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# E-Commerce Database Management System with UI Integration Proposal

## Abstract

This project presents the design and implementation of a comprehensive relational database management system for an e-commerce platform, along with a web-based user interface. The database system efficiently manages user accounts, product catalog, inventory, orders, payments, and customer reviews. The front-end interface, built with HTML and CSS, provides visual components for user interaction. While currently disconnected, this report outlines the integration pathway between the UI and Oracle database backend to create a fully functional e-commerce application.

## Acknowledgement

This project report, entitled E-Commerce Database Management System with UI Integration Proposal, is the culmination of my work and learning during my second year. I wish to extend my genuine appreciation to those who contributed to its completion.

I am profoundly grateful to my project supervisor, ***Prof. Tasfia Tabassum Faija***, Department of ***Computer Science and Engineering***, for her exemplary guidance, motivation, and immense knowledge. Her continuous support and patience helped me immensely at every stage of this project.

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My heartfelt thanks to my project group members, ***Farzana Afroz, Mohtasim Billah Tanvir, and Asif Ahmed*** for their incredible teamwork, dedication, and hard work. It was a pleasure collaborating with them.

A special note of thanks to my parents and my brother/sister for their faith in me and for their endless love and support, which kept me going. Lastly, I thank Almighty **Allah** for giving me the strength and perseverance to complete this project. ***Md Mahabub Hasan (41230301765)***

# 1. Introduction

The rapid growth of e-commerce has created a critical need for robust database systems that can handle complex transactions, user data, inventory management, and customer interactions. Traditional file-based systems or poorly designed databases often lead to data redundancy, inconsistency, and inefficient query processing. Without a properly structured database, e-commerce platforms face challenges in maintaining accurate inventory records, processing orders efficiently, managing user accounts securely, and providing personalized shopping experiences.

The motivation for this project stems from the necessity to create a scalable, efficient, and maintainable database backend for e-commerce operations that ensures data integrity, supports business intelligence through structured data storage, and enables seamless user experiences across various shopping activities.

## 2. Objective of the System

- To design a normalized database schema for e-commerce operations
- To implement tables, relationships, and constraints for data integrity
- To automate critical business processes through triggers and sequences
- To support essential e-commerce functionalities including:
  - User registration and role management
  - Product catalog organization with categories
  - Inventory management with stock tracking
  - Shopping cart functionality
  - Order processing and status tracking
  - Discount and promotion management
  - Product reviews and ratings system
  - Payment method management

