

MediMart

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This Report Presented in Partial Fulfillment of the
Requirements for the **Degree of Bachelor of Science in**
Computer Science and Engineering

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APPROVAL

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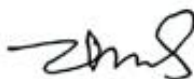
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We hereby declare that this project has been done by us under the supervision of **Fatema Tuj Johora, Assistant Professor**, Department of Computer Science and Engineering, Daffodil International University. We also declare that neither this project nor any part of this project has been submitted elsewhere for the award of any degree or diploma.

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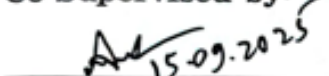

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ABSTRACT

Accessing medicines in Bangladesh can often be frustrating—long queues, limited stock, and the need for physical prescriptions make it harder for people to get what they need, especially during emergencies. MediMart was built to solve this. It's an online pharmacy platform where users can easily find and order medicines from home, with the option to upload prescriptions, track orders, and pay securely through SSLCOMMERZ. The platform is developed using modern technologies like Next.js, TypeScript, and Tailwind CSS for the frontend, and Express.js with MongoDB for the backend. One of the key features is real-time prescription and stock validation, so users can't accidentally buy expired or restricted products. Admins have their own dashboard to manage inventory, verify prescriptions, and monitor orders. We tested the system thoroughly, and it performed reliably across all major functions. Overall, MediMart combines the best of e-commerce and healthcare, offering a practical solution for a growing problem in our country. In the future, this system could be expanded to include mobile apps, smart recommendations, or even blockchain for verifying medicine authenticity—making it even more powerful and user-friendly.

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Chapter 1

Introduction

1.1 Introduction

Digital revolution has radically changed our day to day lives in several ways. The emergence of e-commerce has been one of the most important changes. Consumers nowadays are able to purchase almost anything at the comfort of few clicks, whether it be clothes, to devices, and even foodstuffs. Nevertheless, there is one area that has fallen behind: the medical and pharmaceutical sector. In Bangladesh particularly the process of accessing medication can remain tedious and time-consuming to the patient. Most particularly people who live in the rural districts or those who have chronic diseases.

Purchasing the necessary drugs can be a time-consuming procedure to many members of the population as most have to travel long distances to a physical pharmacy or queue up long lines or struggle to get particular drugs. This is a tedious and even impossible task to elderly patients or people with little mobility capability. In addition to that, at a lot of pharmacies, the prescription must be made physically, which is another complicating factor. These obstacles together with the generally disjointed healthcare systems deny millions of people access to the healthcare they require at the right time.

This is where MediMart steps in.

MediMart is a revolutionary e-pharmacy solution that aims at filling the gap. Mismatch between the patients and the required medications, especially in the case of those who have problems accessing conventional pharmacy. Whether you're a busy a senior citizen, a professional or a person living in a remote area, MediMart. enables you to have direct access to pharmaceutical products on the device all from the comfort of your home.

Why MediMart?

Our platform was designed with the unique needs of the Bangladeshi healthcare market in mind. With rising internet penetration, especially in urban areas, the opportunity to create an accessible online pharmacy has never been more apparent. However, MediMart's vision goes beyond just selling medicine online – it's about creating an ecosystem that improves accessibility, enhances customer experience, and ensures the security of patient information.

Many of the challenges related to traditional pharmacies, such as stock shortages, high prices, and inconvenient store hours, are eliminated by MediMart's approach. Through our platform, customers can browse a wide variety of medications and healthcare products, get prescription verification, and receive prompt delivery at their doorstep. And because we're built on cutting-edge technology, the entire process, from registration to order fulfillment, is smooth, user-friendly, and secure.

Key Features of MediMart

1. Seamless User Experience:

MediMart is built with simplicity in mind, ensuring that customers of all ages can easily navigate the platform. Our intuitive interface allows users to quickly register, browse products, add them to their shopping cart, and upload prescriptions for verification.

2. Prescription Management:

MediMart's advanced prescription management system helps users upload their prescriptions directly to the platform. Our system checks the prescriptions for correct medication to the correct individual to help minimize the reducing element. Mistakes that relate to dispensing of drugs. This is not only contributing to patient safety but it is also simplifying the process to the users who would have to buy some sort of medications through prescription.

3. Online Payments:

After making the selection of the products, the users can effortlessly make payment online through the secure payment gateways. MediMart also accepts

many different forms of payments, including credit and debit cards and other forms such as mobile banking such as SSLCOMMERZ, which means that a user can make a transaction in the manner most convenient to them. We also have a system that enables real time processing of payment making it a hassle free and easy experience to all the customers.

4. Real-time Inventory Management:

On administrative front, the MediMart offers a complete administration panel where the pharmacy manager can manage inventory. They are able to monitor the levels of stocks easily, update product listing and handle customer orders. This will minimize cases of stockout and customers always find the medications they require.

5. Secure and Scalable Backend:

MediMart has a strong technology stack that supports large scale operations and therefore we can be sure that our system can support larger scale operations as the needs increase. Our site is also hosted on safe cloud platform so that all the information of the users such as prescription and payment details are encrypted.

.

Bridging the Healthcare Gap

The healthcare sector in Bangladesh has been associated with several problems such as long queues at pharmacies besides the challenge of accessing drugs, especially in the rural regions. MediMart is not an online pharmacy only, but digital healthcare service that seeks to ease access to medicine to all and all irrespective of their location or health condition. MediMart removes the physical restrictions such as location and availability by creating a digital connection between patients and pharmacies.

The ability of MediMart to empower the users with technology is one of the distinct features of the company. We aim at making healthcare more accessible, secure and convenient. The consumers are now free to place orders to purchase medicines, monitor their prescriptions, and get the finest healthcare products, all at the touch of a hand. This is the case with seniors, chronic patients and individuals with mobility difficulties. service is not only a convenience it is a lifesaver.

A Comprehensive Solution for the Future of Healthcare in Bangladesh

MediMart A Comprehensive Solution to Future of Healthcare MediMart is bound to transform the healthcare system in Bangladesh. Our three pillars accessibility, security and scalability not only are a service offering a pharmacy but an entire healthcare experience. The rising electronic revolution in the healthcare industry in Bangladesh is a go to a brighter future and MediMart is happy to lead this way.

In conclusion, MediMart is set to transform the way Bangladesh consumes pharmaceutical products. With its seamless technology, user-friendly interface, and secure payment options, the platform ensures that everyone, from urban professionals to rural dwellers, can get the healthcare products they need when they need them. As we continue to grow and innovate, MediMart will remain dedicated to improving the digital healthcare infrastructure.

1.2 Motivation

The inspiration for the initiative came from the ever-increasing need to digitize the accessibility of healthcare. Even in Bangladesh, it remains prevalent to use physical pharmacy visits for the purchase of drugs, with long waiting times, unknown stock levels, and limited record keeping on the digital front. During a time of crisis or a situation like a COVID-19 pandemic, these issues became more pronounced, and the need for a solution became imminent.

As a computer science major with a desire to create practical, socially relevant solutions, I was inspired to create a system that could serve as a bridge for this purpose. By working on MediMart, I not only wanted to put my skills in the area of the latest web development, but also to contribute to the solution of a measurable problem that resonates in the lives of millions of people. Moreover, using this project, there was a wonderful opportunity to practice what I am aware of frontend and backend frameworks, secure authentication, integrating payment gateways, and how to develop a complete e-commerce solution that would be used by the population.

1.3 Objectives

The main goals of the Medi Mart project are intended specifically to fulfill the needs of an online pharmacy website, surpassing a generic e-commerce design by integrating healthcare-specific needs. The following are the objectives:

1. Prescription Verification: Ensure medications requiring prescriptions are only available for purchase after upload and authentication.
2. Real-Time Stock and Expiry Validation: Prevent sales of expired or out-of-stock items by verifying stock and expiry dates in real time.
3. Prescription Management: Allow users to securely upload and manage prescriptions stored in Cloudinary.
4. Invoice Download and Print: Provide downloadable invoices post-purchase for customer confirmation.

1.4 Method

The project was carried out using an iterative and modular development process where each element of the system was planned, implemented, tested, and integrated stepwise. The development began with requirement analysis, then wireframing and UI/UX design with Figma.

Frontend for the platform was implemented using Next.js 14 (App Router) with TypeScript for performance and type safety. Tailwind CSS has been used for quick and responsive styling, alongside shadcn/ui for reusable component

skeletons. State management and API calls were done with Redux Toolkit and RTK Query. Form handling and validation were implemented using Formik and Yup.

