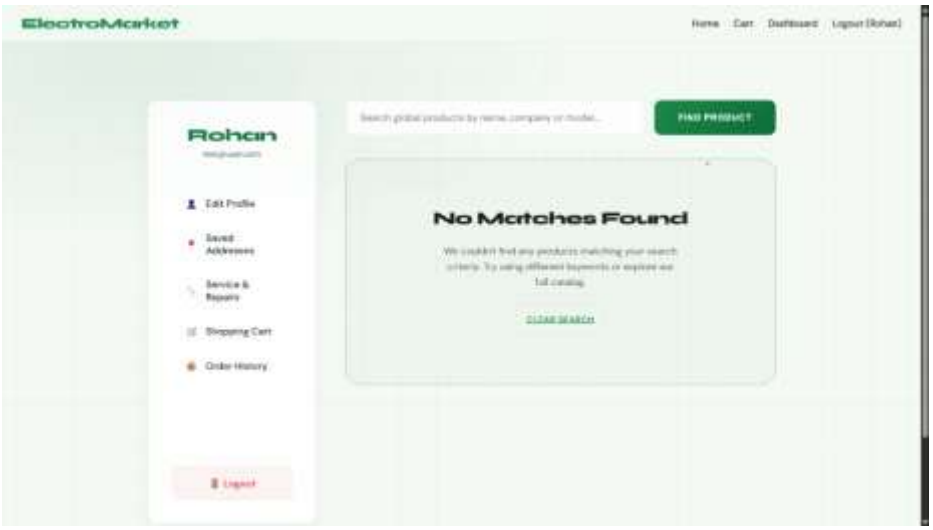

Figure 6: Customer Dashboard Interface

This module supports decentralized inventory management and allows shops to participate actively in the digital marketplace, similar to vendor management systems in multi-vendor platforms (Lijin, 2023).

The shop dashboard, as illustrated in Figure 7, provides tools for managing inventory, processing orders, and handling repair requests efficiently within the system.

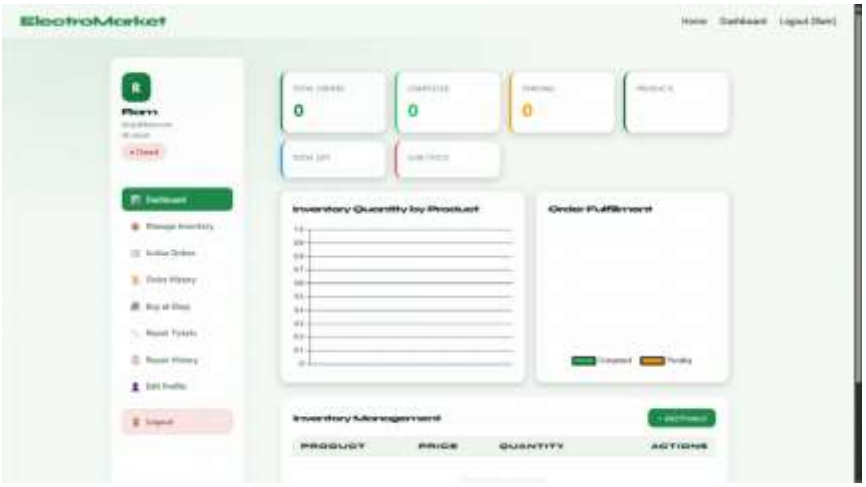

Figure 7: Shop Dashboard Interface

Admin Module

The admin module provides centralized control over the system, ensuring proper management of products, users, and delivery processes.

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- Manage global product database (add, edit, delete products)
- Handle user accounts (customers and shops)
- Monitor and update delivery status
- Access system analytics and reports

This module ensures system integrity and efficient operation by maintaining centralized control, similar to administrative roles in marketplace platforms (Schunter & Waidner, 1998).

The admin dashboard, as illustrated in Figure 8, enables centralized control of the system, allowing efficient management of products, users, and delivery operations.