## 3. System Design and Implementation

### 3.1) Proposed Solution

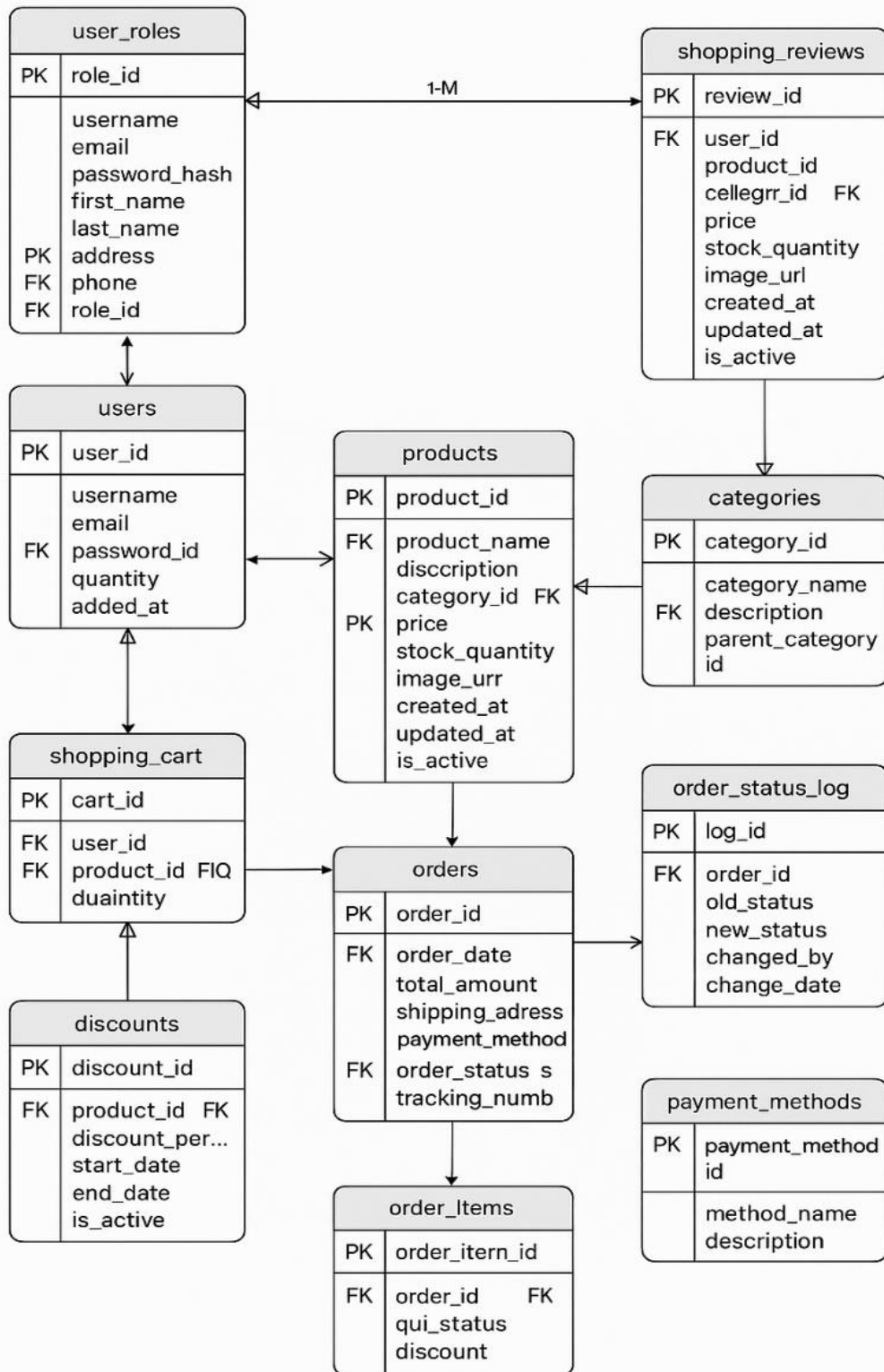
The solution implements a relational database model with carefully designed tables, relationships, and constraints. The system uses:

- Primary and foreign keys for relationship enforcement
- Check constraints for data validation
- Sequences for automated ID generation
- Triggers for automated stock management and rating calculations
- Normalized structure to minimize redundancy

### 3.2) List of Tables with Purpose

Table Name	Purpose
user_roles	Stores different user roles (Admin, User)
users	Contains user account information
categories	Organizes products into hierarchical categories
products	Stores product details and inventory information
discounts	Manages product discounts and promotions
payment_methods	Defines available payment options
shopping_cart	Temporarily stores items users intend to purchase
orders	Records customer orders and status
order_items	Contains individual products within each order
product_reviews	Stores customer ratings and reviews
order_status_log	Tracks order status changes for auditing

### 3.3) ER Diagram:



## 3.4) Physical Schema (Table Structure with Attributes)

### 1. user\_roles

- role\_id (PK, NUMBER)
- role\_name (VARCHAR2(50))
- description (VARCHAR2(200))

### 2. users

- user\_id (PK, NUMBER)
- username (VARCHAR2(50))
- email (VARCHAR2(100))
- password\_hash (VARCHAR2(200))
- first\_name (VARCHAR2(50))
- last\_name (VARCHAR2(50))
- address (VARCHAR2(200))
- phone (VARCHAR2(20))
- role\_id (FK, NUMBER)
- created\_at (DATE)
- last\_login (DATE)
- is\_active (NUMBER(1))

### 3. categories

- category\_id (PK, NUMBER)
- category\_name (VARCHAR2(100))
- description (VARCHAR2(200))
- parent\_category\_id (FK, NUMBER)

### 4. products

- product\_id (PK, NUMBER)
- product\_name (VARCHAR2(100))
- description (VARCHAR2(500))
- category\_id (FK, NUMBER)
- price (NUMBER(10,2))
- stock\_quantity (NUMBER)
- image\_url (VARCHAR2(200))
- created\_at (DATE)
- updated\_at (DATE)

- is\_active (NUMBER(1))
- rating (NUMBER(3,2))

