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Department of Computer Science and Engineering

Project Report

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”TechByte”, an Online Computer Components and Electronics Store

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***Abstract*—This project report presents ”TechByte,” an e-commerce platform specializing in electronics, particularly computer components and accessories, along with select gadgets. Developed using the MERN stack (MongoDB, Express.js, React.js, and Node.js), TechByte is designed for scalability, maintainability, and robust performance. The platform incorporates comprehensive user functionalities such as product search, filtering, categorization, shopping cart management, and a wishlist. It also includes essential administrative modules for inventory control, order processing, and status management. The design prioritizes an enhanced user experience and intuitive navigation. Key non-functional requirements addressed include fast performance, scalability, robust security, high usability, and maintainability. TechByte aims to establish a benchmark in user experience and system performance for electronics retail.**

***Index Terms*—MERN Stack, Electronics E-commerce, Electronics, Online Computer Shop, Computer Components.**

I. Introduction

The growing trend of online shopping has significantly transformed the retail sector, especially in electronics. Despite numerous existing platforms, there's a continuous demand for improved user experience and interface in online electronics stores. This project introduces ”TechByte,” an e-commerce platform focused on electronics and computer components. Built with the MERN stack (MongoDB, Express.js, React.js, Node.js), TechByte aims for high performance, scalability, and maintainability. It will offer comprehensive user functionalities, including advanced search, cart management, and secure checkout, alongside administrative tools for inventory and order processing. By prioritizing user-centric design and efficient management, TechByte seeks to enhance the online shopping experience for electronics.

II. Background Study

The rapid growth of the e-commerce sector in Bangladesh has significantly transformed how consumers purchase electronics and computer components. Prominent online retailers such as StarTech, TechLand BD, Ryans Computers, and UCC have played pivotal roles in shaping this landscape. Each platform offers a wide variety of products, ranging from desktop components to gaming accessories, catering to both casual users and tech enthusiasts. StarTech, for instance, is known for its extensive product catalog, responsive customer service, and consistent availability of new hardware releases. Similarly, TechLand BD provides competitive pricing and seasonal offers, often making it a preferred choice among budget-conscious customers. Ryans Computers distinguishes itself with a balanced mix of gaming peripherals and office equipment, as well as multiple payment and delivery options that enhance the overall shopping experience. UCC, on the other hand, has positioned itself as a reliable distributor of branded components, especially for gamers and system builders, offering genuine products with manufacturer warranties.

While these platforms have laid a strong foundation, certain limitations still exist. Most lack personalized recommendation engines, and their user interfaces are often cluttered or inconsistent across devices. Mobile responsiveness and user journey optimization remain areas of improvement. Additionally, product search and filtering mechanisms sometimes fail to deliver accurate or intuitive results, which can be frustrating for users seeking specific configurations. Security and data protection features are generally in place but vary across platforms, leaving room for enhanced consistency and transparency. Based on this analysis, there is a clear opportunity to build a refined and user-centric e-commerce solution. The proposed platform, TechByte, aims to integrate the strengths of these existing sites while overcoming their shortcomings by offering a modern UI/UX, seamless mobile experience, faster search with intelligent filtering, and robust admin controls for product and order management. Through the use of modern technologies such as the MERN stack, TechByte will provide a scalable, secure, and high-performing solution tailored to the needs of today's online tech shoppers.

III. Functional and Non-Functional Requirements

This section details the specific requirements that guided the project's development.

IV. Tools and Technologies

The development of TechByte will leverage a modern and robust set of tools and technologies to ensure a scalable, maintainable, and high-performing e-commerce platform.

- **MERN Stack**: This comprises:
  - **MongoDB**: A NoSQL database used for efficient and flexible data storage. Graphical database management will be handled using MongoDB Compass.

  - **Express.js**: A back-end web application framework for Node.js, facilitating the creation of robust APIs.
  - **React.js**: A JavaScript library for building dynamic and interactive user interfaces.
  - **Node.js**: A JavaScript runtime environment that allows for server-side execution of JavaScript.
- **Development Environment**: Visual Studio Code (VSCode) will serve as the primary integrated development environment.
- **API Testing**: Postman will be utilized for testing and validating the RESTful APIs developed for the platform.

