FUDMA Journal of Sciences (FJS)
ISSN online: 2616-1370
ISSN print: 2645 - 2944
Vol. 6 No. 5, October, 2022, pp 57 - 65
DOI: https://doi.org/10.33003/fjs-2022-0605-1064

DEVELOPMENT OF A WEB-BASED PLATFORM FOR AUTOMATING AN INVENTORY MANAGEMENT OF A SMALL AND MEDIUM ENTERPRISE

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ABSTRACT

Nowadays, it has been noticed that the majority of businesses manually record and maintain their inventory data in spreadsheets with little to no technological innovation. This has many drawbacks in our contemporary society because it has been demonstrated that successfully monitoring inventories is difficult. This manual method of record keeping was labor-intensive, expensive, and error-prone, and it was unable to guarantee that the inventory remained current due to oversight and internal shrinkage. This study investigates the problems with manual inventory management and creates computerised inventory management software to solve those issues. By creating a computerised inventory management system to help storekeepers make decisions about their stocks, it suggests solutions to the current problems by keeping the records, tracking employee salaries, and updating sales and transactions. To be user-friendly, to accommodate all user requirements, and to adapt to future changes, the system was divided into various modules. The key ideas of the analysis and design methodology for the suggested system were outlined, and they were contrasted with those already in use. They also described how the system was designed and put into use using the MySQL database. The implemented methodology is illustrated with a case study. It is suggested that the computerised system developed in this study replace the manual system of stock recording and processing to make life easier for people, increase effectiveness, efficiency, and improve service delivery. Adopting this software will also reduce unnecessary stress, keep the account current, and simplify their work.

Keywords: Computerized, Inventory Management, Account, Small and Medium Enterprise

INTRODUCTION

An inventory control system is a process of managing inventory to satisfy customer demand at the lowest cost and with the least amount of investment. One of the fundamental issues facing small and medium-sized businesses is inventory management (Erameha and Odoh, 2021). The process of effectively managing the continuous flow of units into and out of an existing stock of goods is known as inventory management. To prevent the inventory from rising too high or falling too low and jeopardising the business's operations, this process typically entails controlling the transfer of units (Abisoye et al., 2013). One of the most important management functions in an organisations is inventory control. This is because inventory control helps organisations internally by facilitating continuous production, streamlining operations, and improving customer service (Singh, 2013).

An inventory control system is a software program that supports companies in managing their inventory. As products move through manufacturing and sales, an inventory management system keeps track of every aspect of a company's inventory (Erameha and Odoh, 2021). This system handles ordering, receiving, storing, tracking, and reordering. The process also involves monitoring customer orders, shipping, costs, stock, and sales. Data will be maintained in databases using web-based inventory control systems, which help to organize entered data for fast recovery (Chassiakos and Sakellaropoulos, 2008). These web-based data management systems coordinate information over the internet or company intranet using a web browser (Liu and Xu, 2001).

A trustworthy and efficient inventory control system is essential for managers to cut costs and maintain their competitiveness (Oballah et al., 2015). The fine lines between replenishment lead time, carrying costs of inventory, asset management, inventory forecasting, inventory valuation, inventory visibility, future inventory price forecasting, physical inventory, available physical space for inventory, quality management, replenishment, returns and defective goods, and demand forecasting are all included in the scope of inventory management, according to Abisoye et al. (2013). A successful inventory control programme also takes seasonal variation, shifting usage patterns, monitoring theft, and purchasing goods commensurate with demand into account.

The estimation of the cost of managing inventory is a first step in the inventory control process. According to Priniotakis and Argyropoulos (2018), the difficulty of effective inventory management is to maintain an upward trend in sales while keeping the investment at the lowest level necessary for adequate customer service. Controlling inventory is necessary to make sure that the company has the right products on hand in order to avoid stockouts, prevent shrinkage (spoilage/theft), and provide accurate accounting. At present, inventory costs typically range from 4% to 90% of total business expenses (Nyabwanga and Ojera, 2012). The manual nature of the current inventory management system, however, makes it inefficient and inaccurate to keep track of the stock of goods in the store. The sales staff must keep track of each item's stock level as part of the inventory updating process. A purchase order is created or stock status reports are written whenever a stock level reaches an unacceptably high or low point. Time wastage, difficulty calculating the total number of items sold, an excessive amount of paperwork, disasters, and difficulty updating each time a change is made are additional issues with using this manual method. Consequently, it is necessary to automate the inventory system.

