

NearBySell : A Novel Approach to Localized E-Commerce with Focus on Seller-Customer Interaction and Enhanced Local Retail Network

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Abstract—This paper examines a novel online retail application optimized for local commerce via a location-based matching system. The application supports the sale of new and secondhand items, home goods, and vegetables, requiring users to register and input their locations. Transactions occur only when the buyer's and seller's locations align, reducing logistical challenges. The system features a review mechanism allowing customers to rate sellers, influencing future buyer decisions and seller reputation. Security is ensured through hand-to-hand payments and direct seller delivery, mitigating risks associated with digital payments and third-party delivery. Additionally, the application supports long-term relationships by maintaining permanent connections between customers and sellers. Technical aspects include the development of location-based matching algorithms, review systems, and security measures. Notably, the application incorporates advanced security features such as fake reviews detection and duplicate listings detection to protect both buyers and sellers from fraudulent activities. This study highlights how these components enhance local market efficiency and e-commerce reliability.

Index Terms—E-commerce, Online retail, Seller-customer interaction, Targeted selling, Seller-preferred locations, Transaction security, Hand-to-hand payment, Product delivery.

I. INTRODUCTION

The rapid expansion of e-commerce platforms has revolutionized retail, creating new opportunities for buyers and sellers alike. However, optimizing local commerce remains a significant challenge due to logistical and operational complexities. This paper introduces a novel online retail application, NearBySell, which leverages a location-based matching system to facilitate transactions involving new and secondhand goods, including home items and vegetables [1]. By requiring users to register and provide their geographic coordinates, the system matches buyers and sellers based on proximity, thereby reducing logistical issues and enhancing transaction efficiency by confining exchanges to nearby participants [2].

The technical foundation of NearBySell includes sophisticated algorithms for geospatial matching, which refine search results and prioritize listings based on user location [2]. These algorithms enhance the relevance of search results, ensuring that users see products that are geographically closer to them. Furthermore, the application incorporates a robust feedback system, allowing customers to rate sellers and creating a

feedback loop that influences seller visibility and reputation [3]. This system is designed to ensure high service quality and provide informed buyer decisions, contributing to a more trustworthy and user-friendly platform.

Security is a critical focus of NearBySell, addressed through features such as hand-to-hand payments and direct seller delivery, which mitigate risks associated with digital transactions and third-party services [4]. By facilitating transactions directly between buyers and sellers, the platform minimizes the potential for fraud and enhances the overall security of the transaction process. Additionally, NearBySell supports persistent connections between buyers and sellers, fostering long-term engagement and encouraging repeat transactions [5].

The application's backend infrastructure plays a vital role in managing key processes, such as user authentication, product selection, cart management, order processing, payment transactions, and returns [6]. Techniques like flow charts, context diagrams, and data flow diagrams are employed to streamline these processes and optimize system architecture, ensuring efficient and reliable operation [6]. This comprehensive approach to backend design supports the platform's scalability and adaptability in a dynamic e-commerce environment.

NearBySell's design not only enhances local commerce by allowing sellers to list products for specific geographic areas but also improves the relevance and user experience of the platform [7]. The targeted approach reduces logistical challenges associated with shipping and delivery while fostering community engagement and strengthening local market connections. The platform ensures secure transactions through hand-to-hand payments and direct product delivery [4], addressing common concerns related to e-commerce fraud.

The system architecture of NearBySell, illustrated in Fig. 1, comprises three main entities: sellers, customers, and admins. Sellers manage listings and interact with buyers, customers browse and purchase products, and admins oversee the platform and analyze feedback for continuous improvement [6]. Advanced security features, such as fake review and duplicate listing detection, are implemented to protect against fraud and maintain marketplace integrity [4] [8]. These features are crucial for maintaining a trustworthy and transparent marketplace.

