

SGP Inventory Management System

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Abstract

An inventory management system allows businesses to track their stocks, supplies and sales through an entire supply chain. The development of an inventory management system is necessary for SGP Store in order to resolve the inaccurate inventory tracking, stockouts and overstocking products, and to avoid the time-consuming manual processes. The objective of this project is to develop an inventory management system for SGP Store, with two targeted users, which are administrator and staff. The software development model that was used to execute this project is the famously used Waterfall model. Therefore, by developing this inventory management system, the SGP Store will be able to monitor their sales patterns, make well informed decisions, and react quickly to changes in the market.

1. Introduction

SGP Store is a very well-known store among Indians from various places and is located in Teluk Intan, Perak. Even though their business sales are great, the store has been taking care of their inventory manually since it was created. Which means that if a customer asks for a specific product, the staff at the store have to go into the store room to find the product that the customer wants, without knowing if the product is still available or not. Productivity in inventory management is essential for corporate success in the fast-paced retail industry. The well-known and customer-focused retail outlet SGP Store is not an exception to this rule. SGP Store has prospered and gained a reputation for providing a wide variety of products over years, but it is currently confronted with an urgent challenge: the requirement for a reliable and cutting-edge inventory management system. The manual tracking procedures now in use have shown to be insufficient and problematic, leading to inefficiencies and disparities that impede the expansion and financial success of the store. The goal of this project is to create a customized inventory management system that will help SGP Store overcome the obstacles that the store is facing and maintain its reputation as a reliable and effective retail location by enabling it to optimize inventory levels and streamline operations.

The manual inventory monitoring procedure used by SGP Store is inefficient and prone to errors, which causes serious operating problems. The primary problems include inaccurate inventory tracking caused by human error and outdated methods, leading to discrepancies between recorded and actual stock levels. Additionally, the store struggles with stockouts, which reduce sales and customer satisfaction, and overstocking, which incurs unnecessary costs and occupies storage space. Efficiency is further restricted by the time-consuming and error-prone features of manual inventory systems. SGP Store requires an automated inventory management system that optimizes stock levels, offers real-time data, and improves overall operational effectiveness in order to overcome these limitations.

The aim of this project is to develop an inventory management system for SGP Store. To achieve this, the objectives are to design the system, develop a web-based platform using HTML, CSS, JavaScript, and PHP, and test its functionality and user acceptance through thorough testing and user feedback.

The scope of this project encompasses the roles of the administrator and the staff at SGP Store. The administrator's key features include login/logout for user validation and access control; a dashboard providing a real-time overview of sales, inventory, and business operations; sales process optimization; product categorization; inventory management; media file uploads for product images; user management; and daily and monthly sales reports. For the staff, the key features include login/logout for access control; sales process optimization; and the generation of daily and monthly sales reports.

2. Related Work

Related work can divide into two parts. The first will be similar type of system, followed by existing related system. Therefore, in section 2.1, warehouse management system, which is a system that was similar to an inventory management system will be discussed. Besides that, in section 2.2, existing system will be discussed.

2.1 Warehouse Management System

Warehouse management system (WMS) is a necessary approach for every warehouse. An automated warehousing system provides less effort, more efficient, and reliable results compared to manual handled system [1]. WMS is designed to help reduce costs through effective warehouse processes [2]. The need for automating the warehouses arises from the fact that manual handling may cause human errors which may affect the warehouse utilization [3]. Some of the common features that can be seen in a warehouse management system will be inventory management, and sales management. Therefore, the section 2.1.1, and 2.1.2 will be discussing about the following features respectively.

2.1.1 Inventory Management

Good inventory management is a good financial management as well [4]. The need for efficient management of available resources in any business organizations requires no emphasis as every industrial undertaking is expected to be run efficiently [4]. The concept of inventory management involves optimization of resources available for holding stock of various materials [4].

The main goal of having inventory management as one of the features that can be found in a warehouse management system is because it can help the users in inventory tracking, which enables a business operator to avoid stockout or overstock products, save time, and also to provide efficient customer service.

Therefore, the inventory management feature and the SGP inventory management system are closely related, working together in order to guarantee a smooth and effective business operation. While the inventory management is only of the feature that can be seen in a warehouse management system, SGP inventory management system is all about inventory management only which is to resolve inaccurate inventory tracking, avoid stockouts and overstock, and avoid time-consuming manual process.

2.1.2 Sales Management

Sales management basically allows users to record information related to sales, products, and suppliers. It can also generate sales reports [5]. The goal of designing sales management features in a system is to make the users manage their own sales network through the internet, changing the traditional business model [6].

Also, the main goal of having sales management as one of the features that can be found in a warehouse management system is because it can help the users in sales tracking, which enables a business operator to track leads, potential customers, and deal improvement throughout the sales move.

Therefore, the sales management feature and the SGP inventory management system are closely related, working together in order to guarantee a smooth and effective business operation. As sales management mainly focuses on sales transaction only, the SGP inventory management system also needs to add the sales management features in order to reflect the real-time changes in stock, which is the goal of developing the SGP inventory management system.

2.2 Study of Existing Related System

Section 2.3 is to discuss about existing related system to SGP inventory management system. The main thing that will be discussed in here will be about the features that the existing systems have. The ideas that can be taken from the existing system to apply it in SGP inventory management system will also be discussed in this section. The existing system that was going to be discussed in this section will be Section 2.2.1 AutoCount POS (Point of Sale), Section 2.2.2 iRS, and finally Section 2.2.3 Zoho Inventory.

2.2.1 AutoCount POS (Point of Sale)

AutoCount POS (Point of Sale) is one of the software that was included in the AutoCount Accounting software package, created by Auto Count Sdn Bhd. AutoCount is a Malaysian startup company that provides accounting and inventory management software.

Some of the key features and aspects of AutoCount POS are sales transaction. Processing sales transactions, including generating sales invoices and receipts and managing several payment options, is made easier by the POS system. Inventory management is also one of the well-known features of AutoCount. Inventory management function in AutoCount POS include controlling item categories, updating product information, and keeping track of stock levels. This system also has the feature of barcode scanning. Where it supports barcode scanning to speed up sales and lower data entry mistakes. Besides that, user access control is also one of the features included in the system. This is one of the security features in the system to limit user access and permission so that only those with the proper authorization may carry out certain tasks within the system.

AutoCount POS system can be related to SGP inventory management system because both the systems have some similar features. Some of them are, sales transactions, inventory management and user access control.

Therefore, one of the features that can be found in AutoCount POS system that I would also like to apply in SGP inventory management system will be their offline mode feature. This feature helps a business to continue processing sales without any issues even in the scenario of a temporary internet connection blackout.

2.2.2 iRS

iRS software is a software that offers the most up-to-date, dependable IT technology and POS system solutions to help manage, expand, and advertise a business. It was very well known among business owners that, with iRS POS system, a business owner can be assured that managing their retail business will be much easier than before.

One of the key features of iRS software is inventory management. It is to track and manage the inventory levels in real-time. This feature also has the ability to update product information, monitor stock levels, and handle variations. Besides that, this software also has the feature of invoice and quotation generator. The key feature in iRS also includes sales report where this feature helps a business in generating of reports detailing sales performance and also gives an insight into revenue, product popularity, and other key metrics.

iRS software can be related to SGP inventory management system because of their features which are too similar to each other. Some of them are, inventory management, invoice generating, sales transaction and sales report.

Therefore, one of the features that can be found in iRS software that I would like to apply in SGP inventory management system will be the low-stock alert feature. This feature will automate alerts or notifications when inventory levels fall below a specified number. It helps in preventing stockouts and ensure timely restocking.

2.2.3 Zoho Inventory

Zoho inventory is a cloud-based inventory management system designed for small to medium-sized enterprises. With an advanced system like Zoho inventory, business owners can track every product in the shop and boost their sales.