Typically, the web-based inventory management system is created for a small- to medium-sized business. Each organisation has had its own stock management strategy or method for a very long time. Numerous researchers have also completed a number of case studies on small- and medium-sized businesses and come to the conclusion that a web-based

inventory management system should be implemented for a business to be successful and profitable (Chin et al., 2009). Previous literature has focused on developing inventory management systems using various strategies. Jayanth et al. (2016) created an inventory management system (IoT) using the Internet of Things. The system was created using an ultrasonic transducer and a web-connected processing device (like a Raspberry Pi). The highly technical equipment used made it difficult for employees to perform their duties effectively. Additionally, Muyumba and Phiri (2017) developed a web-based inventory control system for the Zambia Air Force using cloud architecture and barcode technology. This system uses barcoding to identify objects. This system's limitation is that it can only recognise things next to each other. They used a Microsoft Excel spreadsheet to record inventory-related data was reported in another study by John et al. (2015) on the inventory management practices and operational performance of selected flour mills in Nigeria. However, getting access to specific inventory data and demand information was challenging. Therefore, the inventory management system will work effectively if some of these flaws are fixed.

As a result, the goal of this study is to create a web-based platform that will automate inventory management for small and medium-sized businesses. All supply orders will be handled by the software, which will also save time and energy by making complex processing and inventory sales reports accessible and accountable.

MATERIALS AND METHODS

Software Development Methodology

The Iterative Waterfall Model was applied to accomplish the study's objectives, as shown in Figure 1. This model was selected because it is simple to comprehend and apply. The model also offers feedback pathways for error correction, both now and when discovered at a later stage of a phase (Adetokunbo and Adenowo, 2013). Even though mistakes are unavoidable, it is preferable to find them as soon as they happen. If so, fixing the bug might take less work. The model system also benefits from being in its very early stages of development, which makes it simpler to identify any functional or design flaws. Early problem detection allows for the implementation of cost-effective corrective actions. The model's drawback is that it might take a long time for the project to be finished. The work was done within a deadline to complete the task, so this has no impact on the system.

The traditional waterfall model of software development seems to make the most sense on the surface. The traditional waterfall model is elegant and intuitively clear, but it cannot be used in real software development projects and does not allow for error correction during development, making it an impractical model. The spiral model is appropriate for creating technically difficult software products that are vulnerable to various types of risks. But compared to the other models, this one is significantly more complicated. This is likely a factor that discourages its use in typical projects.