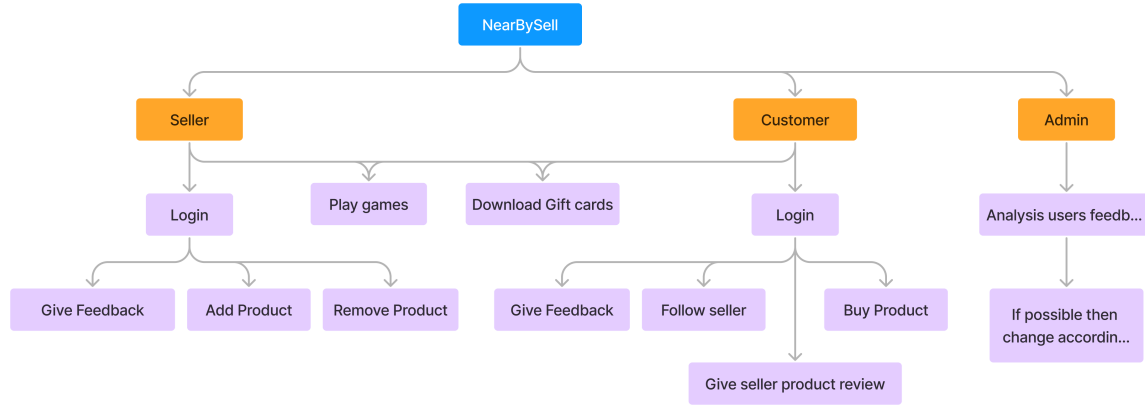


Fig. 1: System Architecture of NearBySell

In addition to its core functionalities, NearBySell supports long-term relationships between customers and sellers, enriching local interactions and promoting user loyalty. The platform also includes additional features, such as games and gift card downloads, which engage users and drive broader adoption [3]. By integrating these interactive elements, NearBySell aims to enhance the overall user experience and foster a vibrant e-commerce community.

II. METHODOLOGY

This section delineates the comprehensive methodology employed in the development and deployment of the NearBySell platform, system design, database architecture, security, implementation, and continuous improvement.

A. System Design

The system design for NearBySell was developed to ensure robustness, scalability, and efficiency. Key design considerations included:

- **Architecture:** Utilizes a modular microservices approach for scalable, deployable components, including user management, payment processing, and order fulfillment. This design supports high availability and fault tolerance, allowing independent scaling and maintenance.
- **Database Design:** Uses an RDBMS to manage structured data with tables for users, products, transactions, and reviews, ensuring data integrity and efficient querying (see Fig. 2).
- **User Interface:** Designed with HTML5, CSS3, and React for a responsive and intuitive experience across devices. Features interactive elements and real-time updates for enhanced user engagement.
- **Location-Based Services:** Integrates geocoding and proximity algorithms to connect sellers with nearby buyers, improving search relevance and optimizing delivery logistics.

Algorithm 1 Location-Based Selling Algorithm

Seller Location: (seller_lat, seller_lon)

Customer Location: (customer_lat, customer_lon)

Product Listing: Includes seller's location and delivery area.

Function: `calculate_distance(lat1, lon1, lat2, lon2)`

Calculate Distance

Filtering and Matching:

Calculate distance for each product from the customer's location. Filter products where distance is within customer's range.

Display Results:

Show matching products with seller contact and reviews.

Complete Transaction:

Facilitate hand-to-hand delivery by the seller.

Enable post-transaction feedback and ratings.

B. Database Design

The database for NearBySell employs a relational model to manage key data efficiently. It includes several essential tables:

- **Users Table:** Stores seller and customer details with fields such as UserID, Name, Email, and PasswordHash. The UserID is the primary key.
- **Products Table:** Manages product listings with fields like ProductID, SellerID (foreign key), ProductName, Price, and Location. ProductID is the primary key.
- **Transactions Table:** Logs purchase details, including TransactionID, BuyerID (foreign key), ProductID (foreign key), and PurchaseDate. TransactionID is the primary key.
- **Reviews Table:** Contains feedback with fields such as ReviewID, ProductID (foreign key), ReviewerID (foreign key), Rating, and Comment.
- **Location Table:** Handles geographical data with fields like LocationID, Latitude, Longitude, and Address.

Normalization is applied to reduce data redundancy. Indexes

enhance query performance, and access controls ensure data security. Regular backups support data integrity and recovery.