V. Functional Requirements

The application will offer distinct functionalities for end-users and administrators.

A. User Features

The user-facing functionalities are engineered to deliver a seamless and intuitive shopping experience:

- User registration and authentication.
- Search of products.
- Browse by category.
- Management of the shopping cart.
- Secure checkout and order placement.

B. Administrative Features

The administrative modules are crucial for efficient management of the e-commerce platform:

- Inventory management, including product additions, updates, and deletions
- Dashboard for analytics and reporting

VI. Non-Functional Requirements

To ensure the success and long-term viability of TechByte, several key non-functional requirements will be addressed:

- **Performance**: Fast response times and fast load speeds
- **Scalability**: Ability to accommodate the growing number of users and the expanding product listings
- **Security**: Implementation of robust authentication, data encryption, and regular security audits
- **Usability**: A user-friendly and intuitive interface to ensure an optimal shopping experience
- **Maintainability**: Modular architecture and comprehensive documentation for easier updates and maintenance

VII. Diagrams

This section presents crucial diagrams that visually represent the system's design and architecture.

A. Use Case Diagram

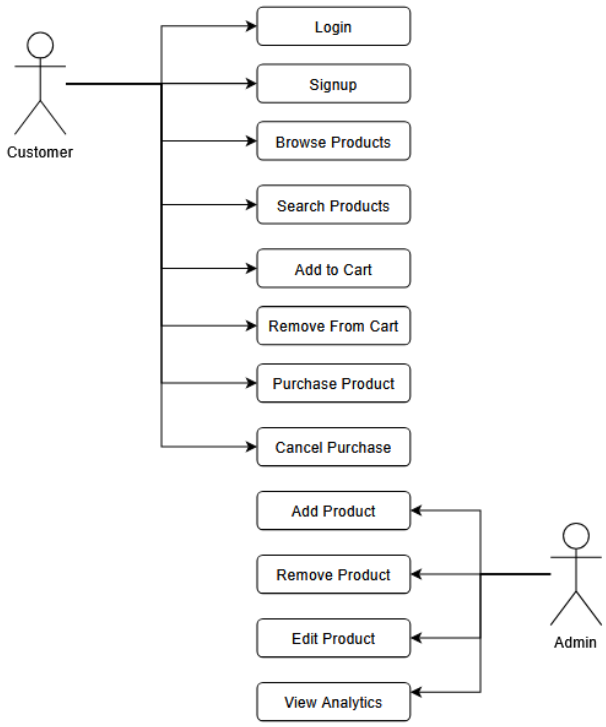

Fig. 1. Use Case Diagram illustrating the interactions between external actors and the system functionalities.

B. Activity Diagram

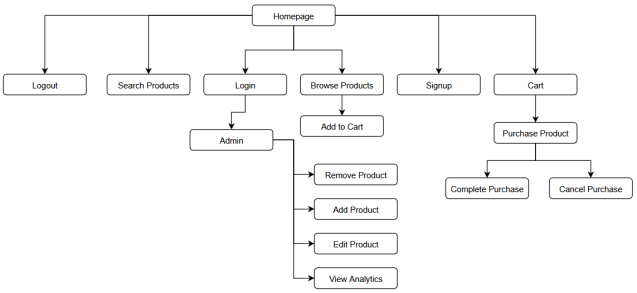

Fig. 2. Activity Diagram depicting a specific workflow or sequence of activities within the system.

C. ER Diagram

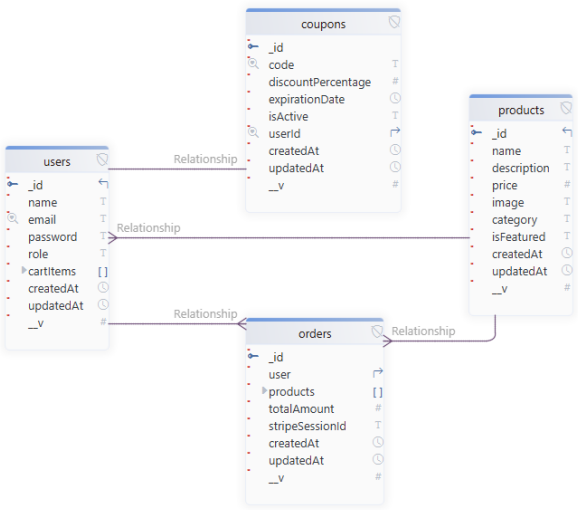

Fig. 3. Entity-Relationship (ER) Diagram showing the structure of the project's database.