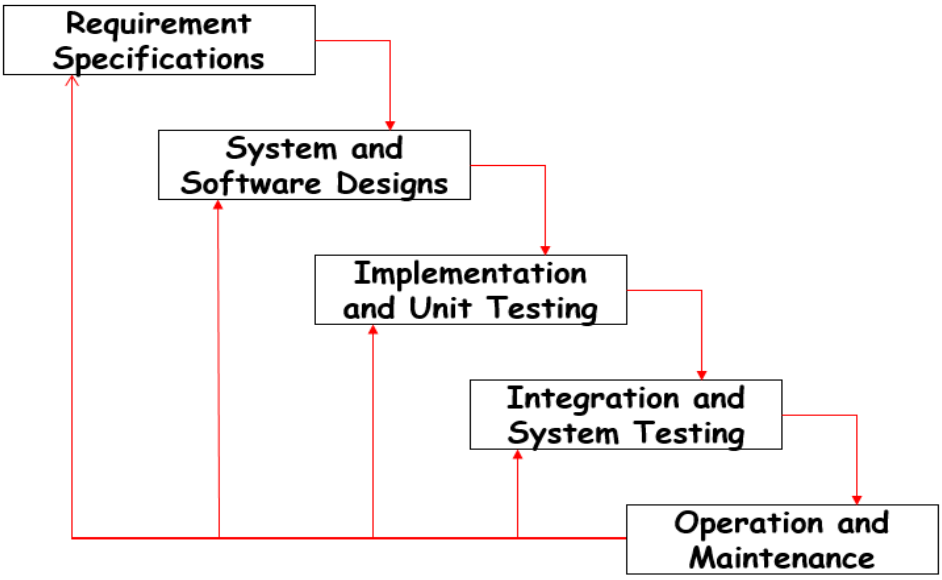

Figure 1: Iterative waterfall model

Data Gathering and Analysis

This entails defining the methods for gathering and analysing the data required to define or address the issue for which the research is being conducted. The automated system was created and put on display using the Sangkemi Global Nigeria Limited inventory management system in Adamawa State as a case study.

System Design

The automation of the inventory management system for efficient management is a key consideration in the design of the new system. The daily transaction report was recorded during the design process, and databases were created to track customer orders. The newly created, more efficient system than the manual system ensures some level of security. It begins with an entry method that enables the user to access the different sections of the programme by selecting a menu item. As a result, it offers quick access to the program's various data areas. The system structure diagram for the created inventory management system is shown in Figure 2. Below are the three branches of the home page's (main module) chart:

1. Sales: this consists of manage sales add new sales.
2. Product: this consists of manage products add new products.
3. Category: the different categories of the products.
4. User Management: this deals with adding users and managing their login credentials.

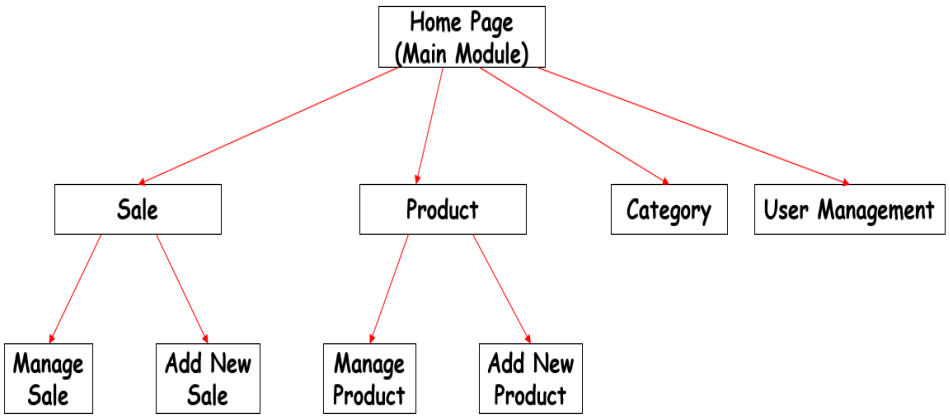

Figure 2: System Structure Chart

Database Design

A database management system is an effective tool for efficiently creating and managing large amounts of data and enabling its safe persistence over extended periods (Delisle, 2006; Molina et al., 2009; Adamu, 2020). The most well-known open-source database management system is MySQL, which was introduced in 1995. These programmes are among the most intricate ones currently available. The success of phpMyAdmin (www.phpmyadmin.net), a well-known MySQL web-based interface, has contributed to MySQL's widespread use (Database-System, 2019). As a result, MySQL is frequently used as a back-end data repository by websites. Based on this justifications, the design of this study made use of a MySQL database. The study's files were composed of a variety of data types. A few of the files have been created and are connected to the database. Table 1 shows the fields and their data types that were specified for the database. The database's relationship diagram is shown in Figure 3.

Table 1: Fields and their data types

Fields	Data types
Table that store information about sales	Such as "product," "qty," "price," and date
Table that store the location of inventory items	Such as product location and product name
Table that store media file information for a specific product	Such as media file name and type
Table that save user information	Such as "User Name," "User Status," and "User Level"
Table that saves user group information	Such as "Group Name," "Group Status"
Table that saves product details	Such as "Name," "Quantity," "Buying Price," "Selling Price," etc.

