

Elanzo: Design and Development of a Tailored Fashion Experience

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FINAL YEAR DESIGN PROJECT REPORT

**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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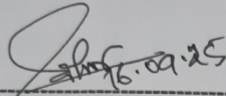
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APPROVAL

This Project titled “Elanzo : Design and Development of a Tailored Fashion Experience”, submitted by Md. Arafath Hossen Abir, ID No: 213-15-4353 to the Department of Computer Science and Engineering, Daffodil International University has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of B.Sc. in Computer Science and Engineering and approved as to its style and contents. The presentation has been held on 16 September, 2025.

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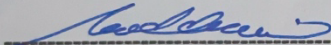
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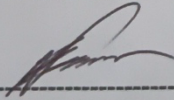
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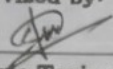
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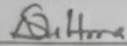
We hereby declare that this project has been done by us under the supervision of Mr. Raja Tariqul Hasan Tusher, Assistant Professor, Department of Computer Science and Engineering, Daffodil International University. We also declare that neither this project nor any part of this project has been submitted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

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ABSTRACT

Elanzo – AI based e-commerce platform transforming the way we shop online. By leveraging advanced AI technologies such as natural language processing (NLP), machine learning and sentiment analysis, Elanzo will be able to expand product discovery, personalization, and mobile user experiences. On the back-end there are the machine learning powered feature such as smart search system, which can search in natural language in products, recommendation engine to find the personal products based on past users' interactions and analyze the sentiment to gain value insight. Moreover, Elanzo leverages AI to personalize product descriptions for a better shopping and search experience. Stack Built with modern web tech such as React.js, Firebase and Google Gemini 2.0 Flash). they claim that they would scale as needed to handle the real-time syncing of data and that they would do so securely with payment functionality. Elanzo It is the end of a e commerce constraints you know for your clients and provides to your customers a very simple and memorable shopping with extreme intelligence for companies to make decisions but also create better products. The project inaugurates the trend of future E-commerce constructed on the AI technique and is the precedent in the intelligent online shopping platform. Future enhancements could include voice search for searching words, augmented reality to show the user their surrounding natural environment, and multi-language support for better customization for the user and wider reach. The study adds to the literature body of AI of e-commerce by showing how combination of smart system can respond to different wants easily of dissimilar users and companies.

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Chapter 1

Introduction

1.1 Introduction

Fueled by the e-commerce revolution, the decades-old ritual of buying items directly off retail-store shelves has been upended as businesses of all kinds — whether by giant retailers like Amazon or by start-ups — lure millions of consumers to an ever-widening variety of more convenient and easier ways to make a connection. We have entered a new era of digital, a variety of Digital means of shown in all walks of life, has developed rapidly in the world, the development of an e-commerce platform also be more and more intelligent: It can be customized services for individual customer demand requirements, in order to meet the demand. But even once you have that, legacy e-commerce can be tricky, both in creating a smooth, personalized shopping experience and in working with all of that customer data. And this is what “Elanzo” saves you from. Elanzo Market is a new era of e-commerce market place and innovative Ai, deep learning technology which is going to change how consumers buy and business sell.

Elanzo was built on state-of-the-art technology—React (front-end), Firebase (back-end services), and Google Gemini 2.0 Flash (for AI features)—to give the network intelligent, real-time dynamics. User Experience is one of the philosophies of Elanzo where we are pushing our limit to offer AI driven intelligent search, context-based product recommendation and sentiment analysis on user’s response. Smart search allows to search for products using natural language queries which contributes to its ease of use. The customizing of recommended products also with a "personal suggestions" field that is reacting on user's behavior further enriched the product discovery. Moreover, sentiment analysis of reviews provides insight into what customers like and what company need to improve to make is product or service more appealing.

In addition to AI-empower features, Elanzo focuses on user-experience and user-friendly interface which are responsive on all device sizes and processes a safe and secure payment through SSLCommerz integration as well. The app also assures safety with Firebase authentication and also lists live feeds of order and cart status. The system is built on architecture at the back-end in order to scale and process information and machines interaction on scale in real-time without losing speed and reliability.

1.2 Motivation

E-commerce sites usually have rudimentary search or filtering functionalities, but Elanzo is aiming to do better by announcing the release of a smart search platform that makes searching for products as easy as conversing with humans, thanks to the wonders of natural language processing (NLP). It may also be provided that the shop makes general recommendation by the shop clerk but for the recommendation of the commodity from the viewpoint of the demand and the action of each user on a more particular basis, some manner is requested.

Moreover, when we look at how many companies are looking to get a feel to what their customers may be saying, the sentiment analysis offered by Elanzo is precious data for companies to have, whether to ignore a comment or adjust product as needed. Combine this with product detailed descriptions that are AI generated and not only do you have a more rich and engaging shopping experience, but also an easier CRO.

Another motivation for this project is, with the rapid development of internet, the problem of data privacy and fast online payment has received increasing attention. In a world of ever-increasing data breaches, having a safe model for both consumers and merchants has never been more crucial. The SSLCommerz payments systems are incorporated by Elanzo alongside the Firebase user authentication, ensuring that users can trust their system. The reason why I work on Elanzo is also related to curiosity towards what AI can do in the easy-to-fix context.

1.3 Objectives

The objectives for this project are:

- Design and Develop Elanzo Platform: An AI-empowered e-commerce platform designed and developed to align AI technologies with cutting-edge web development technologies.
- Design and Develop Elanzo Platform: An AI-empowered e-commerce platform designed and developed to align AI technologies with cutting-edge web development technologies.
- AI Capabilities: Develop AI based features e.g., intuitive search, personalized product recommendations, sentiment analysis and product description for the platform for enhanced user engagement and shopping experience
- Evaluate the influence of AI Study the impact of AI-driven e-commerce on the ways in which e-commerce websites and businesses offer services to prospective customers by analyzing user experience, product search and business decision making.

To contribute in the Future AI (AI for Future e-commerce & next-generation online shopping platform) + To share the Future Wave of AI based e-commerce, and the essence of e-commerce platform in future.

1.4 Methodology

In this dissertation, we describe the design and implementation of Elanzo, an AI powered e-commerce platform at the cutting-edge that aims to incorporate smart techniques to enhance user experience and business functionalities. The project will cover full development cycle from initial prototyping and design to platform deployment, and will leverage the newest developer tools / libraries (React, Firebase, Google Gemini 2.0 Flash for AI integration).

In this thesis, we focus particularly on enterprise-level AI features which includes intelligent search that allows users to search for products using natural language expressions- tailored product recommendations which are intuitive to user preferences and behaviour. Part 3 – We will also research into sentiment analysis of customer feedback and reviews using the power of Natural Language Processing, that will provide business actionable insights into customers Satisfaction. They will also cover AI-based product description enrichment which will enable to entice and sell more.

It also concerns to ascertain the technical feasibility of incorporating AI in popular web technology and consideration of scalability and security of the platform in order to have a taste of real-time functionalities and secure payment (payment gateway service).

1.5 Project Outcome

When users are browsing product through natural language with personalized suggestions and interactive product description based on users, the perception of the portal would expect to be smooth and easy.

In addition to shaping user experience, the project could serve as a proof-of-concept as well as the use case for applying artificial intelligence within e-commerce industry, and demonstrate how AI might be applied Smart Product Discover experience not only to help users to find the right product but also to learn the business valuable information based on the user feed-back. Businesses can also use reviews to extract sentiment and ascertain customer satisfaction and modify their strategies accordingly. You'll also see better and more engagement higher conversion, more smiley customers in general on the back of personal recommendations and AI search all said AI personalized recommendations and search.

Further success is being able to show that it is technically feasible to construct an AI as a service with the latest web technology (like React and Firebase and Google Gemini 2.0 Flash) to offer an extensible, secure and reactive platform.

1.6 Organization of the Report

This document is structured into a number of chapters, each of which covering various phases of the development, deployment, and evaluation of the Elanzo AI e-commerce platform. The report is organized as follows:

Chapter 1: Introduction

This chapter presents the project, the context and importance of the Elanzo platform. It's an overview of the ecommerce industry and how AI is being used to improve ecommerce users' experiences. The chapter also introduces motivations of the work, aim, and objectives along with the project scope and a short description of the anticipated results.

Chapter 2: Literature Review

In this chapter, we provide the background of e-commerce and artificial intelligence, and we review the literatures related to the same. It includes themes around AI in e-commerce, natural language processing for search, sentiment analysis, personalisation and product recommendations. 5 Conclusion This chapter describes Elanzo in its context of AI applications in retail.

Chapter 3: System Architecture

6.1 Introduction In this chapter, we provide an overview of the Elanzo platform architecture by focusing on overall system design and technology aspects. It is based on the frontend and backend architecture along with the technology stack (React, Firebase, SSLCommerz, AND Google Gemini 2.0 Flash) and how do they integrate to become a full platform.

Chapter 4: Features and Functions

This chapter will detail the main functions of the business model - Elanzo platform like AI machine learning smart search, machine learning recommendations, sentiment analysis, and product information frontrunner. It describes how these elements are integrated in the application and how they contribute to enhancing user experience.

Chapter 5: Implementation

This chapter describes the implementation in details, both in frontend and backend side.

Chapter 6: Conclusion

This chapter explains the results of the project, and it focuses on the principal results and contributions of the Elanzo platform.

Chapter 2

Background

2.1 Introduction

AI introduction to E-commerce is the use of smart search systems so that Infact user can search the products by natural language and so forth, but not keywords. This is the bridge between human language and machine knowledge to enable search to become more intuitive. Another key part of the personalised shopping experience is AI product recommendation-based systems that predict which products a user may like based on their browsing history or previous purchases. Similarly, AI- related technologies are also being employed to search for sentiment in customer reviews to give companies an x-ray into how happy their customers are, (and to guide product development).

Some other researches considered how we applied AI to e-commerce and the user experience. For example, Xia et al. zed that the recommendation schemes based on AI could help enhance customer satisfaction and sales by providing personalized recommendations [1]. Similarly, Zhou et al. [2] they have shown that by performing sentiment analysis on customer feedback, business can give a better sense to customer and by that means it can also an increase and marketing the product and service in market. Additionally, Sundararajan et al. [3] AI was heavily used in search service and purchase flows. These buzz-worthy stories suggest that the realm of A.I. has not made customers' online shopping expeditions just more fun but is possibly providing companies with a trove of knowledge derived from data that can make all the difference for marketing and inventory planning.

“The more artificial intelligence goes deep; it can literally create pockets for e-commerce.” Integrating AI into systems like Elanzo is a push to make smarter, and more personalized, online-shopping content. This thesis can be read by latest AI (Google Gemini 2.0 Flash) can elucidate the way AI (or AI-enhanced) was enhancing the accumulation of laboring as backbreaking housework is becoming exclusively devoted to the not only finishing side of both purchaser and browse the inside operations (all from back-end side) quickly and (deeper) longer on the data (deeper) are [4].

2.2 Literature Review

2.2.1 Similar Applications

Santos et al. [5] suggested that search engines powered by AI and natural

language decoding have significantly increased product findability, especially for users who search using ambiguous or partial terms. Similarly, these AI models help to comprehend the query and formulate the answers better (produce better search results).

Another major application of AI in e-commerce is product recommendation. They analyse a user's shopping behaviour, order history and the way he/she goes to the platform to deliver real-time recommendations. Next, personal tastes also become a source of recommendation, and the use of AI techniques for recommendation can be employed to increase product consumption by recommending products that match a customer's personal taste. Research by Chen et al. [6] and implemented the collaborative filtering and deep learning to generate the product recommendations and found these methods more effective in term of precision and relevance of the recommendations than rule-based methods. Additionally, Rendle et al. [7] described how good quality recommendation using matrix factorization techniques can be achieved with AI resulting in better consumer satisfaction and retention.

Another advantage that AI can have for e-commerce sites is the ability to perform sentiment analysis and sift through reviews and other customer feedback. As one example, a product or service may be reviewed by a customer and text data from the review (i.e., the feedback) can be used by a sentiment analysis algorithm to categorize the customer's sentiment as being positive, negative, or neutral, providing business with an informative measure of customer satisfaction. Liu et al. [8] used sentiment analysis for studying the impact of reviews on product sales wherein positive sentiment is positively associated with sales and negative sentiment is negatively associated with sales. This result calls for more customer opinions analysis for better marketing and product services.

2.2.2 Related Research

Product description optimization is also benefiting from AI, with algorithms being utilized in automatically generating or improving product descriptions that can be more compelling for the customer, as well as more SEO friendly. Dai et al. [9] which are generated by NLP techniques over product descriptions to entice potential customers by increasing readability and attractiveness of the offers to increase the conversion rate.

In addition to the AI developments as mentioned above, studies on AI in conversational agents or chatbots have also been focused on. Whereas AI-powered chatbots can assist customers with product decisions, answer product-related questions and make personalized recommendations on the spot. Chaves et al. [10] established that the use of AI chatbots improves customer satisfaction by providing rapid and accurate responses and elevating overall shopping.

The literature we have surveyed has demonstrated that AI can help to enhance e-commerce systems, however there are some current issues such as the need for high-quality labeled datasets, scalability, maintaining diverse legacy systems etc. This thesis is an attempt to fill the gaps in the existing works and it is contributed as the AI-enabled features for an E-commerce website that involves-Bringing the smart searching, product recommendations, module-based sentiment analysis rating-prediction system, product description improvement. (It is about making an E-commerce website catchier and the business better).

