



Design and Development of the Alhazen Mobile-Based Smart E-Commerce Application for Optics Using the Agile SDLC

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Abstract

The growth of e-commerce and the use of mobile devices has driven the need for digitalization in the optical sector, including Alhazen Optics, which still faces limitations in inventory management, transaction recording, order tracking, and marketing. This study aims to design and develop the Alhazen Smart E-Commerce mobile application using the Agile Software Development Life Cycle approach. The research method employs a descriptive qualitative approach through structured interviews and direct observation to identify the system's functional and non-functional requirements. The development stages include requirements analysis, use case design, activity diagrams, class diagrams, interface design, implementation, and scenario-based functional testing. The resulting application integrates features such as registration and login, product catalog, frame and lens selection, eyeglass prescription entry, shopping cart, payment, order tracking, profile management, inventory management, and consultation with an administrator. Test results show that all major scenarios passed, indicating that the application functions as designed. With this integrated system, customers can place orders more easily, while administrators can centrally and efficiently monitor products, transactions, consultations, and shipping status. This application is deemed functionally suitable to support the sales process, improve data management consistency, expand service access, and provide more transparent order information. Further development is recommended to include usability, security, and performance testing, as well as minimum stock notifications, sales analytics, and AI-based virtual try-on features.

Keywords: E-Commerce, Optics, Agile SDLC, Mobile Apps, Sales Information Systems

1. Introduction

Advances in information and communication technology have driven a fundamental transformation in consumer behavior, particularly the shift from conventional transactions to a digital commerce ecosystem based on mobile commerce (m-commerce). In Indonesia, the continuously rising internet penetration and smartphone ownership have become the primary catalysts for e-commerce growth, with the majority of digital transactions now conducted via mobile devices [1], [2]. This phenomenon has also significantly impacted the optical sector an industry with steadily growing demand as public need for eyewear increases, whether as vision aids or fashion accessories. On the other hand, advancements in optical manufacturing technology such as the use of additive manufacturing for advanced optical components indicate that innovation in the optical industry is occurring not only in service and distribution but also in lens design and production [3]. The growth of global e-commerce has also had a tangible impact on the restructuring of retail organizations, including business density and labor productivity [4], meaning that optical stores that fail to adapt digitally risk losing a significant share of the market. This situation indicates that digital transformation is no longer an option but a strategic necessity for small and medium-sized optical businesses.

The main issue underlying this study centers on the gap between the potential of the digital market and the operational capabilities of conventional optical stores. Many small and medium-sized optical stores, including Optik Alhazen located in Bireuen, Aceh, still rely on manual systems for transaction recording, inventory management, order processing, and product marketing [5], [6]. These manual systems create a number of interrelated operational problems: the risk of inventory data errors, including running out of complementary products without early detection; limited market reach due to the absence of an official digital platform; the inability to monitor orders in real-time; and promotional channels that rely entirely on social media and conventional communication. Furthermore, competition from online eyewear retailers offering lower prices adds to the competitive pressure, even though the quality of these online products is often unguaranteed. These conditions reduce operational efficiency and hinder business owners' ability to analyze customer purchasing patterns to support data-driven business decision-making [7].

This study identifies several key challenges faced by Optik Alhazen in its business operations: the lack of an official digital platform as a sales and marketing channel; inventory management that is still conducted manually, making it prone to recording errors and stockouts; the absence of a structured transaction system that can be monitored in real time; and limited digital promotional channels that hinder market reach expansion. Collectively, these challenges reduce operational efficiency and make it difficult for business owners to analyze customer purchasing patterns to support better business decision-making [7]. Service quality and ease of access to digital platforms have also been shown to influence customer satisfaction, which in turn drives the intention to repurchase eyewear products [8]. Therefore, this study focuses on the design and development of a mobile-based smart e-commerce application for Optik Alhazen using the Agile SDLC methodology as an iterative and adaptive development framework.

A number of previous studies have demonstrated the effectiveness of digitalization in the optical store ecosystem, albeit with varying scopes. [9] and [10] demonstrate that the implementation of e-commerce in optical stores has been shown to improve sales quality and reach. [11] designed a desktop-based eyewear sales system, while [12] and [13] developed Android-based solutions to support the growth of the optical business. [14] developed a web-mobile-based optical product ordering system; [15] designed an online-based eyewear accessory ordering information system using a prototype method; and [16] introduced a cutting-edge solution in the form of an AI-based virtual eyewear try-on system with deep learning integration for fashion e-commerce. On the inventory management side, [5] and [17] highlight the importance of computerized inventory control systems. However, most of these studies still focus on specific aspects such as sales, ordering, inventory, or product visualization and have not fully integrated the concept of smart e-commerce into a single mobile platform based on an adaptive Agile methodology. This research gap serves as the scientific justification for the development of the Alhazen Smart E-Commerce application in this study.

The research framework is based on the premise that operational inefficiencies in conventional optical stores stem from the absence of an integrated information system that connects all business processes from catalogs, ordering, prescription management, digital payments, to delivery within a single digital ecosystem. Referring to m-commerce adoption theory, factors such as ease of use, trust, and the availability of digital infrastructure significantly influence the adoption of mobile commerce, both among consumers and SME operators [18], [19], [20]. User interface design elements that account for mass customization needs have also been shown to enhance e-commerce user satisfaction [21], [22]. Thus, the research process begins with problem identification through structured interviews and direct observation, followed by system requirements analysis, architectural design (use case diagrams, activity diagrams, class diagrams), application development using the Agile SDLC, functional testing, and system feasibility evaluation. The Agile methodology was chosen for its ability to adapt to changing user needs through iterative sprint cycles, which have proven relevant in the context of cyber-physical system development and collaborative software [23], [24].