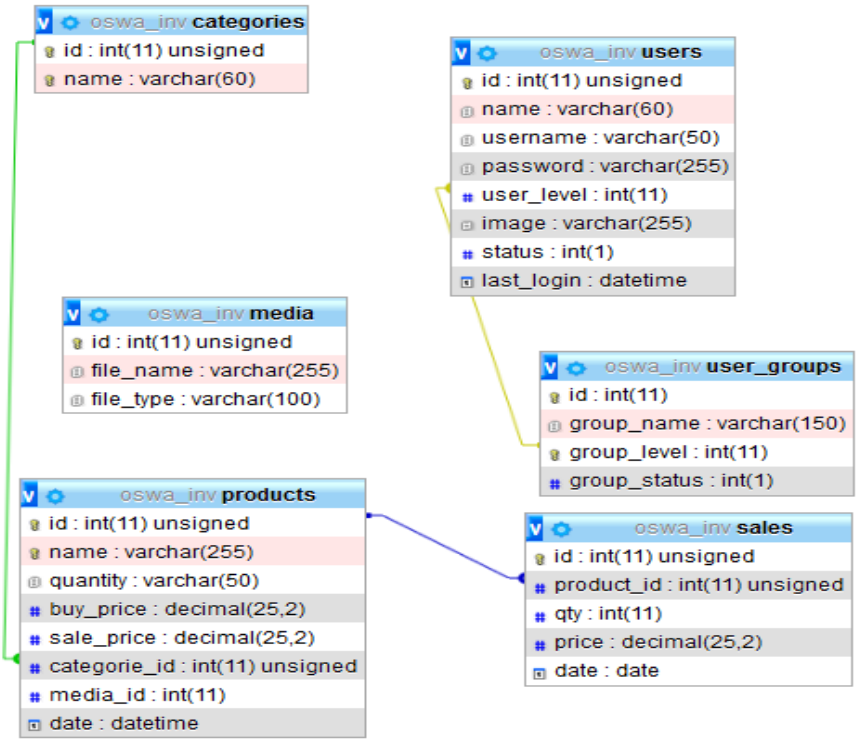

Figure 3: Relationship diagram of the database

Design process

There are two levels to the design process, which are,

1. Logical design, which is the process of writing the specific requirements for the new system.
2. The physical design, or the processes necessary to translate a logical design into reality, the characteristic that would be taken into account in the Sangkemi Global Nigeria Limited inventory management system's logical design is:
   a. Input of data into the system.
   b. Output that the system will generate.
   c. It goes through a process before the output is made.
   d. The design or layout of the database.

Input specification

The data inputs into the Sangkemi Global Nigeria Limited Inventory Management System are from the database, i.e., sales and inventory. The input specification is shown in Tables 2 to 6 below.

Table 2: Input specification for manage users

Description	Field Name	Data Type
Serial number	S/N	Number
Name	Name	Text
Username	Username	Text
User Role	Role	Text
Last Login	Last Login	Date
Action	Action	Binary

Table 3: Input specification for adding new user

Description	Field Name	Data Type
Name	Name	Text
Username	Username	Text
Password	Password	Alphanumeric
User Role	Role	Text

Table 4: Input specification for adding new category

Description	Field Name	Data Type
Serial number	Id	number
Category name	Category Name	Text

Table 5: Input specification for managing products

Description	Field Name	Data Type
Serial number	Id	number
Product name	Product Title	Text
Product Category	Product Category	Text
Quantity in Stock	In Stock	number
Buying price	Buying Price	Number
Selling price	Selling Price	Number

Table 6: Input specification for the sale

Description	Field Name	Data Type
Serial number	ID	Number
Product name	Category	Text
Quantity	Quantity	Number
Sale Total	Total	Number
Purchase date	Date	Number

Output specification

Specification here means the arrangement of headings and details of the output document. That is, whatever the medium used in both paper documents and transaction output, the purpose is to ensure the clarity of the output to the user. The product sales report shows the total products sold, their unit prices, and their amounts. The entire inventory report shows the types of products in stock without counting the items on the shelf one after the other to know the type and quantity of products in stock. It also deals with the unit's prices and costs of goods or items in stock.