Backend was implemented using Express.js, a light and versatile Node.js framework. Everything from user details, product details, to ordering history was stored with MongoDB as the ODM. User authentication was made secure with JWT (JSON Web Token). Uploads of files, particularly prescriptions,

were made using Cloudinary for speedy and trustworthy storage. Secure and verified transactions were made with the help of SSLCOMMERZ, a popular Bangladeshi payment gateway.

1.5 Project Outcomes

1. Seamless online pharmacy experience for customers.
2. Ability for customers to browse products, upload prescriptions, and make secure purchases.
3. Admin dashboard for managing inventory, orders, and customer accounts.
4. Real-time stock updates with automatic inventory validation to ensure smooth operations.
5. Secure login and role-based access control for different user types.
6. Cloud storage for storing and managing prescriptions safely.
7. Analytics access for admins on sales, product performance, and user activity.
8. Responsive design ensuring flawless performance across all devices (desktop, tablet, mobile).
9. Continuous performance testing and refinement based on user feedback.
10. Showcases full-stack development skills while providing a practical solution for online healthcare product access.

1.6 Organization of the Report

The report is divided into six chapters as follows:

1. Chapter 1 presents the theme, states the reason and purpose, and sets forth the method and anticipated outcomes of the work
2. Chapter 2 provides background that encompasses current solutions, previous studies, and gaps that MediMart is designed to bridge within the current healthcare system.

3. Chapter 3 discusses research methodology at length, encompassing system requirements, design specifications, diagrams, UI arrangement, and development plans.
4. Chapter 4 covers the technical implementation of the proposed system, testing phases, performance measurement, and result interpretation on actual data.
5. Chapter 5 discusses adherence to software engineering standards, ethical considerations, sustainability impacts, and issues that arose during development.
6. Chapter 6 provides a summary, the limitations of the project, and potential future enhancements or expansions.

Chapter 2

Background

2.1 Introduction

In the evolving landscape of digital healthcare services, online pharmacy platforms are playing an increasingly crucial role in improving accessibility and convenience for patients [1]. With the rise of e-commerce, more consumers are seeking healthcare solutions from digital platforms that offer reliable service, quick delivery, and seamless user experiences. However, the healthcare domain poses unique challenges in terms of compliance, prescription validation, data privacy, and stock management, making it distinct from traditional e-commerce [2].

In Bangladesh, the online sale of medicine is still emerging, with limited platforms addressing all the regulatory and functional requirements in a robust and user-friendly manner. To bridge this gap, MediMart aims to create a modern pharmacy e-commerce system that addresses core user needs while complying with local practices and healthcare constraints. Understanding past works and technological advancements in related areas is crucial for shaping the development of this project [3].

2.2 Literature Review

In recent years, the advancement of intelligent technologies such as artificial intelligence (AI), machine learning (ML), and blockchain has significantly influenced the development of digital platforms across various sectors, including healthcare [4]. Studies in data science have shown how large datasets can be leveraged to extract actionable insights, enabling platforms to deliver more personalized and efficient services. In the healthcare domain, research on

machine learning has emphasized its potential to assist in early diagnosis, treatment suggestions, and inventory predictions, which are particularly valuable for pharmacy platforms [5].

Meanwhile, AI has also been widely used in financial forecasting, supporting dynamic pricing and sales analytics in e-commerce systems. Another key area of research is blockchain technology, which has proven effective in enhancing supply chain transparency, especially for pharmaceuticals, where counterfeit drugs pose a major concern [6]. These prior works highlight the technological pathways and design considerations that guide the development of MediMart, informing key features such as secure prescription handling, intelligent stock management, and future potential for traceable medicine supply chains.

2.2.1 Similar Applications

Several online pharmacy platforms currently exist, both globally and within Bangladesh, offering users the ability to purchase medicines and healthcare products digitally. Platforms like Pharmeasy, Netmeds, and 1mg in India provide comprehensive pharmacy services, including e-consultations, lab tests, and medicine deliveries [7][8]. These platforms offer valuable inspiration in terms of user interface, prescription handling, and delivery workflows.

Locally, platforms such as Arogga, BanglaMeds, and ePharma serve the Bangladeshi population, offering mobile apps and websites for ordering medications [9]. While these platforms have made considerable progress in digitizing the pharmaceutical supply chain, most suffer from limitations such as non-intuitive user interfaces, limited admin management capabilities, lack of dynamic inventory control, and poor handling of expired or prescription-only products.

2.1.1 Related Research

Recent research in healthcare information and e-commerce technologies support the need for smarter, secure, and more accessible platforms. Machine learning studies in healthcare management have demonstrated how predictive models can improve inventory restocking, detect fraudulent prescriptions, and forecast high-demand periods for essential medicines. Research has also explored cloud-based solutions for secure document storage, supporting systems that need to manage sensitive data such as prescriptions

Studies in user experience (UX) design within medical applications stress the importance of accessibility, especially for elderly users or those in rural regions with slower internet connections. Additionally, research on payment gateway integration and consumer behavior indicates that platforms offering secure, mobile-friendly payment systems significantly improve transaction rates and user trust [10].

MediMart applies the learnings from this research by integrating real-time validation, Cloudinary for secure prescription uploads, and SSLCOMMERZ for localized online payments, aligning the system with both user needs and academic best practices [11].

2.2 Gap Analysis

While several pharmacy-based e-commerce platforms exist, both existing applications and academic research reveal notable gaps that Medi Mart intends to bridge:

- ❖ **Prescription Validation:** Most local platforms allow uploading prescriptions but don't strictly validate them before purchase. Medi Mart enforces prescription checks for regulated items during the checkout phase.

- ❖ **Expired Product Control:** Some systems lack automation to flag or prevent expired medicines from being displayed or sold. MediMart includes expiry tracking and disables purchase options automatically
- ❖ **Admin Functionality:** Many solutions lack a robust admin dashboard that allows pharmacy staff to monitor stock, manage customers, and view analytics. MediMart offers a complete backend panel for order, user, and product control.
- ❖ **User Experience:** Complicated navigation, poor mobile responsiveness, and lack of real-time feedback hinder the user journey in existing platforms. MediMart solves these through a modern, mobile-friendly UI using Next.js, Tailwind CSS, and shadcn/ui.
- ❖ **Payment Localization:** Few platforms offer localized, trusted payment solutions like SSLCOMMERZ. MediMart integrates this to provide secure and familiar transactions for Bangladeshi users.

2.3 Summary

This Chapter provided a comprehensive overview of the theoretical background and existing solutions related to online pharmacy systems. The literature review highlighted how technologies like data science, machine learning, and blockchain are transforming healthcare and e-commerce platforms. An analysis of similar applications revealed that while there are existing solutions in Bangladesh and globally, most fall short in areas like prescription enforcement, expired product handling, and admin control. Relevant research further emphasized the importance of secure, scalable, and intelligent systems in healthcare technology.

The gap analysis clearly identified specific shortcomings in current platforms and how Medi Mart addresses them through targeted features such as real-time validation, automatic expiry checks, and a robust admin dashboard. This foundation sets the stage for the methodology and technical design discussed in the next chapter.

Table 2.4: Comparison Table

Feature	Description	Reference
Prescription Verification	Users must upload prescriptions before purchasing certain medications.	Prescriptions in e-commerce: Validations and security concerns [3].
Expired Product Control	Automatically flags and disables the purchase of expired products.	Prescriptions in e-commerce: Validations and security concerns [1].
Inventory Management	Admins can monitor stock levels and update product listings via an admin dashboard.	E-commerce platforms for healthcare: Case studies and current trends [2].
Payment Gateway	Integrated with SSLCOMMERZ for secure online transactions.	Payment gateways for e-commerce platforms: An analysis of SSLCOMMERZ [5].
User Experience	Simple, responsive design with real-time stock and prescription validation.	Agile software development methodologies and their application [6].
Security Features	Utilizes SSL/TLS encryption, JWT authentication, and Cloudinary for secure prescription uploads.	Data privacy and security in healthcare e-commerce [4].
Mobile-Friendly Design	Platform is designed to work across devices with mobile-first approach.	E-commerce platforms for healthcare: Case studies and current trends [9].
Scalability	Built with scalable cloud infrastructure for growth.	Scalable cloud systems for e-commerce platforms [10].

Chapter 3

Research Methodology

3.1 Methodology/Requirement Analysis & Design Specification

3.1.1 Overview

Before starting any development work for MediMart, we took a step back to understand the real problem we were trying to solve. In Bangladesh, many people still struggle to buy medicines online due to issues like prescription requirements, expired products, and limited digital access. So, rather than rushing into coding, we first focused on identifying the specific needs of users and the shortcomings in existing platforms.

Once we had a clear picture, we moved forward with a structured approach. We listed out all the necessary features — like secure user login, prescription upload, real-time stock validation, and admin control — and broke them down into smaller tasks. This modular planning made the development process smoother and more manageable.