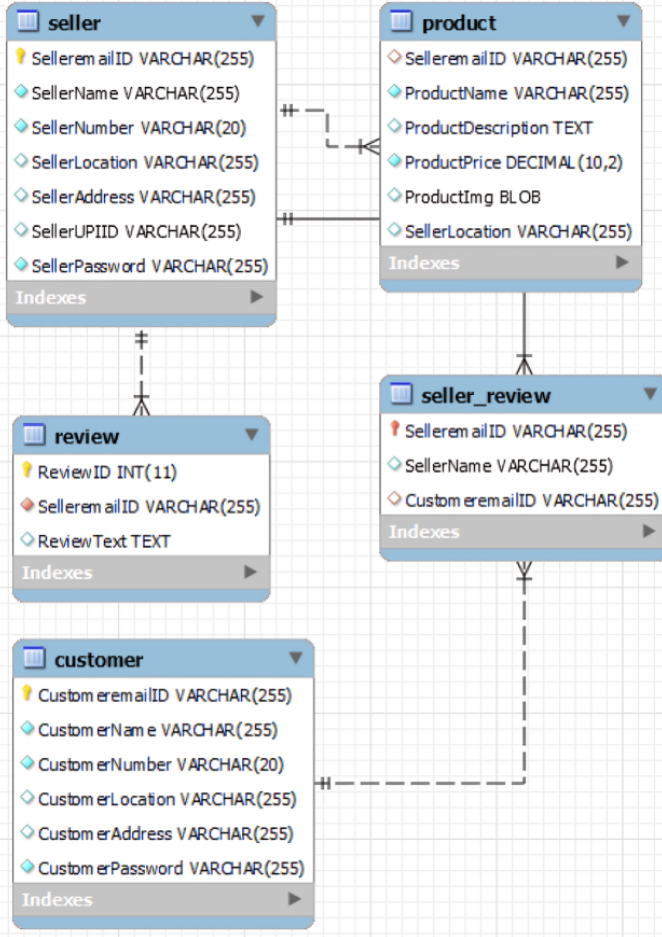


Fig. 2: Entity-Relationship (ER) Diagram for NearBySell Database

C. Customer-Seller Security

- **Fake Reviews Detection (Seller Security):** To protect sellers from fraudulent activities, NearBySell employs algorithms to detect and prevent fake reviews. These algorithms analyze review patterns, user behavior, and review content to identify and flag suspicious reviews. This ensures that sellers are evaluated fairly based on genuine customer feedback, maintaining their reputation and trustworthiness within the platform.
- **Duplicate Listings Detection (Customer Security):** NearBySell implements a robust system to detect and prevent duplicate listings. This system helps safeguard customers by ensuring they do not encounter multiple listings for the same product, which can lead to confusion or misleading information. By checking for duplicate entries and consolidating them, the platform enhances the user experience and ensures that customers are presented with accurate and unique product options.

Algorithm 2 Fake Review Detection Algorithm

```

1: Input: Review dataset with user profiles and review texts
2: Output: Flagged fake reviews
3: Initialize: threshold as a predefined value
4: for each review in the dataset do
5:   user_profile  $\leftarrow$  Get user profile for the reviewer
6:   review_text  $\leftarrow$  Extract review text
7:   product_name  $\leftarrow$  Extract product name from review
8:   seller_mention  $\leftarrow$  Check if review mentions seller
9:   rating_pattern  $\leftarrow$  Analyze rating patterns for anomalies
10:  text_analysis  $\leftarrow$  Perform sentiment analysis on review text
11:  user_behavior  $\leftarrow$  Analyze review frequency and history
12:  if product_name is missing or seller_mention is missing then
13:    Flag review as potential fake
14:  else if rating_pattern indicates self-review or fake positive reviews then
15:    Flag review as potential fake
16:  else if text_analysis or user_behavior deviates from expected norms then
17:    Flag review as potential fake
18:  end if
19: end for
20: return Flagged reviews

```

Algorithm 3 Duplicate Listing Detection Algorithm

```

1: Input: Product listings dataset
2: Output: Flagged duplicate listings
3: Initialize: similarity_threshold as a predefined value
4: for each listing in the dataset do
5:   listing_image  $\leftarrow$  Extract product image from the listing
6:   listing_description  $\leftarrow$  Extract product description from the listing
7:   for each other listing in the dataset do
8:     if listing  $\neq$  current_listing then
9:       image_similarity_score  $\leftarrow$  Compare listing_image with other listings' images
10:      description_similarity_score  $\leftarrow$  Compare listing_description with other listings' descriptions
11:      if image_similarity_score > similarity_threshold or description_similarity_score > similarity_threshold then
12:        Flag listing as duplicate
13:      end if
14:    end if
15:  end for
16: end for
17: return Flagged listings

```

D. Implementation

Implementation of NearBySell involved the following steps:

- **Frontend Development:** Designed a responsive web and mobile interface using React framework. The frontend communicates with the backend.
- **Backend Development:** Built a scalable server-side architecture using Node.js and Express, featuring user authentication, product management, and payment processing.
- **security:** Fake review detection employs NLP technology to identify reviews missing product names or sellers and behavioral anomalies. Duplicate listing detection utilizes image recognition and text similarity algorithms.
- **Real-Time Data Processing:** Employed WebSockets for real-time updates and notifications.