The literature review in this study summarizes the four theoretical pillars underpinning the system's development. First, the literature review on sales information systems and inventory management in the optical industry [5], [6], [17], [25] highlights the importance of digitalization in effectively managing inventory and transactions. Second, research on the implementation of e-commerce and m-commerce in Indonesia's retail and SME sectors [2], [9], [26], [27] indicates that the adoption of digital technology has a tangible positive impact on business performance. Third, an analysis of factors influencing purchase intent and customer satisfaction including ease of access, service quality, and repurchase intent serves as the foundation for developing user-experience-oriented applications [8], [28], [29]. Fourth, literature on Agile software development methodologies and system security [23], [24], [30] serves as a reference in selecting an approach that is both flexible and ensures application reliability. The integration of these four pillars forms a solid conceptual basis for the design and evaluation of the Alhazen Smart E-Commerce application as a digital transformation solution for optical stores.

2. Method

2.1. Data Collection Method

This study employs a qualitative research method with a descriptive approach aimed at gaining an in-depth and contextual understanding of the current state of the Alhazen Optics operational system. A qualitative approach was chosen because the focus of the research is not on testing statistical hypotheses, but rather on comprehensively exploring business problems, user needs, and workflow processes as a basis for designing a sales information system relevant to real-world practices in the field. Through this approach, the researcher can map operational pain points, such as the limitations of manual record-keeping, the absence of an official digital platform, and difficulties in order tracking, and then translate them into specific system functional requirements [7].

Data collection was conducted using two main techniques: structured interviews and direct observation. Structured interviews were used to obtain primary data by compiling a systematic list of questions that were posed to the owner and managers of Optik Alhazen in Bireuen, Aceh. A total of 21 questions were formulated to cover key aspects, such as marketing challenges, product ordering processes, sales recording mechanisms, inventory management practices, communication patterns with customers, as well as needs and expectations regarding the desired digital system. Additionally, direct observation was conducted at the Optik Alhazen location to observe transaction processes, customer service patterns, stock-checking procedures, and how the store tracks orders in real time. This combination of interviews and observation allowed the researcher to cross-check the business owners' narratives with daily operational practices, resulting in a more valid and contextual understanding of system requirements. Field data collection was conducted on April 18, 2026, at Optik Alhazen in Bireuen, Aceh.

2.2. Research Methodology

In the initial stage, the research begins with a literature review to gather theories, concepts, and references from previous studies relevant to the topic under discussion. This stage aims to provide a solid scientific foundation and help the researcher gain a deeper understanding of the issue. Next, the research questions are formulated to ensure that the focus of the research is clear, well-defined, and aligned with the objectives to be achieved.

Next, the researchers selected an appropriate research methodology to guide the systematic implementation of the entire research process. This methodology was used to determine the research phases, data collection techniques, and the appropriate analytical approach.

Following that, a systems analysis was conducted to identify the current state of the ongoing processes, including weaknesses, obstacles, and areas requiring improvement.

The results of this analysis were then used as the basis for developing the proposed system model, which was designed to provide solutions to the identified problems. Once the model was complete, the proposed system was implemented as a functional system. The final stage involved system testing, which aimed to ensure that the system functioned properly, met the requirements, and was capable of addressing the previously identified problems.

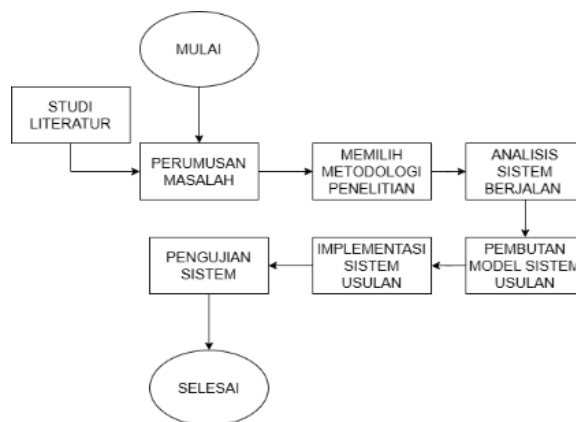


Fig. 1: Research Scheme

2.3. Agile Methods

The application development in this study employs the Agile SDLC (Software Development Life Cycle) methodology, which is an iterative, incremental, and collaborative approach to software development. Unlike traditional linear development models, the Agile methodology breaks the development process down into a series of short sprints or iterations, each of which includes planning, development, and testing activities. This approach was chosen because it is well-suited to the characteristics of a mobile e-commerce application development project, which demands high flexibility in response to changing requirements, continuous user feedback, and the ability to make gradual improvements as understanding of Optik Alhazen's business processes deepens. With Agile, the development team can quickly validate key features, identify design flaws, and make improvements without having to wait for a long development cycle.

In the context of this study, the implementation of Agile begins with the requirements gathering phase, which is based on interviews and observations to identify the system's functional and non-functional requirements. These requirements are then prioritized and broken down into a feature backlog, which is implemented incrementally over several sprints. Each sprint begins with planning (determining which features to develop), followed by technical design and code implementation, and concludes with functional testing of the developed modules. Test results and feedback from owners or prospective users serve as the basis for refinement in the next sprint, whether in the form of interface improvements, process flow adjustments, or the addition of validation controls.

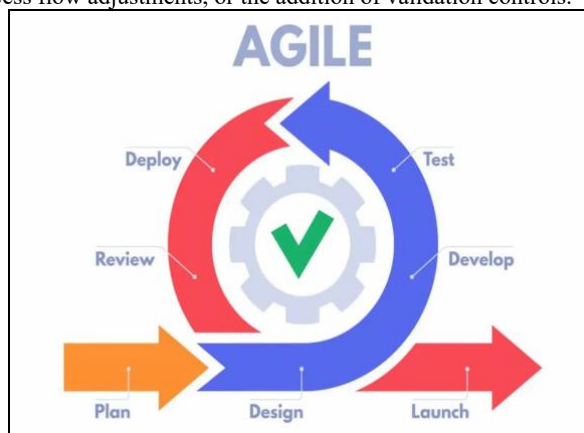


Fig. 2: Agile Methods

Source: <https://audithink.com/blog/agile-development/>

3. Results and Discussion

This section presents the results and discussion, covering the analysis of system requirements, system architecture and design, implementation, and system testing. Each subsection is briefly described to outline the stages of development and evaluation of the proposed system based on the research requirements.