One of the key features of product management, where the user can create and maintain a central product inventory that includes data regarding description, price, and cost. Sales management is also one of the key features of this system. This feature is to track sales and purchase orders, and create and manage invoices and bills. The key features of Zoho inventory also includes warehouse management, which helps a business by organizing inventory across multiple warehouses and also track stock movements between warehouses. Besides that, this system also has the mobile accessibility feature, where the inventory information can be accessed on mobile devices through the Zoho Inventory mobile application.

Zoho inventory system can be related to SGP inventory management system because of their features which are too similar to each other. Some of them are, product management, sales management, stock control, and invoice generator.

Therefore, one of the features that can be found in Zoho inventory system that I would like to apply in SGP inventory management system will be the low-stock alert feature. This feature will automate alerts or notifications when inventory levels fall below a specified number. It helps in preventing stockouts and ensure timely restocking.

2.3 Comparison Table of the Existing Systems

The Table 1 below shows the comparison Table of the existing systems, which are AutoCount POS, iRS, Zoho Inventory and SGP Inventory Management System. The features that will be compared in the Table are login and logout, dashboard, products, categories, media files, sales, scan barcode, generate report, system users, and lastly it will be the track real time inventory stock level. As can be seen in the below Table, most of the features can be seen in the existing systems, except for AutoCount POS system and iRS system not having the dashboard, categories, and media files as their features in their system, and Zoho Inventory system not having the media files, scan barcode, and system users as their features in their system.

Table 1 Comparison table of existing systems

Features/System	AutoCount POS	iRS	Zoho Inventory	SGP Inventory Management System
Login and logout	√	√	√	√
Dashboard	X	X	√	√
Products	√	√	√	√
Categories	X	X	√	√
Media files	X	X	X	√
Sales	√	√	√	√
Scan barcode	√	√	X	X
Generate report	√	√	√	√
System users	√	√	X	√
Track real time inventory stock level	√	√	√	√

3. Methodology

The Waterfall Model is a static model that completes one task at a time and approaches systems development linearly and sequentially [7]. The Waterfall Model is the oldest software development model and the best-known one. The Waterfall Model consists of several phases, each building upon the previous one, with progress flowing in a single direction – like a waterfall [8]. This model provides a structured and systematic approach, making it simpler to manage and understand the project progress. However, it might not be adaptable to accommodating changes that can arise throughout development. The phases typically included in the Waterfall Model are requirement gathering, system design, implementation, testing, and maintenance [8]. The Fig. 1 shows the Waterfall Model [9].

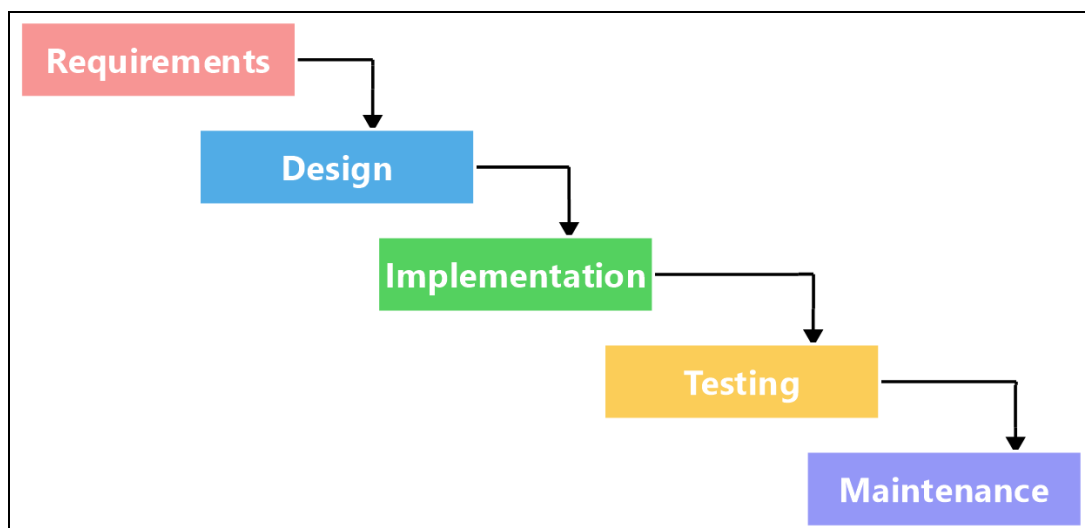


Fig. 1 Waterfall Model

Table 2 below shows the explanation of the tasks that were done in each step using the waterfall model approaches. The five phases of this process are requirements, design, implementation, testing, and maintenance. The table also includes the durations and the project timeline in their entirety.

Table 2 Specifications of activities to be carried out in each phase

Phases	Task / Activities	Deliverables	Tools
Requirements	<ul style="list-style-type: none"> - Identify the system requirements - Analyse requirements through the data collection method, by interviewing the person in-charge of SGP Store to identify their requirements - Project timeline – Gantt Chart 	<ul style="list-style-type: none"> - Proposal - Gantt Chart 	<ul style="list-style-type: none"> - Microsoft Words - Project Libre
Design	<ul style="list-style-type: none"> - Design the user interface - Design the database - Design the Data Flow Diagram (DFD) and Entity Relationship Diagram (ERD) 	<ul style="list-style-type: none"> - Context Diagram (CD) - Data Flow Diagram (DFD) - Entity Relationship Diagram (ERD) - Schema Table - Wireframes 	<ul style="list-style-type: none"> - Lucidchart.com - Wireframe.cc
Implementation	Convert the designated interface design to an actual code	Coding to execute system	<ul style="list-style-type: none"> - Adobe Dreamweaver - XAMPP Control Panel
System Testing	Alpha testing	Test the functionalities and acceptance test	<ul style="list-style-type: none"> - Adobe Dreamweaver - XAMPP Control Panel
Maintenance	Correct the errors and upgrade the system according to the current trends and needs	Make sure the system is in good quality and ready to use	<ul style="list-style-type: none"> - Adobe Dreamweaver - XAMPP Control Panel

4. Analysis and Design

Analysis and design cover the analysis and design phase of a system's development, which took place before the implementation phase. It discusses a comprehensive system specification procedure, model definition, data flow diagram (DFD), sketches, and architecture. The system's operation is demonstrated by its architecture, which includes interface and database design, reflecting the data stored in the system.

4.1 DFD Context Diagram (DFD CD)

DFD CD basically gives a comprehensive overview of the system and is frequently used to establish a clear understanding of the system's context and the scope at the beginning of the system development process. Fig. 2 shows the DFD CD of SGP Inventory Management System. As shown the figure above, there is a total of two users, administrator and staff. It also shows the interaction between the system and the users of the system.

