

Optometry Sales and Inventory Management System

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Abstract

The specialized needs of optical stores and optometry clinics create unique challenges when it comes to managing sales and inventory. These include the handling of prescriptions, tracking frame and lens inventories, and maintaining seamless customer interactions. In the case study of Specku Optometry store, reliance on a mix of manual processes and tools like Microsoft Excel has resulted in inaccuracies and inefficiencies. To address these issues and improve overall efficiency in daily operations, the Optometry Sales and Inventory Management System, a web-based software, has been developed. The primary objective of this software is to streamline daily tasks by managing and storing customer and product details, overseeing inventory levels, recording sales transactions, and generating reports that can provide valuable insights for business decision-making. In order to develop the software, the Agile model is chosen as the software development methodology due to its iterative approach, flexibility, and ability to adapt to user feedback throughout the development process. The software is also built using programming languages such as Hypertext Preprocessor (PHP), Hypertext Markup Language (HTML), Cascading Style Sheets (CSS), and JavaScript, with MySQL employed as the database. The developed system has resulted in improved inventory accuracy, reduced manual effort, and enhanced customer data management, providing valuable insights into sales trends for better decision-making. Finally, further research could be focused to explore the integration of advanced features like payment gateway, predictive analytics and barcode or QR scanning to further improve the system functionality.

1. Introduction

In any business, particularly in the retail sector, sales and inventory management is a very crucial aspect in ensuring operational efficiency, maximizing profitability, and enhancing customer satisfaction [1]. The sales and inventory management system refers to the process of tracking and managing inventory and sales activities concurrently [2]. In an optometry store, this involves tracking and managing products like eyeglasses, lenses, frames, and accessories while maintaining accurate inventory levels. This process is usually managed by the optometry or optical store's manager and staff. The process is important as it allows the store to maintain a proper stock of products, fulfill customer needs efficiently, and prevent product overstock or shortages.

The current sales and inventory management system used by the case study, Specku Optometry, is handled through a combination of manual processes and basic software tools. The optometry store's staff use spreadsheets or paper-based records to log sales and track inventory levels, with data stored either in physical or simple digital

file formats. Inventory is managed by physically checking stock and comparing sales ledgers, which is time-consuming and prone to redundancies and data loss.

The current approach has significant drawbacks as it is prone to human errors. These errors, particularly in sales and billing during high-traffic periods, result in frequent inaccuracies, including miscalculated prices or overlooked discounts, impacting revenue and risking customer dissatisfaction. Additionally, inventory management requires staff to manually record adjustments and track restocking needs, a time-consuming and unreliable process that increases the risk of stock shortages for high-demand items. Furthermore, the absence of real-time sales analytics prevents effective demand forecasting and limits data-driven decision-making, making it difficult for staff to maintain optimal inventory levels and maximize sales. Thus, these inefficiencies lead to higher costs, missed sales opportunities, and reduced customer satisfaction.

Therefore, an Optometry Sales and Inventory Management System (OSIMS) is developed as a solution to the challenges mentioned above. The project aims to build the OSIMS that is designed using structured approach, to develop it using web-based technology, and test the developed system to ensure all its functionalities are working as intended. The system is intended to be an internal system, used exclusively by the workers of the optometry store. The users of the system are divided into two categories: administrators and staff. Both roles share certain functionalities, such as managing customer and product details, but they also have distinct access levels and responsibilities. The store manager will serve as the system administrator while other employees will serve as staff, acting as general users of the system. The features offered by the system include customer management, product and inventory level management, handling sales process, and report generation.

This paper consists of five sections, with the first, Section 1, describing the background of the project. Section 2 provides the literature review of the project, offering insights into related works and concepts while Section 3 elaborates on the methodology used to develop the proposed system, including its analysis and design. The results from developing the proposed system are given in Section 4 and lastly, Section 5 concludes the project by summarizing key findings and suggesting potential improvements for future work.

2. Literature Review

An optometry store is a retail business that provides eye care services, such as eye exams, prescription glasses, and contact lenses. These stores are often the initial choice for individuals seeking for eye examinations due to their accessibility and convenience. They play a critical role in providing prescription glasses to people seeking vision correction, making them a vital part of eye care services [3]. In order to manage operations efficiently, optometry stores usually rely on sales and inventory management systems. While some stores still use traditional methods such as ledgers and books to keep track of their inventory and sales, others make use of digital tools like Excel spreadsheets and other software, and some also combine both methods. The increasing usage of digital tools shows the growing need for more accurate, efficient, and scalable solutions to handle the demands of managing the inventory and processing sales in businesses including optometry practices [4].

The common features of a sales and inventory management system of an optometry store generally include inventory tracking, sales processing, customer management, and order management. Inventory tracking ensures that optical products like lenses and frames are available when needed, while sales processing helps to ensure smooth transactions between the store and its customers, while also helping in making business decisions by recording important details to provide insights into purchasing trends and customer preferences. Next, customer management helps the store owner to maintain detailed records of customer details, prescriptions, and purchase histories. Efficient handling of incoming and outgoing stock is managed with the order management feature to ensure that products are replenished on time to avoid understocking. Additionally, some systems also have reporting tools to provide valuable insights into sales trends, inventory turnover, and other performance metrics. These features help the optometry store to optimize their operation, reduce errors, and improve customer satisfaction.

A web-based system refers to a software application that operates over a network such as the Internet and is accessed through a web browser. It is also known as a browser-based application and can be used for many activities due to their convenience and flexibility, including operating a business. The web-based system offers many benefits, such as lower development costs, centralized data, easy access anywhere, increased efficiency, and adaptability [5]. The system enables businesses to streamline operations, provide real-time data access, and promote smooth collaboration between users. Therefore, it is commonly used by applications that need centralized data management and simple scalability, like inventory and sales management systems for optical shops.

The optometry store's current process for the sales and inventory management process operates with a combination of manual and digital methods. The general flow of operations follows a set of key steps to ensure smooth customer transactions and inventory management, although some areas still need to be done manually. The process begins with a customer greeted by the staff, who then assesses their needs by suggesting products that suit their requirements. For prescriptions that involve lenses, the staff ensures the details are correct by verifying them before proceeding. After the customer confirms their product choice, payment will be processed

by the staff, and sale is recorded using an Excel spreadsheet. The inventory is manually updated following the sales, also using the Excel-based system that tracks stock levels. If certain items are out of stock, the staff places orders with the suppliers to ensure the inventory remains stocked. When the product – either lenses or prescriptive glasses – is ready, the employee give the product to the customer along with the relevant details. Finally, sales data is logged, and inventory adjustments are made, although these tasks often need to be done manually within the Excel spreadsheet.

Three existing software that are similar to the OSIMS were chosen to do a comparison analysis. The three software are FlexScanMD, Optical Shop Manager, and Eye Cloud Pro. FlexScanMD is a medical inventory management system that offers to serve medical practices of all specialties and sizes to efficiently manage the inventory – from products to medications that are stocked, dispensed, and sold [6]. This software offers access and management to the medical inventory on any web browser and device, allowing stores to manage their inventory from any location. On the other hand, Optical Shop Manager is a mobile application designed for managing the operations of an optometry shop. It has several functions that support the business management of the shop, from handling orders and payments to managing inventory and customer data. The defining feature of the system is its mobile app format, which allows mobility for users to access and manage it on-the-go [7].