3.1. System Requirements Analysis

System requirements analysis is a crucial stage in the software development lifecycle, as it is during this stage that all functional and non-functional requirements are thoroughly explored before the design and implementation processes begin. In this study, requirements analysis was conducted through structured interviews involving the owner of Optik Alhazen directly at the store location in Bireuen, Aceh, on April 18, 2026. The interview method was chosen because it can elicit contextual, operational, and qualitative information that cannot be obtained

solely through passive observation. A total of 21 questions were systematically posed, covering aspects such as business challenges, customer service workflows, ordering and payment processes, inventory management mechanisms, communication channels, and the owner's expectations regarding the desired digital system. The interview results were summarized and presented in a structured table, containing pairs of questions and answers from the owner of Optik Alhazen as a representation of the store's current operational conditions.

Table 1: Interview Results

No	Question	Answer
1	What is the biggest challenge facing the optical industry today?	The store's less-than-ideal location, as well as price competition from online eyewear retailers which offer lower prices, even though the quality of their products is often not guaranteed.
2	What sets Al-Hazen Optics apart from other places?	The lens fitting process is performed directly by experts with great care, ensuring more accurate measurements and allowing any customer concerns during the fitting session to be addressed immediately on-site.
3	How long has this store been in business?	This store opened in November 2020, in the midst of the COVID-19 pandemic.
4	Who is the primary target audience?	We serve all age groups, but our primary market currently consists of seniors and middle-aged adults (ages 39 and up) who need reading glasses.
5	What is the ordering process from start to finish?	Customers undergo an eye exam to determine whether they need glasses or a referral to a doctor. If customers need glasses, they can choose the frames they want, and the lenses will be fitted in about 15 minutes, provided they are in stock.
6	Do customers have to come to the store?	There's no need to come in person, as customers can choose to visit the store or order online via social media platforms.
7	How can I contact you to place an order from abroad?	Orders can be placed through various digital platforms such as WhatsApp, Instagram, TikTok, Facebook, or by phone.
8	How do customers choose products?	Customers who visit the store in person have the opportunity to try on eyeglass frames so they can see how well they suit their face shape. Conversely, for online orders, customers can select products based on the photos available in the digital catalog.
9	How does the order tracking system work?	That process is still done manually using receipts or invoices.
10	Have there ever been any errors in the order fulfillment process?	This rarely happens because orders are processed immediately without being backed up.
11	How do I make a payment?	We accept cash and bank transfers. At this time, we do not accept credit card payments.
12	Have you ever had any payment issues?	There have never been any errors in the payment process.
13	How long does it take to process an order?	If standard lenses are available, the fitting process can be completed in about 15 minutes. However, for specialty lenses such as contact lenses, the process takes between 3 days and one week.
14	How do customers know when their order is ready?	Customers will receive a receipt indicating the estimated completion time, and the store will contact them as soon as the ordered glasses are ready for pickup.
15	Can that order be shipped?	Orders can be picked up in person or shipped via courier (JNT) or public transportation (L300).
16	Can customers track the location of their shipments?	The shipment can be tracked if you use a shipping service like JNT, but it cannot be tracked if you use public transportation.
17	How do I check product availability?	This is still done manually by checking the physical inventory on the store shelves.
18	Have you ever run out of something without realizing it?	Yes, this kind of situation usually occurs with complementary products such as cleaning solutions or cleaning cloths, since store managers tend to focus more on managing the inventory of frames and lenses.
19	What makes the sales process difficult?	This kind of situation almost never happens, unless a potential customer cancels their order after comparing prices with online products whose quality cannot be verified.
20	Does that mistake harm the customer or the store?	In its operations, the optical division adheres to the principle of ensuring that customers are not disadvantaged. Therefore, the division offers a one-year warranty on eyeglass frames and a full replacement guarantee for lenses in the event of a sizing error.
21	What are the future prospects for this sales system?	The owner hopes to have a digital system or app with a user-friendly interface that can be operated by multiple administrators using various devices to facilitate inventory tracking and management.

Based on the interview results, it was revealed that Alhazen Optics' services include eye exams for customers, frame selection, and precise lens fitting performed by experts. The wait time is about 15 minutes for standard lenses, while specialty lenses such as contact lenses take between 3 days and 1 week. Alhazen Optics has competitive advantages in the form of on-site lens fitting by experts, a one-year frame warranty, and a full lens replacement guarantee in case of sizing errors. These advantages serve as significant differentiators compared to online competitors. However, an online trial mechanism is not yet available, as product selection outside the store still relies on photos in the catalog [16]. The owner of Alhazen Optics explicitly expressed a desire for a digital system or application equipped with a user-friendly

interface, enabling multiple administrators to operate it across various devices to facilitate real-time order tracking and inventory management. This need served as the primary foundation for the development of the Alhazen Optics Smart E-Commerce mobile app, which has been successfully implemented in various other optical stores through a digital approach [12], [13], [14], [31].

3.2. Use Case Diagram

The Use Case Diagram for the Alhazen Smart E-Commerce Optics application provides a comprehensive visual overview of the interactions between the two main actors Customers and Administrators as well as the various functional features integrated into the system. These features include user registration and authentication, product catalog browsing, medical prescription data entry, frame and lens selection, shopping cart management, payment transactions via the integrated Midtrans payment gateway, real-time order tracking through Biteship, and direct consultation with administrators via the in-app chat feature. On the administrative side, this diagram covers backend management functions, including product and lens master data management, order validation, consultation queue handling, transaction receipt printing, and inventory monitoring. Overall, this diagram illustrates that the application functions not only as a shopping platform but also as an integrated optical information system that unifies ordering, customization based on medical prescriptions, professional consultations, electronic payments, and delivery management into a single integrated digital workflow.