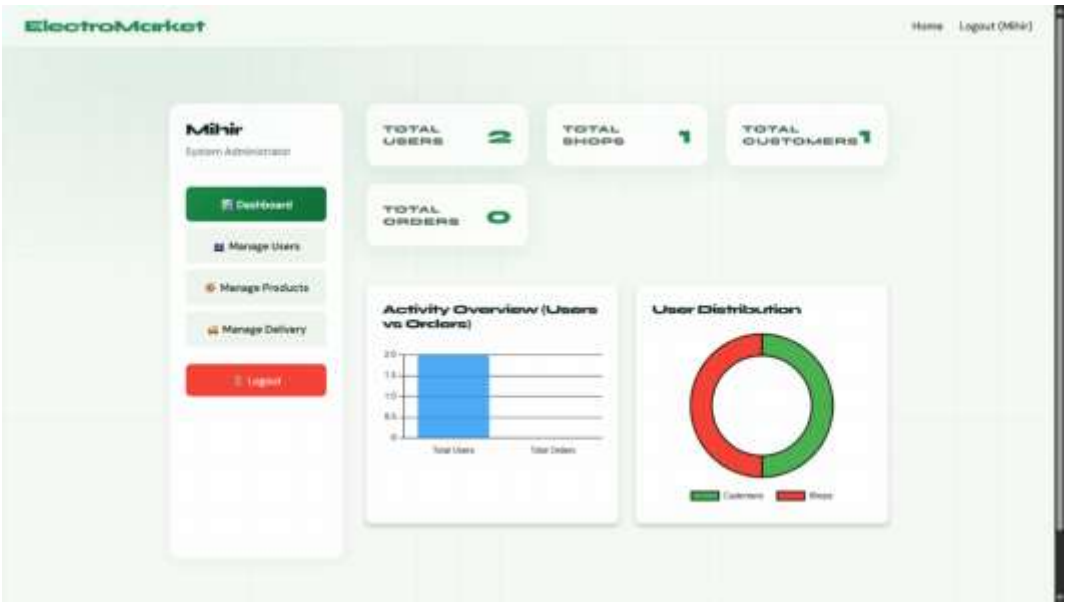

Figure 8: Admin Dashboard Interface

Overall, the implementation of the ElectroMarket system successfully integrates multiple functionalities into a single platform, providing a seamless and efficient user experience while supporting local businesses and service-oriented features.

7. RESULTS AND DISCUSSION

The ElectroMarket system was evaluated through functional testing, system behavior analysis, and comparison with existing e-commerce platforms. The results show that the system successfully supports product search, hybrid purchasing, local shop integration, and repair service management within a unified platform. The evaluation also demonstrates improved efficiency and user experience while addressing limitations found in existing multi-vendor and hyperlocal systems (Lijin, 2023; Panda et al., 2017).

7.1 Functional Evaluation

The functional evaluation confirmed that all major modules of the ElectroMarket system operated according to the defined requirements. Users were able to search and compare

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products from multiple shops, place online and in-store orders, and access repair services successfully. The system also handled order updates and repair workflows efficiently, ensuring smooth interaction between customers, shops, and administrators. These results demonstrate reliable workflow execution and proper coordination between system components (El-Mousa et al., 2008).

7.2 System Performance

The ElectroMarket system demonstrated efficient performance in terms of responsiveness, usability, and real-time processing. Technologies such as Flask and SQLite enabled fast request handling, quick page loading, and smooth frontend-backend communication. Real-time updates in inventory and order status improved operational efficiency and user experience. Integration of local shop data also enhanced delivery efficiency and reduced dependence on centralized logistics systems (Panda et al., 2017).

7.3 Comparative Analysis

The ElectroMarket system was compared with existing multi-vendor and hyperlocal platforms to evaluate its effectiveness. Traditional e-commerce systems mainly focus on online transactions and generally lack local shop integration and repair services. Multi-vendor platforms improve product availability but provide limited localized interaction (Lijin, 2023), while hyperlocal systems improve delivery speed but lack complete marketplace functionalities (Panda et al., 2017). ElectroMarket combines hybrid purchasing, local inventory integration, and repair management into a unified platform, providing a more comprehensive solution.