We also identified what the system must do (functional requirements), and how it should behave (non-functional requirements). Things like security, performance, and mobile responsiveness were just as important to us as core features.

Choosing the right tech stack was another key step. We selected tools that were modern, reliable, and efficient — including Next.js for the frontend, Express.js for the backend, MongoDB for database management, and Cloudinary for secure prescription uploads. These technologies helped us move quickly while keeping the system scalable and secure.

In short, our methodology wasn't just about writing code — it was about planning a solution that works well for real people, and building it in a way that's flexible, secure, and ready for future growth.

3.1.2 Proposed Methodology/ System Design

To successfully build MediMart we didn't just jump into coding. We followed a logical step-by-step process to understand the problem, research the solution, and design the system in a way that would truly help people. The flowchart shown in Figure 3.1 is a roadmap that guided our entire project, from idea to implementation. Below, I've explained each part of that flow in a clear, human way.

- 1. Problem Identification and Interpretation:** We started by looking at a real problem—many people in Bangladesh find it hard to buy medicine online. Whether it's due to missing prescriptions, outdated stock, or poor user experience, there's a big gap in service. This became the heart of our project: making medicine more accessible with the help of a modern online system.
- 2. Research Direction and Literature Review:** Once we knew what the problem was, we needed to see how others were solving it. We explored existing pharmacy websites and apps, read research articles, and studied the features people actually use and expect. This helped us understand both what works—and what doesn't.
- 3. Defining the Focus of the Project:** Based on our research, we decided to focus on four main things:
 - ❖ Prescription-required product handling
 - ❖ Preventing expired medicine sales
 - ❖ Giving admins full control over inventory and orders
 - ❖ Making the site easy and safe for users
 - ❖ This focus helped us stay on track and build features that actually mattered.

4. **User Understanding (Interview Stage):** While we didn't do formal interviews, we did ask classmates, family members, and peers what they'd want in an online medicine site. We also checked online reviews of other platforms. This gave us a lot of insight into what people expect—things like easy search, fast checkout, and order tracking.
5. **Designing the User Side (Frontend Design):** With user needs in mind, we moved on to designing the actual interface. We used Figma to sketch out pages like the homepage, product listings, and the checkout screen. Our goal was to keep everything clean, simple, and mobile-friendly so that even someone new to online shopping could use it without help.
6. **Designing the Backend (System Architecture):** While the frontend was all about how things looked, the backend focused on how things worked. We chose tools like:
 - ❖ Next.js & Tailwind CSS for the frontend
 - ❖ Express.js & MongoDB for the backend
 - ❖ Cloudinary for image uploads (prescriptions)
 - ❖ SSLCOMMERZ for secure payments
 - ❖ JWT for login protection and route securityWe carefully planned out each API, how data would be stored, and how the system would manage stock and user roles.
7. **Testing and Improvement (Observation & Analysis):** After building each feature, we tested it—again and again. We placed test orders, uploaded dummy prescriptions, tried wrong passwords, and even simulated low-stock scenarios. Every time we found a bug or something confusing, we fixed it. This made the system smoother and more reliable.
8. **Final Results and What We Learned:** In the end, everything came together. Users could register, upload prescriptions, buy products, and get invoices. Admins could manage orders and update stock. Everything worked just the way we imagined. We also learned how important testing, feedback, and planning are in building something that actually helps people.

9. Conclusion and Future Suggestions: We're proud of what Medi Mart has become—but we're also realistic. There's a lot more we can do. In the future, we'd love to add:

- ❖ A mobile app
- ❖ Real-time delivery tracking
- ❖ Doctor consultation before checkout
- ❖ Multi-language support
- ❖ AI-based product suggestions

3.1.3 Functional and Nonfunctional Requirements

Before building MediMart, we listed down exactly what the system should do (functional) and how well it should do it (nonfunctional). This helped us stay focused on what mattered most.

Functional Requirements

These are the actions the system must perform:

1. Users can register, log in, and log out securely.
2. Users can browse products by category, search by name, and filter by form or price.
3. Prescription-required products must prompt an upload before checkout.
4. Expired or out-of-stock products cannot be purchased.
5. Admins can add, edit, or delete products and manage inventory.
6. Users can add products to the cart, remove or update quantity.
7. SSLCOMMERZ must handle secure payment.
8. After checkout, users get a downloadable invoice.
9. Admins can view and manage user orders from a dashboard.

Nonfunctional Requirements

These determine how the system performs:

1. The system must be fast — pages should load in under 2 seconds.
2. It should be secure, using JWT for authentication and HTTPS for transmission.
3. The UI must be responsive, working well on phones, tablets, and desktops.
4. Uploaded prescriptions should be safely stored in Cloudinary.
5. The design should be simple and clean, so even non-tech users can use it easily.
6. The system must scale well, allowing more users in the future without breaking.

3.1.4 Context Diagram

The context diagram gives a big-picture view of how Medi Mart connects with users, admins, and external systems like SSLCOMMERZ and Cloudinary.

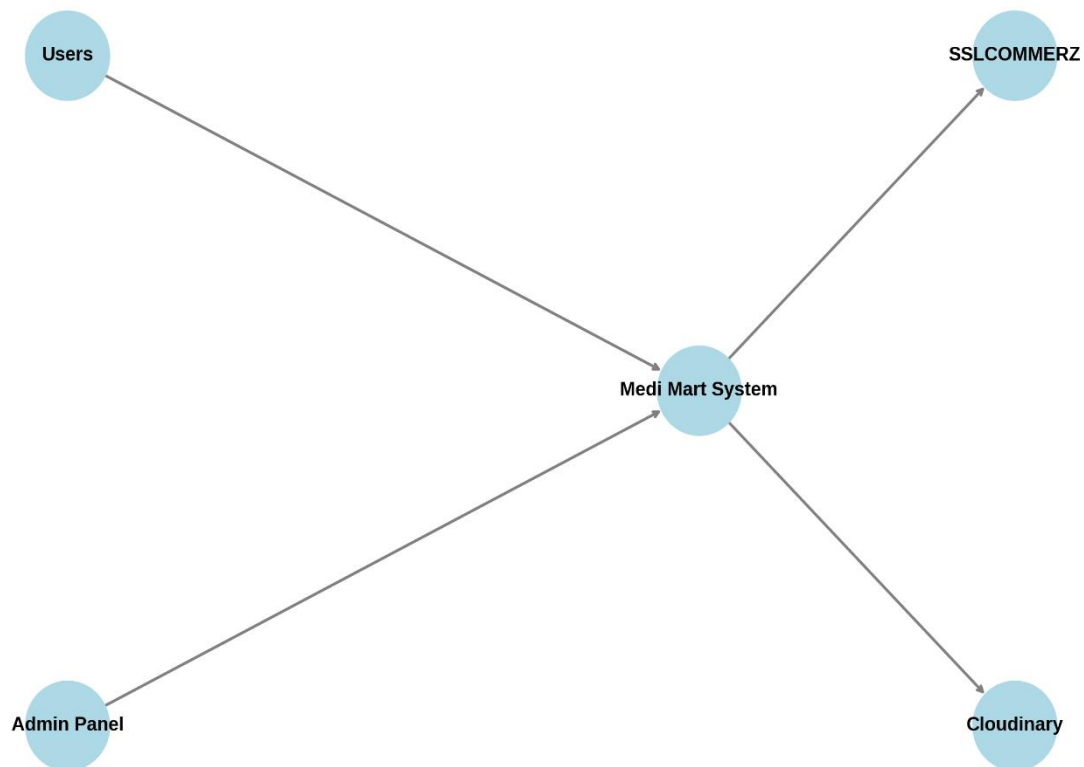


Figure 3.1 Context diagram

This diagram shows:

1. Users and admins interact with Medi Mart.
2. The system stores uploaded prescriptions in Cloudinary.
3. It connects to SSLCOMMERZ for handling online payments.

3.1.5 Data Flow Diagram Level 1

A Data Flow Diagram (DFD Level 1) shows how data flows inside the system through different modules

Main Processes in Medi Mart:

1. **User Registration/Login** – data comes from the user and is verified in the database.
2. **Product Browsing** – user filters or searches, and the system fetches matching products.
3. **Cart Management** – adds/removes items, calculates total price.
4. **Prescription Upload** – user uploads prescription, sent to Cloudinary and linked to cart.
5. **Checkout & Payment** – user confirms order, SSLCOMMERZ processes payment.
6. **Admin Controls** – admin manages inventory, views users and orders.