2.3 Gap Analysis

There is a notable gap in AIs searching capability. Even now, many e-commerce sites rely on keyword search engines to deliver limited results that may not be what the customer meant when he did the query. A next generation of AI search coupled with NLP can change that and the new options for more conversational and context-aware queries is interesting; yet it doesn't surface in enough places. Research by Gao et al. [11] points out that AI search still have a long way from perfect in user intent understanding (in real world e-commerce) and has greatly improved over simple statistical quantitatively way. But we need more advanced algorithm in building dialogue system which could do more complicated things like dealing with human-interpretable languages and achieving answers that are very near to what the user wants.

And the realm of product recommendation systems is no exception. Most ecommerce systems use only the content filtering system because [such] systems are the easiest to design and implement as they are still used today, however due to the systems only depending on the past behavior of an individual in order to construct a recommended list of items, they cannot provide personal recommendations for a user based on the behavior of its community that can hardly distinguish users who have similar interests in products. Li et al. [12] pointed out that although deep learning-based recommendation models reached much better modeling performance, these models require a large volume of data and high computing power to perform well. With efficient AI models that can give personalized recommendations without relying heavily on Database, compute is becoming a second nature.

Sentiment analysis on customer reviews have also advanced somewhat, but it is still an ongoing challenge to look at the nuanced feelings and context in customer feedback. Detecting sarcasm, mixed feelings or domain specific sentiment that could potentially influence purchase decisions, is a challenging task for the current systems. Zhang et al. [13] found that existing sentiment analysis algorithms are unable to detect this nuance, which hinders them to deliver real-time insights to businesses. In addition, despite customer sentiment analysis is supposed to be focused on customer emotions, combining these analyses with other business parts, for example inventory distribution or targeted marketing, is under researched.

The improvement of product descriptions by AI is also an aspect in which current e-commerce platforms are inferior. Although some platforms use simple NLP (natural language processing) to rewrite or create product descriptions, their simplicity fails when aiming for compelling, upbeat and SEO-friendly product descriptions. Kim et al. [14] studied the use of AI on description generation to enhance user engagement, but they concluded that most AI-generated content remains unable to deliver the creativity and personalization that would enable conversions. Therefore, there is a significant potential to further develop AI tools in this space to generate search-engine-optimized and consumer-attractive descriptions.

In conclusion, AI enabled customer service systems like chatbots have come a long way but have yet to reach the stage of being able to seamlessly interact just like a human would. Liu et al. [15], potentially useful for personalization in e-commerce, the chatbot is immature in its sophisticated customer requests and tailored responses. With commerce moving online at an accelerating clip, customers and employees are seeking out more high-powered conversational agents that can absorb context, brush off challenges, and blend seamlessly into the user experience.

2.4 Summary

AI in e-commerce the integration of AI and e-commerce is studied, where AI is used to improve user experience and the performance of the business. These applications emphasize AI-driven search systems that incorporate NLP to interpret what users are looking for, instead of just tying keywords to other keywords to create more intuitive search results. The chapter covers the AI-based product recommendation systems which customize the shopping experience as per the actions and preferences of the user. Sentiment analysis, another important application of AI, is utilized to analyze customer feedback and use the feedback to mold product development and marketing efforts.

The chapter cites several studies that AI has a positive effect on e-commerce, including AI recommendations putting an enhancement to customer satisfaction and sales. It also highlights barriers to AI adoption, such as data quality and the difficulty in scaling. The chapter ends by discussing deficiencies AI has into understanding complex queries and generating better recommendations that still need research and development.

Chapter 3

Research Methodology

3.1 Requirement Analysis & Design Specification

3.1.1 Overview

Routing is managed using React Router v7 which makes it pleasant to use it to navigate between different parts of the website including product pages, user profiles and the checkout flow. Its auto completes search feature is powered by AI, making it possible for the communicator to ask for products just like they would in a conversation, resulting in an improved and intelligent search based on the intent of the user.

Elanzos back end is a cross section that made by Express. on the server-side for logic and API handling. Firebase works as the wireframe of user auth and database handling, allowing it to fetch real-time data without reloading the UI. Firestore is used in combination with Firebase for the user credentials, product and transaction records, and Firebase authentication is utilized for secured sign-in with Google or email/password. Secure Transactions processing payments is secured by SSLCommerz integration to protect customers information and business data. The back end is made to cope with substantial traffic and user behavior maintained for a comfortable experience in case of high-volume shopping.

In addition to core technologies, AI integration is a significant way to increase platform functionalities. Google Gemini 2.0 Flash, a high-level NLP model, is applied to the smart search and recommendation system. Its AI-powered search system can understand natural language queries, like “comfortable running shoes,” and deliver relevant product results based on those expressions, as opposed to just keyword matching. From user behaviors, preferences, and previous purchase history, the recommendation engine for suggesting user-oriented products can help product alternatives attract users and improve conversion rates. Sentiment analysis is also performed on customer reviews, helping companies understand customer satisfaction to improve products and services.

In order to be scalable, Elanzo’s structure is able to scale with business size, which means new functionalities like voice search or AR can be added later. It’s modular, so it’s easy to update and integrate with an external API or service. Safety first security is a top concern – your users’ card data is safe through the app’s secure

payment gateways and encrypted data transmission.

3.1.2 System Design

The application's state is maintained with Redux Toolkit to help simplify component interactions within Checkout (most notably, the cart and user data). Redux ensures that there is a unique source of truth for the state of the application, which is easier to debug and control. This state management mechanism is also able to dynamically update elements such as the shopping cart, where items get added or removed in real-time without needing to have the page refreshed.

For navigation, we are using React Router v7 to smoothly navigate between different parts of the application such as product page, user profile, order history, and checkout process. This results in a single-page application (SPA) which the user can use to travel around without the need to refresh the page, providing a more speedy, seamless interaction experience.

The frontend also features an AI smart search created with Google Gemini 2.0 Flash technology. The AI search engine understands natural language queries like “comfortable sneakers for running” and provides more relevant and context aware product responses. AI-powered product recommendations are plugged directly into the UI, so that users can see personalized recommendations based on their browsing history and deals already claimed. These elements are organized in a manner that is intuitive and easy to navigate, so users can promptly locate what they need, while discovering new, useful items.

To facilitate these AI-driven features, the frontend communicates with the backend using RESTful API calls to securely and efficiently transfer data. The JWT (JSON Web Tokens) provide the secure means to manage user sessions with authentication for both the user and admin sides of the platform.

The backend system of Elanzo acts as a linchpin to the platform's data management system, user authentication system, product storage system, and AI system. Built using Sql, back end is designed to serve any client request, handle them in real time and return responding data to frond-end. The platform utilizes a RESTful API in order to enable more streamlined communication between the frontend and backend.

The backend is mainly on the Firebase platform with the authentication and database two big components. Secure user login and registration with Firebase Authentication supports email/password as well as Google Authentication. This login system is a valuable tool to save sensitive user information and a guarantee for users to view their profiles, review past orders and get to know suggestions and

advice.

Firebase Firestore, a NoSQL cloud data storage, is adapted for the data storage. It saves users, product, orders, transactions with real time synchronization and can be scaled up to use it with any external source. Then there's Firestore's built-in real-time data synchronization which allows you and other admins or users to be always looking at each other's data without the need to refresh the page. This is especially true for features like order tracking and real-time updated cart, where data must be constantly be updated.

Payment Processing is done by SSLCommerz using payment gateway as secure and encrypted for a web. With this technology integration, Elanzo is able to process payments fast and secure, resulting in a safe shopping experience for consumers and merchants at the same time it ensures protection for any financial information.

To prevent unauthorized request the backend uses JWT (JSON Web Tokens) for sessions and also to have your sessions with higher security. This token-based system is able to initiate secure communication between the frontend and the backend, and hence making it difficult for unauthorized users to access a sensitive content or to perform administrative tasks.

Conclusion In this section, the backend architecture of Elanzo is presented which is intended to be strong, scalable and secure to support smooth functioning of the platform. That is, real-time data syncing, secure user authentication and payment processing, etc. and now it becoming more frequent that you have to connect to the APIs of advanced AI features, so that your e-commerce site is high performative and user oriented.

3.1.3 Functional and Nonfunctional Requirements

Functional requirements: This is the basic functionality of your app. These consist of secure user authentication (users can sign in with email/password or Google accounts via Firebase Authentication). The system needs to include an advanced AI-based search that can understand natural language to bring more user-friendly product discovery. It also needs a recommender system appealing to product recommendations from browsing, behavior and preferences of users. Another key feature is sentiment analysis, which uses customer reviews to understand customer satisfaction and assist businesses in refining their offering. On a related note, the site should let me add things into my shopping basket, place orders and pay in a secure manner as well. For admin, the administration of products, users order and access control is required elements to keep the platform clean and healthy.

Nonfunctional requirements, on the other hand, target the performance and quality

attributes of the platform. Scalability is a strong desideratum, given the amount of traffic and data that needs to be managed without sacrificing performance. It also must deliver a smooth experience, even during peak times. Security is also an essential consideration; users must feel their data and money are safe from prying eyes through encryption and secure payment gateways. The platform also needs to be dependable, with systems that have little downtime and solid mechanisms for backing up and failing over data correctly and ensuring service continuity, without a loss of any content. Ease of use is also crucial with an intuitive interface that can be used on different devices. While at the same time maintainable, by being modularly architected and well documented making it possible to easily extend and add new features.

Functional and non-functional requirements established a groundwork for an e-commerce application, which is made capable of providing a secure, powerful and efficient platform that offers customized shopping by complete business transaction as well as ease of operation and continuity improvements.

3.1.4 Context Diagram

The Context Diagram depicts the context of Elanzo AI-Enhanced E-Commerce Platform from a macro perspective, focusing on its major external entities and their relationships with the system. It explains the boundaries of a system and the main actors working in this specific context. At the centre of this diagram there is the Elanzo AI-Enhanced E-Commerce Platform, as core process interfacing with other external entities.

Next to User there are some of most important users that interact with the system by seeking products, purchasing and navigating on it. The Admin is an admin interface to provide access for management to maintain, add new or delete products, orders and maintain the superior functioning of the platform. The Payment Gateway is to provide a processing of the user's payments in transactions and a safe financial exchange. The Product Database contains fundamental data of products and is used by the platform in order to illustrate product information for users. Finally, the Review System provides useful customer reviews and feedbacks for sentiment analysis to enhance platform benefits.

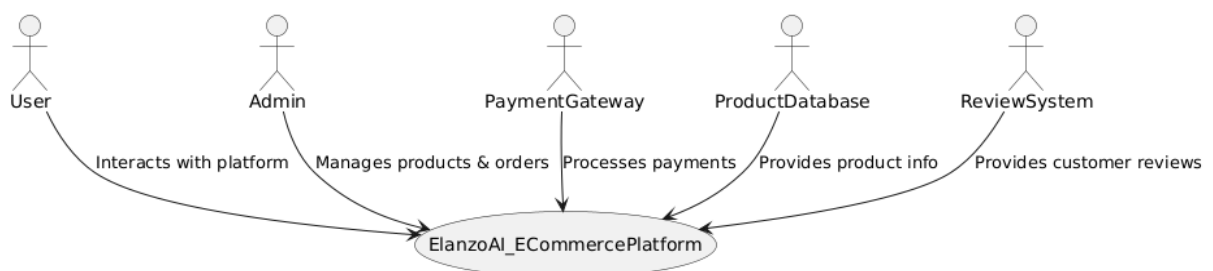


Figure 1: Context Diagram

3.1.5 Data Flow Diagram

The Data Flow Diagram (DFD) provides a more detailed representation of the Elanzo AI-Enhanced E-Commerce Platform than Context Diagram, showing how data moves and interacts with processes through the system and related to data stores, with external entities. The DFD can be thought of as a resolution of the internal working of the system and how data transits from one to another component, thus is a more detailed description of the functions that are built into the platform.

The essential processes are indicated at Level 1 of the DFD. SmartSearch receives user searches, to understand natural language user input and respond with proper product items. ProductRecommendation analyzes user behavior data, like search history and order history, to recommend products specifically for those users. SentimentAnalysis extracts sentiments from customer reviews that can help in taking decision on product development or marketing. The ProductManagement process is in charge of product data on the platform, which includes adding, updating and dropping products. OrderProcessing Finally, OrderProcessing processes customer's orders by the ability to do payment processing and update order status and store associated details of an order.