Continuous monitoring and iterative updates were applied to enhance platform performance and address user feedback.

E. Continuous Improvement

NearBySell employs a continuous improvement strategy based on:

- **User Feedback:** Regular collection and analysis of user feedback to identify areas for enhancement.
- **Data Analytics:** Leveraging analytics to understand user behavior, trends, and platform performance.
- **Iterative Updates:** Implementing updates and new features based on feedback and analytics to continually refine the user experience.

Overall, the methodology employed in the development of NearBySell aimed to align with best practices in software engineering, agile methodologies, and user-centered design principles to deliver a robust and user-friendly e-commerce platform.

III. RESULTS AND DISCUSSION

Here is a detailed description of the website's functionality and outputs, accompanied by screenshots. This section provides a comprehensive view of how the website operates and showcases the results, offering valuable insights for the discussion and evaluation of its performance and effectiveness.

A. Home Page

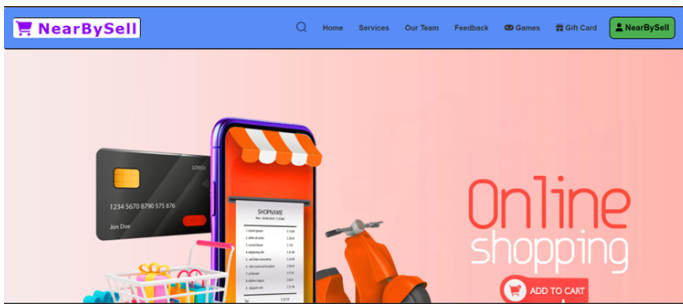


Fig. 3: Home page of NearBySell

The homepage of NearBySell offers a multi-faceted user experience. It prominently displays available products for local purchase, ensuring high visibility for sellers' offerings. The page includes options for users to download free gift cards and access interactive games, adding value beyond conventional e-commerce functions. Social media links are embedded in the footer, encouraging users to follow NearBySell across various platforms and engage with the community. This approach not only enhances user interaction but also boosts brand visibility and customer loyalty, creating a more connected and engaged user base.

B. Create-Account Page



Fig. 4: Create-account page of NearBySell

The "Create Account" page allows users to register as sellers or customers, requiring location details for localized listings and transactions. It prevents the use of the same email for both account types to ensure distinct profiles and data integrity. This approach personalizes the experience and optimizes interactions within the local market.

C. Login Page

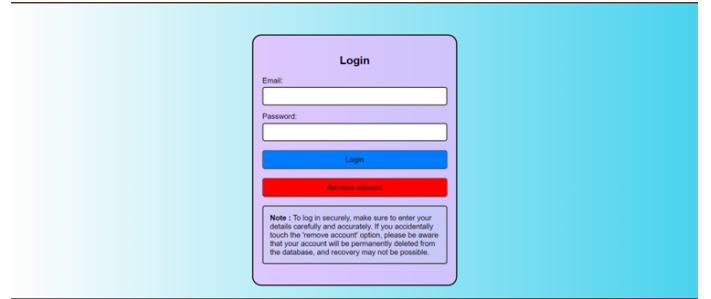


Fig. 5: Login page of NearBySell

The NearBySell login page provides access for both sellers and customers. Sellers manage listings, track reviews, and engage with users, while customers browse products, follow sellers, and leave reviews. The design facilitates a smooth transition between roles, enhancing usability and interaction within the platform.