Fig. 3: Use Case Diagram

3.3. Activity Diagram

This activity diagram provides a detailed overview of the eyeglass ordering business process within the Alhazen Smart E-Commerce Optics application, clearly dividing responsibilities between the customer and the system using swimlanes, making the interaction flow easier to understand and analyze. The customer begins with the registration or login process as an authentication gateway to ensure the user's identity is recorded, then browses the eyewear product catalog, performs a search based on preferences, and selects the product deemed most suitable. After selecting a product, the customer proceeds to a more detailed customization stage, such as choosing the type of lens (e.g., single-vision, progressive, or anti-radiation), determining the frame material and design, and entering specific prescription details to ensure the ordered product fully meets clinical needs. All these configurations are then added to the shopping cart, before the customer is directed to the checkout process, which requires them to enter a complete and valid shipping address, select the desired shipping service, choose an available payment method (e.g., bank transfer, digital wallet, or credit card), and provide final confirmation of the order summary. On the other hand, the system automatically responds to every customer action by displaying a structured catalog page, presenting product details along with relevant customization options, and generating a checkout page that facilitates systematic data entry, thereby reducing the risk of omissions or errors. After the customer clicks to confirm, the system runs a series of integrated validation processes that include checking the consistency of order data, the accuracy and completeness of the shipping address, as well as the status and validity of the

payment before the transaction status is marked as successful and recorded in the database as an order ready to be processed by the Optik Alhazen operations team. Thus, this diagram not only visualizes the user interface steps, but also illustrates the end-to-end transformation of the manual ordering process—which previously relied on phone calls and social media—into a standardized digital workflow that can be monitored in real-time, has a clear audit trail, minimizes misunderstandings between customers and staff, and provides a strong foundation for future service quality improvements and data-driven decision-making.

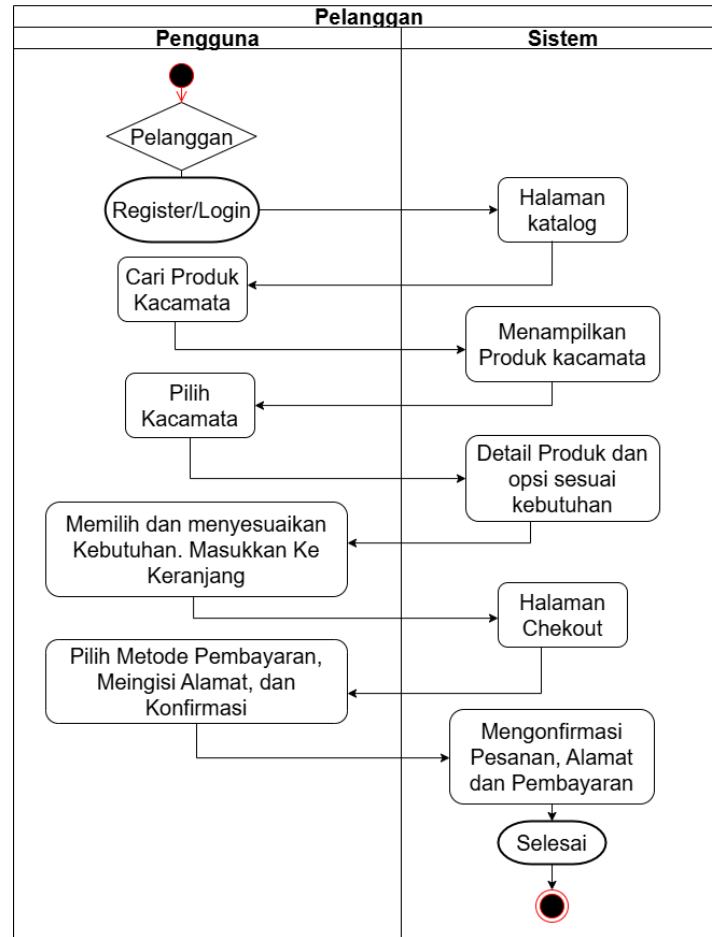


Fig. 4: Activity Diagram

3.4. Class Diagram

The class diagram illustrates the system structure and the relationships between classes that make up the Alhazen Smart E-Commerce Optics application. This diagram includes various key entities, such as users, addresses, products, product images, lens types, shopping carts, orders, transactions, and consultation messages. The relationships between entities in this system enable integrated management of various business aspects. The system is capable of managing user accounts, shipping addresses, product catalogs, stock availability, lens options, and the entire ordering process, which includes product details, the quantity of items ordered, prices, and eyeglass prescription information. Each class is designed with interrelated attributes and methods to support the application's overall workflow, from the user registration stage to the successful completion of a purchase transaction.

In addition, this class diagram illustrates the relationships between orders, transactions, and user addresses, which are designed to streamline the payment process, transaction verification, and accurate product delivery. These relationships allow the system to store a complete transaction history and help users track the status of their orders. This diagram also accommodates a consultation feature that allows customers to communicate with administrators or optical specialists regarding product needs and eyeglass prescriptions. This feature provides added value because users can obtain recommendations for products and lens types that suit their vision needs before making a purchase.

Overall, class diagrams serve as a foundation for database design and software development, ensuring that all system components operate in a structured, consistent, and integrated manner. Through class diagrams, development teams can better understand the relationships between entities, minimize potential errors during system implementation, and ensure that all functional requirements of the application are optimally met. These diagrams also play a crucial role as technical documentation that supports the development, maintenance, and future feature development of the application.