The third software, Eye Cloud Pro, is an all-in-one platform that combines Electronic Health Records (EHR), Point of Sale (POS), and inventory management functionalities, specifically designed to cater to optometrists [8]. The platform offers various features such as real-time inventory tracking, automatic reporting, and the ability to integrate across patient care and retail, linking inventory control with patient services like billing and electronic prescriptions. Eye Cloud Pro's unique advantage lies in this integration, but its extensive functionality might be too complex for smaller retail shops. From these three existing systems, the key features assessed in this comparison include user registration and login, visual product display, stock level tracking, customer details module, item shortage notifications, report generation, system type, and user interface. Table 1 below presents an overview of the system comparison.

Table 1 *System comparison*

Features/system	FlexScanMD [6]	Optical Shop Manager [7]	Eye Cloud Pro [8]	OSIMS
Registration and Login	√ user ID and password	√ user ID and password	√ user ID and password	√ user ID and password
Display Products Visually	X	X	X	√
Inventory Stock Tracking	√	√	√	√
Customer Details Module	√	√	√	√
Notification on Item Shortage	√	X	√	√
Report Module	√	√	√	√
Order/Reorder Management	Supplier-linked reorder automation	Manual reordering	Automated order suggestions	Manual reorder with history loggings and automated suggestions
Inventory Usability	Complex interface suitable for larger setups	Mobile-friendly but lacks dedicated stock UI	Cluttered interface due to integration scope	Clean layout with inventory-focused UI
Type of System	Web-based	Mobile Application	Web-based	Web-based
User Interface	A bit overwhelming for first time users	Home page has too many options that overlap with the bottom tab bar	Too cluttered, due to too many functionalities/features	Simplistic and intuitive to users

Based on this comparison, it is evident that each system serves a distinct user base. FlexScanMD is feature-rich but potentially excessive for small businesses, while Optical Shop Manager offers simplicity at the cost of automation. Eye Cloud Pro excels in integration but can overwhelm users with its complexity. In contrast, OSIMS is specifically designed to meet the needs of small optometry shops by offering only the most essential inventory

management features. It includes a clear interface, stock tracking, shortage alerts, and simplified reports, ensuring staff can manage inventory efficiently without being burdened by unnecessary complexity.

This comparison highlights the rationale for developing OSIMS as a targeted, user-friendly solution that prioritizes ease of use, clarity, and essential inventory functionality tailored to small-scale optical businesses.

3. Methodology

3.1 Methodology Chosen and System Workflow

The Agile Model is a type of Software Development Life Cycle (SDLC) and it was chosen to develop the proposed Optometry Sales and Inventory Management System due to its iterative and incremental development. This methodology model was designed to address the drawbacks of linear models like the Waterfall model [9]. Agile's flexibility is one of the reasons why this methodology was chosen for this project, as it allows for continuous feedback and improvements at each phase.

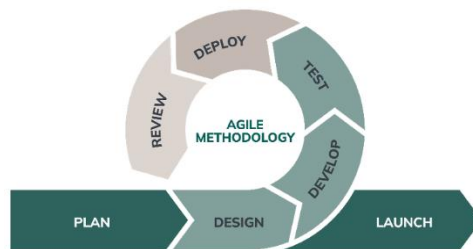


Fig. 1 Agile model cycle

Based on Figure 1 above, the Agile Model generally can be broken down into five phases, which are planning and analysis, design, implementation, testing, and deployment and maintenance. Each phase has its own set of tasks that need to be completed to produce valuable outputs for developing a system. As mentioned before, Agile is not a linear model, as each phase is revisited multiple times throughout the project. Agile's iterative approach allows for continuous refinement of the system, with feedback from previous cycles being implemented into each subsequent phase. This approach ensures the developed system can evolve in response to changes and feedbacks. The Table 2 below shows the overall workflow throughout the development of the proposed system.

Table 2 Software development activities and their tasks

Phase	Task	Output
Planning and Analysis	- Propose the project	- Project proposal
	- Determine the project schedule, activities, and outputs	- Gantt chart
	- Collect the requirements from stakeholders	- Comparison table of proposed project with similar existing systems
	- Analyze collected information	- Flowchart
	- Analyze existing systems	- DFD
Design	- Design the system architecture	- ERD
	- Design database scheme and data dictionary	- Database schema
	- Design the system user interface	- Data dictionary
Implementation	- Develop and code the front-end and back-end of the system	- System architecture
		- User interface
Testing	- Develop and code the front-end and back-end of the system	- Developed system modules
	- Unit testing and modular testing	- Linked system with database
	- Debugging	- Tested system and system modules
Deployment and Maintenance	- Test the connection to database and real-time data updates in system	
	- Delivery of finished system to end users in working environment	
	- Further maintenance through updates if necessary	- Developed system

3.2 System Requirements

In analyzing the system requirements, it is important to clearly define the system's functional and non-functional requirements. Functional requirements are the specific functionalities and features that the system must perform to meet the project's objective while non-functional requirements are quality attributes of the system, such as performance, security, and operational. By defining these requirements clearly, it ensures that the developed system meets user needs and operates effectively in its working environment. The Table 3 and Table 4 below shows the system's functional and non-functional requirements respectively.

Table 3 *Functional requirements*

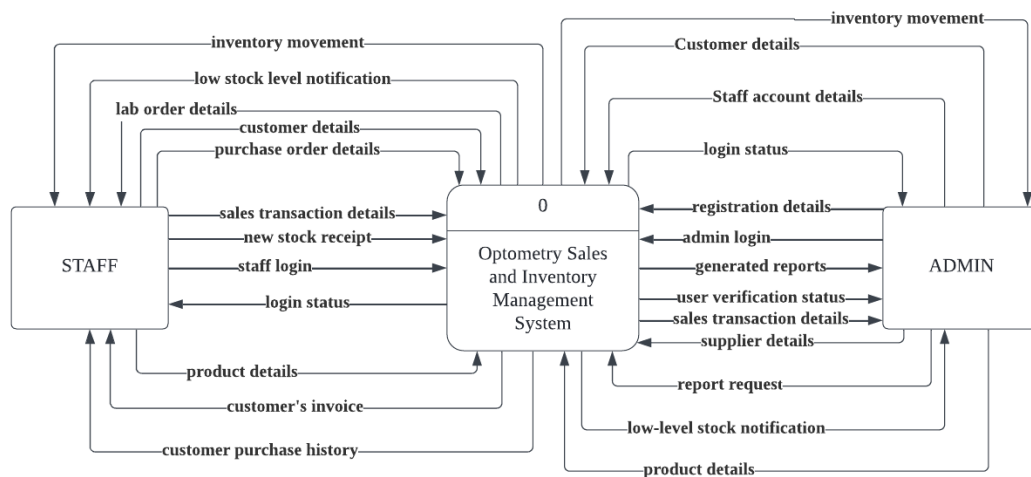
No	Module	Description
1	User Management and Login	• Allow the new users to register new account before login. • Allow the existing users to login with the id and password. • Redirect the valid users to dashboard when successful login. • Validate the registering users by sending detail to their email. • Allow administrator to manage user accounts. • Allow administrator to assign and update roles of users.
2	Customer and Supplier Information Management	• Allow the users to add new customer details. • Allow the users to edit and delete customer records. • Allow the users to check the customers' purchase history. • Allow the administrator to add new supplier record. • Allow the administrator to edit and delete supplier records. • Allow users to update the supplier with its associated products supplied. • Allow staff to only edit the supplier record partially.
3	Product and Inventory Management	• Allow the users to add new product details. • Allow the users to edit the product details. • Allow the users to view the display of products and its associated suppliers. • Allow users to delete products record. • Allow users to view low-stock products. • Allow users to do manual inventory adjustments.
4	Sales Operations Management	• Allow the staff to process the sales order details. • Allow the staff to handle purchase and lab orders. • Allow the staff to record receipts for newly received stocks. • Allow the administrator to view the sales operations records.
5	Report	• Administrators can generate reports about their sales, product performance, and inventory status.
6	Notification	• Allow users to get notified when a product's level is low in stock. • Allow the administrator to notify staff to take actions when there are low-stock products.