D. Product Page

The product page displays seller-added products with images, prices, and locations, emphasizing local commerce. Its

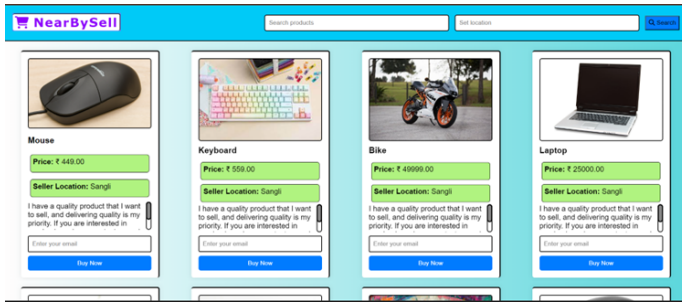


Fig. 6: Product page in NearBySell

layout facilitates quick browsing and informed decisions, making it easy to find nearby products. This design improves user experience by streamlining selection and promoting efficient local transactions.

E. Customer-Product-Buy Page



Fig. 7: Customer-product-Buy Page in NearBySell

The Customer-Product-Buy page uses location-based matching to connect customers with nearby sellers. When locations align, it provides detailed seller info and direct communication options like WhatsApp and Gmail. The “Follow” button keeps customers updated on seller activities, while review access helps assess product quality and seller reliability, improving the overall buying experience.

F. Customer-Add-Review Page

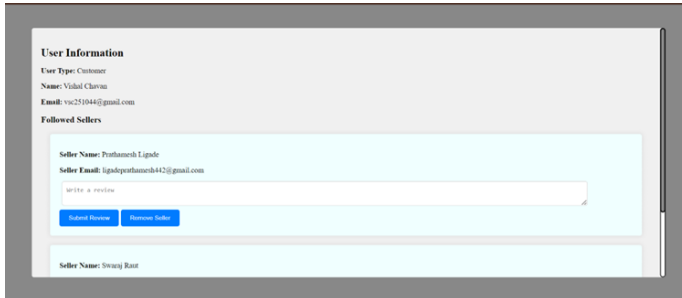


Fig. 8: Customer-Add-Review Page in NearBySell

On the Customer-Add-Review page, users can view followed sellers and write reviews. This feature promotes community trust and transparency by allowing customers to share

experiences and provide feedback. Sellers gain insights to improve their offerings, while reviews support informed decision-making and enhance overall user satisfaction.

G. Seller-See-Review Page

The Seller-See-Review page allows sellers to view customer feedback, helping them identify strengths and areas for improvement. Positive reviews attract more buyers, while constructive criticism provides actionable insights. This feedback loop aids sellers in enhancing their products and service, boosting sales and reputation.

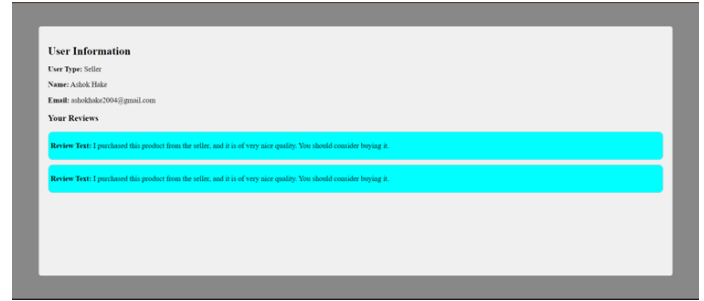


Fig. 9: Seller-See-Review Page in NearBySell

In summary, NearBySell’s interface is designed to facilitate effective local transactions through its user-friendly pages. Features such as product listings, review systems, and direct communication tools are tailored to enhance the user experience and support local commerce. By optimizing these elements, NearBySell delivers a robust platform that benefits both sellers and customers, fostering a dynamic and interactive online marketplace.

IV. CONCLUSION

In conclusion, NearBySell emerges as a groundbreaking solution that effectively addresses longstanding challenges faced by sellers and customers in local markets. By integrating advanced location-based services and innovative algorithms, the platform connects sellers and buyers within their vicinity and supports a diverse range of products, including second-hand items, home goods, shop inventory, and farmers’ crops. Its commitment to security is evident through features such as fake reviews detection, which protects sellers from unfair evaluations, and duplicate listings detection, which ensures customers encounter accurate product options. These security measures, along with a streamlined buying process and improved visibility for sellers, contribute to a vibrant and inclusive marketplace. NearBySell not only fosters economic growth for local sellers but also addresses societal issues like limited market access and trust in digital transactions, showcasing the potential of technology-driven solutions to transform traditional retail landscapes and create a more equitable and sustainable marketplace for all stakeholders.

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