VIII. Implementation

A. Homepage

The initial landing page of the "Techbyte" e-commerce site, showcasing "Featured" PC parts like RAM and a GPU.

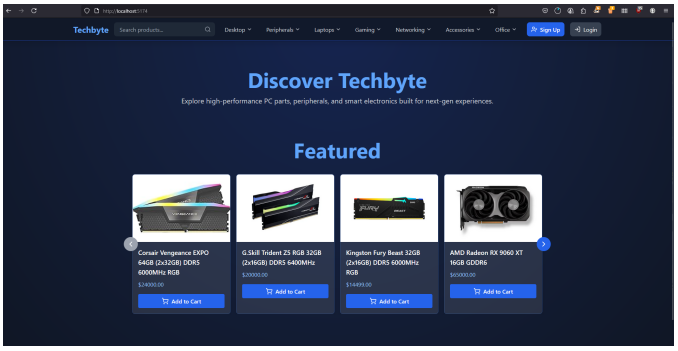

Fig. 4. Homepage with Featured Products

B. Sign In Page

A login interface for existing users to enter their email and password.

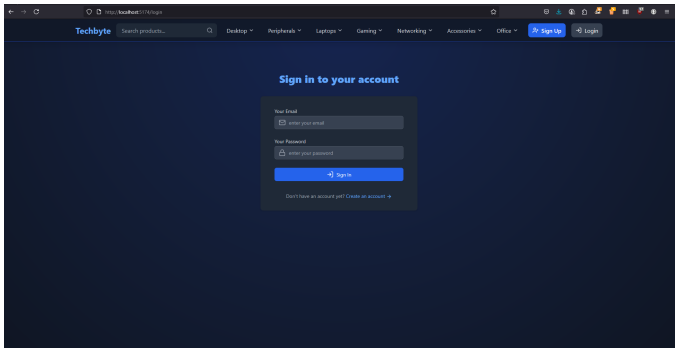

Fig. 5. Sign In Page

C. Register New Account Page

A signup form for new users to create an account by providing their name, email, and a password.

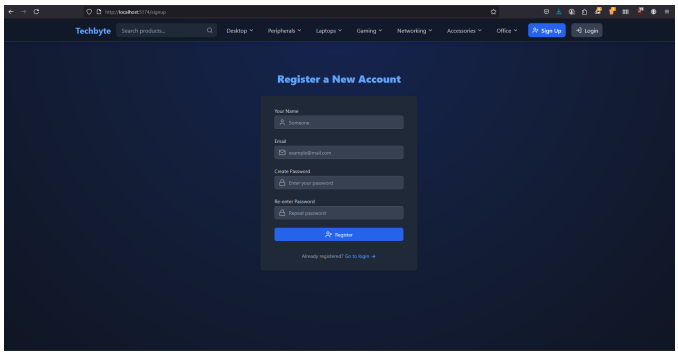

Fig. 6. Register New Account Page

D. Homepage with Search Suggestion

The homepage again, demonstrating a search bar with an autocomplete suggestion for "ddr5."

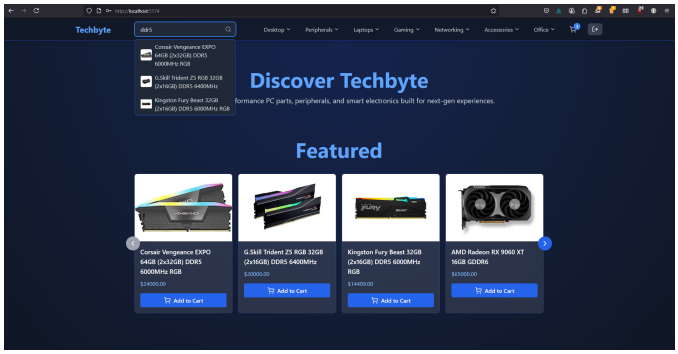

Fig. 7. Homepage with Search Suggestion

E. Product Details Page

A dedicated page for a specific product, "G.Skill Trident Z5 RGB 32GB (2x16GB) DDR5 6400MHz," showing its image, description, and price with an "Add to cart" button.