Table 4 *Non-functional requirements*

No	Requirement	Description
1	Performance	The system should always be usable.
2	Operational	The loading time required for a website is no more than 1 minute.
3	Security	The system should only allow validated users to log in.
4	Cultural and political	The system should be able to work on any web browser.

3.3 System Analysis

After identifying and defining the system's requirements, the system should be analyzed further by delving into how the data and processes work in the system. To do so, several methods are used, including drawing the system's context diagram, data flow diagram (DFD), and entity relationship diagram (ERD). These diagrams present an overview of the interaction between the system and its users, showing the flow of inputs and outputs to and from its user and system. Figure 2 below shows the context diagram for the proposed system while Figure 3 illustrates its DFD Level 0, and Figure 4 presents the ERD that defines the entities, attributes, and relationships within the system's database design.

**Fig. 2** *Context diagram*

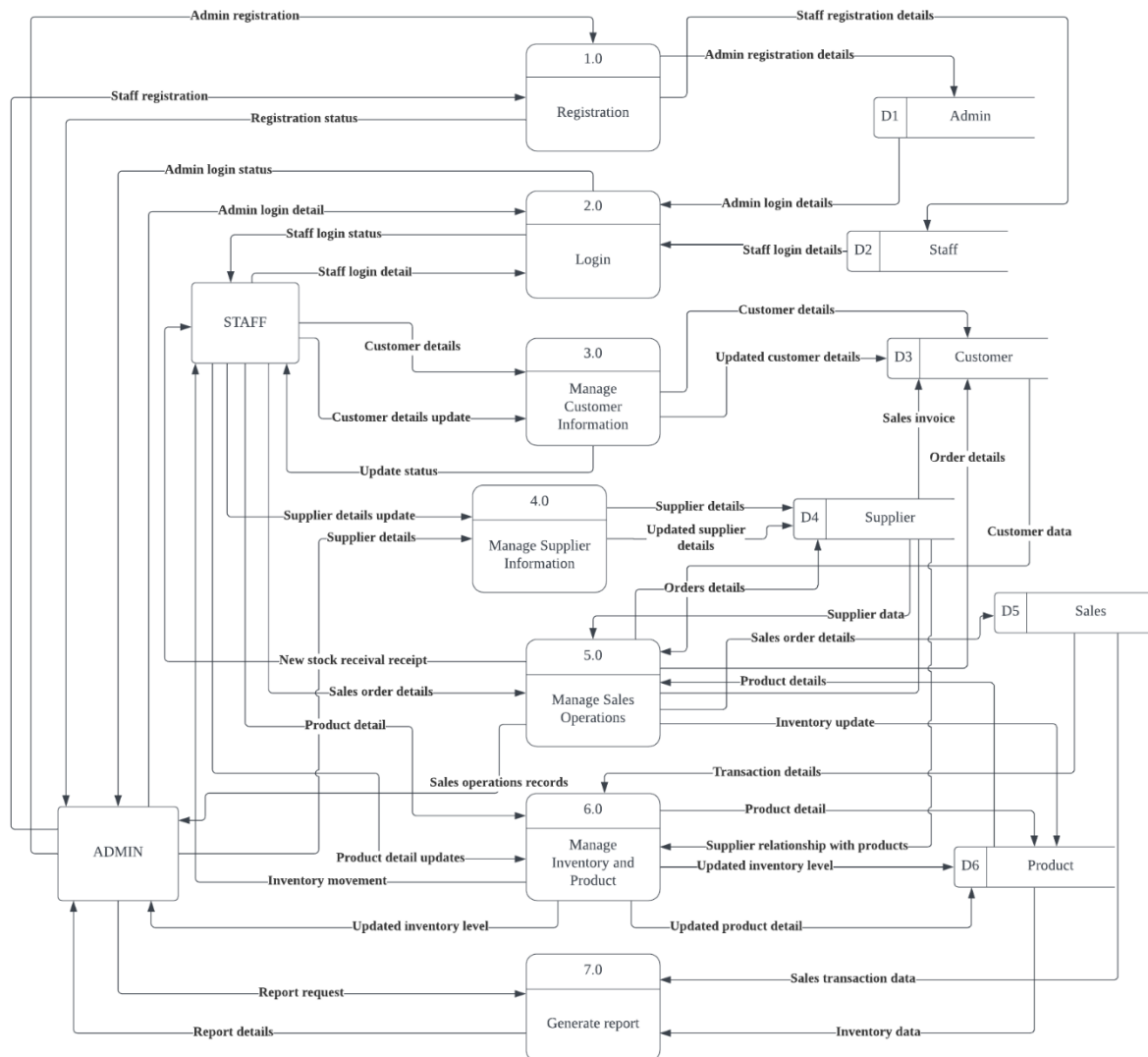


Fig. 3 DFD level 0

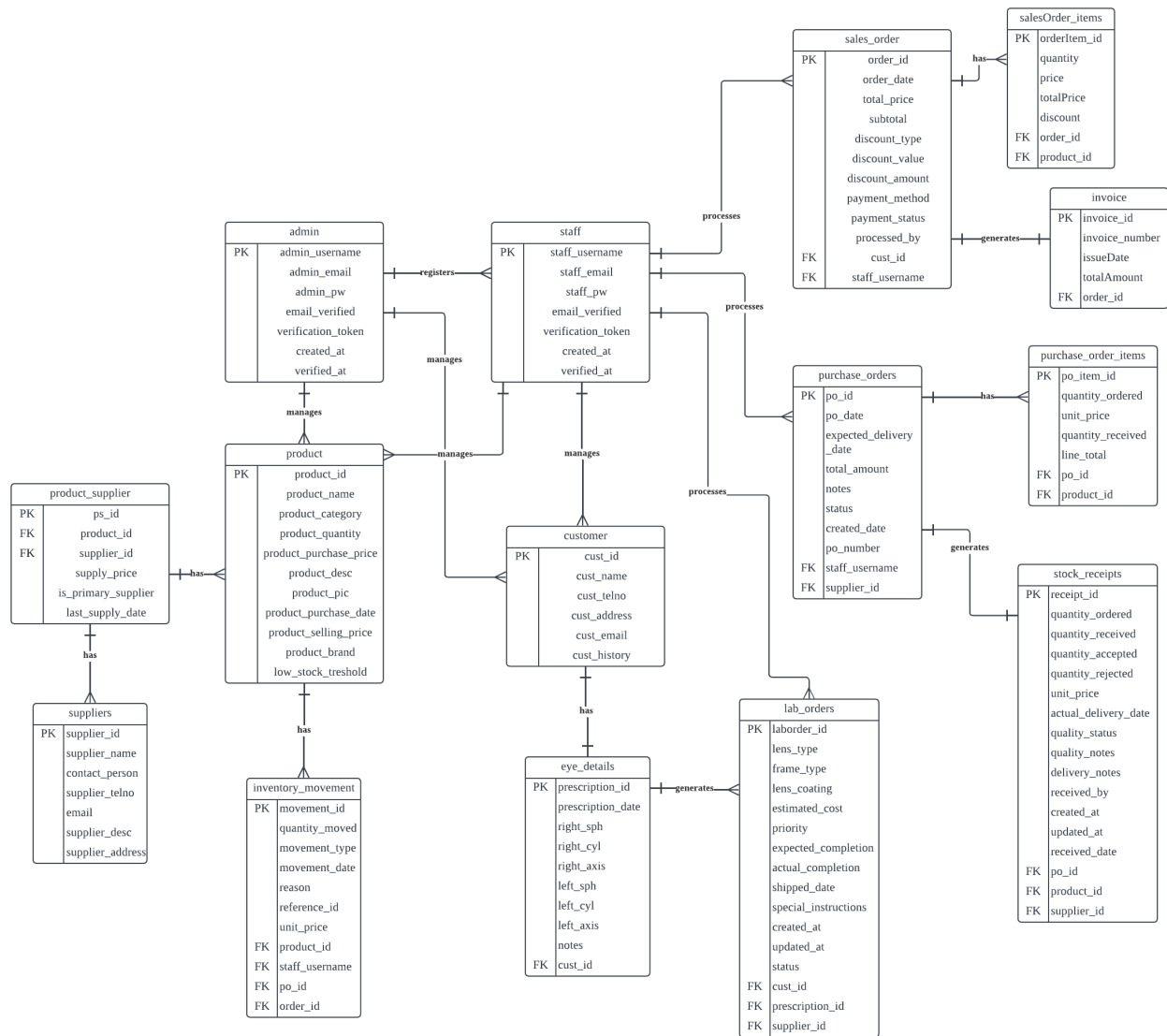


Fig. 4 Entity relationship diagram

3.4 System Design

The design phase focuses on developing the system's architecture, database structure, and user interface after analyzing the relevant requirements. This phase is essential for visualizing the system before coding and incorporates considerations like hardware, operating systems, programming, and security [10].

System architecture serves as the foundation for understanding how the system functions and interacts with its components by identifying key requirements and making strategic design decisions that impact the entire system [11]. Figure 4 below shows the design of the system architecture for the proposed sales and inventory management system for an optometry store.

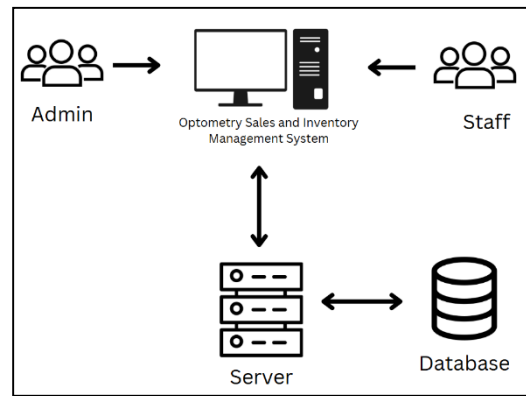


Fig. 5 System architecture for OSIMS

In the diagram above, the Optometry Sales and Inventory Management System is designed with two types of users: administrators and staff. Administrators have high-level access for managing user permissions, system settings, and generating reports, but do not process sales orders, while staff handle sales orders, inventory management, and customer interactions. The system processes user requests and communicates with the server, which executes business logic and interacts with the database to retrieve or store data such as customer details, sales records, and inventory. This architecture ensures efficient data flow and accurate, up-to-date information for optimal system performance.

The relational schemas for the database are listed as follows:

- i. admin (admin_username, admin_email, admin_pw, email_verified, verification_token, created_at, verified_at)
- ii. staff (staff_username, staff_email, staff_pw, email_verified, verification_token, created_at, verified_at)
- iii. customer (cust_id, cust_name, cust_address, cust_telno, cust_email, cust_history)
- iv. product (product_id, product_name, product_selling_price, product_purchase_price, product_quantity, product_brand, product_category, product_desc, product_pic, product_purchase_date, low_stock_treshold)
- v. product_supplier (ps_id, supply_price, is_primary_supplier, last_supply_date, product_id[FK], supplier_id[FK])
- vi. sales_order (order_id, order_date, total_price, subtotal, discount_type, discount_value, discount_amount, payment_method, payment_status, processed_by, staff_username[FK], cust_id[FK])
- vii. salesOrder_items (orderItem_id, order_id[FK], product_id[FK], quantity, price, totalPrice, discount)
- viii. invoice (invoice_id, invoice_number, issueDate, totalAmount, order_id[FK])
- ix. suppliers (supplier_id, supplier_name, contact_person, supplier_telno, email, supplier_desc, supplier_address)
- x. inventory_movement (movement_id, quantity_moved, movement_type, movement_date, reference_id, unit_price, reason, product_id[FK], staff_username[FK], po_id[FK], order_id[FK])
- xi. purchase_orders (po_id, po_number, po_date, expected_delivery_date, total_ampunt, notes, status, created_date, staff_username[FK], supplier_id[FK])
- xii. purchase_order_items (po_item_id, quantity_ordered, unit_price, quantity_received, line_total, po_id[FK], product_id[FK])
- xiii. stock_receipts (receipt_id, quantity_ordered, quantity_received, quantity_accepted, quantity_rejected, unit_price, actual_delivery_date, quality_status, quality_notes, delivery_notes, received_by, created_at, updated_at, received_date, po_id[FK], product_id[FK], supplier_id[FK])
- xiv. eye_details (prescription_id, prescription_date, right_sph, right_cyl, right_axis, left_sph, left_cyl, left_axis, notes, cust_id[FK])

- XV. `lab_orders (laborder_id, lens_type, frame_type, lens_coating, estimated_cost, priority, expected_completion, actual_completion, shipped_date, special_instructions, created_at, updated_at, status, cust_id[FK], prescription_id[FK], supplier_id[FK])`

The interfaces for the OSIMS are designed to provide an intuitive and user-friendly web page. A clean, consistent design with responsive elements enhances usability, ensuring the website is accessible on various devices. By prioritizing both a seamless user interface and effective navigation, the system enables efficient workflow, improving overall user experience and productivity [12]. Some of the designs are shown in the Figures 6 – Figures 7 below.