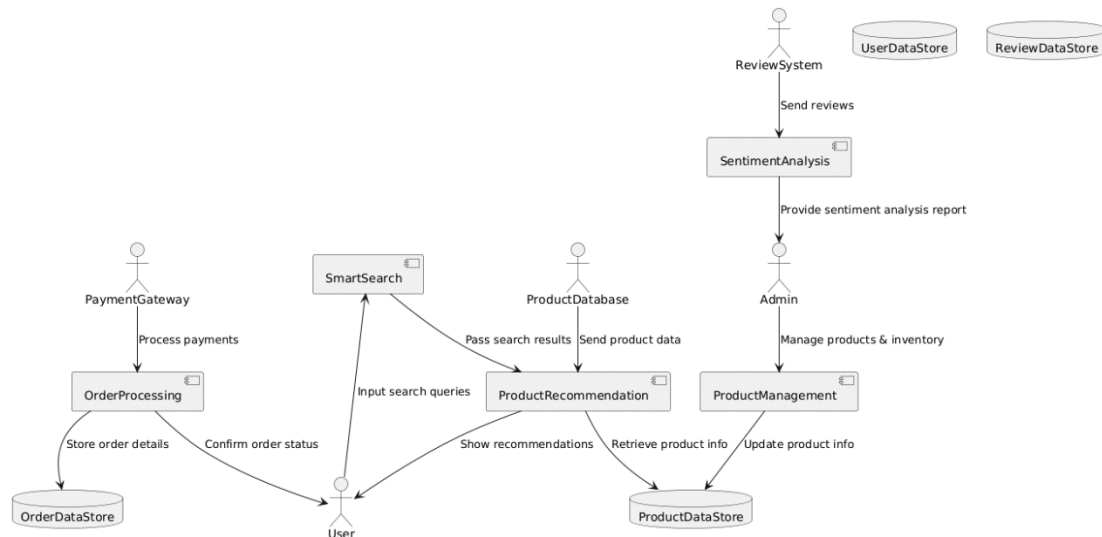


Figure: Data Flow Diagram

3.1.6 UI Design

User Interface Design (UI) is developed to make our shopping as easy and intuitive as possible for users on all devices. The design philosophy behind Elanzo is that the platform makes it simple for users access and finds products, and can place their orders without a lot of complication. The platform is mobile-first, so all the content will be light and will work just fine even on smaller screens, but this doesn't mean everything is related to mobile specific features, everything will form perfectly also

on desktops. This way user experience is same on any device; one less thing for customers to think about while on the go, at home or work.

Configurable with responsive layouts, that make your website responsive to all devices – from large monitors to mobile phones. The design is simple and minimal, focusing on ease of use and readability. The styling is done using Tailwind CSS which provides the flexibility and speed to change the looks of the app without lacking aesthetics. The intuitive navigation makes it easy for users to find what they need easily through crisp sections, categories, sub-sections, while the main “search” bar can be found right at the top for amazing product discovery.

One of the most important characteristics of UX design is its focus on AI-based features, such as smart search or custom product recommendations. The smart search is embedded into the theme layout, enabling users to search for products easily with natural language. The auto-suggestions feature provides users with recommendations as they type, assisting them on discovering desired items without having completed the typing process. Shoppers are given real-time personalized product recommendations throughout their shopping, based on their browsing and purchasing activities, ensuring the experience remains fresh and inspiring. These suggestions are subtly (and not so subtly) displayed through a user’s visit: on the homepage, the product pages and even the checkout.

Elanzo also works for dark mode, where users choose between the light and dark theme. This also gives users more options to select the views they prefer, while helping make the platform more accessible and easier to use in varying light conditions. Elanzo’s UX design also includes the highest interest in security and user-friendliness while checking out. The straightforward integration with SSLCommerz enables safe payment processing. The checkout process has been stripped down, eliminating friction and enabling customers to make purchases quickly and securely.

In general, the user experience design of Elanzo is based on developing a personalized, easy-to-use, and secure solution that satisfies different customer's needs. Whether it’s the seamless UX/UI (user experience/user interface) structure, dynamic design that caters to cross-interface interactions, or AI-based search function or personalized offerings, the marketplace is designed to make the shopping process easy and fun, and to invite users to come back and interact with the marketplace.

3.2 AI Integration Architecture

AI inbuilt in Elanzo is concentrated to enhance your experience with customized intelligent aspect to make your shopping smart. The architecture of the AI layer

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(describe below) is designed to be a plug-in into both front end and backend, take care of the real time streaming data, and provide with personalized recommendations, smart search, and sentiment analysis.

Recommended products are updated in real time based on the activity of the user such as previous products purchased, items browsed and product clicks. The user profiles that have been created on the product is then analysed at the backend and then passed to the recommendation engine which uses collaborative filtering, content-based filtering and machine learning tools and will generate personalized product's list for each user. These recommendations are immediately refreshed and shown to the users if a view displays several products and if users to view the most relevant product.

The platform also include AI based sentiment analysis. This model uses customer reviews and annotates them with labels: positive, negative, and neutral. By combining sentiment analysis Elanzo can give businesses the ability to rapidly see how satisfied their customers are, and what can be done to improve their product. Sentiment analysis happens on the backend, with the AI examining the comments in the reviews and deciding the sentiment polarity. This information is published on product pages for customers to support their purchase decision.

The AI integration is on the Firebase Firestore database and their backend API. Whatever data it's possible for the platform to house, including user event data, product info, and customer feedback/reviews, is stored and transformed in Firestore.

3.3 Security Features and Authentication

Sessions are managed using JWT (JSON Web Tokens). Upon signing in, the authenticated user receives a token that is saved in the frontend in a secure location. This token is then sent on further requests to log in the user and make sure they have access to particular resources like their profile or the admin dashboard. JWT takes care of security, only authenticate user can have sensitive information and the token expiration time adds more security.

Sensitive user and transaction-based data are encrypted globally within the platform. All client and server communication are encrypted with HTTPS and TLS/SSL certificates. This means that all information exchanged between the user's browser and platform is safe from eavesdroppers. Payment is safe and easy through SSLCommerz, click Checkout with SSLCommerz which will enable you to use an existing SSLCommerz account to use the payment funds to pay for the items that you have won.

The backend is hardened against typical web risks like SQL injection, XSS, and CSRF. The RESTful APIs of the platform have strong validation and sanitation mechanisms in place to avoid any possible harmful input, thus ensuring that only valid requests are accepted and processed. Furthermore, CORS rules are set to block certain domains from accessing the backend, and they thus protect the platform from stray access.

If this generated document contains privileged information, the role-based access control (RBAC) is applied, so that only authorized users can access and modify sensitive data.

3.4 Project Plan

Requirement Gathering and Analysis – The initial phase consists of the team gathering the key requirements for the platform. This phase consists of a few talks with stakeholders to ensure that project goes along with user's requirements and business's need. Once the requirements are collected, the team proceeds to the 5th phase, System Design, where the total structure of the system is designed (both towards frontend and backend).

After that, the following phase is Development Phase and the team starts executing core features like AI based search system, personalized recommendations, sentiment analysis and so on. This involves front end development with React.js and backend created with Firebase—this power duo fusing the UI with the database makes me pleased.

The project now moves into the Testing and Evaluation Phase in which the platform is subjected to a series of tests, including unit testing, Integrated Testing, and reviews of performance to ensure that all features operate as expected. This phase also adds on user acceptance testing for feedback and to rev things up as required.

Lastly, Deployment and Maintenance is the phase where platform goes live to public. The team takes care of hosting the system right and scalability optimizations. Following launch, the system will be maintained and supported and any issues will be corrected with regular updates and maintenance.

Clear milestones and deadlines are established to monitor progress throughout the project; meetings are used to monitor the project and nothing to keep the project on-schedule and on-scope. The plan emphasizes the need to develop the platform iteratively and iterate based on feedback, to deliver a great product user experience.

Sessions are managed using JWT (JSON Web Tokens). Upon signing in, the

authenticated user receives a token that is saved in the frontend in a secure location. This token is then sent on further requests to log in the user and make sure they have access to particular resources like their profile or the admin dashboard. JWT takes care.

3.5 Task Allocation

This table depicts the timeline of the principal activities in each period of the project.

Table 1: Task Allocation

Tasks	Weeks																		
	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48
Design Collection Phase																			
Frontend Development																			
Database Connection																			
Evaluate, Tesing																			

3.6 Summary

Elanzo platform, divided into distinct phases. It begins with Requirement Gathering and Analysis, where essential features are identified in collaboration with stakeholders. The next step is System Design, which involves planning the platform's architecture for both frontend and backend. The Development Phase follows, focusing on the implementation of core features such as AI-powered search, personalized recommendations, and sentiment analysis, using technologies like React.js and Firebase.

Chapter 4

Implementation and Results

4.1 Environment Setup

The role includes working on the Environment Configuration of Elanzo which is essential in making the platform run smoothly, scalable and secure. With the right set up for development and production, you can deploy easily, implement the mix-ins of features nicely and be resilient for future updates/changes that may come. Below, we describe the relevant Elanzo environment configuration in detail.

Development Environment

Elanzo's development environment is configured with state-of-the-art web technologies, enabling a very productive development, testing and debugging process for the platform. Their programming environment and libraries consist of the following tools:

- React.js - A JavaScript library for creating user interfaces - the base tech for Elanzo frontend. It has the capability to deliver quick, user-friendly interaction as well as rendering the pages in a smooth manner.
- Firebase SDK - Elanzo relies on Firebase as backend support (Firestore database, Firebase Authentication for user signin, Firebase Storage for facial expressions media). The development environment contains the Firebase SDK that allows for easy access to all Firebase services through the development environment.
- Vite: A frontend build tool that applies the concept of over-optimize, bringing faster reloads and start up times to React apps.
- Tailwind CSS: Utility-first CSS framework used to style the Elanzo frontend. It allows developers create clean, responsive and maintainable code by providing an easy-to-use helper with classes for layout and design.
- Redux: It is a state management library that efficiently stores and manages the data of the app across different components. Elanzo makes use of it to handle the cart data, the user session or other global states.

Production Environment

The production environment is where your application is running and the users can access it. It is designed for high-availability, security, and performance on live streaming sites. The production environment configuration consists of:

- **Hosted On Firebase:** Elanzo is hosted on Firebase hosting, a high secured, scalable hosting platform for your content and static assets. This means every connection to firebase is secured over HTTPS, using SSL.
- **Cloud Functions:** Firebase Cloud Functions is employed to perform backend tasks without the need for server. such as sending alerts, processing transactions, or updating dynamic content.
- **Firestore Database:** The production has Firebase Firestore for the NoSQL database for storing users, products, orders and dynamic details. The real-time synchronization in Firestore makes every device up to date.
- **Security Rules:** Firebase Security Rules are set up to protect data in Firestore and Firebase Storage. These are rules for restricting read and write access to the data using user-authentication a role-based permissions (such as admin, user etc.). For instance, adding or removing products is restricted to admin users, customers can only view products and make purchases.
- **Environment Variables:** Environment variables store sensitive information such as API keys, database configuration, and Firebase configuration. These variables are never exposed in the frontend code.
- **Continuous Deployment (CD):** A continuous deployment pipeline is in place that deploys new changes to the prod for Elanzo completely automatically. That way any new features, bug fixes or security patches are sent to the live platform effortlessly.
- **CDN and Cache Everything:** We use CDN to serve static files (images, CSS, JavaScript) to visitors around the world through servers closest to their location, resulting in a faster load time for everybody. Caching techniques are also employed to limit server load and improve responsiveness.

Testing Environment

A test environment would be the hypothetical scenario all things work before it gets deployed to your production environment. Distinguishing features of the

setting up of the test environment are:

- **Unit Testing:** You write up unit tests to verify an individual component and ensure it functions as you intended it to.
- **Fake Data:** Mock data is employed when it comes to the testing phase to imitate the actual usage in the platform. This can assist developers in examining possible problems without hitting real databases.
- **Staging:** The staging environment is an identical copy of the production environment and is used for final testing before site/app updates are launched to production. It gives the team a chance to find any lingering problems before they harm actual users.

Security Configurations

- The Elanzo platform is dedicated to security. The context is protected by the following steps:
- **SSL/TLS Encryption:** The platform is encrypted with SSL/TLS certificates on all connections, which means that the information between the users and the platform is secure.
- **Authentication and Authorization:** Secure user sign-in using Firebase Authentication as well as sign-in through email / password and Google account. Access to sensitive data such as products and orders is protected by role-based access control, so only approved users (admins) can manipulate it.
- **Data protection:** Security rules can be used in the Firebase Firestore to regulate the access to data. For instance, only users can access their order data, and only admins can update or delete products.

Performance Optimizations

Elanzo is tuned to get the fastest possible performance in production by doing the following:

- **Lazy Loading:** Product images and data make your website heavy and slow down your system; all these can be loaded later whenever they are needed.
- **Frontend ductily divided:** We are splitting the frontend to only download the javascript of the page user is browsing.

- **Optimized Images:** Images are optimized to be smaller without losing quality so your website loads at lightning speed.

4.2 Testing and Evaluation

Unit Testing

Unit Testing: The individual components/functions are tested in isolation, using a process called unit testing. Every unit test covers one part of the domain and makes sure that it works the way it should work. While in the frontend, we use testing libraries such as Jest and React Testing Library to write and run tests for components. For instance, we write unit tests to ensure that product details are properly displayed, that the shopping cart is properly updating when items are added, as well as make sure buttons are interactive. These tests make sure that each piece of code works independently of the other, before it is plugged into the rest of the application.

Integration Testing

Integration testing tests that separate structures of the app work together well. This helps us verify how different pieces are related to each other which includes verifying that the product search works fine and the results returned are as expected or the shopping cart system integrates seamlessly with the back end for storing user's selections etc. Integration tests are critical for catching problems in a frontend-back interaction, especially in scenarios with several systems processing user actions.