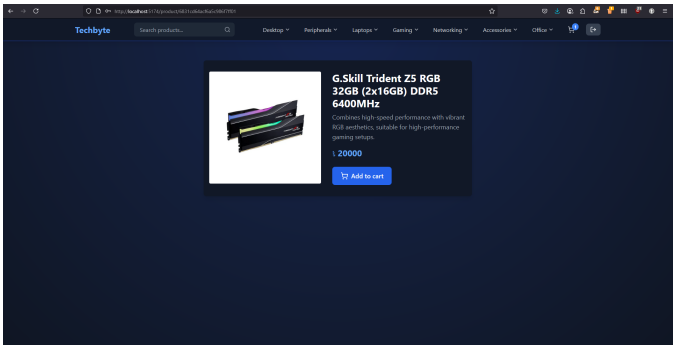

Fig. 8. Product Details Page

F. Cart/Order Summary Page

Displays selected items (RAM and GPU) in the cart, showing original price, savings, total, and an option to apply a coupon.

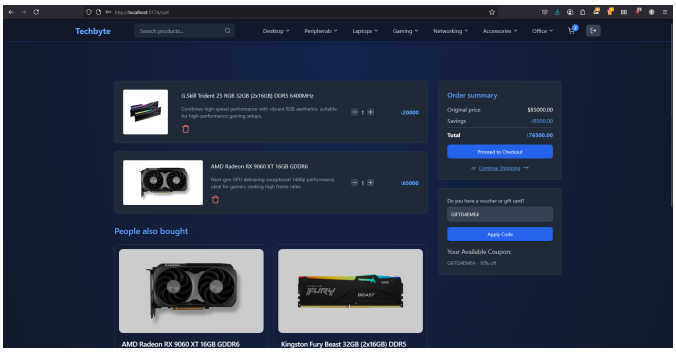

Fig. 9. Cart/Order Summary Page

G. Payment Page (Stripe Sandbox)

A checkout page powered by Stripe, where the user can enter card information and complete the payment.

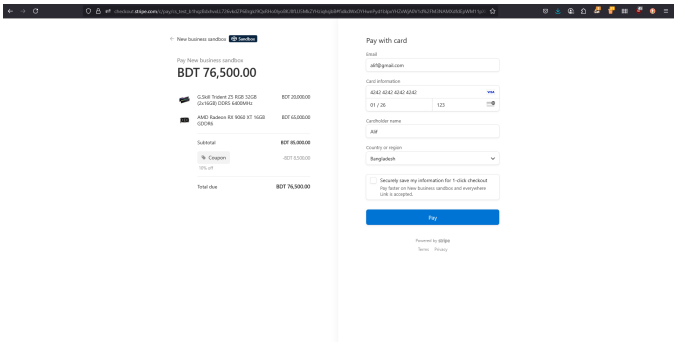

Fig. 10. Payment Page (Stripe Sandbox)

H. Order Successful Page

A confirmation screen indicating that the order was successful, providing an order number and estimated delivery.

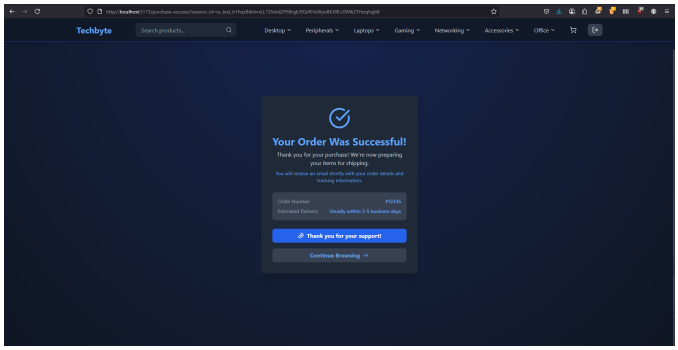

Fig. 11. Order Successful Page

I. Order Cancelled Page

A notification page stating that the order was cancelled and no payment was processed.