In addition, this class diagram design also emphasizes data security, information consistency, and system scalability by clearly separating the responsibilities of each class according to its business domain, such as user management, addresses, products, inventory, orders, transactions, and consultation features integrated with the ordering process. This approach helps developers apply object-oriented programming principles, such as encapsulation, separation of concerns, and code reusability, so that changes to business rules or the addition of new features—such as additional payment methods, new lens types, price promotions, or customer loyalty modules—can be

implemented in a controlled manner without disrupting the stability of other components already in operation. With this clean and well-documented structure, processes such as requirements analysis, database modeling, debugging, testing, refactoring, and integration with external services (such as payment gateways, shipping systems, or notification services) become more focused, while ensuring that the Alhazen Smart E-Commerce Optics system is ready to be developed, scaled, and maintained sustainably as the user base grows and feature complexity increases in the future.

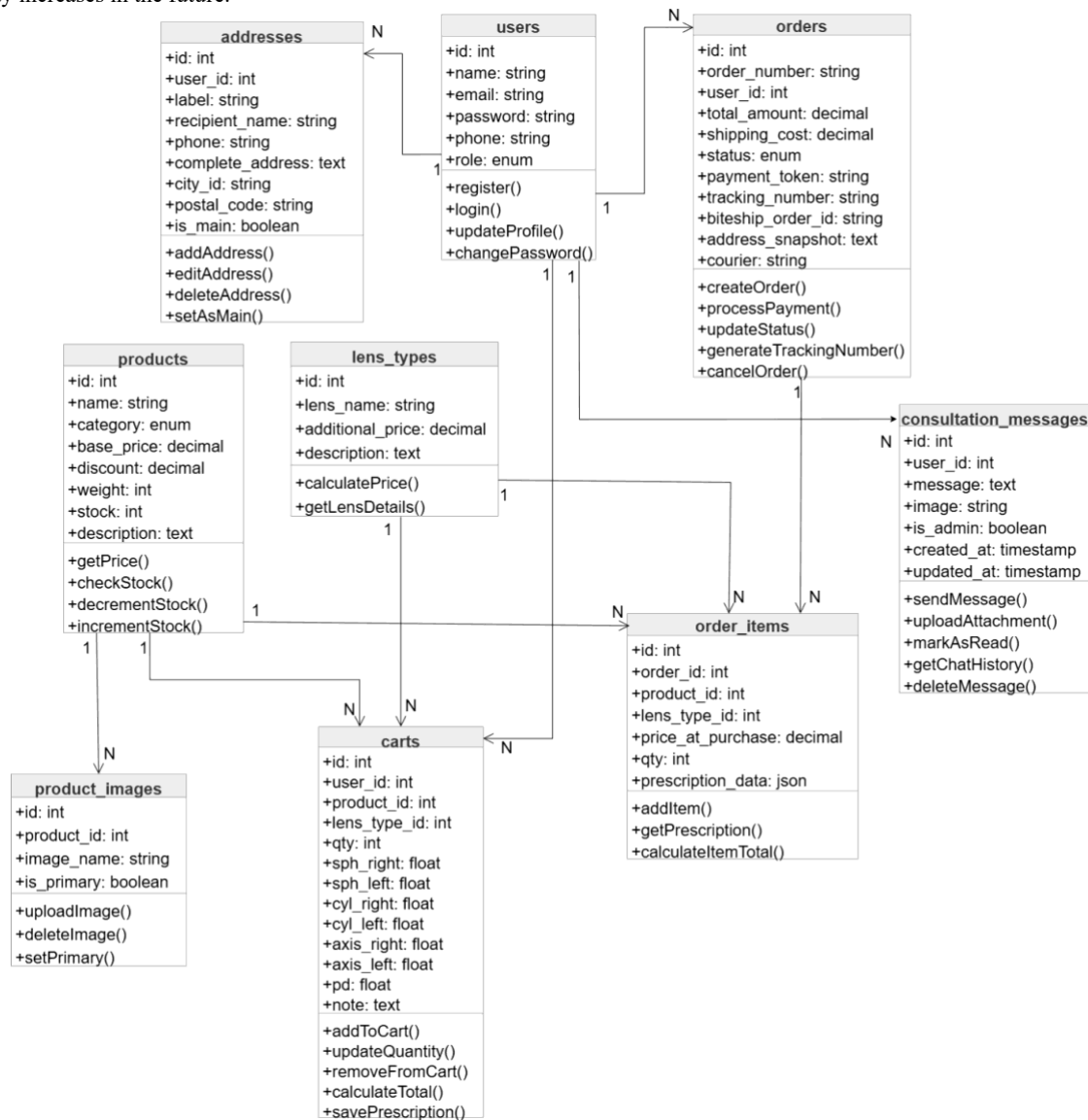


Fig. 5: Class Diagram

3.5. System Design

The Alhazen Smart E-Commerce application system is designed with a focus on simplicity, clarity of information, visual consistency, and ease of use for both customers and administrators. The interface is developed in a mobile-friendly format with a structured layout of elements, ensuring that every function can be accessed intuitively without requiring specialized technical knowledge. These steps are arranged sequentially, starting with the login or registration process, followed by searching for and selecting products, specifying lens types, entering eyeglass prescriptions, adding products to the shopping cart, selecting a shipping address and delivery method, completing the payment process, and ending with tracking the order status. Each page uses consistent layouts, colors, typography, icons, and navigation buttons to prevent user confusion when moving from one feature to another. Key aspects such as product prices, stock availability, product specifications, prescription details, additional fees, and order status are clearly presented to help users make informed decisions before completing a transaction. For administrators, the system’s design provides centralized access to manage products, lens types, order inventory, customer data, and customer consultations. Through this design, the application functions not only as an online sales platform but also as a service and operational management tool that supports transaction processes in a more efficient, structured, transparent, and integrated manner, in line with Optik Alhazen’s needs.

In addition, the Alhazen Smart E-Commerce application system is designed to provide a responsive and adaptive user experience by displaying real-time feedback at every stage of the transaction process, such as success notifications, data confirmations, and input error messages. As a result, users can navigate each stage of the purchasing process with greater confidence and ease, while administrators can easily monitor system activity in real time, enabling continuous improvement in customer service quality.