End-to-End Testing

End-to-End (E2E) tests are like real user journeys and make sure everything works as expected from a user perspective. These tests cover complete scenarios (browsing products, adding to cart, completing the checkout process, and getting the confirmation email). Cypress/Selenium could drive these tests, interacting the app as a user would. E2E tests reveal any bugs that a user may encounter when using the platform, like challenges with navigating or making payments or placing an order.

Manual Testing

Automated testing gets you great coverage, but some edge cases and UX issues can't be well-tested with automation. Manual testers perform exploratory testing,

such as navigating across the platform to detect usability problems, broken links, or other UI issues. Such testing helps make the platform user-friendly and intuitive and provides feedback that comes from a real user.

Debugging

Debugging continues from the very beginning of developing period. When problems are found in tests, developers use a combination of debuggers and other debugging approaches to isolate the problem and fix what's wrong. Within the React ecosystem, developers use React DevTools, Chrome Developer Tools, and console tools. log statements to debug the component tree, see how state changes over time, and observe network requests. These tools offer useful views into the behaviour of an application, and can help track down where things are going awry).

Beyond frontend debugging, I troubleshoot backend concerns by running the Firestore Emulator to simulate database interactions locally, and checking Google Cloud Functions Logs to view their behavior. Troubleshooting backend troubles consists often in going through logs and error messages to know where things fail, be it customer authentication, orders or products management.

Continuous Integration and Delivery (CI/CD)

Elanzo leverages CI/CD pipelines for automation of testing and deployment as well. With CI/CD, each change in code is automatically tested through a set of pre-set tests that help to prevent new features or bug fixes from breaking the existing ones. When the tests are green, the latest code is automatically deployed to the staging environment to be tested. If the deployment in stage passes, it is promoted to the production environment. It makes the code cleaner and faster to develop.

Bug Tracking and Reporting

For debugging, Elanzo uses a bug tracker (e.g., Jira or GitHub Issues) to report, follow, and manage bugs. Developers can log every issue, assign it to a team member, manage follow-ups. Such systems make it easy to avoid overlooking any bug and delay the fixing of the same.

User Acceptance Testing (UAT)

Prior to major releases, User Acceptance Testing (UAT) is done to make sure that the platform fits the requirements of real users. In UAT, one or more business owners and key users are invited to test the solution to verify that it meets the

business requirements and user needs. It's very important to receive UAT results to make any last tweaks or make improvements before the product goes live.

Through thorough testing and debugging, Elanzo thoroughly tests and debugs its own platform providing a reliable, secure and production ready platform. By blending of manual and automation testing with CI/CD and bug tracking, the product is rigorously tested to the highest quality. These constant debugging, the user's feedback make the platform more solid and reliable, let users "0 delay" uninterrupted shopping.

4.3 Results and Discussion

Elanzo uses ML and NLP to personalize every user engagement for the end user, so that you can optimize comfort and performance of your marketplace. Its "smart" search" is one of its most notable AI features. By comparison, Elanzo uses an AI search system which knows what users are looking for using natural language processing, whereas search engines use key word matching. The problem is that, those search results are similar only because, at that point, the users have not logged in to possess in-memory personalized, tracked behavior. Users are able to search in natural language such as "best running shoes for flat feet" or "cheap leather jackets for winter". And one of the primary capabilities of AI is a personalized product recommendations engine. Powered by smart algorithms, it generates personalized offers based on how a user is visiting the site – such as browsing patterns, previous purchases and the movement the mouse makes over a product.

It's an autoregressive and adaptive recommendation engine that elaborates itself as users takes actions, always trying to learn the most about what that user might be interested in thus keep serving to any user a catalog of recommendations based in that user actions that fits to that user in a personal way. "If a user consistently looks at athletic wear, the AI system may recommend new additions to the sportswear category, if they already made a purchase for home decor, the AI system may recommend furniture or wall decor items," for instance. This unique feature is not only a great User Interface feature, it also has a real impact on your Conversion Rates: your customers will be naturally more interested in those products that they will like (more): because it will match their tastes & needs.

Additionally, user satisfaction is also investigated using sentiment analysis on user reviews. Artificial-intelligence-driven algorithms parse the text of the reviews to figure out whether feedback is what's known as positive, negative or sentiment-neutral information that can offer guidance to product developers. For example, if the product has some issues which found in many reviews, by doing sentiment analysis businesses would be able to detect some of the bad quality product and get

to respond for this problem when necessary and stop selling. And beyond that, the data that Sentiment is able to provide also enables companies to see what is making an impact with their customers, and to tailor marketing around that. Elanzo also includes sentiment scores with customer reviews so you can be made to can feel like purchasing juicy, tender beef coked with only a hint below is just the word of wine.

4.4 Product Intelligence

Elanzo's Product Intelligence features create a highly personalized shopping experience such as recommendation, sentiment analysis & a Product Enhancer and are powered by AI. They are very well integrated into the platform to drive product discovery and consumers journey while increase satisfactions and conversion rates.

- **Product Recommendations:** A product recommendation engine is going to be a rockstar in Elanzo. This platform uses advanced machine learning to observe what a JTV user does (e.g work/ school browsing history, purchase history, information search, online click behavior) and teach itself to make real-time personalized recommendations.
- **Sentiment Analysis:** Elanzo has sentiment analysis to analyze customers feedback and review. AI can analyze the sentiment (positive, negative or neutral) of product reviews and enhance understanding of customer satisfaction.
- **Product Enhancement Tool:** The AI-written descriptions are designed to highlight the features, benefits and USPs (unique selling point) of the product making it more appealing and sell better. The product copy is also SEO-friendly that can make your product rank better on search engines in order to grab the eyeballs of the potential customers.

Elanzo Smart Search A smart search for a more intuitive user-friendly approach of searching for products, faster and with an advanced Natural Language Processing (NLP). Unlike traditional search systems using only the logic of matching keywords, the Elanzo smart search receives the natural language queries and analyse and understands it and it processes in context so that user can search for the products on in a conversational way like 'comfortable shoes to run' and 'best budget smartphones. This AI based search engine is capable of taking a search request in a manner that corresponds not only to the searching thought process but also to the context of the search input query.

Elanzo's intelligent search is 100% powered by a machine learning models that are able to actually understand what the users are asking for, and is able to rank different products in a new level that is not keyword based but on relationship,

context and the user intent on the search. The system also deals with ambiguous queries, serving results according to the interpretation that seems most probable for the system. For example, if a user searches for “black winter jacket,” the system will determine that she is likely looking for jackets for cold weather, even if product descriptions do not contain the word “winter.”

4.5 Admin Features

Elanzo makes your life easier Elanzo's admin functionalities are made to give you maximum control over your products, orders, users and shop analytics. With an easy-to-understand and straightforward admin dashboard, it acts like a command center that allows administrators to stay on top and in control of everything that happens in the e-commerce site.

Product management is a key feature for administrators. Why it matters: Via the admin interface, staff are able to quickly add, update and remove products, assign pricing and group products in to related sections. This is what enables them to maintain a clean, updated and refreshed product catalog and always stocked with hot and new products! You can also edit product information such as description, images, and inventory levels right in the administrative area, a must-have feature for keeping your product pages fresh and accurate.

Order Management is an important factor as well for site admins to monitor customer orders in real time. Store owners can get up-to-the-minute information on all orders in the system, whether order was paid or shipped, that make it easy to manage sales. They can even change the status of the order (like processed, shipped, completed or cancelled), turning on automatic order fulfillment and sending of confirmation emails to your customers. This will help admins to be on top of customer queries and complaints and address them promptly to maintain good user experience.

admin panel comes with user management features where admin can view and manage customer accounts. Admin special Permissions It allows the admins and support managers to track user activity including purchase history, user preferences and interactions with the platform that may be used for better customer care and marketing purposes. Admins can also take actions to permanently block or delete accounts if it is needed to keep the site safe and reliable.

Finally, there are analytics and reporting features available in the admin panel for gaining insights into aspects of the platform such as sales, traffic sources or customer engagement. This information allows the administrators to make informed business decisions, to fine-tune marketing strategies, and to enhance overall platform

performance.

4.6 Authentication & Security

Authentication and security features in elanzo are also such as to keep sensitive data, transaction, financial details that are easily at all times. The application also uses a secure and easy to use authentication layer (Firebase Authentication) to handle login and registration of users. They can login with email and password or use Google oath and in conclusion can easily join the platform while not having to be worried about their account security.

For session handling, Elanzo utilizes JSON Web Tokens (JWT) instead of cookie-based information to keep session data secure. On log in success, server sends back a JWT token, that managed client side securely. Notice that the user now carries this token with itself to authenticate onto the server on future requests, so that not everybody can get access to our private resources like our wallet or the history of our orders, and that also, not everyone has the rights to perform admin stuff, for what we need to be very careful for instance that not just anyone gets access. JWT also helps to secure sessions and it's transient which reduces the likelihood of session hijacking.

For privacy, the organization, as well as its full platform, operates with HTTPS; meaning HTTPS all over the line between client and server with SSL/TLS certificates. This also means your data will be encrypted over the air and the security of information such as your username and password, personal details and credit card numbers.

Admin panel and sensitive areas of the system has RBAC-security. There are numerous roles determined for admins and staff members, so each user sees only what's related to them.

4.7 Real-Time Updates and Order Tracking

Elanzo has live updates and follow on of the order shopping, the experience is human like and on-line less not so in that app has updates you the order and happenings. This platform also offers live cart updates so the users get to see their cart updating live as they add or reduce some items. This is a great benefit as there is less reliance on page refreshes and the shopping flow is seamless. Like when users add an item to the cart, the cart icon immediately refreshes (no page refresh) and provides users with real time feedback right at that moment which to the user it's a pleasant experience.

Order tracking Elanzo gives the consumers a provisioning to track the status of their orders starting from when it is placed to reaching your doorstep. Tracking Once an order has been placed creates can be tracked through status updates, shipment notifications, and order status changes. It is this live-tracking that offers the peace of mind that keeps them out of the anxious zone, and focuses your anticipation on something that helps anxiety shrivel. I would be happy for our users to have access to that.

4.8 Frontend Development

The frontend is powered by React.js for component-based structure which will update/render fast and it's perfect for creating dynamic and high-performance ui. The use of Vite improves upon this with faster build times and a development experience that's optimized for flow between your development and deployment cycle.

The responsive and smartphone friendly design was created with the help of Tailwind CSS. With these utilities first framework you can style fast and keep everything neat and tidy. With mobile-first design in mind, Elanzo is built to have consistent experience on all screen sizes, desktop, mobiles & tablets. The interface also utilizes in Material Tailwind components including polished and professional looking.

State managing - I use Redux Toolkit to make it easier in managing application data between certain components. This allows frontend can really stay up-to-date in real-time, while adding/removing from the cart, and fetching new product recommendations. App navigation is managed by React Router v7 so users can smoothly move between pages (for example the product page, user profile, and the checkout flow) without any browser refresh.

An outstanding feature of the Elanzo's frontend is the AI smart search. Translate natural language queries like "running shoes for flat feet comfortable" Increasingly, search engines, including Google, are interpreting human-friendly queries so it's easier for users to find content using the type of language they might use speaking to friends.

Figure 1. Home Page (Navbar, Hero Section)

Figure 1. Home Page (Navbar, Hero Section)

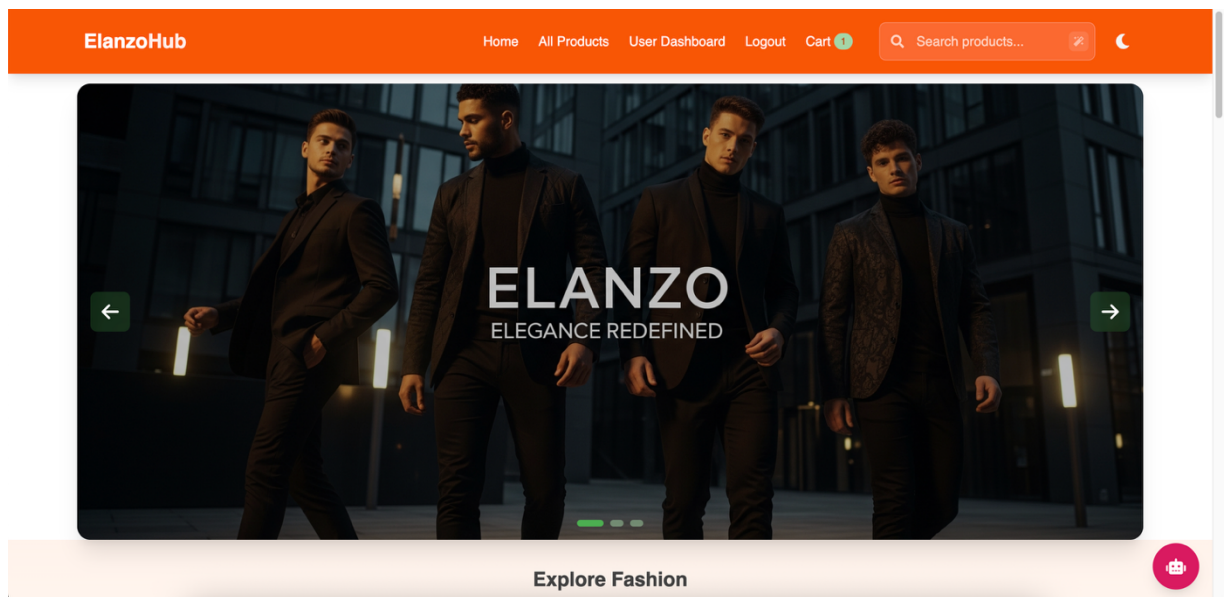


Figure 2. Home Page (Navbar, Hero Section)

On the right, there is a search bar for users who want to quickly access a specific device by typing keywords, making the navigation experience more enjoyable. The hero section of the page displays an appetizing image of a woman looking relaxed with shopping bags emphasizing the shopping. This part doesn't just focus on the e-commerce component, but also offer a friendly approach reflective of the customer-centric tone. The distinctive colors & styling are eye-catching and reinforce the brand's personality. The left and right navigation buttons of the hero image enable neat and efficient interaction.