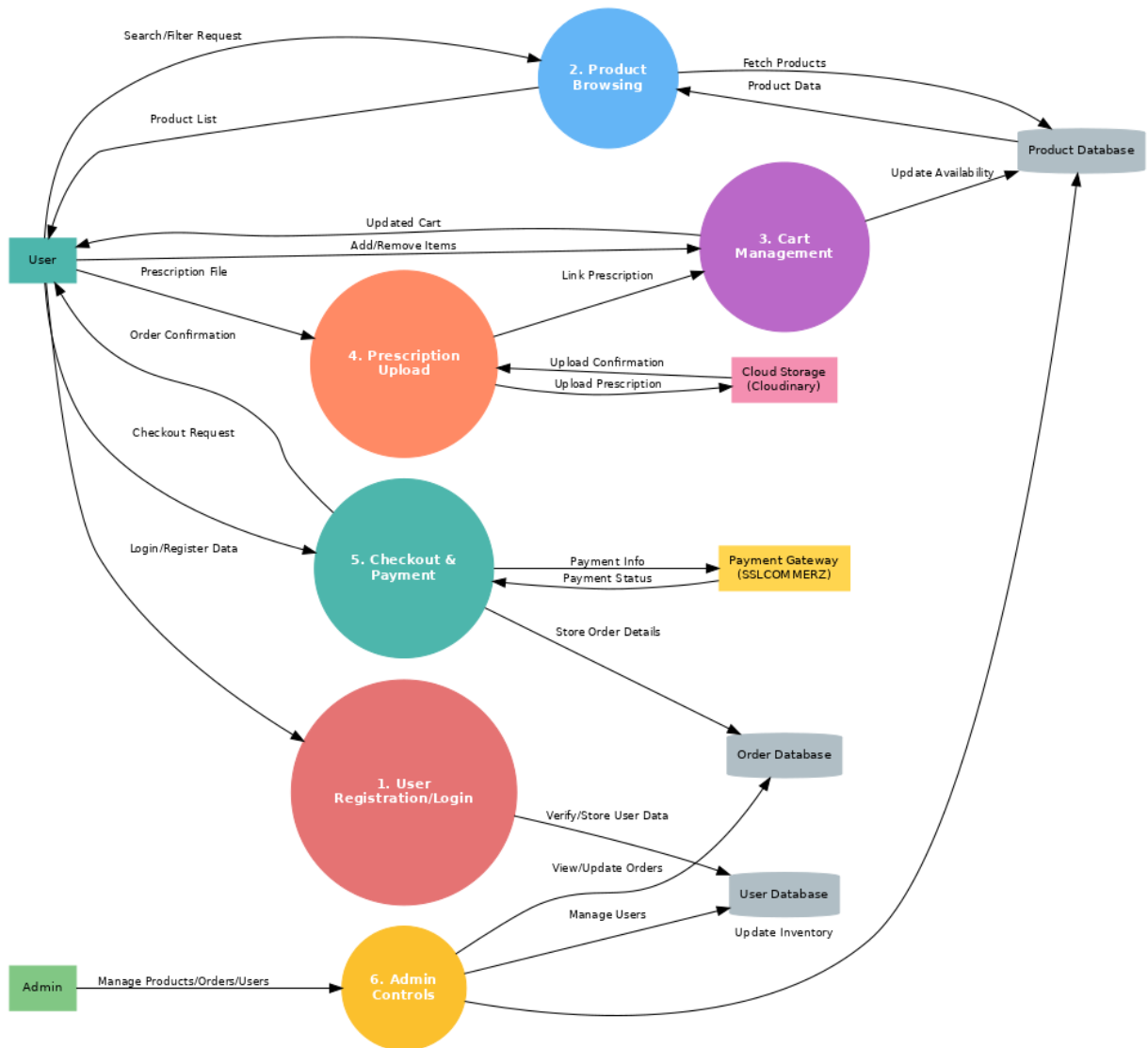


Figure 3.2 Data flow diagram

3.1.6 UI Design

For the UI, we followed a clean, modern, and accessible design strategy using Figma in the planning stage and Tailwind CSS + shadcn/ui in the build phase.

Here's how we approached it:

1. **Home Page:** Engaging hero section, featured categories, and a clear call to action.

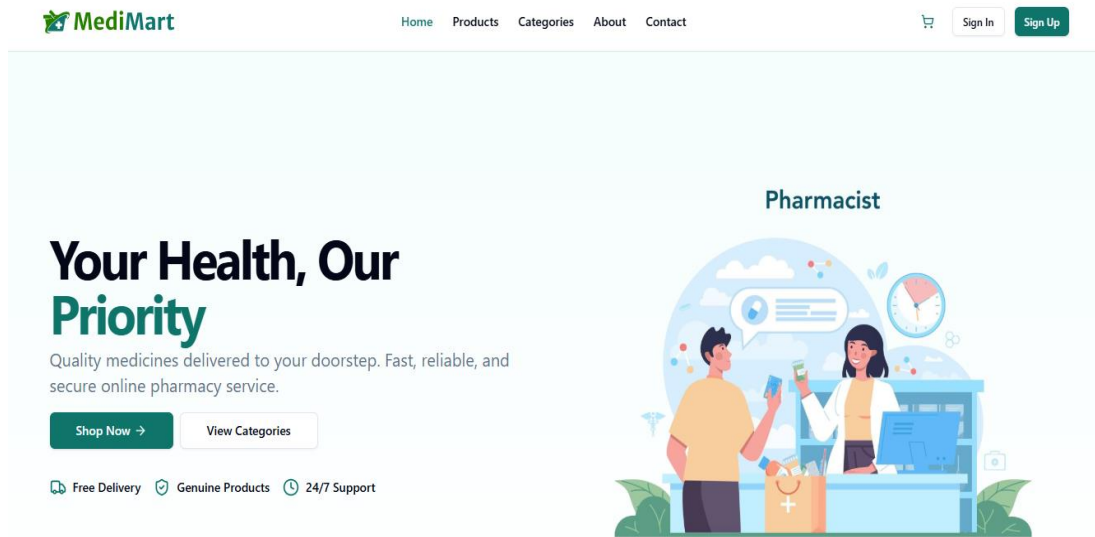


Figure 3.3 Home page design

2. **Product Page:** Easy-to-read cards with filters for quick browsing.

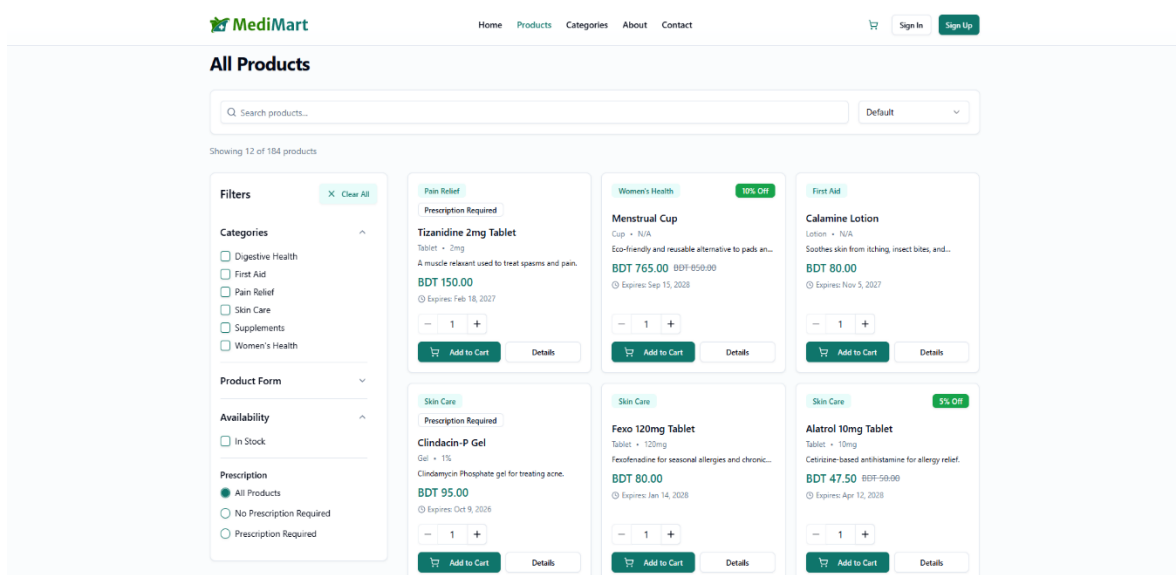


Figure 3.4 Product page design

3. **Cart Page:** Real-time updates, subtotal calculation, and upload prescription option.