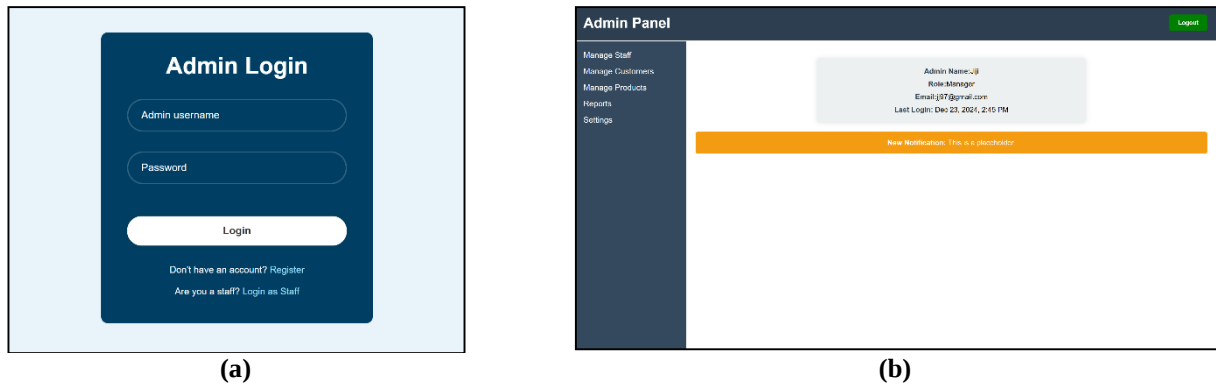


Fig. 6 Design interfaces: (a) Admin login page; (b) Admin main menu page

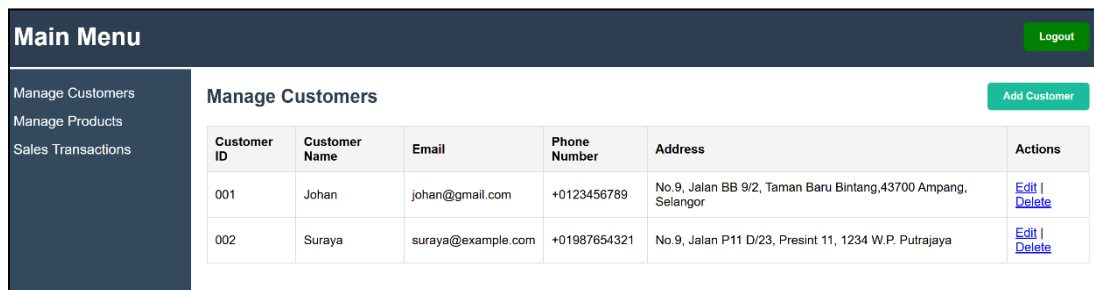


Fig. 7 Customer management page

4. Results and Discussion

The development of OSIM system used two main software tools which are Visual Studio Code and Laragon. Visual Studio Code is the primary development environment to build and design the system's user interface, using HTML, PHP, CSS, and JavaScript. Meanwhile, Laragon is used to set up a local server environment to perform server-side scripts and database management.

4.1 System Module Development

The developed system module includes user management and login, customer and supplier information management, product and inventory management, sales operations management, and reporting.

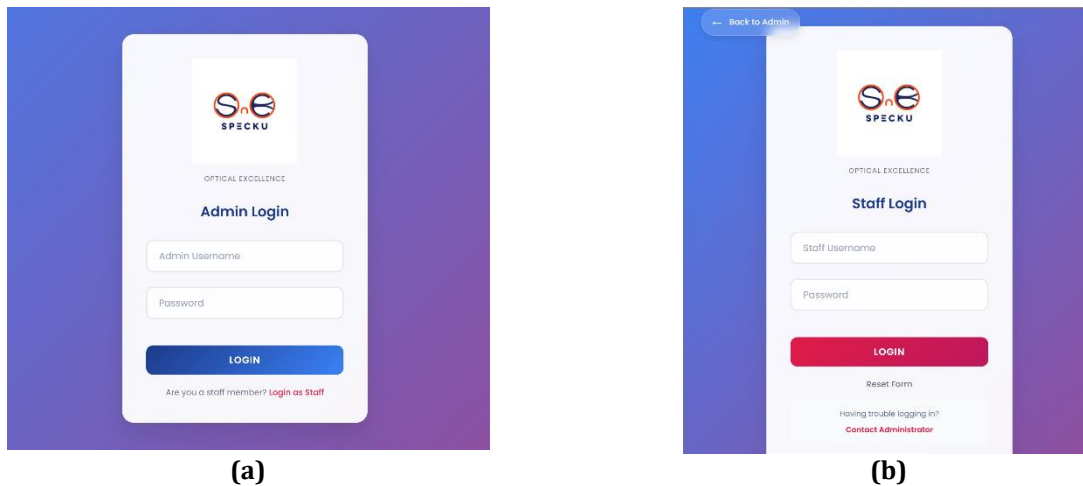


Fig. 8 Login interfaces: (a) Admin page; (b) Staff page

Figure 8 above shows the user interface of user login for the two types of users: admin and staff. Figure 9 below is the interface for user registration, which shows the implementation of role-based logic to ensure that each user type is granted appropriate permissions based on their role. Administrators are provided with elevated privileges to oversee overall operations, such as managing user accounts, monitoring inventory levels, and viewing reports. Staff members, on the other hand, are granted access to daily operational features such as recording sales transactions, updating customer records, and handling product stock-in and stock-out. This separation of roles enhances both system security and workflow efficiency, minimizing the risk of unauthorized access and ensuring that users only interact with the features relevant to their responsibilities.

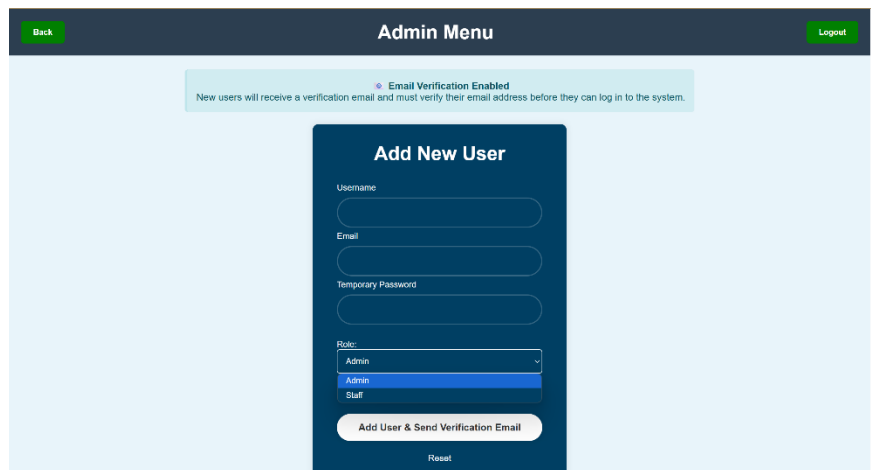
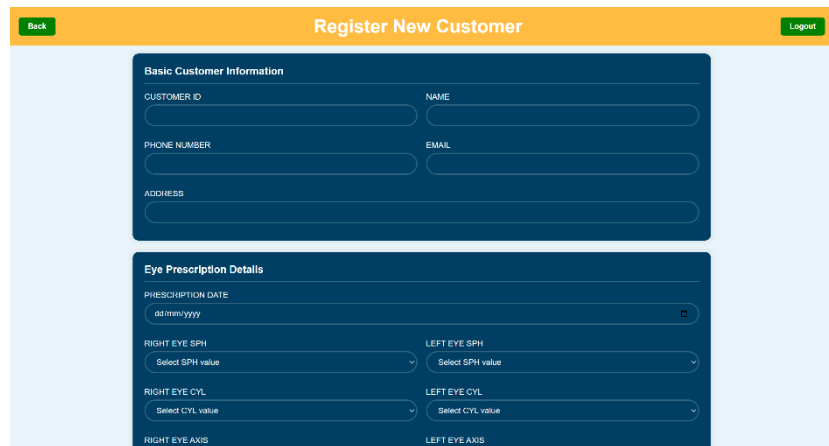


Fig. 9 User registration interface

The following Figure 10 shows the customer registration interface, where users can fill in customer details with or without eye prescription information. This allows users to register customers who purchase either prescription products such as lenses, or non-prescription ones such as sunshades, demonstrating the flexibility of the system.