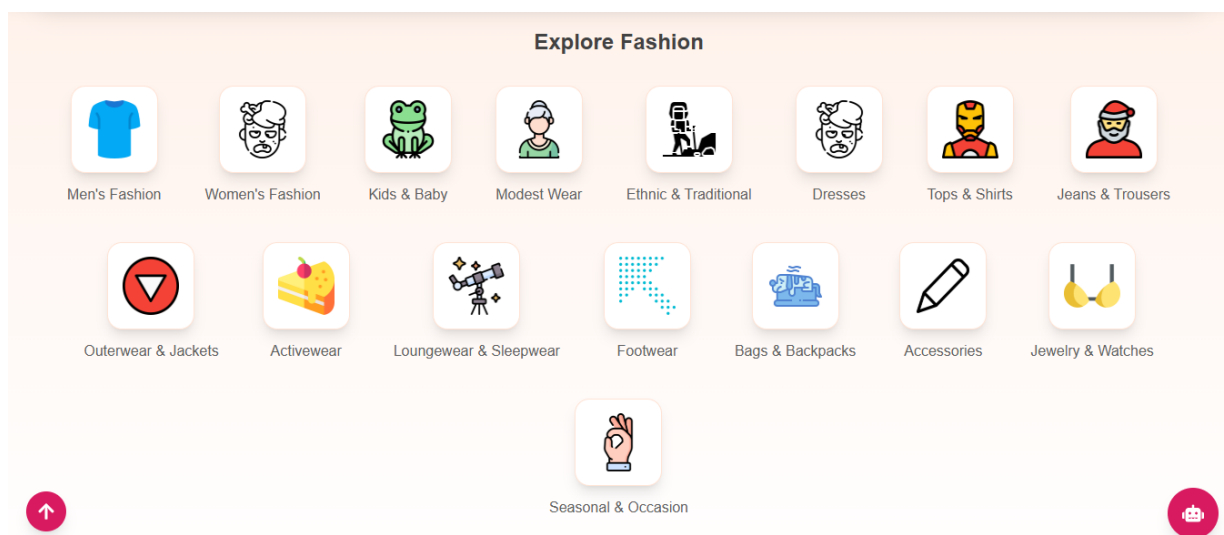


Figure 3. Explore Fashion Categories

Check out this beautiful fashion categories section of Elanzo there's really a clear and organized UI. A grid of icons showing various clothing and accessory categories appears to users, who can easily peruse through the latest fashion options. Categories

include Men's Fashion, Women's Fashion, Kids & Baby, Modest Wear, Ethnic & Traditional, and so much more, catering to all your fashion needs. A corresponding icon represents each category, so the system is intuitive and easy to navigate in. This section incites to be zapped, and makes exploration easy as user can easily flick through 1000s of items in Fashion, from Outerwear & Jackets to Jewelry & Watches as well as enhancing our shopping experience by curating all our products in a visually engaging and easy to navigate way.

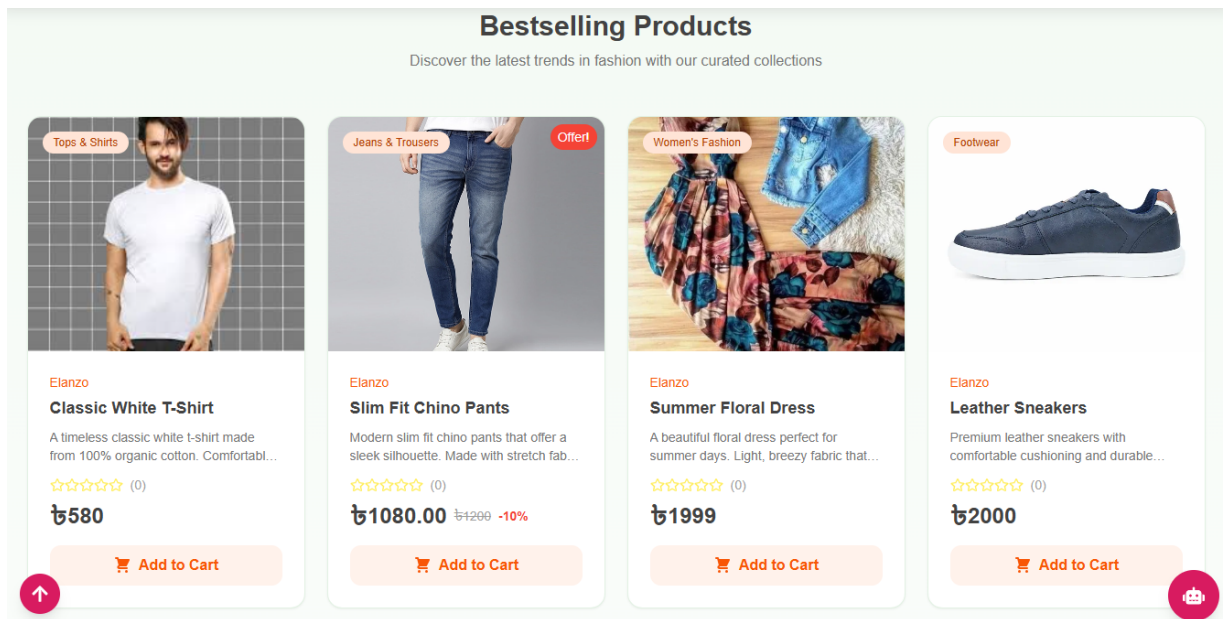


Figure 4. Bestselling Products Section

Bestselling Products The picture features the Browsing Bestselling Products on Elanzo. All items are showcased with a high-quality image, name and price so that users can browse the bestselling products on the platform. The items are a Classic White T (T-Shirt), Slim Fit Chinos, Summer Floral Dress, and Leather Trainers. The items are categorized: Each item has its category, such as Tops & Shirts, Jeans & Pants, Women's Fashion, Shoes listed just above the item's image.

You also see deals in fuchsia tags, like the 10%-off Slim Fit Chino Pants. Prices are easily discerned in Bangladeshi Taka (₹) and each item has an Add to Cart button, promising a frictionless shopping experience. The storefront is intended to help shoppers quickly and easily find what's new and hot in fashion, showcase best-selling products and efficiently display of top products based on customer ratings.

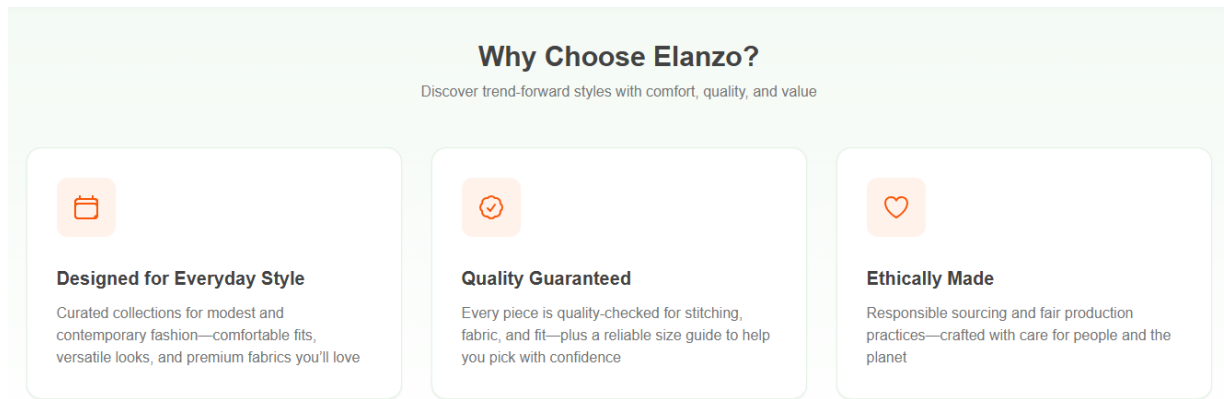


Figure 5. Home Page (Why Choose Elanzo)

This section is there to inspire trust and a level to tell customers about the values of Elanzo.

- **Perfect for Daily Fashion:** Elanzo is the perfect Fashion Destination of choice that provide not only trendy, but also ergonomically designed fashion for wear everywhere! The emphasis is on cozy fits, casual chic, and quality material, to always have our customers looking and feeling great at approachable price points.
- **Quality Assured:** All the products on the website are checked for stitching, fabric and fitting. Moreover, a trusted size chart is available to choose your fit comfortably as well.
- **Socially Responsible:** Elanzo values responsible sourcing and transparency so you can feel confident that your new purchase was made with care for the people who created it and the earth.

The clean simplicity of the layout paired with the lovely little icons to help get the messages across – means that, for a new user, this section's clear and visually appealing, and a great way to communicate what the platform is all about to a potential new customer.

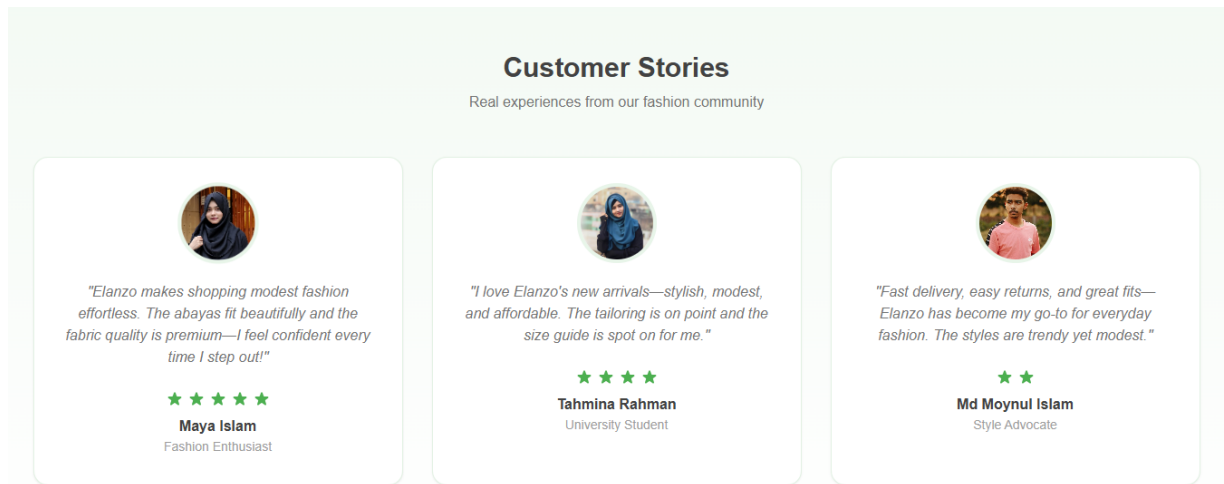


Figure 6. Customer Stories

The image features the Customer Stories, where real customers talk about products, they bought from Elanzo. This is a trust-building and credibility establishing section with real testimonials from different people.

Maya Islam, a fashionista, loves Elanzo, she says, “They've taken the stress out of shopping for modest fashion, the beautiful fit of the abayas and the premium quality of the fabric makes me feel a million dollars, every time I step out”.

'Elanzo's new arrivals cater to every heart' "Elanzo offers something to every heart," says a university student, Tahmina Rahman who loves Elanzo's new arrivals stressing the stylish, modest and affordable clothing. She also likes the great tailoring and the accurate size guide that enables her to make proper choices.

Md Moynul Islam A style advocate reviews the brand and says - amazing experience with Elanzo, super-fast delivery, ridiculous easy returns, and I love the fitstell quality. He also says that Elanzo is his staple for every day wear like, its trendy okros and mild modest outfit.

The section is eye-catching with featured star ratings along with images of the customers, making the testimonials convincing and credible to future customers.