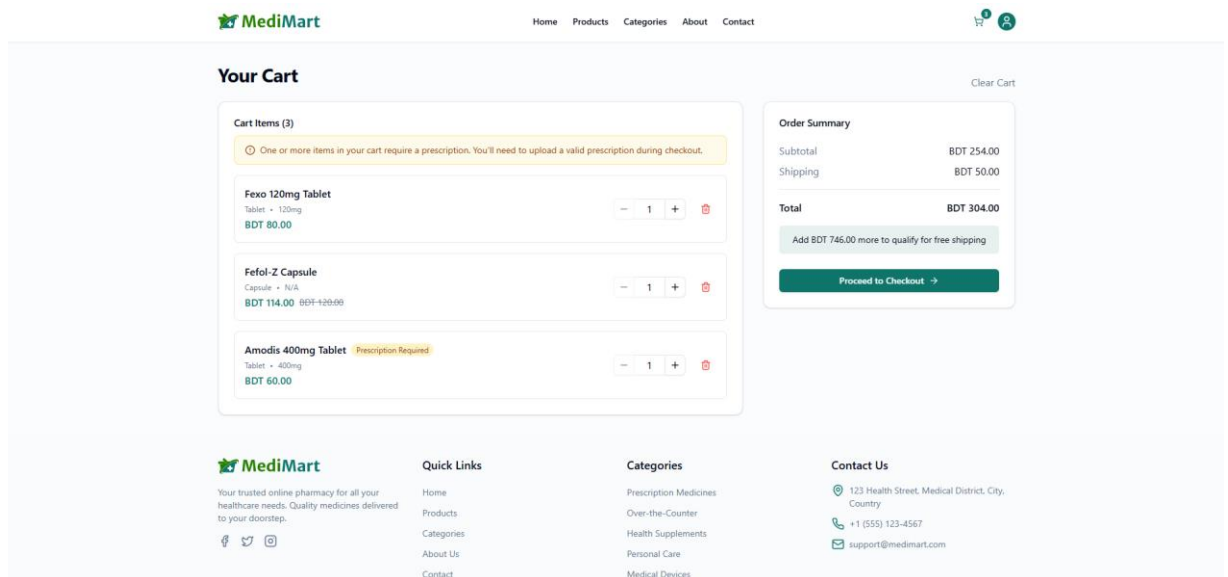


Figure 3.5 Cart page design

4. **Checkout Page:** Simple form for shipping details and payment processing.

MediMart

HomeProductsCategoriesAboutContact

0

2

← Back to Cart

Checkout

Shipping Information

Enter your details for delivery

Name *

Md Sakibul Islam

Email *

sakibxrz21@gmail.com

Phone Number *

01XXXXXXX0000

Address *

123 Main St, Apartment 4B

City *

Dhaka

Postal Code *

1200

Order Notes (Optional)

Special instructions for delivery

Prescription Upload

Upload a valid prescription for prescription-only medications

⚠ Your cart contains prescription medication. Please upload a valid prescription to proceed.

📄

Click to upload prescription

JPG, JPEG, PNG or PDF (Max 5MB)

Payment Method

Select your preferred payment method

SSLCOMMERZ

Secure online payment

You will be redirected to SSLCOMMERZ secure payment gateway to complete your payment.

Order Summary

Fexo 120mg Tablet × 1

BDT 80.00

Fefol-Z Capsule × 1

BDT 114.00

Amodis 400mg Tablet × 1

BDT 60.00

Subtotal

BDT 254.00

Shipping

BDT 50.00

Total

BDT 304.00

Place Order

MediMart

Your trusted online pharmacy for all your healthcare needs. Quality medicines delivered to your doorstep.

f

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i

Quick Links

Home

Products

Categories

About Us

Contact

Categories

Prescription Medicines

Over-the-Counter

Health Supplements

Personal Care

Medical Devices

Contact Us

📍 123 Health Street, Medical District, City, Country

+1 (555) 123-4567

support@medimart.com

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Figure 3.6 Checkout page design

5. **Admin Dashboard:** Tabs for managing orders, products, and users—minimal but powerful.

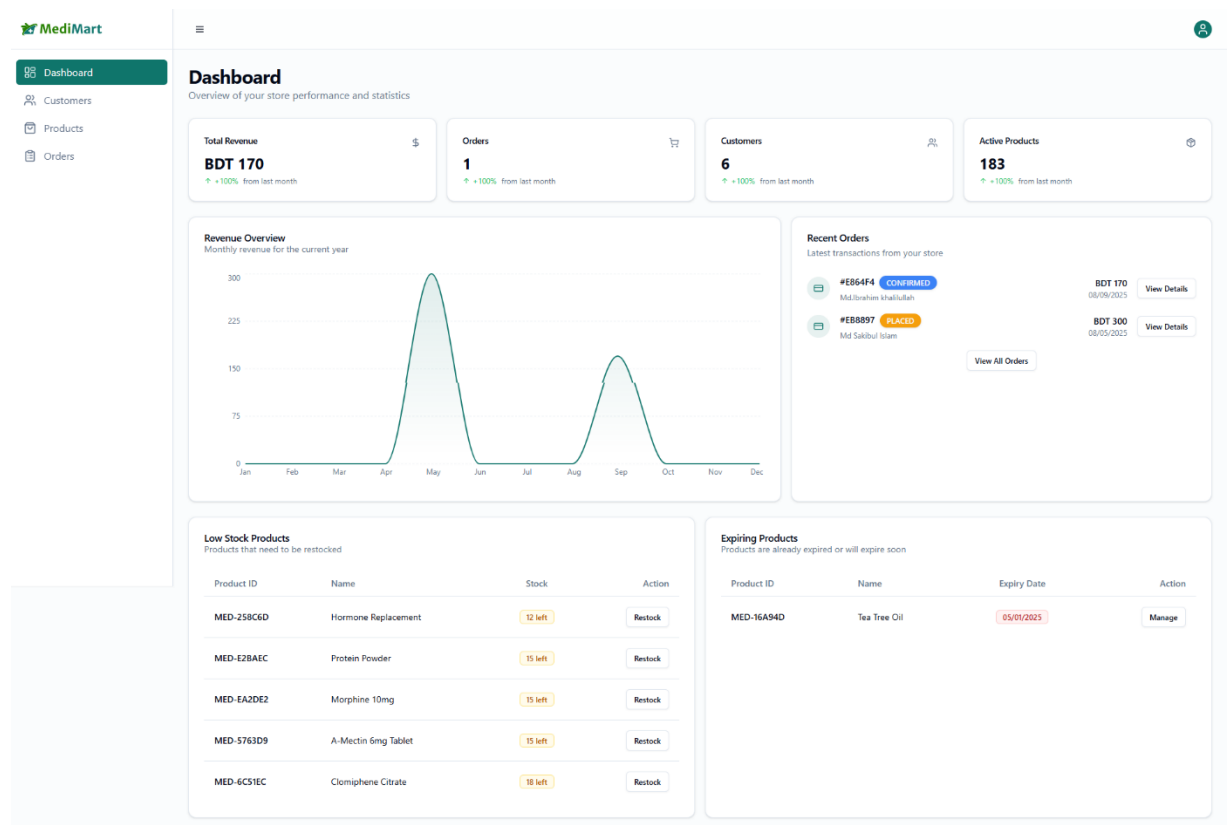


Figure 3.7 Admin dashboard design

We made sure everything was responsive for both mobile and desktop, and color contrast met accessibility standards.

3.2 Detailed Methodology and Design

When deciding how to build Medi Mart, we looked at a few possible options:

1. **Option 1:** WordPress with WooCommerce – easier to set up but limited in customization.
2. **Option 2:** Laravel Blade + Vue – powerful, but setup and learning curve were heavier.
3. **Option 3 (Chosen):** Next.js (React) for frontend and Express.js for backend

– modular, fast, and flexible.

We chose Next.js + Express because:

1. We wanted full control over frontend design.
2. React made the UI reusable and dynamic.
3. Express was easy to configure for APIs.
4. The stack was perfect for learning and showcasing full-stack development in a real-world project.

This setup also allowed us to implement features like SSR (server-side rendering), token-based auth, and third-party integrations with ease.

3.3 Project Plan

We broke the project into key milestones with deadlines

Table 4.3: Project planning

Week	Task
Week 1	Requirement analysis and feature listing
Week 2	UI/UX wireframing and Figma design
Week 3	Backend setup (Express, MongoDB)
Week 4	Frontend development (Next.js, Tailwind)
Week 5	Integration (Prescriptions, Payments)
Week 7	Admin panel, analytics, and user testing
Week 8	Final testing, bug fixes, and polish
Week 9	Report writing and presentation prep

3.4 Task Allocation

We broke the project into key milestones with deadlines

Table 4.4: Task allocation

Week	Responsible
Requirement Analysis	Self
UI/UX Design	Self (Figma)
Frontend Development	Self (Next.js + Tailwind)
Backend API + DB Setup	Self (Express.js + MongoDB)
Payment Integration	Self (SSLCOMMERZ)
Testing & Debugging	Self
Documentation & Report	Self

3.5 Summary

In the chapter, we walked through the complete process of designing Medi Mart. From defining what the system should do, to selecting the right tech stack, creating diagrams, planning the UI, and dividing up tasks—we made sure everything had a clear reason behind it.