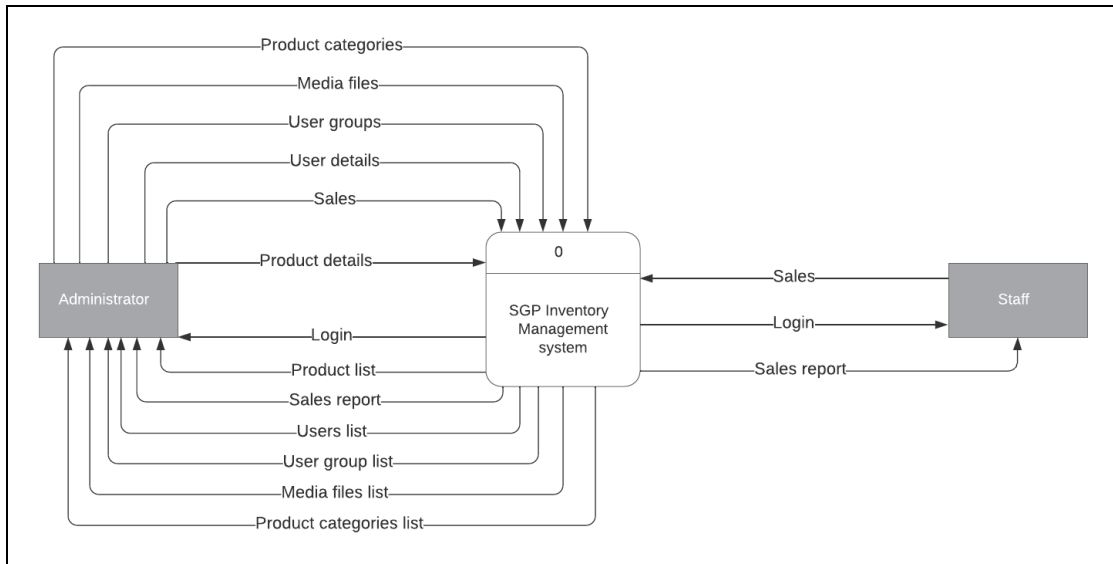


Fig. 2 Data Flow Diagram Context Diagram (DFD CD)

4.2 DFD Level 0

The level 0 data flow diagram of SGP Inventory Management System can be seen in Fig. 3. The relationships between each process and entities at level 0 of the data flow diagram are depicted below in the figure.

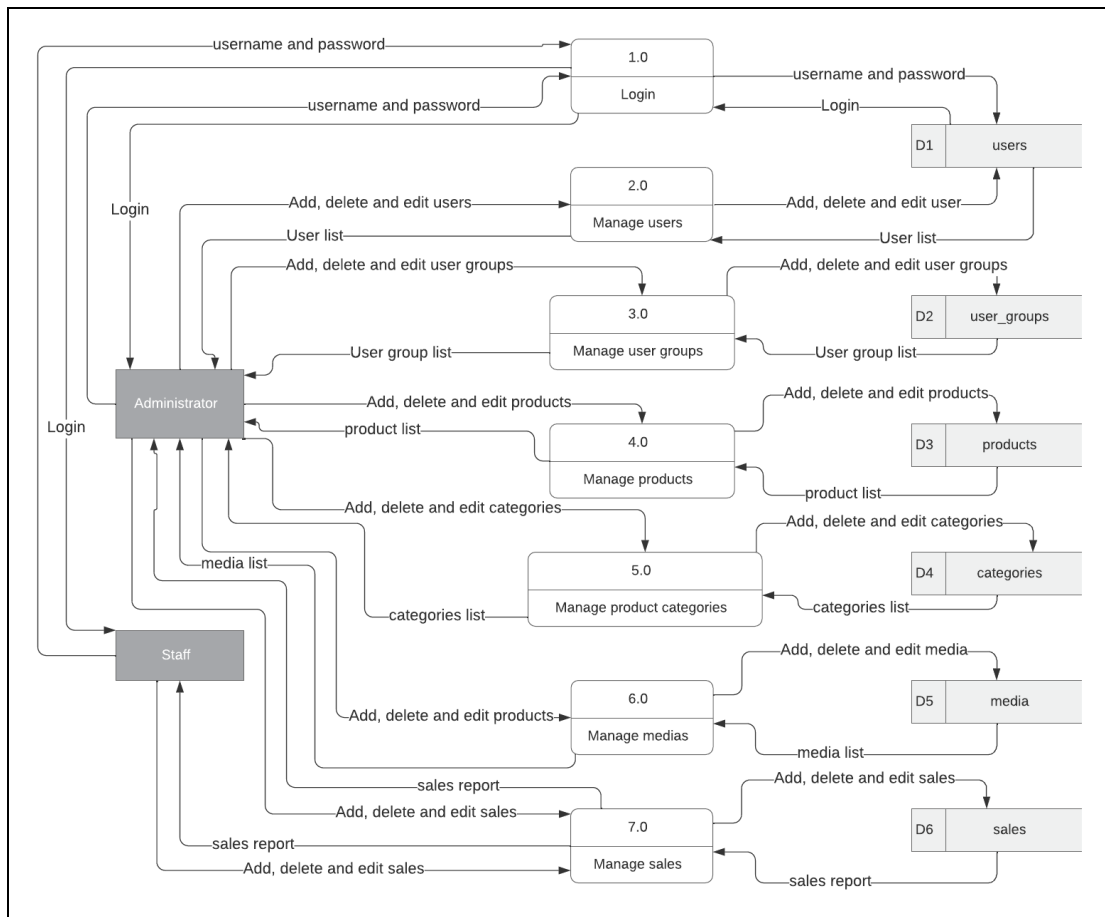


Fig. 3 Data Flow Diagram (DFD) Level 0

4.3 Entity Relationship Diagram (ERD)

An entity diagram also known as an ERD or E-R diagram, is a methodology that described how the data of a system is stored at a high level of detail. Therefore, the Fig. 4 below shows the ERD of SGP Inventory Management System.

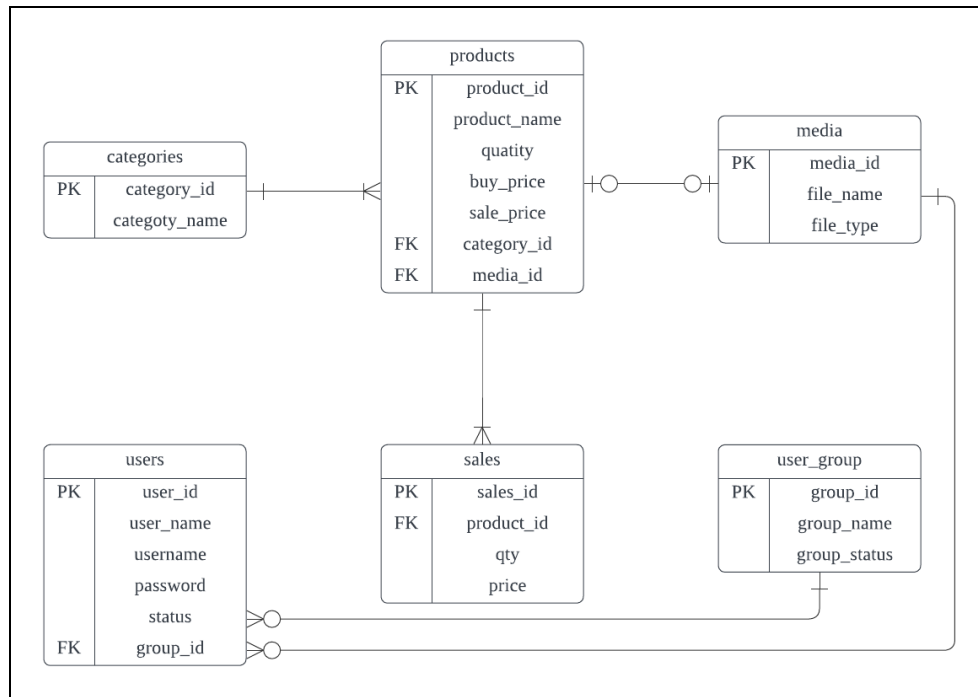


Fig. 4 Entity Relationship Diagram (ERD)

5. Implementation and Testing

This section discusses about the implementation and testing of SGP Inventory Management System. The system implementation and testing phases are crucial in the development process because it enables us to evaluate whether the system's features fulfil the users' needs. Additionally, coordinating the system flow is essential so that the modules in the design and analysis phases can function optimally. To ensure that the project functions well once the design is implemented, the SGP Inventory Management System is developed and tested as intended in this section.

5.1 System Implementation

The SGP Inventory Management System was developed as a web-based system using HTML, CSS, JavaScript, and PHP. The system's database was created with MySQL and managed via phpMyAdmin. The user interface includes modules for login, dashboard, user management, categories, products, media files, sales, sales report.