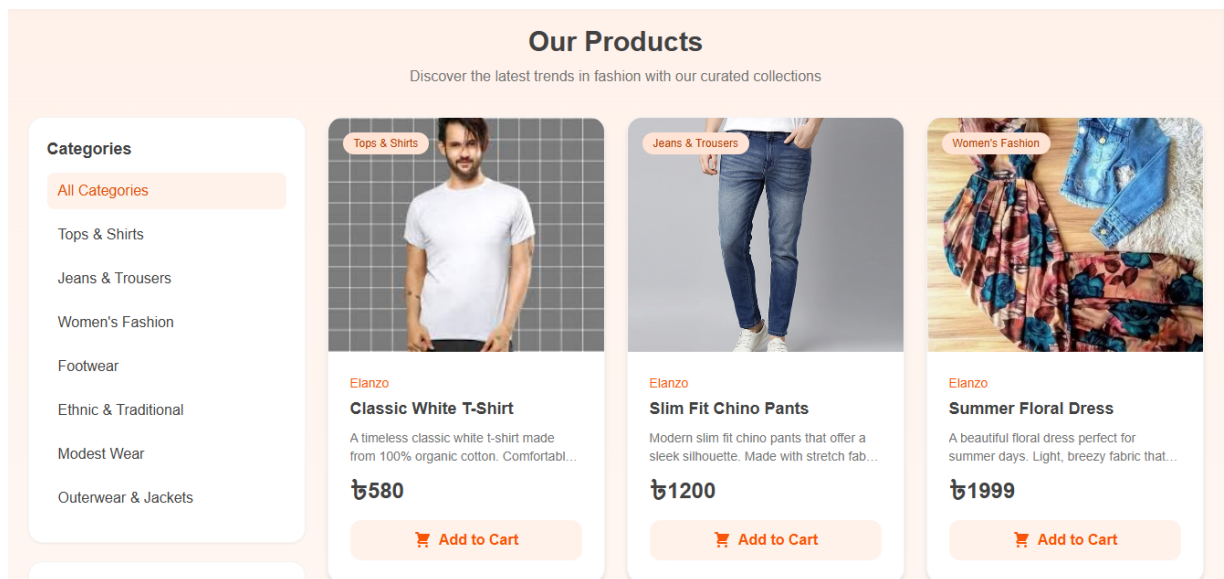


Figure 7. Our Products Section

This is Our Products section just for you, where users can browse several fashion items from many categories. At the head of the section, the header introduces it. Below are presented three selected items: a Classic White T-Shirt, Slim Fit Chino Pants and Summer Floral Dress. Customer Product details with Name, Short Description and Price in Bangladeshi Taka (₳) are an integral part of product display. And finally, a "Add to Cart" button is displayed for each product, giving the users the ability to buy the product directly from the gallery.

A Categories sidebar is provided on the left of the page along with a range of quality filters allowing customers to filter down products based on type e.g., Tops & Shirts, Jeans & Trousers, Women's Fashion etc. This is a smart feature that consumers are thankful for as it allows them to easily filter through products and makes shopping simpler and more organized. It's neat yet intuitive design is a command of the site's appeal itself, which triggers more browsing through Elanzo's innovated product lines.



Figure 8. Product Detail (Sample: Classic White T-Shirt)

The picture presents a detailed photo of the Classic White T-Shirt in Tops & Shirts. The white t-shirt is worn by a model on the product image to show you relatively a true image.

Below the image we're shown a little product detail that can quickly inform a potential customer of what they are looking at, what it does and the price (₹580). The write-up speaks to the timelessness of the t-shirt that is constructed of 100% f907 organic cotton, and can fit with a number of outfits. The item is also reinforced with a sense of scarcity with the line "Only 1 left in stock - order soon!" to entice customers not to wait. Underneath the product information is the "Add to Cart" button, which makes it easy for the user to put this item in their cart. The product page was fairly clean and simple and all the information I needed was available for informed decisions to be made by the customer.

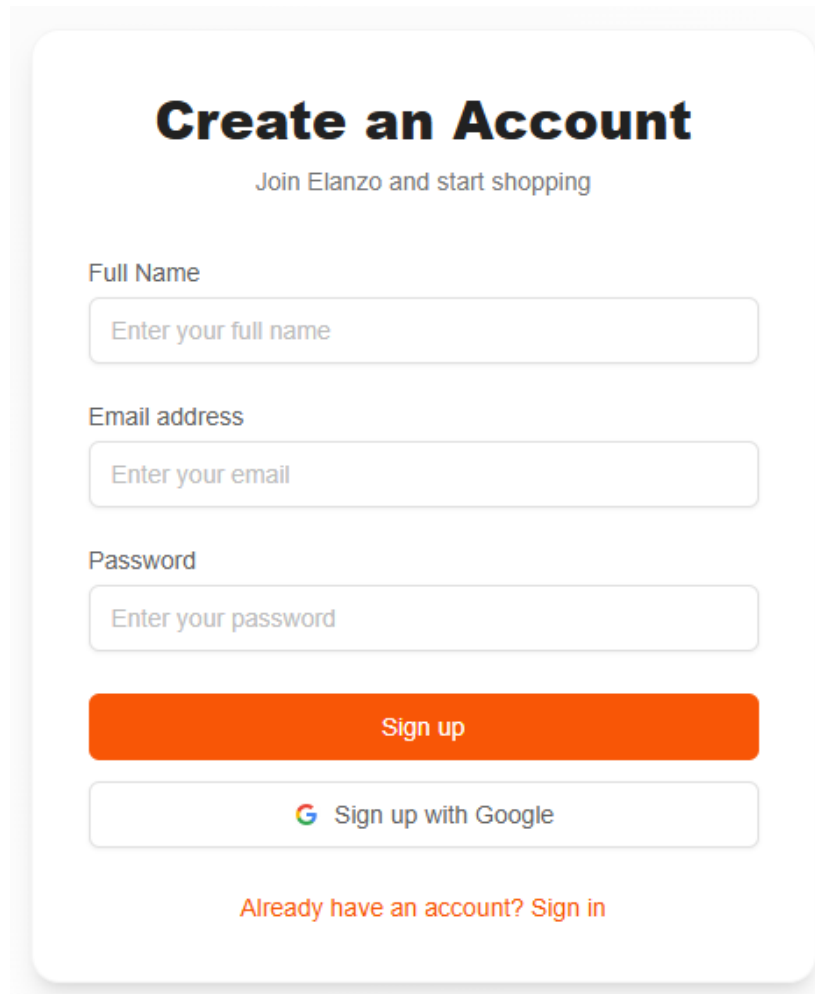
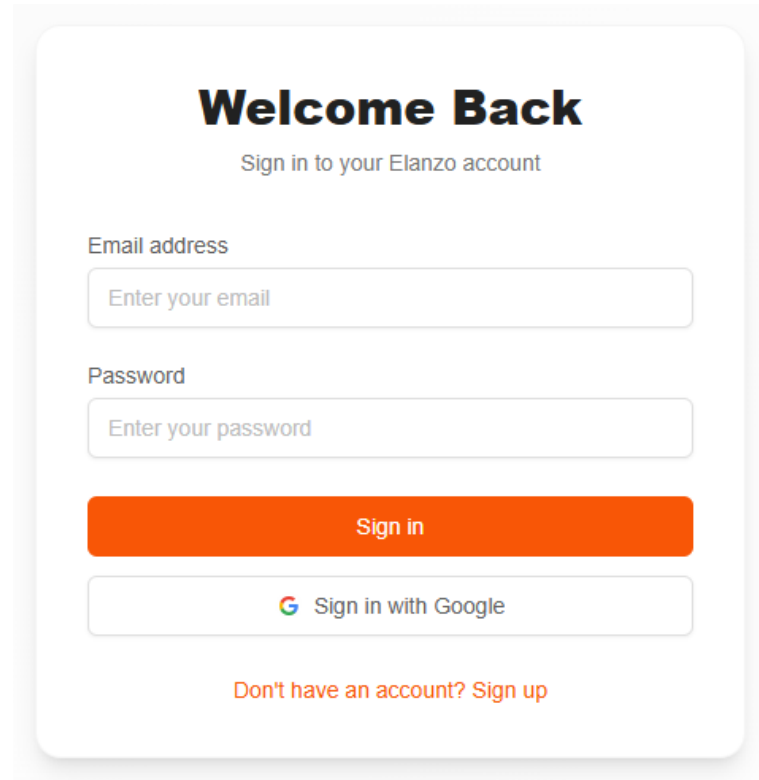


Figure 9. Account Creation Page

This is the Create an Account page on Elanzo, for new members to register and begin shopping. The page contains heading for Name, Email created By and set a password respectively. And underneath the form fields, the orange button Sign-Up is hard to ignore asking you to finish your registration. Also, you may choose to Sign up with Google for a faster signing up process through Google authentication. The bottom of the page contains a link to Sign In for existing users that redirects to the login page. The layout is clean and straightforward, making sign up easy and enabling a user to shop almost immediately upon signing onto the site.



Welcome Back

Sign in to your Elanzo account

Email address

Enter your email

Password

Enter your password

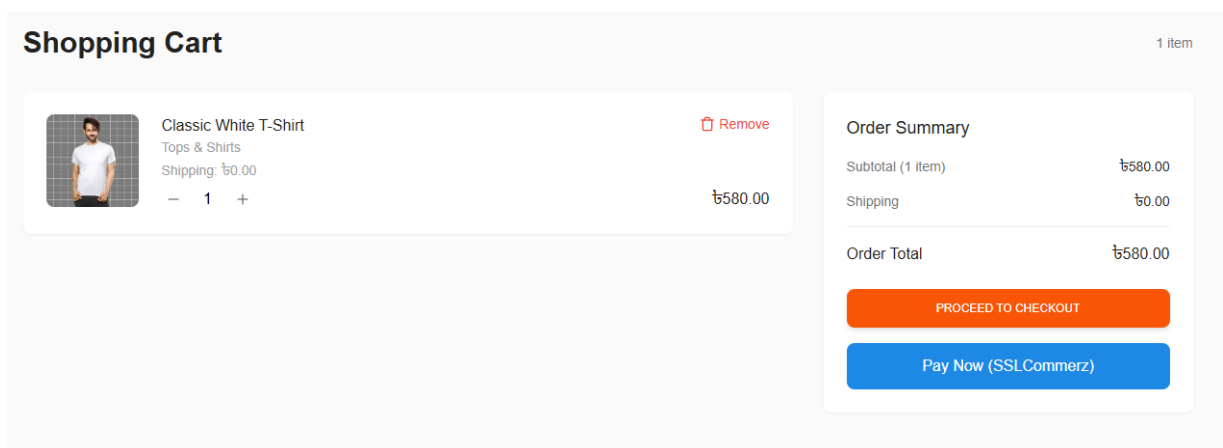
Sign in

Sign in with Google

Don't have an account? Sign up

Figure 10. Sign In Page

This screenie shows the Sign In page on Elanzo which is meant for the members to log in. It also provides an Email Address and Password field to sign in. The Big Orange Sign In button asks users to log in. Furthermore, users have the choice of logging in with Google, making it a convenient feature to collect users who want to sign in with their Google account. At the bottom of the page, Non-members are given a link to Sign up for new users. The minimalist and clean design makes it easy to login, saving you even more time & hassle.



Shopping Cart 1 item

 Classic White T-Shirt Tops & Shirts Shipping: ₦0.00 — 1 +	Remove ₦580.00
---	------------------------------

Order Summary

Subtotal (1 item)	₦580.00
Shipping	₦0.00
Order Total	₦580.00

PROCEED TO CHECKOUT

Pay Now (SSLCommerz)

Figure 11. Shopping Cart Page

This is an image of the Shopping Cart page of Elanzo where customers are able to review the items they plan to purchase prior to entering Checkout. There is currently one item in the cart, a Classic White T-Shirt, and a few details about this, such as the product category ("Tops & Shirts") and the cost of shipping, which is displayed as free (₦0.00).

Items can also be deleted from the cart by tapping the minus sign then the StoreCart — You may set any Quantity by clicking on the minus/plus button together with additional options like Remove.

On the right side of the screen under Order Summary, your total cost is calculated, including the subtotal (₹580.00), shipping (free), and total Order Total (₹580.00). Below the summary, there are two action buttons: Proceed to Checkout, and Pay Now (SSLCommerz), which would enable users to proceed with secure payment through SSLCommerz. The page is meant to present a user with quick and easy cart review and provide seamless transition to the payment and order finalization.

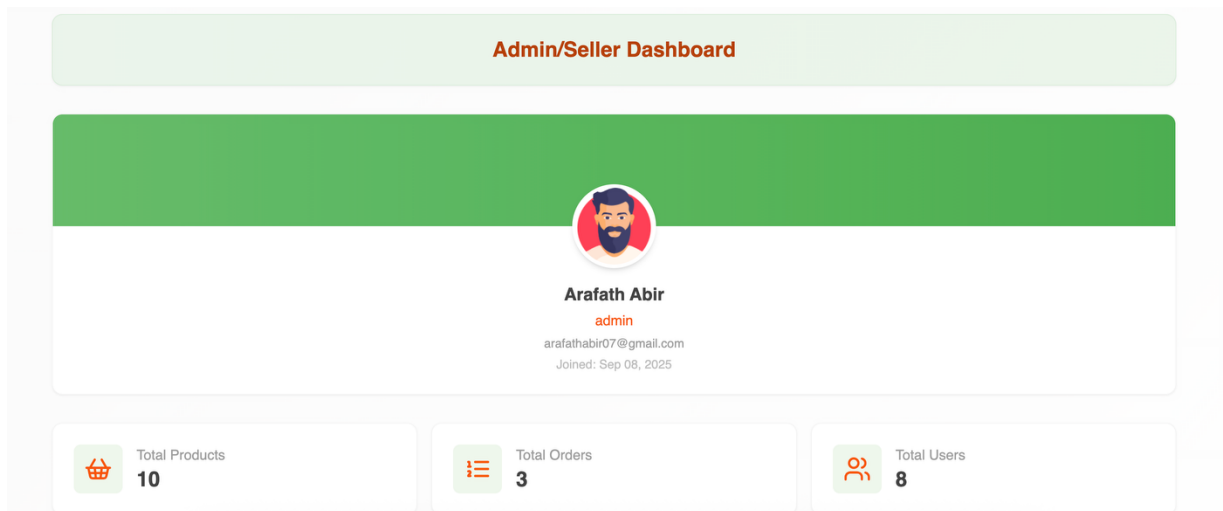


Figure 12. Admin/Seller Dashboard

This is the Admin/Seller Dashboard of Elanzo, which shows the admin's account summary and stats. The dashboard is referred to as "Admin/Seller Dashboard", hinting towards an admin or a seller who is managing the marketplace. admin here its profile section his or her Name, role like he or her admin and email. Below this, the account join date of the admin is displayed as well.