The interface is titled "Register New Customer" and features a "Back" button on the left and a "Logout" button on the right. It is divided into two main sections: "Basic Customer Information" and "Eye Prescription Details".

Basic Customer Information:

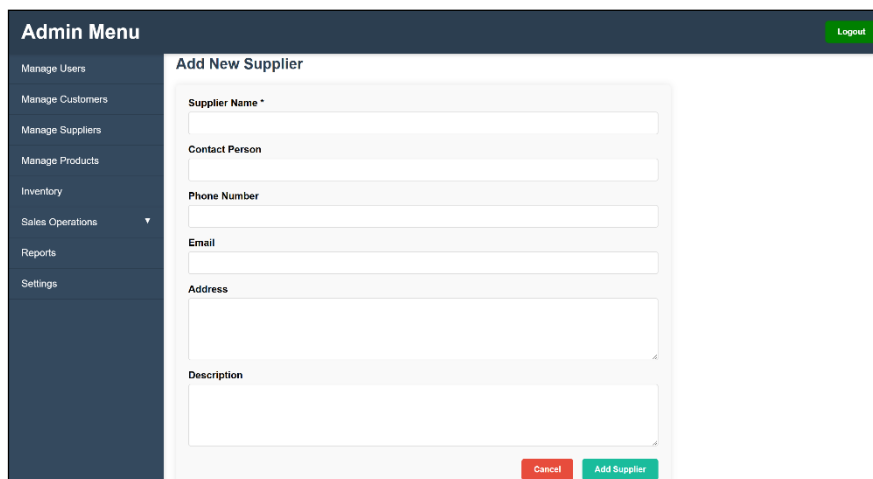
- CUSTOMER ID (text input)
- NAME (text input)
- PHONE NUMBER (text input)
- EMAIL (text input)
- ADDRESS (text input)

Eye Prescription Details:

- PRESCRIPTION DATE (date picker, format dd/mm/yyyy)
- RIGHT EYE SPH (dropdown menu, "Select SPH value")
- LEFT EYE SPH (dropdown menu, "Select SPH value")
- RIGHT EYE CYL (dropdown menu, "Select CYL value")
- LEFT EYE CYL (dropdown menu, "Select CYL value")
- RIGHT EYE AXIS (text input)
- LEFT EYE AXIS (text input)

Fig. 10 Customer registration interface

The administrator can also manage the information of companies that supply products to them by adding their details into the system by using the interface shown in Figure 11. Meanwhile, staff members are restricted to only editing several particulars of the suppliers and the products they supplied.



The interface is titled "Add New Supplier" and features a "Logout" button on the right. It has a sidebar menu on the left with the following options: Manage Users, Manage Customers, Manage Suppliers, Manage Products, Inventory, Sales Operations, Reports, and Settings. The "Manage Suppliers" option is currently selected.

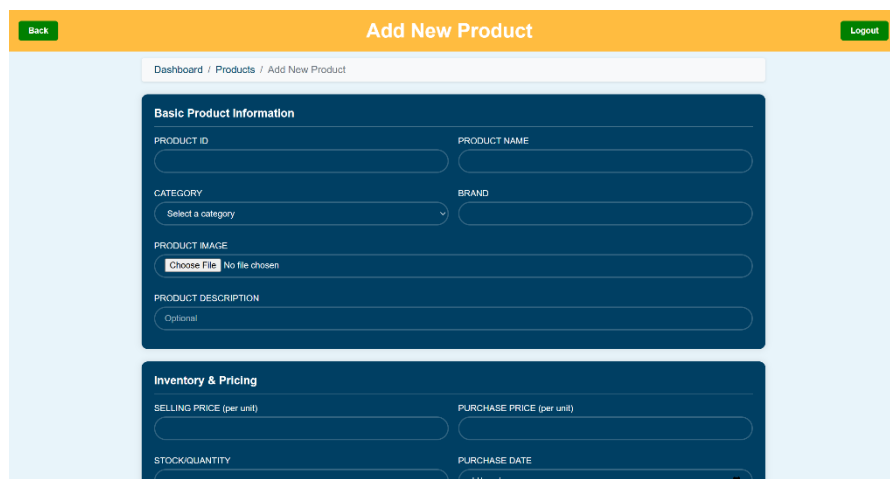
Add New Supplier Form:

- Supplier Name * (text input)
- Contact Person (text input)
- Phone Number (text input)
- Email (text input)
- Address (text input)
- Description (text input)

At the bottom right, there are two buttons: "Cancel" (red) and "Add Supplier" (green).

Fig. 11 Add supplier interface for admin

Figure 12 below shows one of the core functions of product and inventory management module as users can add new products into their system by filling in product details such as product brand, category, name, selling price, purchase price, and its supplier details. The users can add more than one supplier to a product and appoint one of them as a primary supplier of the product.



The interface is titled "Add New Product" and features a "Back" button on the left and a "Logout" button on the right. It has a breadcrumb trail: Dashboard / Products / Add New Product.

Basic Product Information:

- PRODUCT ID (text input)
- PRODUCT NAME (text input)
- CATEGORY (dropdown menu, "Select a category")
- BRAND (text input)
- PRODUCT IMAGE (file upload, "Choose File" button, "No file chosen" text)
- PRODUCT DESCRIPTION (text input, "Optional" label)

Inventory & Pricing:

- SELLING PRICE (per unit) (text input)
- PURCHASE PRICE (per unit) (text input)
- STOCK/QUANTITY (text input)
- PURCHASE DATE (date picker, format dd/mm/yyyy)

Fig. 12 Product registration interface

Figure 13 shows the inventory interface from a staff member's perspective. The staff is able to monitor the latest inventory movements as the system shows twenty latest inventory movements of various types such as purchase, sales, receive stock, return, adjustment, and damaged. The users can also be notified of any low-level products.