RESULT AND DISCUSSION

Login Page

This is the first page where the user must enter the login details (such as the username and password) required to access the software. When a user enters their username and password and clicks the login button, the form automatically redirects them to the main menu. However, a warning alert appears on the screen when the incorrect user name and password are entered.

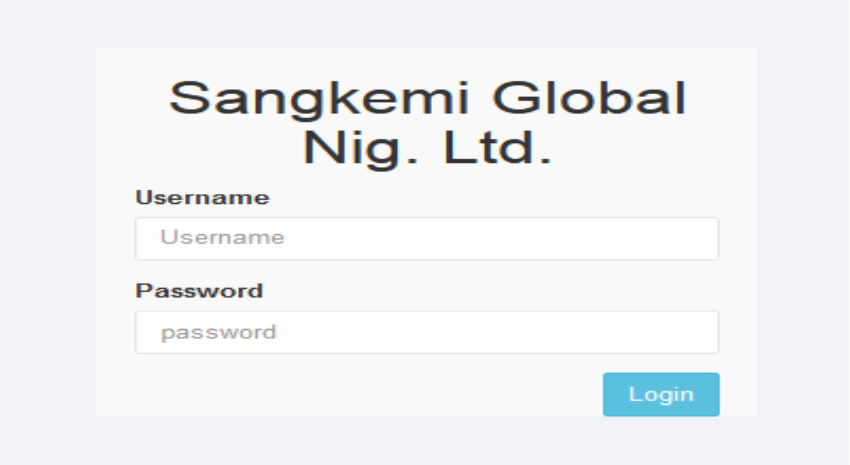

Figure 1: Login page

Home Page (Administrator)

This is the form that appears after entering or providing the username and password (Figure 2). Now it is possible to access the software features and choose the kinds of operations to carry out.

Figure 2: Home page (Admin)

Home Page (Sales Personnel)

This is the form seen after clicking on the home of the salesperson (Figure 3). Now, the software's features will be limited to those of the system administrator. That is, features peculiar to the salesperson will only be displayed.

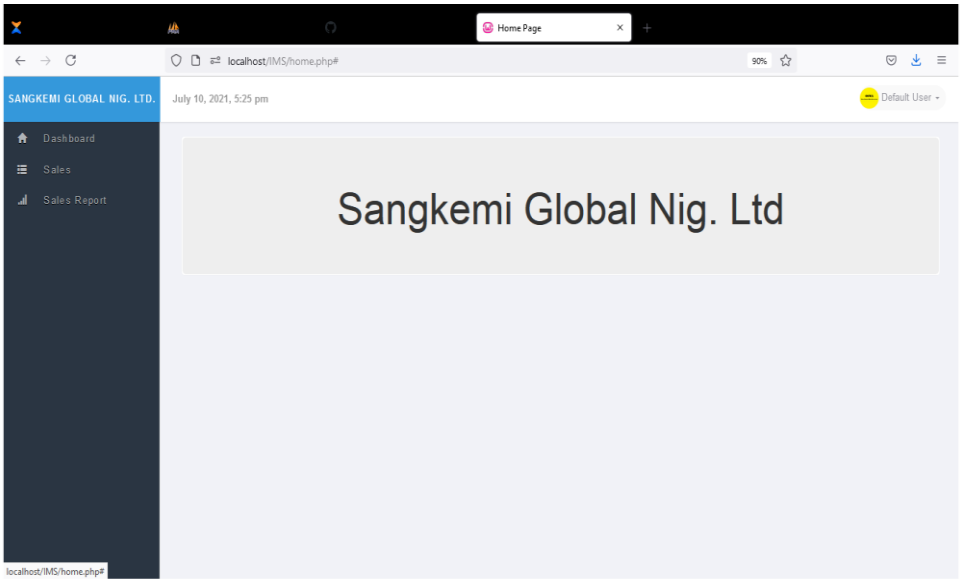

Figure 3: Home page (Sales Personnel home page)

Sales Page
The sales page is used to sell available products, and customers can only view this page to know the number of goods.