## **5. discounts**

- discount\_id (PK, NUMBER)
- product\_id (FK, NUMBER)
- discount\_percent (NUMBER(5,2))
- start\_date (DATE)
- end\_date (DATE)
- is\_active (NUMBER(1))

## **6. payment\_methods**

- payment\_method\_id (PK, NUMBER)
- method\_name (VARCHAR2(50))
- description (VARCHAR2(200))

## **7. shopping\_cart**

cart\_id (PK, NUMBER)  
 user\_id (FK, NUMBER)  
 product\_id (FK, NUMBER)  
 quantity (NUMBER)  
 added\_at (DATE)

## **8. orders**

order\_id (PK, NUMBER)  
 user\_id (FK, NUMBER)  
 order\_date (DATE)  
 total\_amount (NUMBER(10,2))  
 shipping\_address (VARCHAR2(200))  
 payment\_method\_id (FK, NUMBER)  
 order\_status (VARCHAR2(20))  
 tracking\_number (VARCHAR2(50))

## **9. order\_items**

order\_item\_id (PK, NUMBER)  
 order\_id (FK, NUMBER)  
 product\_id (FK, NUMBER)  
 quantity (NUMBER)

unit\_price (NUMBER(10,2))  
discount\_amount (NUMBER(10,2))

#### **10. product\_reviews**

review\_id (PK, NUMBER)  
product\_id (FK, NUMBER)  
user\_id (FK, NUMBER)  
order\_id (FK, NUMBER)  
rating (NUMBER(1))  
review\_text (VARCHAR2(1000))  
review\_date (DATE)

#### **11, order\_status\_log**

log\_id (PK, NUMBER)  
order\_id (FK, NUMBER)  
old\_status (VARCHAR2(20))  
new\_status (VARCHAR2(20))  
changed\_by (VARCHAR2(50))  
change\_date (DATE)

## **4. Result and Discussion**

The implemented database system successfully addresses all core requirements of an e-commerce platform. The normalization process eliminated data redundancy while maintaining referential integrity through well-defined relationships. The UI components have been designed with modern e-commerce principles:

- Responsive design for various device sizes
- Intuitive navigation and product browsing
- Clean shopping cart interface
- Streamlined checkout process
- User account management pages

**4.1) Current State:** The UI is currently static (HTML/CSS only) without database connectivity.

**4.2) Integration Requirements:** To connect the UI with the database, the following components are needed:

- Server-side technology (Node.js, PHP, Java, or Python)
- REST API or server-side scripts to handle database operations



- Connection middleware (like Oracle Instant Client)
- Authentication and session management

## 5. Application and Future Scope

### 5.1) Current Applications

- Online retail stores
- Inventory management systems
- Order processing systems
- Customer relationship management
- Product review and rating systems

### 5.2) UI-Database Integration Plan

- **Phase 1:** Connect product catalog and shopping features
- **Phase 2:** Implement user authentication and profiles
- **Phase 3:** Develop order processing and payment integration
- **Phase 4:** Add admin dashboard for inventory and order management

### 5.3) Future Enhancements

- **Real-time Inventory Updates:** WebSocket integration for stock level updates
- **Payment Gateway Integration:** Secure connection to payment processors
- **Image Upload:** Product image management system
- **Search Functionality:** Advanced product search with filters
- **Order Tracking:** Real-time shipment tracking integration
- **Email Notifications:** Order confirmation and status updates
- **Recommendation Engine:** Personalized product suggestions
- **Mobile App:** React Native or Flutter application

## 6. Conclusion

The e-commerce database management system designed and implemented in this project provides a robust foundation for online retail operations. The front-end interface offers a user-friendly experience that, when connected to the database, will create a complete e-commerce solution. The integration pathway outlined demonstrates how the static UI can be transformed

into a dynamic web application through server-side scripting and API development. This comprehensive system provides all necessary components for a modern e-commerce platform that can scale with business growth.

## 7. Reference

- Connolly, T. M., & Begg, C. E. (2014). Database Systems: A Practical Approach to Design, Implementation, and Management. Pearson Education.
- Oracle Database Documentation. (2023). Oracle Help Center.
- MDN Web Docs. (2023). JavaScript and Web APIs.

## 7. Screen short of UI

### 7.1) Home page & Registration:

The image displays two screenshots of the TechShop web application interface.