5.1.1 Login

In the login interface, the user has to enter their username and password in order to log into the SGP Inventory Management System. Only the username and password that matched will be able to access the system. Therefore, Fig. 5 shows the login interface of SGP Inventory Management System.

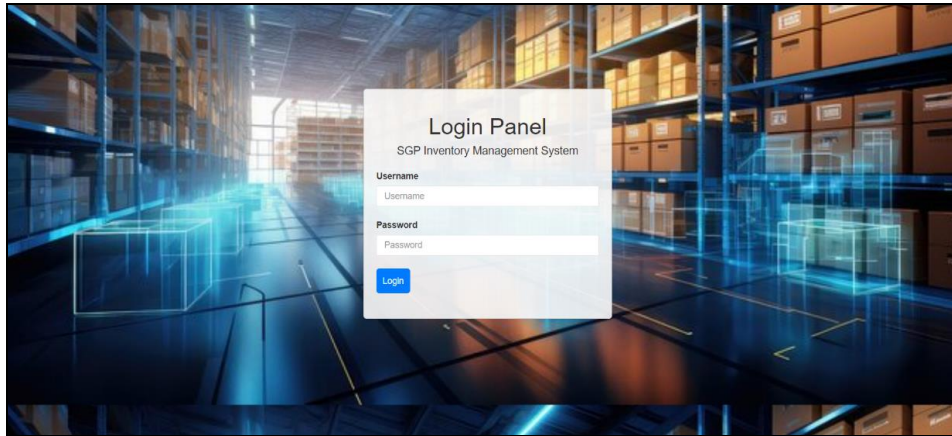


Fig. 5 Login Interface

5.1.2 Dashboard

Fig. 6 shows the dashboard interface for the administrator. The dashboard interface is mostly used to show the statistic and recent activities that took place within the system. In SGP Inventory Management System, the dashboard shows how many total users are there in the system, total categories, total products and also total sales that has taken place in the system. There are also three tables in the dashboard where it shows the highest selling product of SGP Store, latest sales and also recently added products.

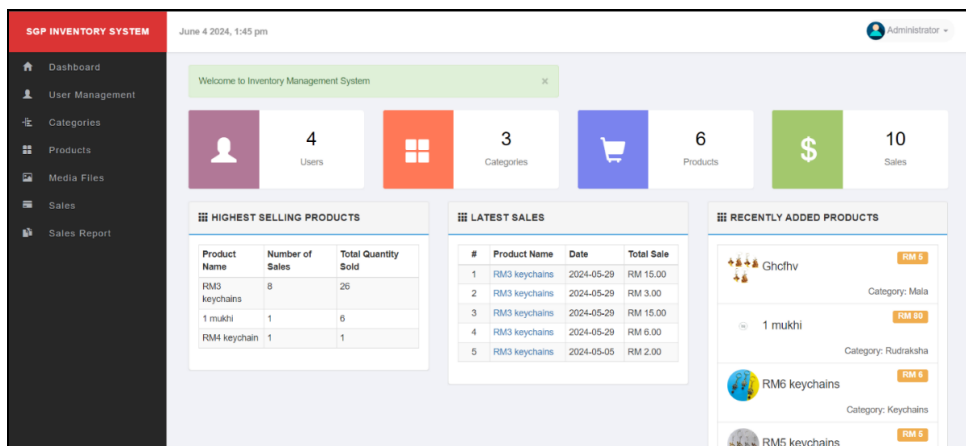


Fig. 6 Dashboard Interface

5.1.3 User Management

Under the User Management module, there is two more sub-modules which are, manage groups and manage users. Fig. 7 below shows the interface of Manage Group, which is under the User Management module. This interface can be used to view the list of groups in the system, add a new group, edit the existing group and also delete the existing group. Whereas, Fig. 8 shows the Manage Users interface, which is also under the User Management module. The list of users of the system can be seen in this interface with their name, username, user role, status, and also their last login date and time. Besides that, this interface can also be used to add a new user into the system, edit the information of existing users, and delete the existing users.

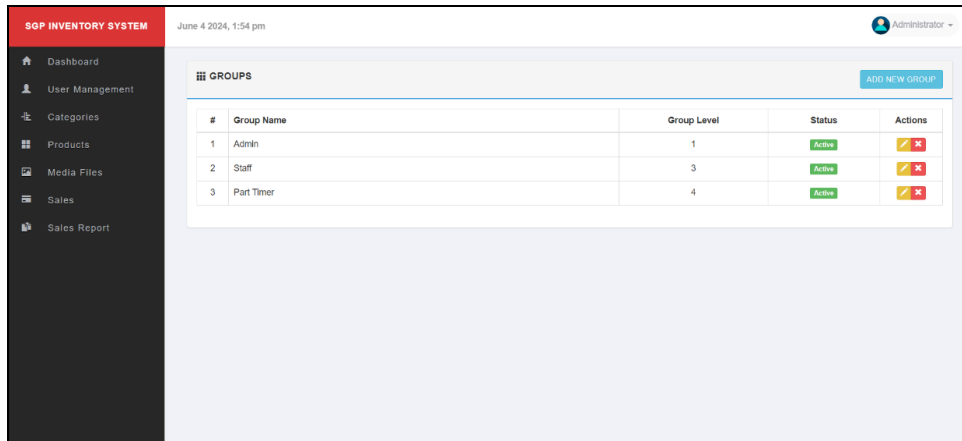


Fig. 7 Manage Groups Interface

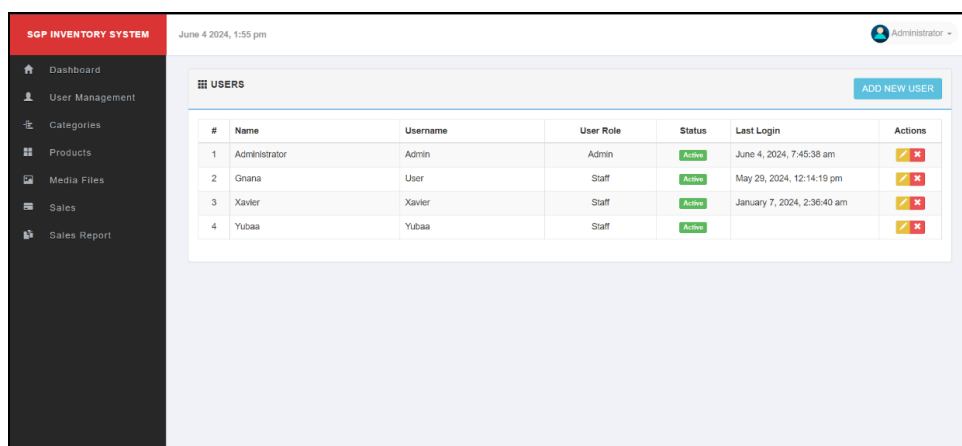


Fig. 8 Manage Users Interface

5.1.4 Categories

Fig. 9 shows the categories interface. The list of categories can be seen in this interface. Besides that, this interface can also be used to add a new category into the system, edit the existing categories and also delete the existing categories.