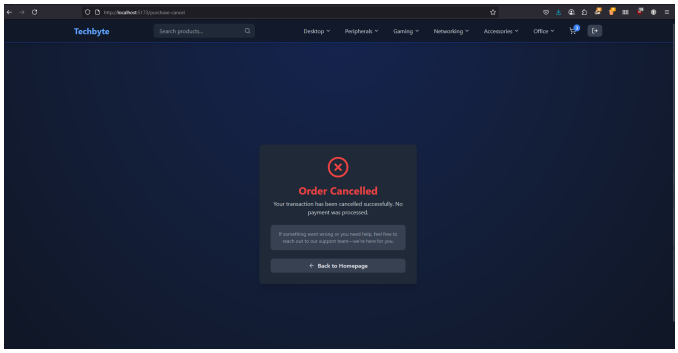

Fig. 12. Order Cancelled Page

J. Admin Dashboard Analytics

Shows a dashboard with key metrics such as total users, total products, total sales, and total revenue, along with a sales and revenue graph.

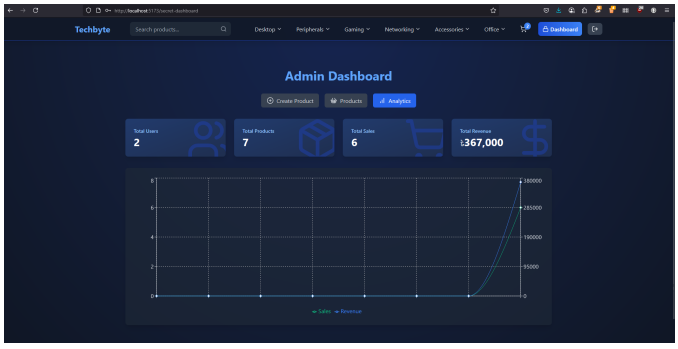

Fig. 13. Admin Dashboard Analytics

K. Create New Product

Displays the interface for adding a new product, including fields for product name, description, price, category, and image upload.

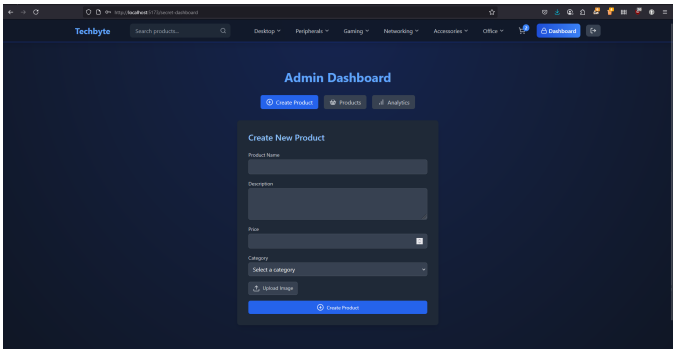

Fig. 14. Create New Product Page

L. Products List

A list of products with details like name, price, category, and options to feature or delete them.

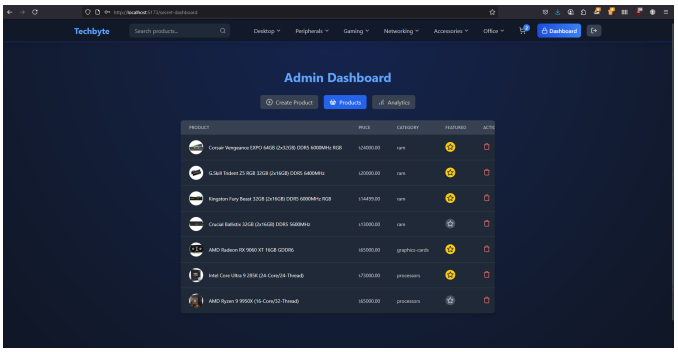

Fig. 15. Products List Page

IX. Conclusion

TechByte aims to bridge the gap between user expectations and the current state of e-commerce platforms for electronics and computer components in Bangladesh. By analyzing leading platforms like StarTech, TechLand BD, Ryans Computers, and UCC, it is evident that while these sites offer diverse products and services, there is still room for improvement in areas such as user interface design, personalized search, and streamlined order management. TechByte is designed to address these gaps using modern web technologies and a user-centric approach, ensuring a fast, secure, and intuitive shopping experience for both customers and administrators. The platform not only aspires to deliver technical excellence but also set a new benchmark in usability and functionality for local online tech retailers.

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