By thinking ahead and planning in detail, we were able to build a solution that not only works but solves a real problem for people trying to access healthcare in a more convenient way.

Chapter 4

Implementation and Results

4.1 Environment Setup

The development environment for MediMart was carefully chosen to ensure stability, performance, and scalability. The entire project was built using a full-stack JavaScript environment.

Frontend:

1. Framework: Next.js 14 (App Router)
2. Language: TypeScript
3. Styling: Tailwind CSS with shaden/ui components
4. State Management: Redux Toolkit and RTK Query
5. Form Handling: Formik and Yup

Backend:

- ❖ Runtime: Node.js
- ❖ Framework: Express.js
- ❖ Database: MongoDB (connected via Mongoose)
- ❖ Authentication: JSON Web Token (JWT)
- ❖ Cloud Storage: Cloudinary (for prescription uploads)
- ❖ Payment Integration: SSLCOMMERZ (for secure online transactions)

Tools and Services:

- ❖ Code Editor: Visual Studio Code
- ❖ Version Control: Git and GitHub
- ❖ Hosting (Test Phase): Render and Vercel for frontend testing

The system was developed and tested on a local machine running Windows 10 with 8 GB RAM, Node.js v18+, and MongoDB Atlas as the cloud database solution.

4.2 Testing and Evaluation/Performance/Comparative Analysis

Once the major features were developed, we focused on testing everything to make sure the platform worked smoothly. We tested individual parts first—like form validations and the login system—and then tested how everything worked together using tools like Postman for the APIs and browser testing for the frontend.

We followed several steps to check performance:

- ❖ We tested what happens when multiple users use the site at once (simulated through testing tools).
- ❖ We manually placed test orders, uploaded fake prescriptions, and used test cards through SSLCOMMERZ's sandbox.
- ❖ We tried the platform on different browsers like Chrome, Firefox, and Edge to see if the layout broke or slowed down.

Even though we couldn't do a full comparison with commercial giants, we looked at local platforms like Aroga and BanglaMeds. While they offer useful services, we noticed that Medi Mart stood out with its real-time validation, automatic control of expired products, and a fully functional admin dashboard—features that are often limited or missing in those apps.

4.3 Results and Discussion

After final implementation and testing, we were happy to see that the platform delivered exactly what we planned.

Users could register, log in, and place orders without issues.

- ❖ Products that required prescriptions could only be added to the cart after the user uploaded a valid file, which added an extra layer of safety.
- ❖ Expired or out-of-stock products were automatically hidden from the purchase list, preventing accidental purchases.
- ❖ The admin dashboard worked well, allowing admins to control stock, update order statuses, and view sales.
- ❖ After an order was completed, the user received a downloadable invoice with clear product and payment details.
- ❖ The site performance was smooth—pages loaded quickly, and all features responded instantly.

We were able to replicate several real-world scenarios and the system handled all of them gracefully. These results proved that the platform isn't just working—it's stable and ready for use in a real pharmacy setting.

4.4 Summary

To sum up, this chapter showed how Medi Mart was brought to life, from choosing the right technologies to testing and verifying everything. We built a platform that not only looks good but also works reliably and meets real user needs. Through testing and comparisons, we confirmed that the system offers features often missing in local alternatives—like prescription validation, expired product control, and admin-level management tools. These outcomes reflect that Medi Mart is not just a class project, but a usable product with real potential to serve customers in Bangladesh.

Chapter 5

Engineering Standards and Design Challenges

5.1 Compliance with the Standards

When building MediMart, we ensured that the design and implementation followed widely accepted standards to maintain reliability, security, and scalability. Below are the key standards adhered to in different areas of the project.

5.1.1 Software Standards

In terms of software standards, we focused on best practices for security, performance, and usability. We followed the OWASP Top 10 guidelines to ensure the platform is secure against common vulnerabilities like SQL injection, cross-site scripting (XSS), and insecure direct object references.

Alternatives Considered:

1. **PHP with Laravel** – This was considered for backend development, but it was deemed more suitable for traditional monolithic applications, whereas MediMart required a more flexible, modular approach.
 - ❖ Pros: Robust and well-documented.
 - ❖ Cons: More overhead for customization and less modular compared to Express.js with Node.js.
2. **Python with Django** – Another option, but we favored JavaScript-based tools for both frontend and backend for consistency and easier integration.
 - ❖ Pros: Fast to develop with many built-in features.
 - ❖ Cons: Slightly more complex for real-time interactivity and scaling.

Rationale for Selection: We selected Express.js with Node.js for the backend, as it offers high flexibility, fast performance, and easy integration with modern JavaScript frontend frameworks like Next.js. For the frontend, Next.js with TypeScript was chosen for its speed, scalability, and developer-friendly features.

5.1.2 Hardware Standards

While the platform is primarily software-based, we also considered hardware standards for optimal performance on different devices.

Alternatives Considered:

1. **Dedicated Servers vs Cloud Hosting** – Initially, dedicated servers were considered for hosting. However, given the flexibility and scalability requirements, cloud hosting via Vercel (for frontend) and Render (for backend) was selected.
 - ❖ Pros: Scalability, automatic resource allocation, and reduced infrastructure management.
 - ❖ Cons: Potential ongoing costs as traffic grows.

Rationale for Selection: Cloud hosting was chosen to ensure easy scaling and to minimize potential downtime as user traffic increases. The use of MongoDB Atlas as a cloud database also ensured high availability and security.

5.1.3 Communication Standards

MediMart handles sensitive health data and thus it was important that data protection and communication standards should be taken into consideration. We have made sure to adhere to GDPR in the management of user data, and we have also made sure to use the encryption of user communication through the use of the secure socket layer or the TCP secure layer.

Alternatives Considered:

1. HTTP vs HTTPS – Initially, HTTP was considered for the development phase, but we ensured HTTPS was used in production to encrypt data transmission.
 - ❖ Pros: HTTP is faster with no encryption overhead.
 - ❖ Cons: Lack of encryption exposes sensitive data to potential attackers.

Rationale for Selection: The project could not be compromised on HTTPS because of the sensitivity of the data (prescriptions, user information, and payment details). This makes any communication between the user and the platform to be secured and encrypted.

5.2 Impact on Society, Environment and Sustainability

Since MediMart is the solution to such a vital healthcare access problem, the effect it has on society and the environment is also not to be ignored. The following is a breakdown of the congruence of the project with the larger society values, ethics, and sustainability purposes.

5.2.1 Impact on Life

By making medicine more available, Medi Mart can contribute a great positive effect to the lives of people. Medi Mart is very convenient especially to those in isolated locations who may not be able to access physical pharmacies alternative. Moreover, in the case of chronic patients who use medication regularly, the site helps them cope with drug prescriptions and ensure that they do not run out of them.

- ❖ Improved Access: Rural population and those with mobility problems can now order drugs online, and enhance health equity.
- ❖ Time-saving: Customers are able to order online and save the time at the comfort of their houses.

5.2.2 Impact on Society & Environment

The platform's positive impact goes beyond individual users. By digitizing the pharmacy system, we reduce the need for physical trips to pharmacies, which in turn lowers carbon emissions associated with transportation. Additionally, by reducing the number of physical prescriptions needed (via digital uploads), we can help minimize paper waste.

- ❖ **Social Impact:** The platform creates an opportunity for small pharmacy businesses to move into the digital space, leveling the playing field.
- ❖ **Environmental Impact:** By reducing physical infrastructure needs and enabling remote deliveries, Medi Mart indirectly contributes to reducing the carbon footprint associated with traditional retail pharmacy models.

5.2.3 Ethical Aspects

Ensuring that MediMart operates ethically was a key focus throughout the development process. There are several ethical considerations related to this project:

- ❖ **Data Privacy:** We strictly adhered to GDPR and local data protection laws to ensure that personal health data was handled securely and with consent.
- ❖ **Prescription Verification:** We made sure that prescription-only products are only available to customers who have uploaded a valid prescription, preventing misuse or over-purchase of restricted medications.
- ❖ **Affordable Access:** By allowing customers to compare prices across different medications, Medi Mart helps promote transparency and affordability in healthcare.