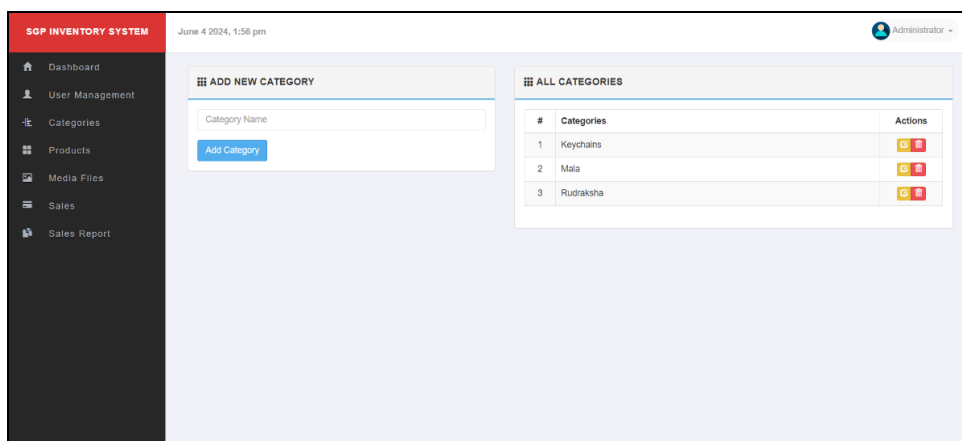


Fig. 9 Category Interface

5.1.5 Products

There are two sub-modules under the product module, which are manage products and add products. Fig. 10 below shows the interface of manage products, which is under the products module. This interface can be used to view the list of products in the system, add a new product, edit the existing product, restock products and also delete the existing products. Whereas, Fig. 11 below shows the interface of add products, which is under the products module. In this interface, the user has to enter the product name, select the product category (from the drop-down menu), select the product photo from the drop-down menu), quantity of the product, buying price of the product and also the selling price of the product in order to add a new product in the system.

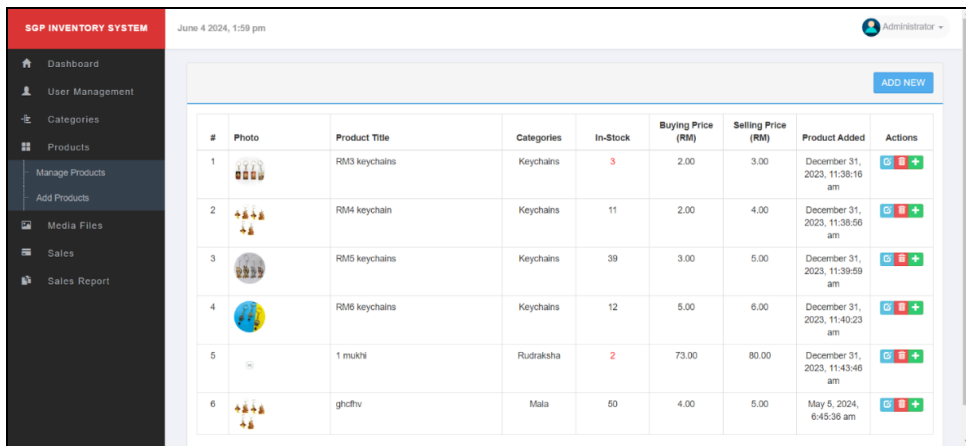


Fig. 10 Manage Products Interface

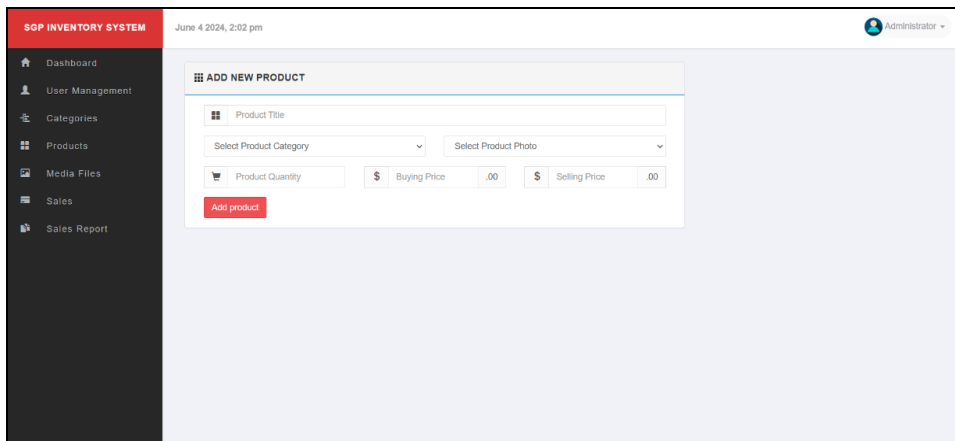


Fig. 11 Add Products Interface

5.1.6 Media Files

Fig. 12 shows the media files interface. The list of media files can be seen in this interface. Besides that, this interface can also be used to upload a new media into the system, edit the existing medias and also delete the medias.

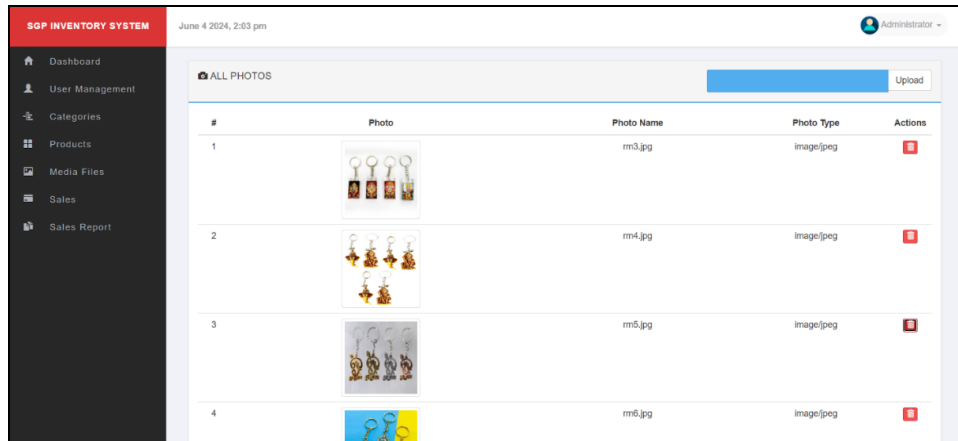


Fig. 12 Media Files Interface

5.1.7 Sales

There are two sub-modules under the sales module, which are manage sales and add sales. Fig. 13 below shows the interface of manage sales, which is under the sales module. This interface can be used to view the list of sales that has taken place in the system, add a new sale, edit the existing sales, and also delete the existing sales. Fig. 14 below shows the interface of add sales, which is under the sales module. In this interface, the user has to enter the product name in the search column and click the 'Find It' button in order to search the specific product and add it into the sales. After adding the product, the price of the product, quantity of the product, total price, and date will show up in a table form. The user can change the price and the quantity of the product according to their wish and click on the 'Add Sales' button in order to add the sales in the system.