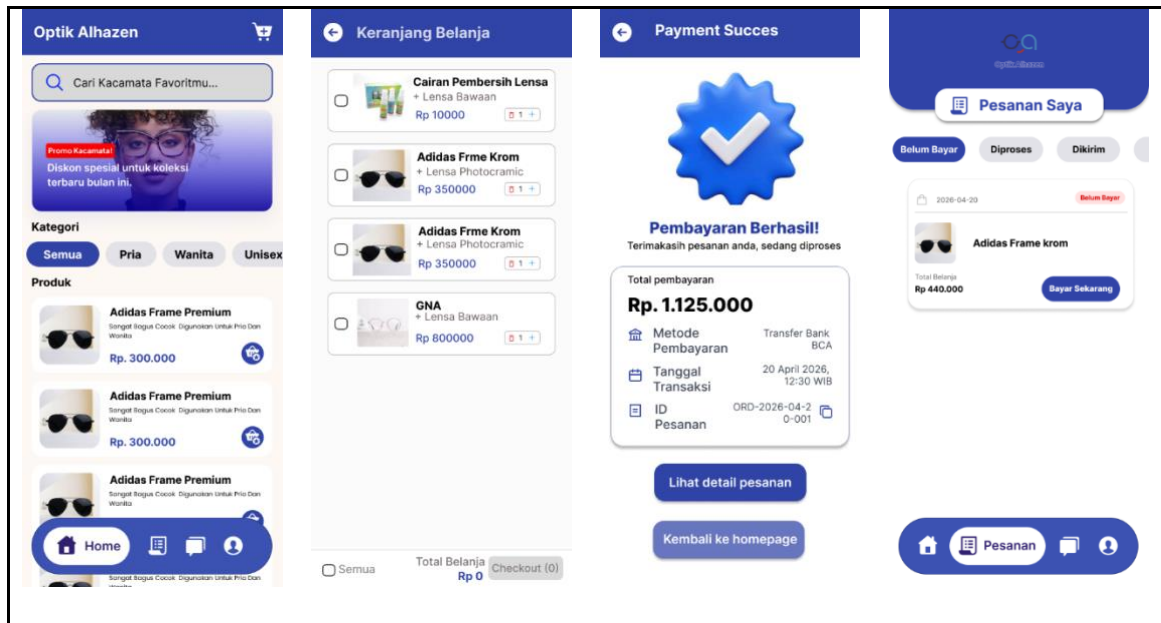


Fig. 6: System Design

3.6. System Implementation

Here is a screenshot of the designed system.

3.6.1. Admin Main Menu Page

The Admin Main Menu page serves as the control center for the e-commerce system, designed to provide a comprehensive overview of operational status and business performance in real time. This dashboard interface displays a summary of key data, including total revenue, number of orders, and orders currently being processed. This data serves as key performance indicators (KPIs), allowing administrators to quickly monitor system performance without having to open separate reports.

In addition to presenting summary data, this dashboard features a sidebar navigation panel containing various management modules, including lens type management, product management, order management, online consultation, and user data. This navigation structure is designed in a modular fashion to ensure the seamless integration of every system function, allowing administrators to switch between features easily without confusion or overlapping tasks. The clear separation of modules makes the system management process more systematic and efficient.

To improve workflow efficiency, this page also includes a search feature that allows administrators to find specific data or information more efficiently. Additionally, a logout button is provided to ensure system security, especially when the system is used by more than one user or device. The inclusion of these features demonstrates that the system not only focuses on core functionality but also prioritizes ease of use and security.

From a design perspective, the dashboard layout was created with visual hierarchy and usability in mind. Key data is placed in easily visible areas, allowing administrators to quickly grasp the system's status at a glance. A consistent and structured navigation menu also enables users to access various features with minimal steps. This approach aims to reduce the user's cognitive load and speed up the decision-making process.