Staff Menu

- CUSTOMER & SALES
 - Manage Customers
 - Sales Transactions
- PRODUCTS & INVENTORY
 - Products
 - Inventory Management
- RECEIVE STOCK
 - Receive Stock
- PROCUREMENT
 - Create Purchase Order
- SUPPLIERS
 - Suppliers
- LAB
 - Lab Orders
- ACCOUNT
 - Profile Settings

Inventory Dashboard

Low Stock Items: 1 | Today's Movements: 0 | Total Inventory Value: RM 5,628.00

Low Stock Alert

Product ID	Product Name	Current Stock	Threshold	Action
2	Blue Light Glasses	1	5	Create PO

Inventory Movements

Product Name: Movement Type: From Date: To Date: Filter: Reset:

ID	Product	Type	Quantity	Date	Staff	Reference	Reason
11	Sunglasses	PURCHASE	60	2025-06-07 12:48	-	-	Stock receipt - PO-0006
10	ColourBlends - Hazel	PURCHASE	5	2025-06-07 12:42	-	-	Stock receipt - PO-0005

Fig. 13 Inventory Management interface

Sales operations are managed by staff members while administrator monitors and oversees them. Thus, the Figures 14-17 below shows the staff's perspective of the sales operations which include handling sales transaction, creating purchase orders, generating lab order, and recording the receipt of new stock received respectively. These operations are essential to the daily workflow of the optometry shop, and the system is designed to streamline these processes while ensuring accuracy and traceability.

Staff Menu

- CUSTOMER & SALES
 - Manage Customers
 - Sales Transactions
- PRODUCTS & INVENTORY
 - Products
 - Inventory Management
- RECEIVE STOCK
 - Receive Stock
- PROCUREMENT
 - Create Purchase Order
- SUPPLIERS
 - Suppliers
- LAB
 - Lab Orders
- ACCOUNT
 - Profile Settings

Register Sales Transactions

Select Customer:

Products: 1 RM0.00 RM0.00 Remove

Add Another Product

Apply Discount

Discount Type: Discount Value:

Payment Method

Payment Method: Payment Status:

Subtotal: RM0.00
Discount: -RM0.00
Total Price: RM0.00

Fig. 14 Sales transaction interface

Staff Menu

Create Purchase Order View Purchase Orders

Step 1: Select Supplier

Supplier A

Choose Supplier --

OptiCraft Labs

Supplier A

Supplier B

VisionLab Pro

Step 2: Select Products to Order

Select	Product Name	Current Stock	Low Stock Threshold	Suggested Qty	Order Quantity	Unit Price (RM)	Line Total
☐	blue spotted frame	17	10	20 Suggested		2.59	0.00
☐	ColourBlends - Hazel	33	10	20 Suggested		9.00	0.00
☐	Sunglasses	60	30	60 Suggested		40.00	0.00

Total Amount: RM 0.00

Email Notification
Send purchase order notification to supplier via email

Fig. 15 Purchase order interface

Staff Menu

Create New Lab Order + New Lab Order

Select Customer & Prescription *

Lab Provider *

Lens Type *

Frame Type *

Lens Coating

Priority

Estimated Cost (RM) *

Expected Completion Date *

Special Instructions

Any special requirements or notes for the lab...

Cancel Create Order

Fig. 16 Lab order interface

Staff Menu

Receive Stock Record Stock Receipt

Delivery Information

Delivery Date *

08/06/2025

Delivery Notes

Any delivery issues, driver notes, etc.

Items to Receive

Manual Entry Mode: Add items manually below. You can add multiple items.

Supplier *

Select Supplier --

Product *	Received *	Accepted *	Rejected	Unit Price *	Quality	Notes
Select Product --			0		Gr	

Fig. 17 Receive stock interface

Figure 18 below shows the interface of the generate module, where administrators can ask the system to produce reports by choosing the desired report type and specifying a date range. The generated report can then be printed or downloaded in PDF format. This feature enables efficient tracking and analysis of business performance over specified periods of time.

The screenshot displays a web application interface. On the left is a dark blue sidebar titled 'Admin Menu' with options: Manage Users, Manage Customers, Manage Suppliers, Manage Products, Inventory, Sales Operations (with a dropdown arrow), Reports, and Settings. The main content area is white and titled 'Select Report Parameters'. It contains a form with the following elements: a 'Report Type' dropdown menu with the text '-- Select Report Type --'; 'Start Date' and 'End Date' fields, each with a date picker icon and the placeholder 'dd/mm/yyyy'; and a green 'Generate Report' button at the bottom.

Fig. 18 *Generate report interface*

4.2 Testing

In the testing phase, functional testing and user acceptance testing (UAT) have been conducted to ensure that the developed system functions as intended and aligns with the requirements defined. In functional testing, test cases are used to test each module of the system. Tables 5-10 show the test cases done for the system's modules.

Table 5 *Test case for user management and login module*

Test Case ID	Description	Expected Result	Actual Result	Pass/Fail
M1-1	To check whether administrator can register a user account	The user should be able to create a user's account	The user has successfully created an account for user	Pass
M1-2	To check whether administrator can manage the created user account by editing user's details and role, and deleting the account	The user should be able to manage the created user account by editing its details and role, and deleting the account	The user has successfully edited a created user account's details and role and able to delete it	Pass
M1-3	To check if administrator can create user account with existing username or email	The user should not be able to create user account with existing username or email	The system returns an error to the user stating the username or email already exists	Pass
M1-4	To check if the system will automatically send a verification email to registered users	The system should automatically send a verification email to registered user	The system sends a verification email to registered user automatically	Pass
M1-5	To check if users can login into the system	The users should be able to login into the system	The users have successfully logged into the system	Pass
M1-6	To check if user can login with the wrong credentials	The user should not be able to log in with wrong credentials	The system restricted the login when an incorrect or no credentials were entered	Pass

Table 6 *Test case for customer and supplier information management module*

Test Case ID	Description	Expected Result	Actual Result	Pass/Fail
M2-1	To check whether users can register customer details	The users should be able to register customer details	The users have successfully registered customer details	Pass
M2-2	To check whether users can register existing customer	The users should not be able to register existing customer	The system returns an error when user register existing customer	Pass
M2-3	To check whether users can register customer details without eye prescription details	The users should be able to register customer details without eye prescription details	The users can register customer details without eye prescription details	Pass
M2-4	To check whether users can manage customer record by editing and deleting	The users should be able to edit and delete customer record	The users have successfully edit and delete customer record	Pass
M2-5	To check whether users can view customer's purchase history	The users should be able to view the customer's purchase history	The users have successfully view customer's purchase history	Pass
M2-6	To check whether administrator can register new supplier company	The administrator should be able to register new supplier company	The administrator has successfully registered a new supplier company	Pass
M2-7	To check whether administrator can fully manage supplier record by editing its details and deleting it	The administrator should be able to fully manage supplier record by editing its details and deleting it	The administrator is able to edit supplier record's details and delete it	Pass
M2-8	To check whether staff can edit the supplier record fully or partially	The staff should only be able to edit the supplier record partially	The staff is only able to edit the supplier record partially	Pass
M2-9	To check whether system allows for management of product relationship with supplier	The system should allow the management of the relationship between product and supplier	The system allows management of relationship between product and supplier	Pass