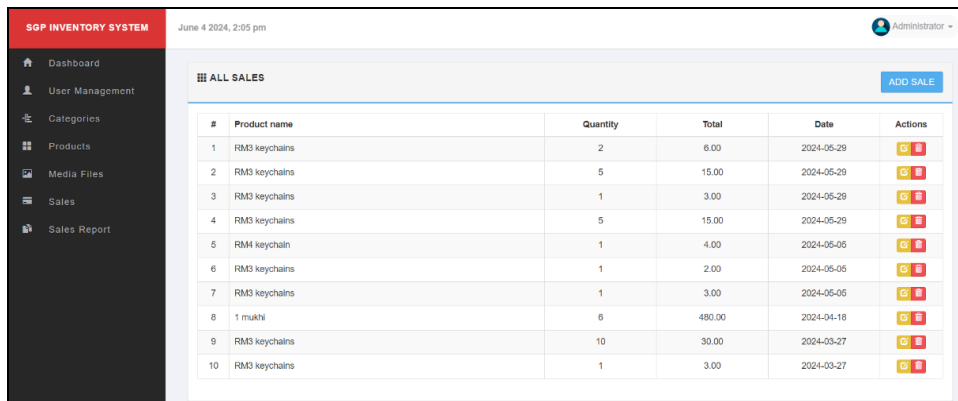


Fig. 13 Manage Sales Interface

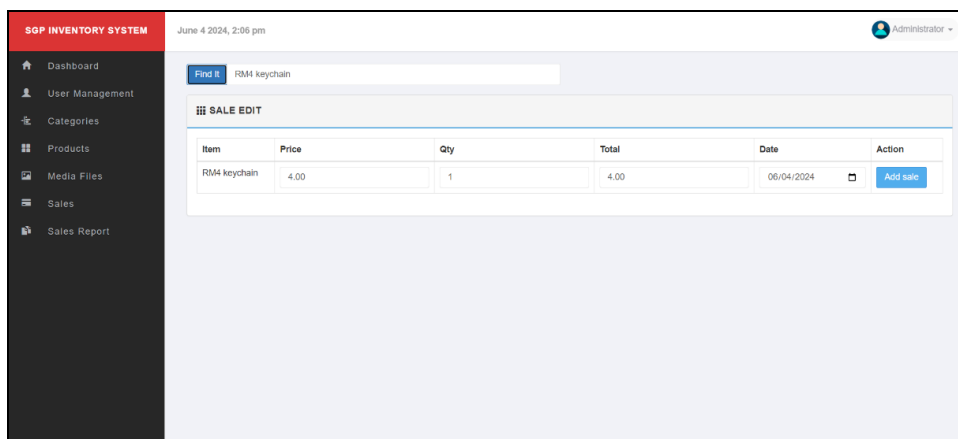


Fig. 14 Add Sales Interface

5.1.8 Sales Report

There are three sub-modules under the sales report module, which are sales by date, monthly sales and daily sales. Fig. 15 below shows the interface of sales by date, which is under the sales report module. The user will have to select dates in order to get the sales report according to the dates that the wanted. Fig. 16 below shows the interface of monthly sale, which is under the sales report module. This interface will show the sales list that took place in the system according to the month. Whereas, Fig. 17 below shows the interface of daily sales, which is under the sales report module. This interface will show the sales list that took place in the system on the day.

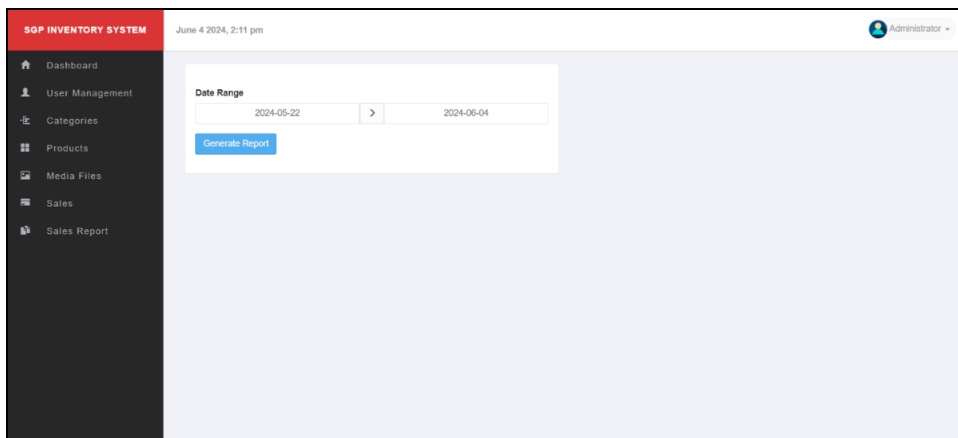


Fig. 15 Sales by Date Report Interface

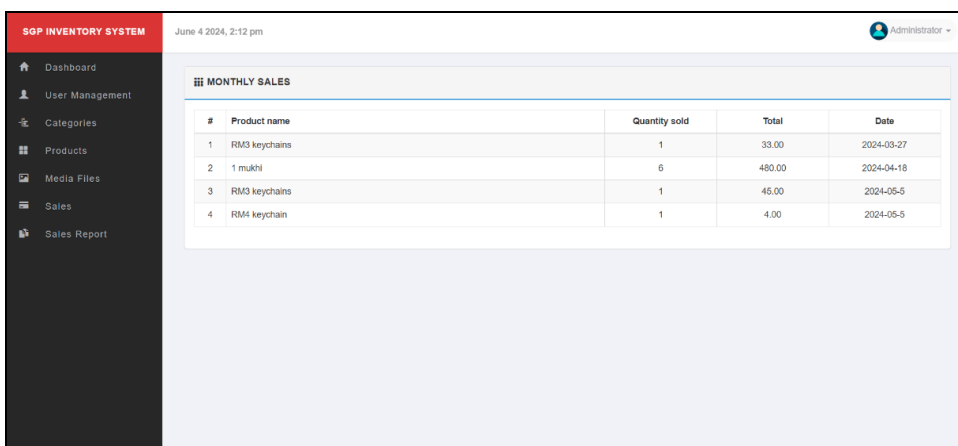


Fig. 16 Monthly Sales Report Interface

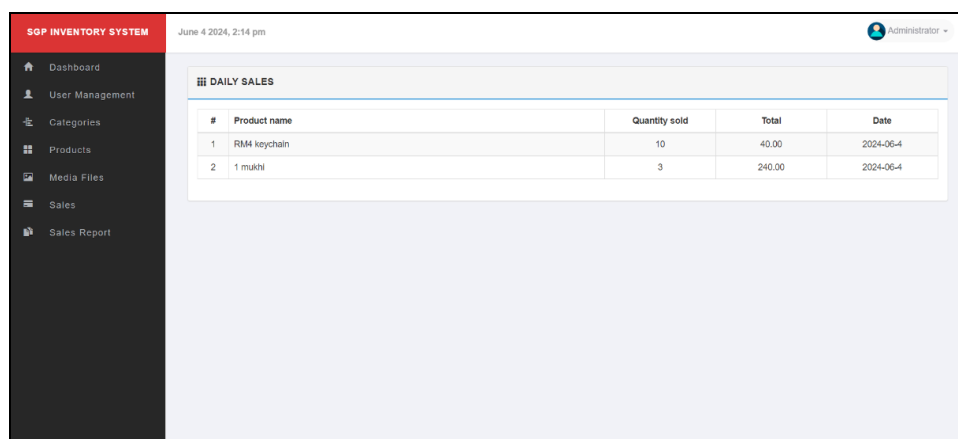


Fig. 17 Daily Sales Report Interface

5.2 System Testing

System testing is a crucial stage in a software development lifecycle, assessing the entire integrated system's compliance with specified requirements. It evaluates the system's functionality, performance and reliability in real-world conditions, ensuring all components in the system works and interacts correctly. This system testing enhances the product quality and customer satisfaction by ensuring robustness and readiness for deployment.

5.2.1 System Functionality Testing

Functional testing is a sort of software testing in which the software system is evaluated against functional requirements. Each function of a module will be tested during functional testing by providing appropriate value, determining the output, and comparing the actual output of the expected value. As a result, functional testing was undertaken to ensure that the SGP Inventory Management System corresponds to the functional requirements

Table 3 List of Test Cases

Module	Test Case ID	Description	Expected Result
Login	TC_Login_01	Verify login with valid credentials	User is redirected to the dashboard and sees a welcome message
	TC_Login_02	Verify login with invalid credentials	User sees an error message indicating invalid credentials
	TC_Login_03	Verify logout functionality	User is redirected to the login page
	TC_Login_04	Verify login with blank username and password	User sees an error message indicating that the fields cannot be blank
Dashboard	TC_Dashboard_01	Verify that the dashboard loads successfully	Dashboard loads without errors
	TC_Dashboard_02	Verify that the dashboard displays real-time data	Dashboard displays up-to-date key performance indicators and relevant data
	TC_Dashboard_03	Verify that the key performance indicators are accurate	KPIs displayed on the dashboard match the expected data
Sales	TC_Sales_01	Verify adding a new sale	Sales is added successfully and appears in the sales list
	TC_Sales_02	Verify editing an existing sale	Changes to the sales are saved and reflected correctly
	TC_Sales_03	Verify deleting a sale	Sales is removed from the sales list
	TC_Sales_04	Verify the sales process workflow	Sales process completes without errors, and data is accurate
Categories	TC_Categories_01	Verify adding a new category	New category is added successfully and appears in the category list
	TC_Categories_02	Verify editing an existing category	Changes to the category are saved and reflected correctly
	TC_Categories_03	Verify deleting a category	Category is removed from the category list
	TC_Categories_04	Verify viewing all categories	All categories are displayed correctly
	TC_Products_01	Verify adding a new product	Product is added successfully and appears in the product list