Table 2: Test Cases

Test Case	Input	Expected Output	Result
User Login	Valid email and password	User successfully logs in	Pass
Product Search	Enter product name	Relevant products displayed	Pass
Add to Cart	Select product and quantity	Product added to cart	Pass
Online Order	Select product and address	Order confirmed with invoice	Pass
Buy at Shop	Select product and shop	Token generated	Pass
Inventory Update	Purchase product	Quantity decreases automatically	Pass
Repair Request	Submit repair details	Request sent to shops	Pass
Repair Offer	Shop submits offer	Offer visible to customer	Pass
Delivery Update	Admin updates status	Status updated correctly	Pass

The functional testing of the ElectroMarket system is summarized in Table 2, where all test cases were successfully executed and produced the expected results, confirming that the system functions correctly and meets the defined requirements.

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8. FUTURE WORK

The ElectroMarket system can be further enhanced by integrating intelligent technologies, improving user interaction, and expanding accessibility features. Future developments may focus on personalization, automation, and mobile support to improve system efficiency and user experience. Modern e-commerce research highlights the importance of AI-driven recommendations, automated support, and mobile accessibility in marketplace systems (Lijin, 2023; Panda et al., 2017).

AI-Based Recommendation System – An AI-based recommendation engine can provide personalized product and service suggestions based on user behavior and purchase history. Recommendation systems improve user engagement and support better purchasing decisions in e-commerce platforms (Lijin, 2023).

Chatbot Integration – A chatbot can provide real-time assistance for product search, order tracking, and repair-related queries. Automated support systems improve communication efficiency and enhance customer satisfaction in multi-vendor platforms (Goyal et al., 2021).

Mobile Application Development – Developing a mobile application can improve accessibility through features such as push notifications, location-based services, and real-time updates. Mobile integration also enhances user engagement and delivery efficiency in hyperlocal systems (Panda et al., 2017).

Review and Rating System – A review and rating feature can improve transparency by allowing users to share feedback on products, shops, and repair services. Such systems help build trust and influence purchasing decisions in modern e-commerce platforms (Lijin, 2023).

9. CONCLUSION

The ElectroMarket system has been successfully designed and implemented as a web-based electronics marketplace that integrates customers, local shops, and administrators into a unified platform. The study addresses key limitations of existing e-commerce systems, including lack of local shop integration, absence of repair services, and dependency on centralized delivery models. By combining principles of electronic marketplaces, multi-vendor systems, and hyperlocal commerce, the proposed system provides a hybrid solution that supports both online purchasing and in-store buying. This approach enhances flexibility and improves overall user experience while maintaining system efficiency.

The primary contribution of this research lies in the development of a comprehensive multi-user platform that incorporates product purchasing, local shop interaction, and service-based functionality within a single system. Unlike traditional platforms, the ElectroMarket system introduces a hybrid buying model and an integrated repair service module, enabling seamless interaction between customers and local shops. The centralized product database ensures

consistency, while decentralized inventory management allows shops to maintain control over pricing and availability. These features collectively demonstrate how combining different e-commerce paradigms can lead to a more effective and practical marketplace solution.

The impact of the proposed system is significant in bridging the gap between online and offline retail environments. By integrating local shops into a digital platform, the system supports small businesses and improves accessibility for customers. The inclusion of repair services further enhances the practicality of the system, particularly in the electronics domain where maintenance is essential. Additionally, the adoption of a hyperlocal approach contributes to faster service delivery and improved operational efficiency, aligning with modern trends in e-commerce development (Panda et al., 2017). Overall, the ElectroMarket system presents a scalable and user-oriented solution that can be further extended to meet evolving market demands and technological advancements.

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