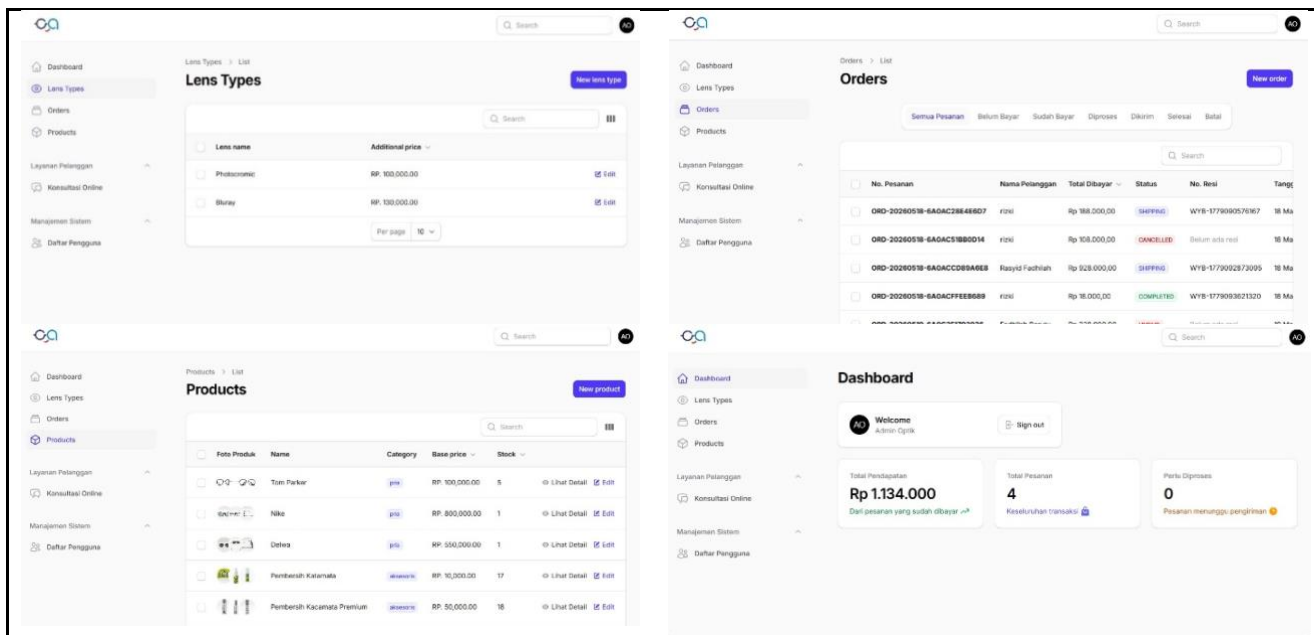


Fig. 7: Admin Menu Interface

3.6.2. Login and Registration Page

The login and registration screens serve as the initial authentication pages that users must go through before they can access the main features of the Alhazen Smart E-Commerce Optics app. On the login page, existing users can enter their email address and password to log in to the system, while new users can select the registration menu to create an account by entering their full name, email address, password, and password confirmation. Both interfaces are designed with a simple, user-friendly structure to ensure that the login and account registration processes are fast and efficient, while also guaranteeing that each user’s account information is securely stored and can be used to access the app’s services optimally.

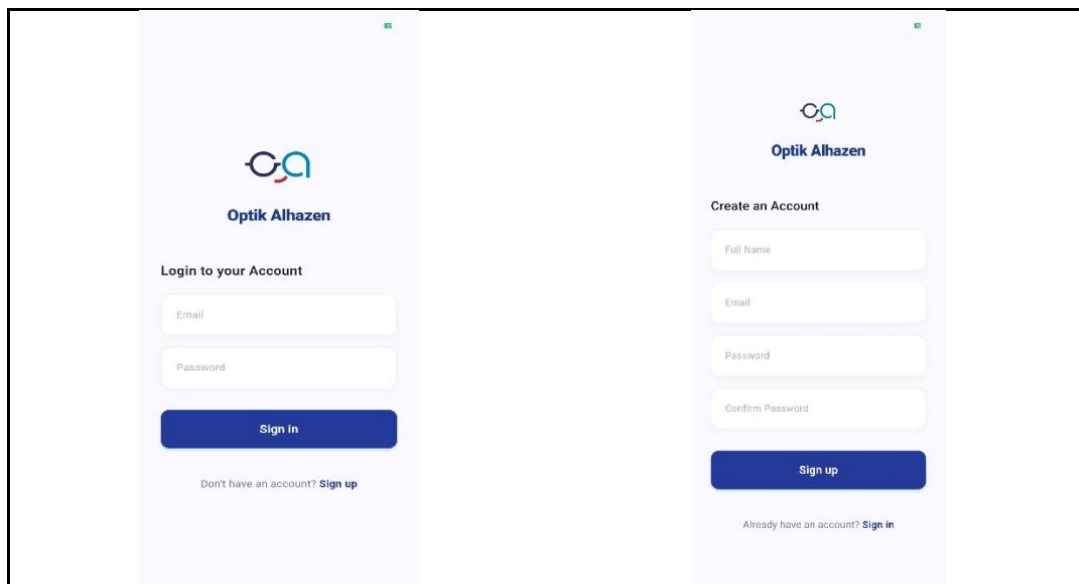


Fig. 8: Login and Registration Page

3.6.3. Homepage and Order Details

The homepage and order details serve as the main pages where users can search for, view, and select eyewear products available on the Alhazen Smart E-Commerce Optics app. On the homepage, users can use the search feature, select product categories, view promotional information, and browse product recommendations complete with images, names, and prices. After selecting a product, users are directed to a details page displaying more comprehensive information about the eyewear, lens type options, additional costs, product descriptions, and fields for entering prescription details such as SPH, CYL, and pupillary distance. Once all selections are confirmed, users can add the product to the cart to proceed with the ordering process.