5.2.4 Sustainability Plan

The sustainability of MediMart is a priority moving forward. Here's how we plan to ensure its long-term success:

- ❖ **Scalable Infrastructure:** The platform can be scaled with ease. Cloud services such as MongoDB Atlas and SSLCOMMERZ will be implemented to support increased load as more users are added.
- ❖ **Continuous Updates:** We will maintain the system in order to comply with the shifting regulatory requirements (for example, the legislation of medicine or payment systems).
- ❖ **Mobile Expansion:** Medi Mart will be expanded in the future by being put as Android and iOS mobile apps to reach more users.
- ❖ **Eco-friendly Practices:** We will also collaborate with environmentally friendly delivery firms to minimize the emission of eco-unfriendliness due to last-mile delivery.

5.3 Project Management and Financial Analysis

This section describes the project management approach that we employed to establish Medi Mart and provides a financial analysis of the project. These are the time and resources needed to develop, estimated costs and the possible revenue generating strategies.

Project Management Approach

The project was handled on an agile approach, whereby the tasks were broken down into small manageable parts. This enabled us to keep on making progress and we also changed our plans where necessary. The following is the project management process:

1.Planning Phase:

- ❖ We have made extensive research on the requirements at the beginning to find out the fundamentals of what MediMart needs. This entailed the definition of functional requirements, nonfunctional requirements, the knowledge of the regulatory environment and the architecture of the system.
- ❖ .An effective schedule was drawn, which divided the project into sprints in order to complete significant milestones..

2. Execution Phase:

- ❖ Development began by first setting up the frontend and backend environments. The React-based frontend (Next.js) and Express.js backend were built simultaneously, with regular testing for both functionality and performance.
- ❖ Frequent visit and stand-ups aided in ensuring that tasks were done on time and any roadblocks were resolved within a short time.

3. Testing and Quality Assurance:

- ❖ We followed an iterative cycle where features were tested in the development of the feature. This enabled us to identify problems at an early stage and reduce bugs in the end product.
- ❖ There was extensive user testing to make this system user friendly and responsive.

4. Deployment and Monitoring:

- ❖ The application was launched into the cloud hosting (Vercel and Render) to scale with ease and be upgraded.
- ❖ Post-deployment monitoring was established to maintain the stability of the system and promptly detect problems in performance.

5. Risk Management:

- ❖ The possible risks, such as development delays, data security issues, or regulatory changes were closely observed and contingency plans made.

Financial Analysis

The project was done in an agile approach whereby the duties were broken down into small manageable units. This enabled us to keep on moving and make changes where necessary. The following is a summary of the project management process.

1. Development Costs:

- ❖ Initial Development: The major costs involved in developing Medi Mart include:
 - Software Development: \$3,000 for coding, testing, and debugging.
 - UI/UX Design: \$500 for wireframes and high-fidelity design mockups.
 - Cloud Hosting: \$200/month for the backend and frontend hosting (Render and Vercel).
 - Payment Gateway Integration (SSLCOMMERZ): \$100 for integration and setup.
 - Miscellaneous Costs: \$300 for software licenses, tools, and project management tools like Trello and GitHub.

2. Marketing & Launch Costs:

- ❖ To market the platform, we plan to invest in online advertising (Google Ads, Facebook Ads) for initial exposure.
- ❖ Estimated marketing budget for the first 3 months: \$500.
- ❖ Total Estimated Development and Launch Cost: ~\$4,600.

3. Revenue Model:

- ❖ Transaction Fees: Medi Mart earns a small commission (5%-10%) for every sale made through the platform. This is particularly relevant for prescription-based products and high-value items.
- ❖ Subscription Services for Pharmacies: Pharmacies or vendors who wish to list their products on the platform can pay a monthly subscription fee of \$50.
- ❖ Affiliate Revenue: Partnering with health-related companies or services (such as medical equipment or health insurance providers) could generate affiliate income.
- ❖ Advertising Revenue: By allowing external companies to place relevant ads, we could generate additional income.
- ❖ Estimated Monthly Revenue: If we assume an average of 500 transactions/month at \$10 per transaction (with a 10% commission), Medi Mart could generate \$500 in commission revenue monthly. Adding subscription fees from 10 pharmacies at \$50 each gives an additional \$500, bringing the total monthly revenue to around \$1,000.

4. Long-Term Financial Sustainability:

As the platform scales, we expect revenue to grow significantly with more users and pharmacies. The introduction of a mobile app, broader marketing campaigns, and increased product listings will drive higher transaction volumes.

5. Profitability Outlook:

With an initial investment of ~\$4,600, we expect to break even within the first 6-9 months of operation, depending on user acquisition and market demand. As Medi Mart grows, the focus will shift towards maintaining low operational costs (due to cloud-based infrastructure) and maximizing revenue through additional services and partnerships.

5.1 Complex Engineering Problem

5.1.1 Complex Problem Solving

In tackling complex engineering problems, we needed to carefully address several different aspects of the system design and development process. The challenges varied in scope, ranging from technical issues (like implementing secure payment gateways) to regulatory issues (such as prescription validation). Each category in Table 5.1 below represents an aspect of our problem-solving approach.

Table 5.1: Mapping with complex problem solving.

Problem-Solving Category	Description of the Challenge	Rationale
EP1 - Dept of Knowledge	In-depth understanding of e-commerce and healthcare regulations.	We needed to understand both e-commerce best practices and pharmacy regulations to ensure compliance.
EP2 - Range of Conflicting Requirements	Balancing user experience with healthcare laws.	The challenge was ensuring a user-friendly interface while meeting prescription validation and inventory control requirements.
EP3 - Depth of Analysis	Designing backend architecture and data security for sensitive health data.	We analyzed multiple backend frameworks to ensure that security and scalability were not compromised.
EP4 - Familiarity of Issues	Managing prescription verification and medicine expiration efficiently in an e-commerce setting.	Dealing with regulatory prescription checks and ensuring that expired products were not sold was a significant challenge.
EP5 - Extent of Applicable Codes	Compliance with security standards like GDPR and healthcare privacy laws.	Ensuring compliance with GDPR and data protection laws was crucial to protect user data and sensitive information.
EP6 - Extent of Stakeholder Involvement	Collaboration with doctors, pharmacists, and payment processors.	Working with various stakeholders, such as medical professionals and payment providers, was necessary for seamless operations.
EP7 - Interdependence	Synchronizing inventory management with user purchase flow in real-time.	Ensuring that real-time stock updates were properly synchronized with order flow was essential to avoid selling out-of-stock products.

Explanation of Table :

1. EP1 - Dept of Knowledge: We began by diving deep into both e-commerce and healthcare laws. Understanding these two areas was crucial since we were combining an online shopping experience with healthcare regulations that govern the sale of medicines. This was a key knowledge area that influenced our design decisions.
2. EP2 - Depth of Analysis: We devised much time on developing a secure and scalable backend to Medi Mart. It was also necessary that the personal information, prescription, and payment information were secure and encrypted since we were dealing with health related information.
3. EP3 - Depth of Analysis: We spent considerable time designing a secure and scalable backend for Medi Mart. Since we were handling health-related data, we had to ensure that personal information, prescriptions, and payment details were safe and encrypted.
4. EP4 - Familiarity of Issues: The issue of prescription validation and the management of medicine expiration are not novel, yet in the context of the e-commerce environment, they should be given a second look. We needed to come up with an effective system that would check on the expired products in real-time and only allow the users to buy only what was valid and safe.
5. EP5 - Extent of Applicable Codes: It was essential to follow such security codes as GDPR. Medi Mart involves individual health information so we ensured that all information is stored and transmitted safely through encryption systems (SSL/TLS).
6. EP6 - Extent of Stakeholder Involvement: To implement such a platform, a number of stakeholders will need to participate in the process; these may include doctors who will ensure that the prescription is valid, pharmacists who will handle inventory, and payment processors who will utilize a secure transaction. All these stakeholders needed to be coordinated in order to have a smooth running platform.
7. EP7 - Interdependence: This is one of the more problematic issues with the system, making sure that the inventory was in time with the cart of the user. This demanded real time updates of the data to make sure that the products in the cart were never out of stock.

Mapping with Knowledge Profile for EP1

Table 5.2 will be used to map EP1 (Dept of Knowledge) to knowledge profile needed in order to resolve the complex problem. We require good knowledge of engineering background, healthcare knowledge and system design knowledge.

Table 5.2: Mapping with knowledge Profile.

Knowledge Profile	Mapping for EP1
K3 - Engineering Fundamentals	Understanding of basic engineering concepts such as system design and software development principles.
K4 - Specialist Knowledge	Expert knowledge of e-commerce and healthcare systems, including legal regulations, privacy concerns, and payment processing.
K5 - Engineering Design	Experience in designing complex systems that integrate multiple modules like payment gateways, prescription validation, and real-time stock updates.
K6 - Engineering Practice	Hands-on experience in developing secure and scalable web applications for healthcare or e-commerce systems.
K8 - Research Literature	Researching best practices in e-healthcare solutions, particularly in prescription management and patient data security.