Table 7 *Test case for product and inventory management module*

Test Case ID	Description	Expected Result	Actual Result	Pass/Fail
M3-1	To check whether users can register product details	The users should be able to register product details	The users have successfully registered product details	Pass
M3-2	To check whether users can register existing product	The users should not be able to register existing product	The system returns an error when user register existing product	Pass
M3-3	To check whether users can manage product record by editing and deleting it	The users should be able to edit and delete product record	The users have successfully edit and delete product record	Pass
M3-4	To check whether the row of product will be highlighted if its quantity is below threshold	The system should highlight the product row that has quantity below its defined threshold	The system highlights the product row with quantity that is below its defined threshold	Pass
M3-5	To check if the users can view the relationship between product and its supplier	The users should be able to see the relationship between product and its supplier	The users have successfully viewed the relationship between product and its supplier	Pass
M3-6	The system should show list of low-stock products in inventory	The system shows the list of low-stock products in inventory	The system shows the list of low-stock products in inventory	Pass
M3-7	The staff should be able to access create purchase order form from the low-stock product list	The staff can access create purchase order form from the low-stock product list	The staff has successfully accessed the create purchase order form from the low-stock product list	Pass
M3-8	To check whether the system will show 20 latest inventory movements done by staff	The system should show 20 latest inventory movements done by staff	The system shows 20 latest inventory movements done by staff	Pass
M3-9	To check whether users can manually adjust inventory	The users should be able to manually adjust inventory	The users have successfully adjusted inventory manually	Pass

Table 8 *Test case for sales operations management module*

Test Case ID	Description	Expected Result	Actual Result	Pass/Fail
M4-1	To check whether staff can record a sales transaction	The staff should be able to record a sales transaction	The users have successfully recorded a sales transaction	Pass
M4-2	To check whether system generates invoice according to sales transaction	The system should generate invoice according to sales transaction	The system has successfully generated invoice for sales transaction	Pass
M4-3	To check whether system sends email to customer regarding sales transaction	The system should send email to customer about their purchase	The system has successfully sent an email to purchasing customer	Pass
M4-4	To check whether users can view sales transaction history	The users should be able to check sales transaction history	The users have successfully view the sales transaction history	Pass
M4-5	To check whether staff can perform purchase order	The staff should be able to perform purchase order	The staff has successfully performed purchase order	Pass
M4-6	To check whether system send email to supplier regarding purchase order	The system should send email to supplier regarding purchase order	The system has successfully sent an email regarding the purchase order	Pass
M4-7	To check whether users can view purchase order history	The users should be able to view purchase order history	The users have successfully viewed purchase order history	Pass
M4-8	To check if staff can perform lab order	The staff should be able to perform lab order	The staff has successfully performed lab order	Pass
M4-9	To check whether system send email to supplier regarding lab order	The system should send email to supplier regarding lab order	The system has successfully sent an email regarding the lab order	Pass
M4-10	To check whether users can view lab order history	The users should be able to view lab order history	The users have successfully viewed lab order history	Pass
M4-11	To check whether staff can perform receive stock operation	The staff should be able to perform receive stock operation	The staff has successfully perform receive stock operation	Pass

Table 9 *Test Case for generate report module*

Test Case ID	Description	Expected Result	Actual	Result
M5-1	To check whether system can generate report based on type chosen by administrator	The system should be able to generate report based on type chosen by administrator	The system has successfully generated report based on type chosen by administrator	Pass
M5-2	To check whether administrator can download or print generated report in PDF format	The administrator should be able to download or print generated report in PDF format	The administrator has successfully downloaded or printed the generated report in PDF format	Pass

Table 10 *Test Case for User Login and Registration Module*

Test Case ID	Description	Expected Result	Actual	Result
M1-1	To check whether system notifies users when product quantity is below threshold	The system should notify users when product quantity is below threshold	The system has successfully notified users when product quantity is below threshold	Pass
M1-2	To check whether users can access their notification list	The users should be able to access their notification list	The users have successfully accessed their notification list	Pass
M1-3	To check whether administrator can notify to staff to take actions when product quantity is below threshold	The administrator should be able to notify staff to take actions when product quantity is below threshold	The administrator is successfully able to notify staff to take actions when product quantity is below threshold	Pass

A UAT has been performed by selected end-users such as staff members and manager of Specku Optometry. These end-users were asked to perform several tasks using the system and rate its functionality and interface. Figures 19 and 20 are shown below to illustrate the result of the evaluation of user interface and system module functions respectively.

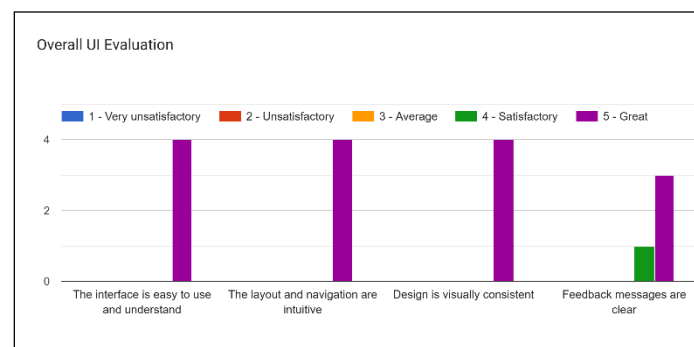


Fig. 19 Result for evaluation of user interface

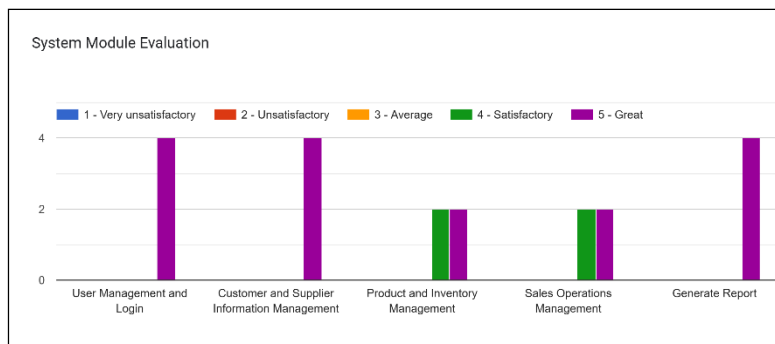


Fig. 20 Result for evaluation of system module functions

5. Conclusion

In conclusion, the proposed Optometry Sales and Inventory Management System (OSIMS) can help Specku Optometry to improve their inventory management and sales processes. Issues derived from the store's current use of hybrid methods – manually and using tools – such as human errors and inefficiencies in daily operations can be overcome by implementing the OSIMS into their business operations. The significance of OSIMS is in reducing the staff workload and minimizing human errors, while also increasing the efficiency of the store's inventory process. However, the system also has some limitations. It requires training for non-tech-savvy users to fully utilize its features, which may result in an initial learning curve. Additionally, data migration from existing records into the new system could also be time-consuming, especially if the data is unorganized. Despite these limitations, the OSIMS is a valuable tool to improve business operations and make the business run more smoothly. Finally, further research could be focused on exploring the integration of advanced features like payment gateway, predictive analytics and barcode or QR code scanning to further improve the system functionality.

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Conflict of Interest

Authors declare that there is no conflict of interests regarding the publication of the paper.

Author Contribution

*The authors confirm contribution to the paper as follows: **study conception and design:** Iman Insyirah Shah Rizal, Suziyanti Marjudi; **data collection:** Iman Insyirah Shah Rizal; **analysis and interpretation of results:** Iman Insyirah Shah Rizal; **draft manuscript preparation:** Iman Insyirah Shah Rizal, Suziyanti Marjudi. All authors reviewed the results and approved the final version of the manuscript.*

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