Products	TC_Products_02	Verify editing an existing product	Changes to the product are saved and reflected correctly
	TC_Products_03	Verify deleting a product	Product is removed from the product list
	TC_Products_04	Verify checking the inventory level of a product	Inventory level of the product is displayed correctly
	TC_MediaFiles_01	Verify uploading a product image	Image is uploaded successfully and appears in the product's media list
Media Files	TC_MediaFiles_02	Verify deleting a product image	Image is removed from the product's media list
	TC_MediaFiles_03	Verify viewing uploaded product images	Uploaded images are displayed correctly
	TC_UserManagement_01	Verify adding a new user	New user is added successfully and appears in the user list
User Management	TC_UserManagement_02	Verify editing and existing user	Changes to the user are saved and reflected correctly
	TC_UserManagement_03	Verify deleting a user	User is removed from the user list
	TC_UserManagement_04	Verify viewing all users	All users are displayed correctly
	TC_SalesReport_01	Verify generating a daily sales report	Daily sales report is generated and data is accurate
Sales Report	TC_SalesReport_02	Verify generating a monthly sales report	Monthly sales report is generated and data is accurate
	TC_SalesReport_03	Verify the accuracy of the sales report data	Sales report data matches the expected data from sales records

5.2.2 User Acceptance Testing

User Acceptance Testing (UAT) is a kind of testing that determines whether software can perform real-world tasks and fulfil development objectives. End-users are given the opportunity to engage with software prior to its official release to check if any features have been missed or if there are defects in it. SGP Inventory Management System was tested through UAT which allows users to interact with the system before it is formally established.

Table 4 User Acceptance Testing Evaluation

No.	Question	Scale					Total
		1	2	3	4	5	
1	How user-friendly is the interface of the SGP Inventory Management System?					4	4
2	How easy is it to navigate through different pages of the system?				1	3	4
3	How well does the system track inventory accurately?					4	4
4	How easy is it to complete tasks within the system?					4	4
5	How clear and helpful are the error messages?				1	3	4
6	How easy was it to learn how to use the system?					4	4
7	How accurate and efficient is the search functionality?					4	4
8	How clear and understandable are the terminologies that was used in the system?					4	4
9	How responsive is the system to user inputs?					4	4
10	Overall, how satisfied are you with the system's functionality?					4	4

6. Conclusion

Overall, the Inventory Management System for the SGP Store met the objectives established at the outset. This system successfully achieved its primary goal of creating an accessible web-based inventory management system using HTML, CSS, JavaScript and PHP. The development process followed a structured methodology, encompassing planning, analysis, design, and implementation phases. Each stage included activities aimed at enhancing the system's development, such as conducting meetings and surveys, comparing with existing methods, and consulting relevant journals and books. Upon completion of the testing phase, which involved selecting target users to analyse the system, the results were documented and suggestions were made based on user feedback. Although the SGP Inventory Management System offers numerous noteworthy benefits, it also has certain drawbacks that impact its overall effectiveness.

The SGP Inventory Management System offers several widely recognized benefits, including real-time visibility of current stock status, eliminating the need for manual inventory counts and reducing discrepancies. It centralizes all inventory data, allowing for quick access and efficient management. By automating several processes, the system provides accurate inventory tracking based on real-time data, reducing human error and ensuring timely stock updates. Additionally, it offers insights into inventory levels, trends, and costs, aiding in more informed management decisions.

Like any other system, the SGP Inventory Management System has limitations that became evident during its development. These limitations include the system's inventory tracking module, while efficient in monitoring inventory levels and generating reports, the system does not support automated reordering. As a result, restocking must still be initiated manually. Another drawback is the absence of advanced analytics features. This means the system does not include functionalities for detailed trend analysis and predictive stock management, which could further enhance inventory control and decision-making.

Based on the testing conducted, several suggestions for improvement have been identified. These proposals include integrating automated reordering features to streamline the restocking process. By implementing this enhancement, the system can automatically generate purchase orders when inventory levels fall below predefined thresholds, reducing manual intervention and ensuring timely replenishment. Besides that, an advanced analytics capabilities for detailed trend analysis and predictive stock management can also be introduced. This improvement will provide valuable insights into inventory patterns, helping to optimize stock levels and improve decision-making processes.

Therefore, it is safe to say that the SGP Inventory Management System has meet the goals and also satisfies the user demands, demonstrated by its functionality and test results. Future improvements will ensure the system meets user demands and maintain the quality and performance of the system through further ongoing studies and research.

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Conflict of Interest

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

Author Contribution

This journal requires that all authors take public responsibility for the content of the work submitted for review. The authors confirm contribution to the paper as follows: **study conception and design:** Gnana Sri D/O Arumugam, Nurul Aswa Binti Omar; **data collection:** Gnana Sri D/O Arumugam; **analysis and interpretation of results:** Gnana Sri D/O Arumugam, Nurul Aswa Binti Omar; **draft manuscript preparation:** Gnana Sri D/O Arumugam. All authors reviewed the results and approved the final version of the manuscript.

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Appendix A

Process 1.0 Login:

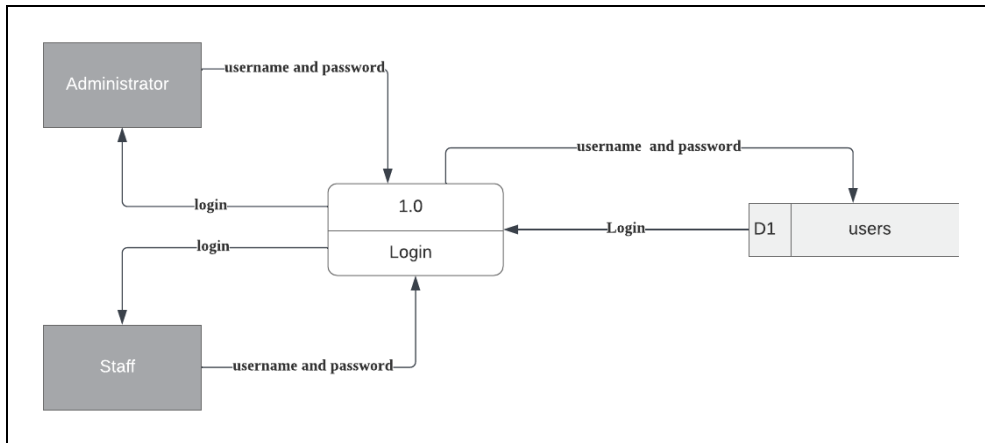


Fig. 18 Process 1.0 Login

Process 2.0 Manage Users:

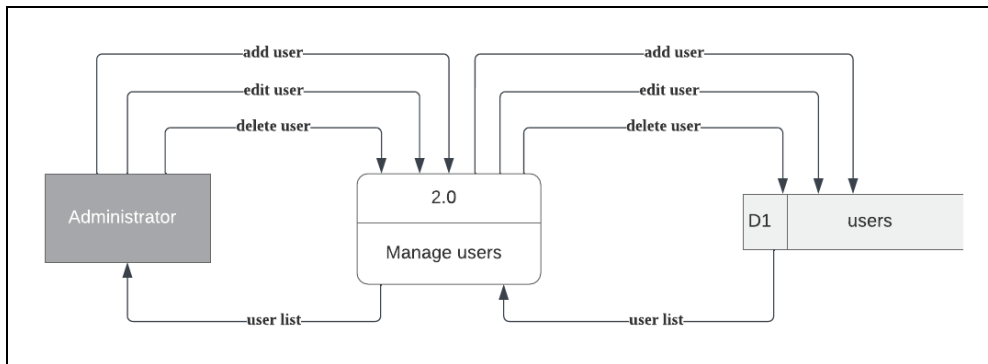


Fig. 19 Process 2.0 Manage users

Process 3.0 Manage User Groups:

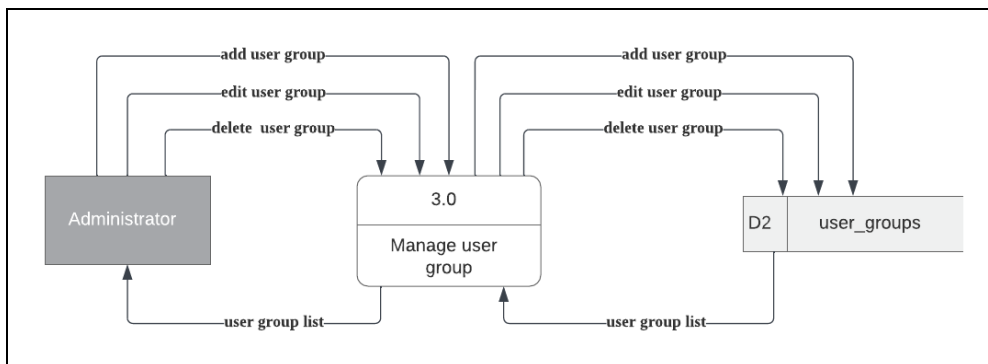


Fig. 20 Process 3.0 Manage user groups

Process 4.0 Manage Products:

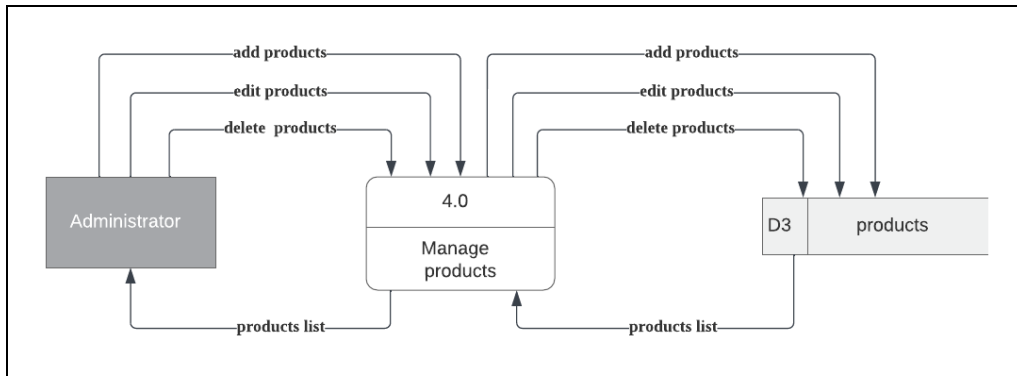


Fig. 21 Process 4.0 Manage products

Process 5.0 Manage Categories:

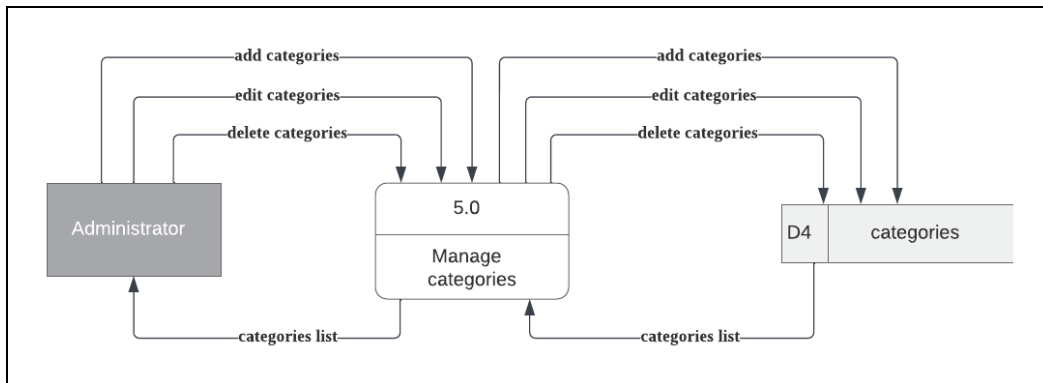


Fig. 22 Process 5.0 Manage categories

Process 6.0 Manage Medias:

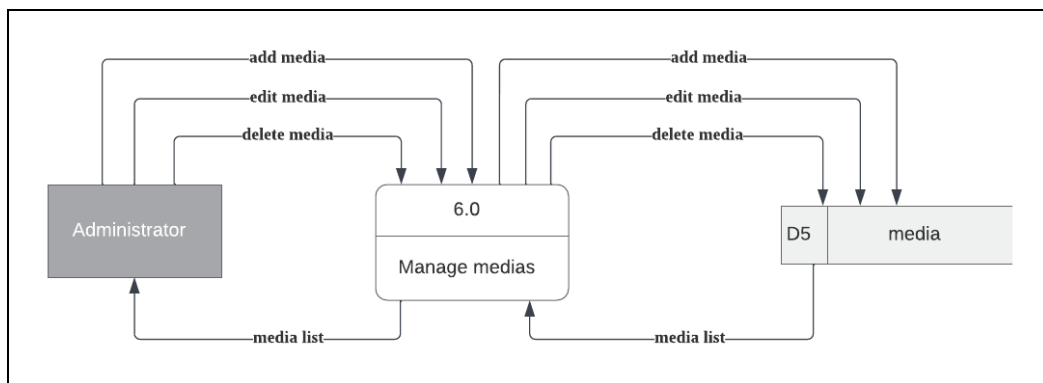


Fig. 23 Process 6.0 Manage medias

Process 7.0 Manage Sales:

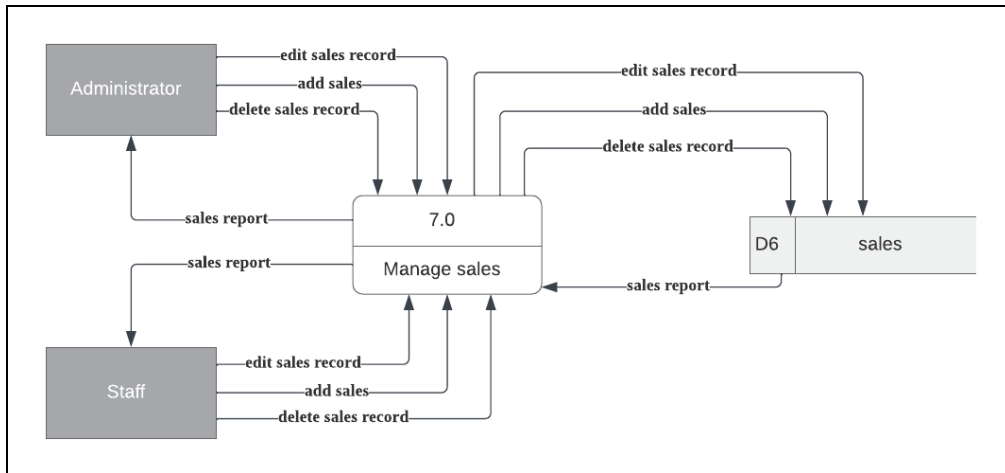


Fig. 24 Process 7.0 Manage sales