The dashboard provides vital statistics, including:

- Total Products: The admin currently manages 7 products.
- Total Orders: There is 1 order in the system.
- Total Users: The platform has 4 users registered.

The clean and organized design of the dashboard allows admins to quickly assess key performance indicators, making it easy to manage products, track orders, and monitor user activity on the platform.

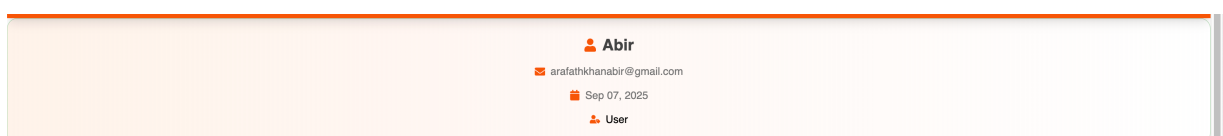
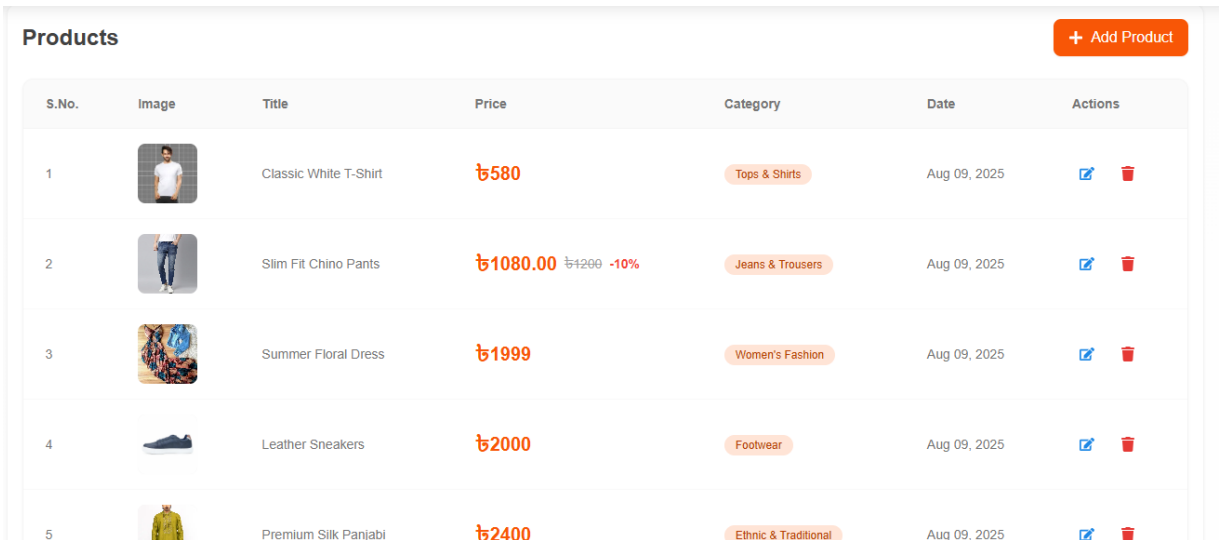


Figure 13. User Profile Page

This is a snapshot of a User Profile page on Elanzo containing the information of a registered user. The profile portion shows the username, and email and when did he join the platform. The user also belongs to the User role, which denotes the access the user has on the platform. This simple design makes crucial user information readily accessible, where admins or the users themselves can proofread their own account information at a glance. The design is clear and simple, and makes the important information easy to find and manage account easily.



S.No.	Image	Title	Price	Category	Date	Actions
1		Classic White T-Shirt	₹580	Tops & Shirts	Aug 09, 2025	 
2		Slim Fit Chino Pants	₹1080.00 ₹1200 -10%	Jeans & Trousers	Aug 09, 2025	 
3		Summer Floral Dress	₹1999	Women's Fashion	Aug 09, 2025	 
4		Leather Sneakers	₹2000	Footwear	Aug 09, 2025	 
5		Premium Silk Panjabi	₹2400	Ethnic & Traditional	Aug 09, 2025	 

Figure 14. Product Management Page

This image displays the Product Management page on Elanzo, where administrators or sellers can view and manage the products listed on the platform. The table includes several key columns such as the Product Image, Title, Price, Category, Date, and Actions.

The products listed are:

- Classic White T-Shirt: Priced at ₹580 in the Tops & Shirts category.
- Slim Fit Chino Pants: Priced at ₹1080 (originally ₹1200, with a 10% discount) in the Jeans & Trousers category.
- Summer Floral Dress: Priced at ₹1999 in the Women's Fashion category.
- Leather Sneakers: Priced at ₹2000 in the Footwear category.
- Premium Silk Panjabi: Priced at ₹2400 in the Ethnic & Traditional category.

Each product entry includes Actions buttons, such as an edit (pencil) and delete (trash) icon, allowing admins to update or remove products as needed. At the top right corner, the Add Product button allows the admin to add new products to the platform. The clear and organized design of the page makes it easy for administrators to manage their product listings effectively.

S.No.	Order ID	Product	Category	Price	Quantity	Total	Status	Customer	Action
1	tu1LHfT1...	 Premium Denim Jacket	Outerwear & Jackets	₹1000	1	₹1000	Confirmed	Abir Ashulia, Dhaka 01749393736	
2	szr3T363...	 Slim Fit Chino Pants	Jeans & Trousers	₹1200	1	₹1200	Confirmed	Abir Ashulia, Dhaka 01749393736	
3	gDXgz5EL...	 Leather Sneakers	Footwear	₹2000	1	₹2000	Confirmed	Abir Ashulia, Dhaka 01749393736	

Figure 15. Orders Management Page

This screenshot of Orders Management page in Elanzo where user can view a list of customers' orders and admins can perform operations on it. The table has several columns like S. No., Order ID, Product, Category, Price, Qty, Total, Status, Customer and Actions. Each order is accompanied by the product details such the Premium Denim Jacket, Slim Fit Chino Pants and Leather Sneakers.

There is Status column next to each of these orders which will have options like “Pending”, “Confirmed”, “Processing” and “Delivered” in a droop down so that the admin can easily change the status of the order. You will also find the Delete button for deleting the order in the Actions column.

The page includes critical details of the customer, such as name, address and telephone number. If no orders have been placed, a message is shown that no order has been placed yet. This organized design allows admins to maintain the orders, update the status and carry out any other operation quickly.

4.9 Backend Development

The Elanzo e-commerce backend is built with Firebase Firestore, a scalable NoSQL document database. At the backend, data of the platform are managed in firebase, of which synchronize in real time, scaled up and a secure environment is provided by firebase. The Firebase configuration and initialization is done in the `FirebaseConfig` file containing initialization for Firestore, Firebase Authentication, and Firebase Storage. This configuration provides full synergy between database, user auth, and firestore systems.

The Firestore Database has 3 primary collections, products, user and order.

Products Collection: This collection contains all product metadata such as product title, price, description, image URL, shipping fee and the information about the offer. The products collection is for storing the data of the products one is selling, and products are added to the data using the `addDoc` method in the `AddProductPage.jsx` file. In a product, the fields are:

- title: Name of the product.
- price: Cost of the product.
- productImageUrl: The image URL of the product.
- category: Product category (such as Tops & Shirts, Jeans & Trousers).
- desc: Product's description.
- shippingCost: The cost of shipping.
- offer: An object which provides information regarding discounts and offer existences.
- quantity: Available stock quantity.
- time: Timestamp for the moment when the product was added.
- date: A formatted string for the date of the product.

User Collection: It was where user-related details like name, email, custom Firebase UID, user role (either user or admin) and email verified status were stored. Users are added either by registering using an email/password or via Google sign-in and they are stored in the user collection. This one provides the system with the means to authenticate and authorize users according to their role, giving them access to the features the platform offers. Admins have control on orders and products Regular users just can see the products and buy.

Orders Collection: The Order Collection keeps all the customer orders in it such as products in the cart, customer's shipping details and status of the order. Each order contains:

- cartItems: An array containing product objects of the order.
- addressInfo: Shipping details of customer including name, address, mobile number, pincode.
- email: Customer email address.
- userid: Firebase UID of the user making the order.
- Status: The status of the order, as explained whether confirmed,

processing, delivered, etc. Form: Order status.

- time: Timestamp for order placing.
- Other date: Formatted date of order.

Order data is controlled from the addDoc to add new order, updateDoc to update the status of the order, deleteDoc to delete orders from the system.

Authentication is implemented via Firebase Authentication with support for email/password and Google login. When users sign up or log in, they are authenticated, and their credentials are secured.

Database Storage: Media files (like products images) are stored using Firebase Storage, but further information about its application is not available in the analyzed files. It's probably there just to deal with storage of high volumes of files in a safe way and easy to grab back from the Platform.

Security and Access Patterns: The security model of the platform was based on Firebase's role-based authentication. Administrators has the ability to admin dashboard in order to manage products, users, orders. Regular users, on the other hand, are able to see only their own orders. Users have access limitations such as, for example, allowing sensitive operations such as managing products and changing orders to be carried out by an admin only.

Conclusion Elanzo's backend is built exploiting Firebase's scalable and secure platform using which product, user and order details can be managed effectively and efficiently in a way that fulfils individual requirements of both admin and users. Firebase Firestore, Authentication and Storage confidently scales your backend to "Nice" cloud service for modern e-commerce.

4.10 Integration of AI Features

AI E-commerce Integration Artificial Intelligence (AI) will be incorporated into the Elanzo e-commerce platform to improve user experience through product recommendation, search optimization and sentiment analysis. Artificial intelligence capabilities are built into the platform to enable a more intelligent, intuitive, personalized shopping experience.

Smart Search and NLP

One of the main AI functionalities installed in Elanzo is the Smart Search, based on Natural Language Processing (NLP). An issue with traditional search engines is its dependence on keyword matching which is not always accurate, especially if the user enters imprecise queries or incomplete information they seek. By comparison, Elanzo's search engine powered by AI can interpret what a customer wants and needs when they are inputting search queries and looks for products.

Personalized Product Recommendations

These data points are then used by the engine to surface products that the user wants and needs. The more they use the platform, the smarter their recommendations get and their shopping experience becomes more personalized. For example, if a user often shops for athletic wear, the service will suggest related items such as running shoes, sports gear or workout clothes. This tailored form of advertising not only enhances the overall experience for the individual user, but also greatly enhances the probability of conversion (sale) as end users are only shown the products that they are most likely to purchase.

Sentiment Analysis

Elanzo additionally supports Sentiment Analysis to help understand customer feedback and enhance business decision making. By analyzing customer feedback, the AI can ascertain the general sentiment – good, bad or neutral – which users express about a product.

AI-Enhanced Product Descriptions

The AI will write/re-write Product Descriptions to help them sound more appealing, have better SEO, and are in line with what will appeal to your readers. Using natural language processing (NLP) and deep learning, Elanzo's A.I. can rewrite product descriptions on an automated basis to highlight the features, benefits and selling points for products that matter to the customer. That's because these descriptions aren't meant to just to sell the buyer—but also to sell the search engines, so that you appear higher than your other 3.8 million brethren. The AI fresh descriptions have helped keep my product pages fresh and compelling and are helping with conversion rates!

4.11 Summary

This thesis studied Elanzo which is an AI- driven e-commerce platform that is a

helpful tool to improve the users' online shopping. Built using React, Firebase and Google Gemini 2.0 Flash technology which gives users personal, smart search results to the products you offer getting better over time learning from user actions! Using latest security systems such as Firebase Authentication and Encryption, Elanzo cares for its data safety. With AI-driven features and security that stronger than Kleopatra and Houdini combined, the platform provides an experience made better for both buyer and seller with every transaction.

Chapter 5

Engineering Standards and Design Challenges

5.1 Compliance with the Standards

5.1.1 Software Standards

Elanzo adheres to coding guidelines and software development best practices. The platform uses React; the de facto standard in the industry. js for building the frontend), Firebase to provide backend services, and Google Gemini 2.0 Flash for the AI integrations. The development is according to clean code and modular architecture with responsive design to provide maintainability and scalability. Additionally, the service follows best standards, encrypting sensitive data and ensuring user authentication is strong thanks to Firebase, so that the platform is secure and doesn't break easily.

5.1.2 Hardware Standards

While Elanzo is a cloud application, it was designed with hardware considerations in mind for the purpose of hosting and scaling the application. The backend is built to be scalable in the cloud (e.g., using Firebase) and can be spun up or down to support traffic needs and data storage. The system performs well on variety of screen sizes – Mobile phones, Tablets and Desktop which gives the required hardware performance for a great user and customer engagement.