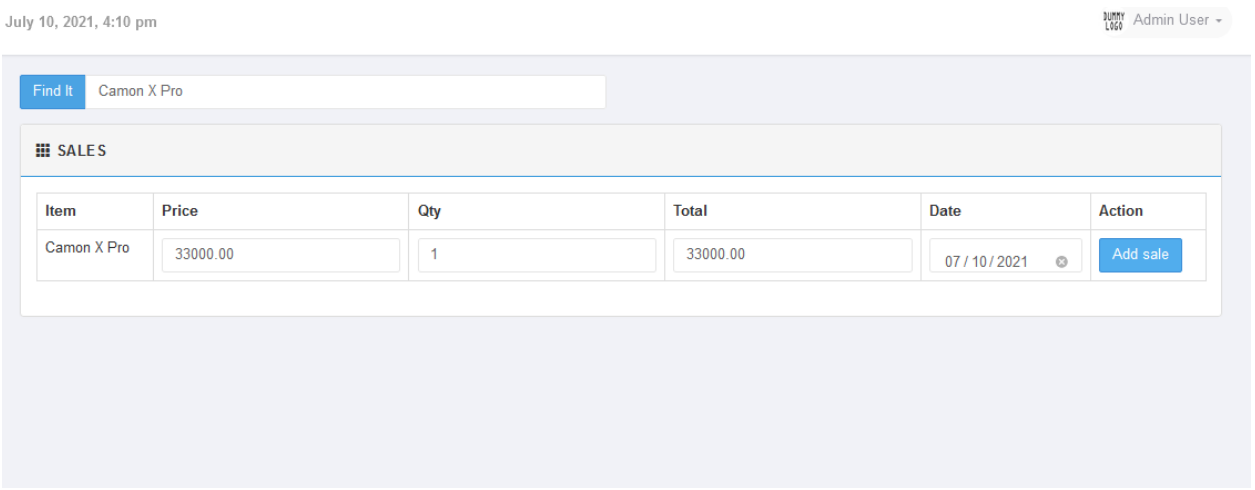

Figure 4: Sales page

Sales Report Page
This page enables the report of the purchase to be printed and gives an update on the profits generated on each product. This page can only be viewed by the accounting officer to generate the sales report.

Date	Product Title	Buying Price	Selling Price	Total Qty	TOTAL
2021-07-10	C11 Charger	20.00	300.00	10	3000.00
2021-07-10	Tecno	12.00	12.00	3	36.00
				GRAND TOTAL	$ 3,036.00
				PROFIT	$2,800.00

Figure 5: Sales Report

Add New Product Page
The admin can update the selected stock balance and add new stock that has been sold on this page.