**Top Screenshot: Home Page**

- Header:** A blue navigation bar containing the TechShop logo, links for Home, Products, Categories, About, and Contact, and buttons for Login and Register.
- Banner:** A large blue banner with the text "Welcome to TechShop" and "Discover the latest tech products at amazing prices with fast shipping and excellent customer service." A large "SALE" watermark is visible in the background. A "Shop Now" button is centered below the text.
- Featured Products:** A section titled "Featured Products" with a red underline, showing three product images.

**Bottom Screenshot: Registration Form**

- Header:** Similar to the home page, with the TechShop logo and navigation links.
- Form Title:** "Register for TechShop" is centered at the top of the form area.
- Form Fields:**
  - Full Name:** A text input field with the placeholder "Enter your full name".
  - Email Address:** A text input field with the placeholder "asifahmad280820tp@gmail.com".
  - Phone Number:** A text input field with the placeholder "Enter your phone number".
  - Password:** A password input field with the placeholder "....".
  - Confirm Password:** A label for the second password input field, which is partially visible at the bottom.

## 7.2) Log In & About:

The image displays two screenshots of the TechShop website interface.


**Top Screenshot (About Page):**

- Header:** Blue navigation bar with "TechShop" logo, links for Home, Products, Categories, About, and Contact, and Login/Register buttons.
- Product Cards:** Two white cards with "Add to Cart" buttons.
- Footer:** Dark grey section with four columns:
  - About TechShop:** TechShop is a leading online retailer of technology products, committed to quality and customer satisfaction.
  - Quick Links:** Home, Products, Categories, About Us, Contact.
  - Contact Info:** 123 Tech Street, City, +1 234 567 8900, info@techshop.com.
  - Newsletter:** Subscribe to our newsletter for updates and offers. Includes a "Your Email" input field and a "Subscribe" button.
- Copyright:** © 2023 TechShop. All rights reserved.

**Bottom Screenshot (Login Page):**

- Header:** Same as the top screenshot.
- Login Form:** A white card with the title "Login to TechShop". It contains:
  - Username or Email:** Input field with "asifahmad280820tp@gmail.com".
  - Password:** Input field with masked characters "\*\*\*\*".
  - Login Button:** A red button labeled "Login".
  - Registration Link:** "Don't have an account? [Register here](#)".


### 7.3) Developer's & View Product :

 TechShop


[Home](#) [Products](#) [Categories](#) [About](#) [Contact](#)

[Login](#) [Register](#)


## Our Development Team




**Asif Ahmad**  
Lead Developer  
Northern University Bangladesh  
Specializes in front-end




**MD. Mahabub Hasan**  
Database Developer  
Northern University Bangladesh  
Expert in database development



**Mohtasim Billah**  
Database Developer  
Northern University Bangladesh  
Database developer and SQL



**Farjana Afroz**  
Query Expert  
Northern University Bangladesh  
Create any types of query for

 TechShop

[Home](#) [Products](#) [Categories](#) [About](#) [Contact](#)


[Login](#) [Register](#)

## Find Your Perfect Product


Showing 12 products

Sort by ▾


[All Products](#) [Electronics](#) [Books](#) [Food & Beverages](#) [Fashion](#) [Home & Kitchen](#)