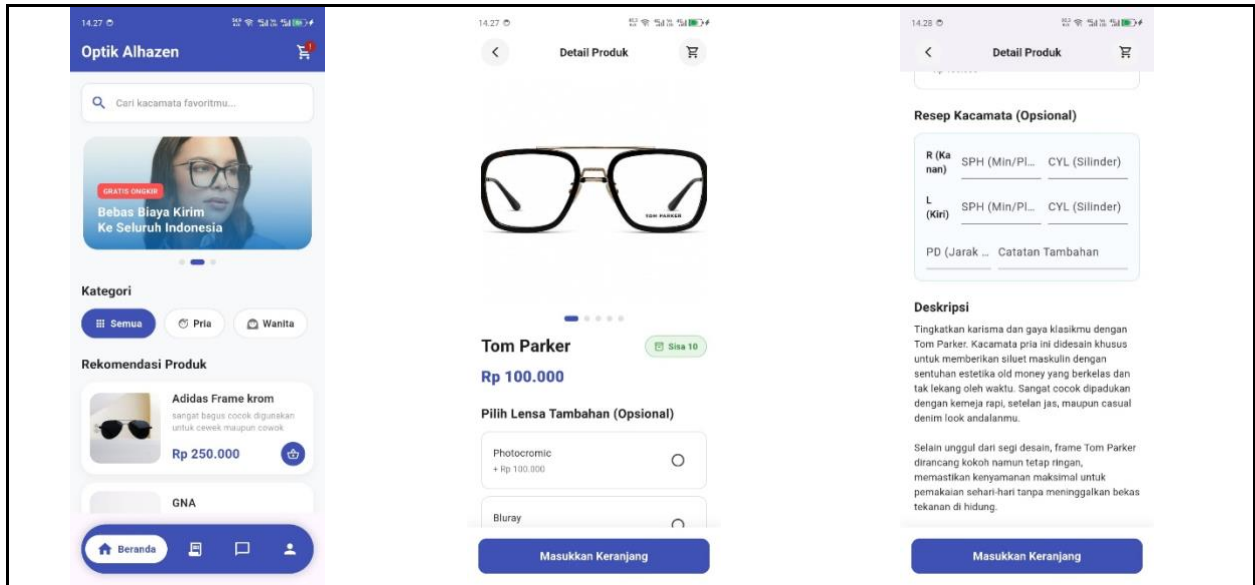


Fig. 9: Homepage and Orders Details

3.6.4. Tracking and Admin Chat Page

The order tracking and admin chat interface is designed to help users monitor the transaction process and communicate directly with the Optik Alhazen team. On the order page, users can view the status of their orders ranging from unpaid, in progress, shipped, to completed along with product information, transaction dates, and total payment amounts. The admin chat feature allows users to ask questions about products, order status, product availability, or any issues encountered during the purchasing process. Additionally, the profile interface displays user account information and phone numbers, as well as a feature to change passwords, so users can independently manage their personal data and account security. These three features support a more transparent, responsive, and easily accessible service through a single application platform.

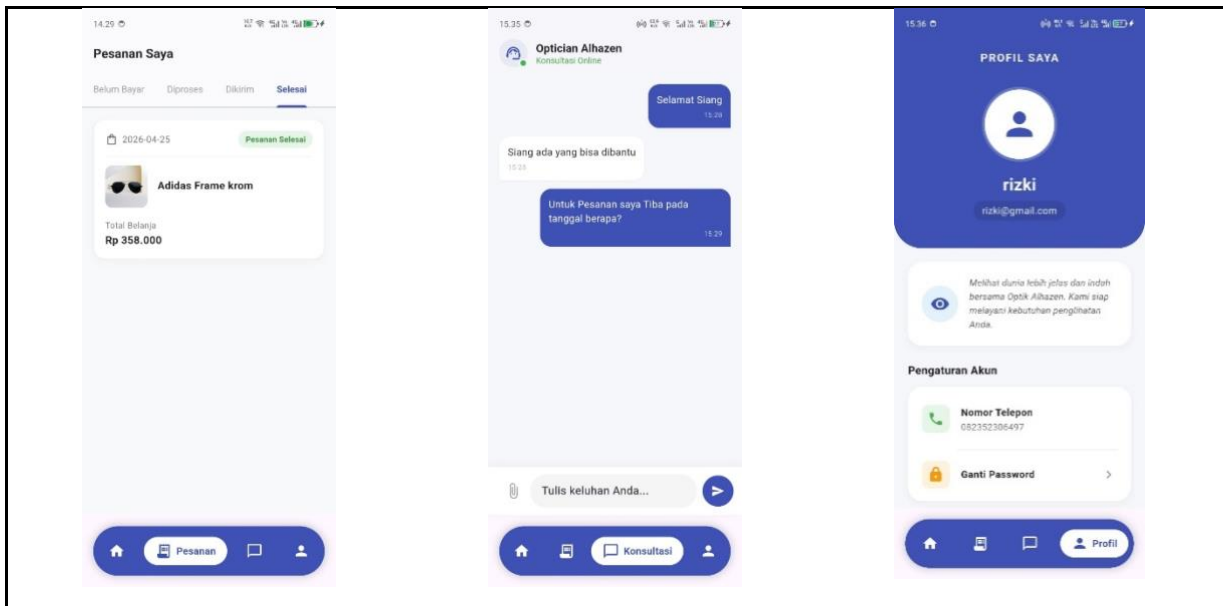


Fig. 10: Tracking and Admin Chat Page

3.7. System Testing

The following are the test scenarios used to evaluate the system's effectiveness:

Table 2: System Testing

Story	Test Scenario	Expected Result	Test Results
Go to the Account Login Page	Enter your email address and password	The homepage displays the Optik logo	Passed
Home Page	Browse products by scrolling through the screen, then select a product	The product has been successfully selected and viewed	Passed
Product Details Page (Select Additional Lenses)	Choosing Lenses Based on User Needs	The eyeglass lenses have been selected	Passed

Product detail page for eyeglass prescriptions (optional)	Filling out an eyeglass prescription according to the user's needs	The product has been added to your shopping cart	Passed
Shopping Cart Page (Checkout)	Users can click the checkout button	The product has been successfully added to your shopping cart (Proceed to checkout)	Passed
Payment Page	After selecting your payment method and shipping option, click the "Place Order" button	Your order is ready to be processed	Passed
My Orders Page	View orders in the navigation bar below the Order button	Displaying successfully placed product orders	Passed
Profile Page	Users can view and edit their account profiles	The user profile data has been successfully updated	Passed
Consultation Page (Chat)	Users click the consultation button on the bottom navigation bar	The chat message to the store admin has been sent successfully	Passed

4. Conclusion

This study successfully designed and developed the Alhazen Smart E -Commerce application using the Agile SDLC approach as a digital solution for sales and service processes at Optik Alhazen, integrating registration and authentication, product catalog, frame and lens selection, eyeglass prescription entry, shopping cart, payment processing, order tracking, user profile management, inventory management, and consultation with administrators into a single integrated platform. Based on functional testing, all major scenarios passed, indicating that the implemented features operate as designed and meet the functional criteria required to streamline the ordering process, expand the scope of services, simplify product and order data management, and increase transparency for customers and administrators. For further development, direct testing with customers and administrators using usability evaluation methods, such as the System Usability Scale, is required to objectively measure ease of use, comfort, and user acceptance. This must be accompanied by testing of security, performance, device compatibility, server load, and prescription data protection before the application is widely deployed. Additionally, the system can be further enhanced by adding features such as low-stock notifications, sales reports and analysis, product recommendations, customer loyalty programs, and virtual try-on technology based on artificial intelligence or augmented reality, which allows customers to estimate how well eyeglass frames fit their faces and ensures that the quality of Alhazen Optics' services can continue to be improved.

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