5.1.3 Communication Standards

Elanzo maintains communication standards through the implementation of RESTful API for secure and fast communication between Frontend and Backend. To secure the data in transit between users and the system, the site uses SSL/TLS encryption. With Firebase Authentication, which now has been integrated, the communication process is even more empowered, delivering secure access to communication for users and administrators.

By following these guidelines, Elanzo provides a safe, stable and user-friendly environment that fulfills the industry standards for the performance of software and hardware systems and communication safety.

5.2 Impact on Society, Environment and Sustainability

5.2.1 Impact on Life

The Elanzo platform could transform the consumer's daily life by delivering an exceptionally customized shopping experience. Using AI features such as smart search, personalized recommendation, and sentiment analysis, Elanzo makes shopping online easy, intuitive, fun! It makes it easy for users to discover items that suit their wants, tastes and previous behaviour when shopping. "It's also multi-device, so, whether users are at home, in the office or on the move, they can shop without restrictions. By enhancing the convenience of the online shopping experience, Elanzo makes tapping into the furthering digital world to give more time back to the user and the ease of shopping on the user's terms.

5.2.2 Social & Environmental Impact

The effect of Elanzo has a positive impact not only on individual users, but on human society and the environment. By empowering a smarter way to shop, the platform also promotes responsible consumerism, with products are suggested for user preferences or behavior, rather than instinct buying. This may lead to a decrease of overconsumption and waste, as users are steered towards things which are likely to come in use. Finally, the website advocates the brand's commitment to the ethical sourcing, and transparency in the range which, as we well know, can emanate in to influencing companies to operate in more fair ways. On the environmental front, he says Elanzo's digitally driven nature cuts the carbon impact of traditional retail — through saving on physical store operations and transport.

5.2.3 Ethical Aspects

Ethical principles Any profits generated from Elanzo are re-invested into the business to help power our growth and development. The platform is committed to protecting user privacy and takes the handling of sensitive information such as personal data and payment details seriously with encryption and secure authentication systems. In addition, the sentiment analysis function is leveraged in a non-invasive way to enhance product offerings without violating user rights or tapping their data. Elanzo follows ethical practices in their AI algorithms, avoiding biased product suggestions, and search results, which are all user based, and not manipulated. The way the platform ensures transparency, user consent, and data security alluded to its ethical business practices.

5.2.4 Sustainability Plan

The Elanzo sustainability model addresses both the environmental and socio-economic impact over the longer term. It operates on scalable cloud infrastructure

such as, which promotes efficient utilization of resources and reduces the requirement of physical hardware consuming power. Elanzo will further pay special attention to the energy-saving technologies and methods in order to reduce carbon footprint as it goes along. Socially, the app champions responsible consumption, advocating products whose sourcing is ethical and who reminds users to shop more consciously. Commercially, Elanzo makes strategic adjustments to further solidify the viability of the platform, improves our users' satisfaction, and further exploits the features offered in order to maintain attractive profitability over a long period.

5.3 Project Management and Financial Analysis

This section describes the managerial techniques and financial aspects required for the creation and deployment of the Elanzo platform. Excellent project management was crucial to deliver the platform on time and within budget. The acceptance criteria above have verified that the system is meeting the expectation and desire of the user accordingly to the Agile process. We had transparent milestones and deadlines in our project, and the team met regularly to see if we could solve any problems that occurred during the development. On the economic point of view, the ratio cost/benefit is evaluated (considering development costs, cloud infrastructure, licenses and marketing costs). The business model accounted for the possibility of the platform to be profitable on the long run using subscriptions, product sales and advertising, as revenue streams. By working in a moderately efficient way and living within their means, the project was able to ship a working, scalable platform that could sustain itself financially.

Table 2: Cost Analysis

Category	Description	Estimated Cost (BDT)
Platform Development	Development of frontend, backend, and integration with Firebase.	500,00
Cloud Hosting (Firebase)	Monthly hosting and real-time data management on Firebase.	20,00/month
Security and Encryption	SSL/TLS certificates, Firebase Authentication, and data encryption costs.	15,00
UI/UX Design	Design services for user interface and experience.	100,0
Testing and Debugging	Quality assurance, testing tools, and bug fixes.	50,00
Marketing and Promotion	Initial marketing campaign for platform launch (social media, ads).	1500
Ongoing Maintenance	Monthly updates, server maintenance, and performance monitoring.	300/month

Legal and Compliance	Legal fees for terms of service, privacy policy, and compliance with regulations.	500
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5.4 Complex Engineering Problem

Section 5.4 discusses the demanding engineering tasks we had to cope with when we created the Elanzo platform and how we solved these. The utzomic team faced multiple technical challenges, including integrating AI (smart search, personalized recommendations, and sentiment analysis) within an e-commerce environment. One of the main challenges was to maintain synchronised real-time data among various devices, which was critical for user experience. Another key challenge was to make sure that the system could scale gracefully to support increase in the number of users and amount of data. Furthermore, a user-friendly platform and one that could cope with the sophisticated AI-driven functionalities, needed a fine interplay among performance, design, and technology selection.

5.4.1 Complex Problem Solving

To overcome these technical hurdles, the team employed a variety of methodologies – iterative development, rapid prototyping and iterative design. These methods contributed to fine-tune the AI system’s recommendation engine and sentiment analysis feature running tests and gathering data continuously. For example, the search system was a complicated problem to solve - it was necessary to understand natural language queries, process them, and display accurate search results. The team used machine learning models to improve the systems’ ability to understand and prioritize products based on user intent. Further, incorporating real-time synchronization of data between the front-end and back-end was a challenge that was solved in a unique manner such that one system could provide updates to other systems without causing latency and responsiveness issues. The team’s discipline in applying structured, problem-solving methodology throughout the development process resulted in a methodical approach to tackling these complex problems.

Table 3: Complex Problem Solving

Complex Engineering Problem (EP)	Dept of Knowledge (EP1)	Range of Conflicting Requirements (EP2)	Depth of Analysis (EP3)	Familiarity of Issues (EP4)	Extent of Applicable Codes (EP5)
System Architecture Design	Software Engineering, Cloud Computing	Balancing scalability, performance, and security	High	Moderate	High
Data Security and Privacy Compliance	Cybersecurity, Legal & Compliance	Ensuring data protection while maintaining usability	High	High	High
Real-Time Data Management	Database Management, Cloud Computing	Real-time updates vs. data consistency and performance	High	Moderate	High
Frontend and Backend Integration	Web Development, System Design	Compatibility between frontend technologies and backend services	Moderate	High	Moderate
Mobile-First Design and Responsiveness	UI/UX Design, Web Development	Ensuring consistent performance across devices with varying resources	Moderate	High	Moderate
Scalability and Load Balancing	Cloud Computing, Software Engineering	Optimizing system resources while handling growing user base and traffic	High	Moderate	High

Table 4: Mapping with Knowledge Profile

Knowledge Profile (K)	K1: Natural Science	K2: Mathematics	K3: Engineering Fundamentals	K4: Specialist Knowledge	K5: Engineering Design
System Architecture Design	✓	✓	✓	✓	✓
Data Security and Privacy Compliance	✓	✓	✓	✓	✓

5.4.2 Engineering Activities

The work of engineering during design and development was extensive and varied. This encompassed the frontend architecture created (using React) for the platform. Backend with Firebase along with AI focused components such as NLP for smart search and sentiment analysis. The engineering group also assembled and optimized to mid-3 seconds a very useful, systems staffed α1-MDAW demonstration vehicle. Code reviews, UNIT testing and INTEGRATION testing were necessary to keep the level of quality and make sure could be no issues with all the components interconnected and not. In addition, the team checked platform performance on a regular basis and performed load testing to test for heavy traffic such that the queries would be supportable as the database grew. Through these engineering activities the team systematically tackled technical challenges and was able to produce a resilient, scalable solution.

Table 5: Mapping with Complex Engineering Activities

Complex Engineering Activity (EA)	EA1: Range of Resources	EA2: Level of Interaction	EA3: Innovation	EA4: Consequences for Society and Environment	EA5: Familiarity
System Architecture Design	High: Involves software, hardware, cloud infrastructure	High: Requires close coordination between teams (frontend, backend, cloud)	High: Involves novel architectural approaches and scalable solutions	Significant: Direct impact on platform scalability, performance, and security	High: Well-known in software engineering practices
Data Security	Moderate:	Moderate:	Moderate:	High: Direct	High: Well-

and Privacy Compliance	Involves legal, technical, and security resources	Requires collaboration with legal teams, developers, and users	Utilizes encryption and privacy frameworks	impact on user trust, data protection, and regulatory compliance	established best practices in cybersecurity
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5.5 Summary

Summarizing management, the engineering challenges faced and the problem-solving which went into the project. The project management activities guaranteed the Elanzo system was designed in a cost-efficient way and, the financial study showed that the platform can be profitable. Issue The engineering challenges involved in development, including integrations with AI, real-time data syncing, and system scale-up, were successfully tackled by the structured problem solving and creative engineering practices. Successfully deploying these approaches, we developed a functioning and user-friendly platform serving the project's needs and preparing the ground for further improvements to come.

Chapter 6

Conclusion

6.1 Summary

This dissertation investigated the development, deployment and aftermath of Elanzo, an Artificial Intelligence powered on-line shopping platform that was to transform the way in which people purchase on-line. Elanzo aims to users a better shopping experience with modern age tools like React, Firebase, Google Gemini 2.0 Flash, bringing businesses a toolbox of analysis to optimize their performance. A number of fascinating findings emerged through the investigation, including myths busted around the use of AI in e-commerce, the capabilities and potential of the platforms we frequent and what the future holds for in-store visits.

Key among the recommendations is the need for AI-powered smart search, a approach that will bring natural language processing (NLP) to a higher level with a next-generation smart search pricing information to finding products. The AI becomes smarter on user intent recognition and question refinement making search results more quality and context based. “It’s not just good for visit numbers but is also one less place we have to fall back on legacy keyword matching, losing non-nerds to the system.

One more reason too is, Elanzo's own version of bagging an eye of recommendation engine was in itself supposed to really give an outstanding result and take the user engagement and the conversions to the peaks. The recommended system recommends detailed product for low-risk level product (epding on the user’s individual need according to his behaviorism, preference and history of interaction). And it learns as you peruse, so its suggestions grow smarter over time — changing based on the things you’re into or browsing, day by day.

The security and the authentication architecture of Elanzo like Firebase Authentication, Duality Handshake Authentication and JWT based Session Two Encryption Support were established, and regularized the secure state of the personal data. Platform level SSL/TLS encryption secures data as well as financial transactions thereby inspiring trust and can also help make an e-commerce market place safer.

Final Thoughts So, as we observed today, Elanzo is undoubtedly the AI to look
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out for in e-commerce and offers a whole lot of value to shopping business including online, personalized experience for customers and so much more. Packed full of features, unparalleled AI capabilities and security features, the online shopping landscape has a new contender – consumers an efficient and enjoyable shopping experience, and businesses an incredibly powerful platform that will drive their operation forward.

6.2 Limitation

The constraints of Elanzo project include complexity in incorporating advanced AI features, scalability, and data privacy. One major bottling neck is the quality of AI algorithms, especially in NLP for smart search. Although the AI system will get better with more usage but understanding complex or confusing queries are hard. Also, the ability of it to scale should be looked into expanding the number of users and products as the current architecture cannot be expected to service under heavy load unless further optimisations are made. Another bottleneck is that managing the data with respect to privacy and security issues, as dealing with sensitive data from users' needs to follow data protection laws which may limit certain AI capabilities (e.g., heavy customization or data collection). Last but not least, the platform's reliance on external services like Firebase and Google Gemini 2.0 Flash for backend support and AI is risky in terms of reliability and longevity of service. These drawbacks point towards further development and enhancement of the Elanzo platform.

6.3 Future Work

One interesting future work would be to provide the support of speech search. Voice Search As we can see there's an increase in usage of voice assistant eg: Amazon alexa we can get some good response with voice search in elanzo which again will make the process quicker and easier to search the product. Using NLP models, Elanzo translated spoken articles and provided personalized, voice-prompted search results for easier handsfree order placement by the customer.

Another cool thing could be AR-integration for product view etc. AR, he suggested, would enable customers to try on — clothes or accessories — or bring pieces of furniture into their homes before purchasing them. If you are Wonder Trading the item out in the world (you know: fashion or home decor), you want to keep popping onto Twitter and/or Instagram to accept the versions you are sent, so they can then resurface elsewhere. AR is, of course, something that would make shopping an interactive and fun experience, ultimately driving up acquisition and driving down returns.

The future work of reinforcement learning would be improving the personalized recommendation engine in two aspects, these two aspects are investigating other deep learning-based models such as neuro collaborative filtering and the skill of reinforcement learning. Such elaborate methods could in theory enable a more finely tuned and aggressive recommendation of products when the model keeps learning from the user feedback and dynamically adjusts itself to the changing tastes and trends.

Also maybe drive BI tools and analytics tools directly within the admin features inside the platform. Tools like this can give you information about what your customers are doing in real time and report on activity, sales activity, inventories and even how your marketing efforts are performing. With Elanzo in and in operation, decision takers will be able to easily make decision and analytics driven decisions, and this would mean a better tuned business and in turn a profitability sooner or later.

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