Electronics

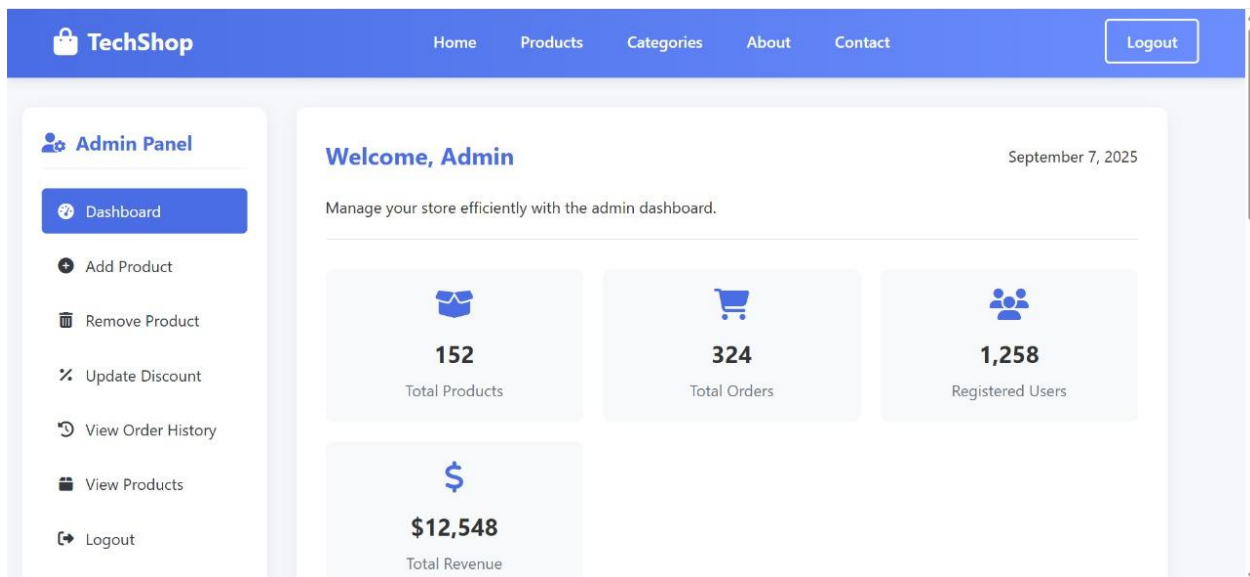
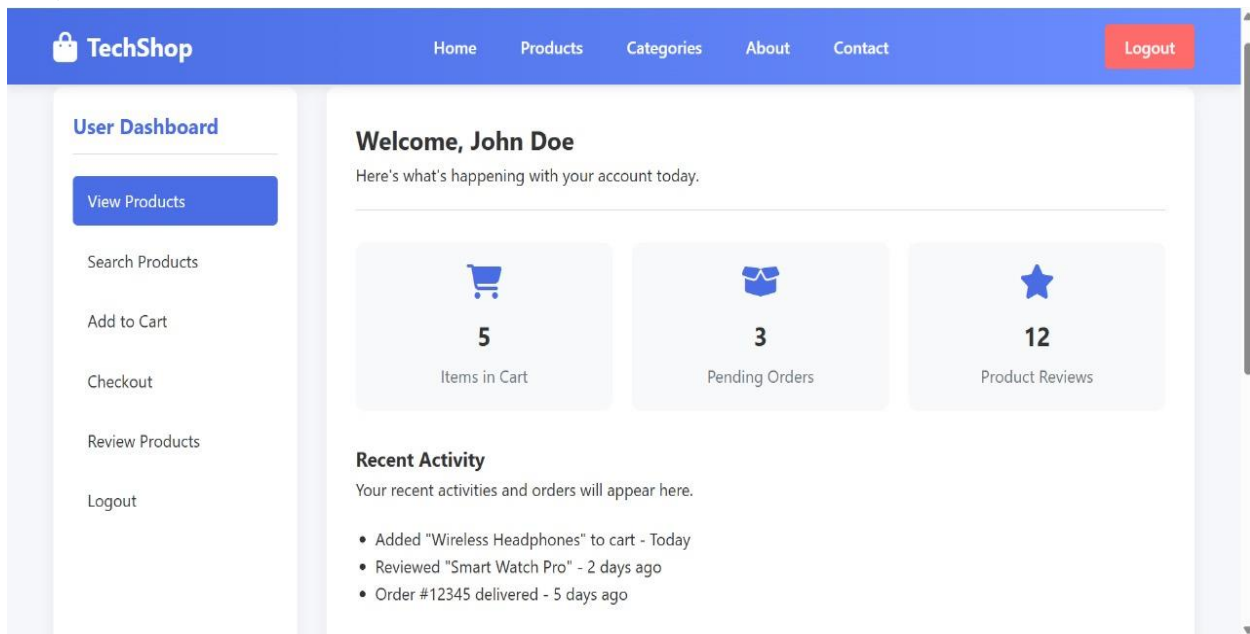


Electronics




Electronics

## 7.8) User Dashboard & Admin Dashboard:




## 7.5) Shop address:

 **TechShop**


[Home](#) [Products](#) [Categories](#) [About](#) [Contact](#)

[Login](#) [Register](#)


### Get In Touch

 **Our Address**


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+1 (987) 654-3210

 **Email Address**

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 **Working Hours**

Monday - Friday: 9:00 AM - 6:00 PM  
Saturday: 10:00 AM - 4:00 PM  
Sunday: Closed

### Send Us a Message

**Your Name**

**Your Email**

**Subject**

**Your Message**