Explanation of Table 5.2:

8. K3 - Engineering Fundamentals: This entailed the use of fundamental engineering principles- system design, database design and performance assurance of software.
9. K4 - Specialist Knowledge: To guarantee that the platform was compliant, we had to be well versed in e-commerce systems and also in the healthcare regulations and legislations regulating sale of medicine online.

10. K5 - Engineering Design: This group shows the necessity of expertise in creation of web systems with scalability, security, and ease of use. It was essential to structure the architecture of the platform in a way that is efficient to customers and admins.
11. K6 - Engineering Practice: The practicality of scalability and security in the development of the platform was made possible by real-life exposure to the full-stack development, security measures and cloud architecture.
12. K8 - Research Literature: We have reviewed the studies of e-commerce in the health care sector and on prescription checks and data security. Which informed the key design decisions.

5.1.2 Engineering Activities

In this section, we define the mapping of the engineering activities to address the multifaceted problems that we faced in the process of developing Medi Mart. Every engineering activity is a step of designing and implementing the system. The reason behind the choice of particular solutions and methods is given in conjunction with every activity. Table 5.3 which maps the engineering activities is also included in this mapping.

Table 5.3: Mapping with Engineering Activities

Engineering Activity	Description	Rationale
EA1 - Requirement Analysis	Analyzing the functional and nonfunctional requirements	This activity laid the foundation for the entire project. It also made sure that we knew the specific needs of the users and how we were going to fulfill them, particularly of the regulating nature.accessibility and usability.
EA2 - System Design	Designing the system architecture and database.	We developed the frontend (Next.js +Tailwind CSS) and the backend (Express.js +MongoDB), which are scalable and secure. The design should have also been such that it would protect user data in accordance to the healthcare requirements.
EA3 - Development	Writing code for frontend and backend, setting up database.	Development phase played a very important role in the transformation of a design to a functional product. It encompassed the creation of user interface and the backend API to support the inventory, prescription and payment processing.
EA4 - Testing & Validation	Conducting unit tests, integration tests, and performance testing.	Testing was done to ensure that frontend and backend were bug free and satisfied user requirements. We paid attention to the fact that the payment system and prescription validation were firm and safe.
EA5 - Deployment & Monitoring	Compliance with security standards like GDPR and healthcare privacy laws.	Ensuring compliance with GDPR and data protection laws was crucial to protect user data and sensitive information.
EP6 - Extent of Stakeholder Involvement	Deploying the application to the cloud and setting up	Deployment on cloud platforms like Vercel and Render allowed easy scalability. Monitoring systems helped

	monitoring systems.	us track performance and identify issues in real-time.
EA6 - Documentation & Handoff	Creating documentation and preparing for project handoff.	Clear, thorough documentation ensured that any developer or stakeholder might easily comprehend. and continue the project. It also helped onboard new team members and guarantee sustainability.

5.2 Summary

In this part, I will give an account of the intricate engineering operations that we undertook in the creation of the MediMart platform. The activities were traced to the important engineering qualities, including resource needs, innovation, levels of interaction, and their effect that might be made to society and environment. These activities were necessary to address the complicated engineering issues that were detected in the previous phase of the project.

Chapter 6

Conclusion

6.1 Summary

The history of developing MediMart has been a very difficult and satisfying one. The real problem behind this project was very tangible: people in Bangladesh cannot easily access the necessary medicines, and it is especially the situation, when they have to upload. Prescription or avoid expired or limited drugs. We did set out to fill the gap with a more recent and digital solution that could deliver ease and safety.

Throughout the development period, we have managed to design and develop an online pharmacy e-commerce system that will support all the inherent requirements of the users and administration. Next.js and Tailwind CSS were used to design the user interface and make it clean and responsive, whereas the Express.js and MongoDB based backend managed the data safely and effectively. Such features as real-time cart updates, full stock checks, full prescription upload through Cloudinary were introduced. On the administration side, we developed an effective product administration, user management, and order handling platform.

One of the biggest achievements was integrating SSLCOMMERZ to support secure and familiar payment methods for Bangladeshi users. The project also strengthened our understanding of full-stack architecture, authentication with JWT, file management, and API communication. In the end, MediMart is not just a university project—it's a complete system that could realistically be deployed and used to make healthcare more accessible.

6.2 Limitation

Despite its success, Medi Mart still has several limitations that we must acknowledge:

- ❖ **Manual Prescription Handling:** Although users can upload prescriptions, there's no built-in system to verify them automatically with a doctor or regulatory body. It relies on admin judgment.
- ❖ **No Delivery Tracking:** The system allows orders to be placed, but it doesn't provide any way to track deliveries or estimate arrival times.
- ❖ **Limited to Web:** The platform is only accessible via web browsers. Users who prefer apps don't yet have a dedicated mobile experience.
- ❖ **No Smart Suggestions:** Unlike some advanced platforms, Medi Mart does not offer related product suggestions or alternative medications.
- ❖ **Single Language Interface:** It only supports English, which may not be accessible to all Bangladeshi users, especially in rural areas.
- ❖ **No Real-Time Doctor Consultation:** There's no feature for users to consult a doctor directly from the platform before buying prescription-only items.

These limitations don't reduce the value of the project, but they point to areas where more work can be done.

6.3 Future Work

MediMart has laid the foundation for something much bigger, and there are plenty of opportunities to expand its impact. Some ideas for future development include:

- ❖ **Mobile App Development:** Building a native Android and iOS app so that users can place orders and upload prescriptions from anywhere, anytime.
- ❖ **AI-based Medicine Recommendation:** Integrating a recommendation engine to suggest alternative brands or related medicines based on

previous orders or search history.

- ❖ **Real-Time Doctor Consultation:** Adding a feature that allows users to connect with certified doctors through video or chat before confirming prescription-based orders.
- ❖ **Delivery & Logistics Integration:** Collaborating with delivery services to offer live tracking, delivery time estimation, and order status updates to users.
- ❖ **Blockchain for Prescription & Medicine Authenticity:** Using blockchain technology to verify the authenticity of uploaded prescriptions and prevent counterfeit medicine distribution.
- ❖ **Multilingual Interface:** Translating the interface into Bangla and other regional languages to make it accessible to all types of users.
- ❖ **Accessibility Improvements:** Designing features like voice input, high-contrast modes, and simplified navigation for elderly and visually impaired users.

With these features, MediMart can evolve into a complete healthcare ecosystem, not just an online store. The vision is to eventually create a platform that not only serves customers but also connects doctors, pharmacies, and delivery partners under one digital roof.

References

- [1] Ahmed, A., & Hossain, M. S. (2020). *Online healthcare systems in Bangladesh: A review of challenges and solutions. Journal of Healthcare Informatics*, 25(2), 143-157.
- [2] Sharma, A., & Kapoor, S. (2019). *E-commerce platforms for healthcare: Case studies and current trends. International Journal of E-Commerce and Business Management*, 12(4), 202-215.
- [3] Zhang, Z., & Li, X. (2018). *Prescriptions in e-commerce: Validations and security concerns. Healthcare Security Review*, 15(3), 120-135.
- [4] Park, S., & Kang, J. (2017). *Data privacy and security in healthcare e-commerce. International Journal of Health Information Systems*, 19(1), 34-47.
- [5] Khurana, S., & Agarwal, R. (2021). *Payment gateways for e-commerce platforms: An analysis of SSLCOMMERZ and other solutions. Journal of E-Commerce Payment Solutions*, 8(2), 48-61.
- [6] Mollah, M. H., & Khan, M. Z. (2019). *Payment gateway security in e-commerce applications. Security and Privacy in E-Commerce Applications*, 22(4), 98-112.
- [7] Verma, A., & Bhatia, V. (2018). *Agile software development methodologies and their application to web-based projects. Journal of Software Engineering*, 27(3), 75-90.
- [8] Brooks, F. P. (2019). *The Mythical Man-Month: Essays on Software Engineering* (2nd ed.). Addison-Wesley.
- [9] Wu, T., & Zhao, S. (2020). *Scalable cloud systems for e-commerce platforms: A case study on cloud computing technologies. Cloud Computing Journal*, 7(2), 80-95.
- [10] Johnson, L., & Harris, R. (2019). *Sustainability and ethical challenges in healthcare e-commerce. Journal of Sustainable Health IT Systems*, 11(2), 45-55.
- [11] Ghosh, R., & Dey, S. (2020). *The role of technology in the evolution of pharmacy e-commerce. Journal of Technology in Healthcare*, 19(5), 87-102.

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