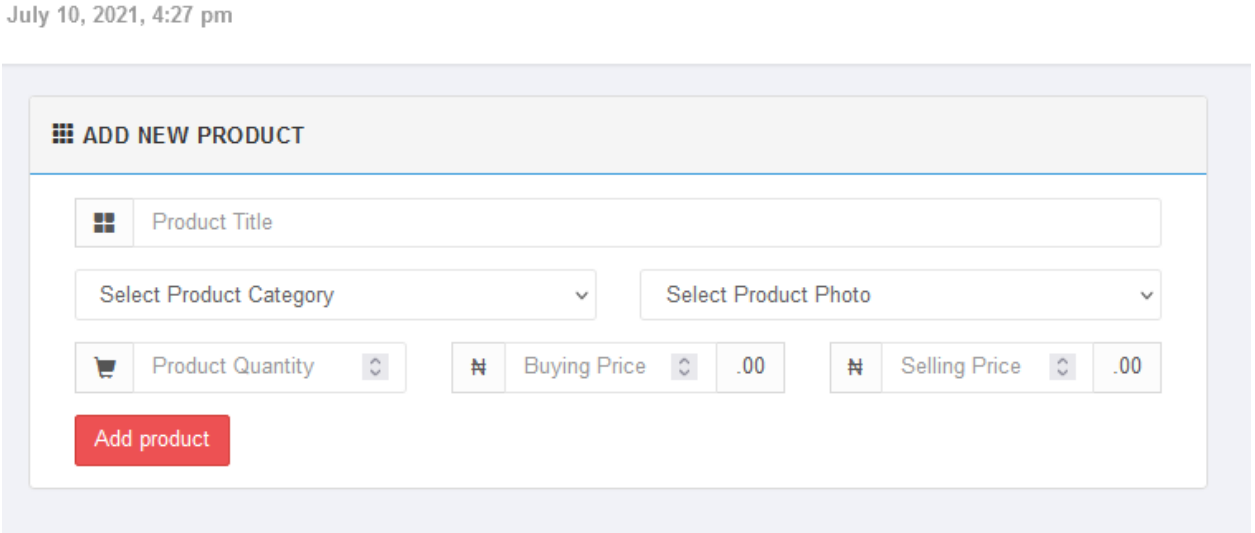

Figure 6: Add New Product form

Dashboard
This interface shows the list of users, categories, products, and sales. It also provides the records of recent transactions conducted as well as interfaces with other functionalities.

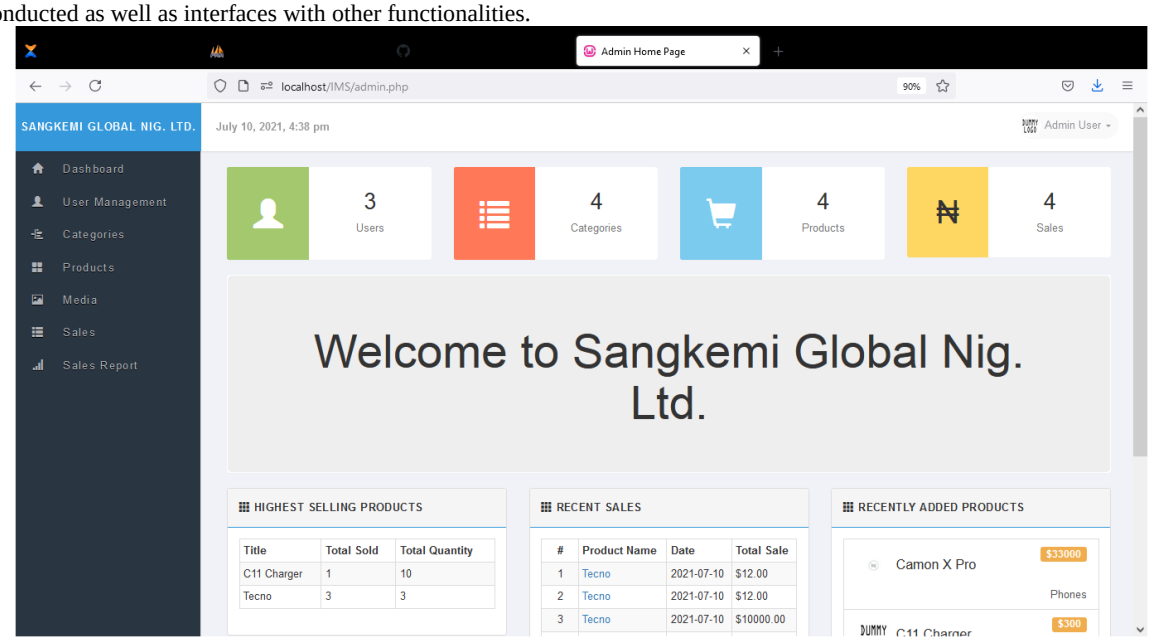

Figure 7: Dashboard

Add New User Page
This allows the system administrator to add a new user to the system.

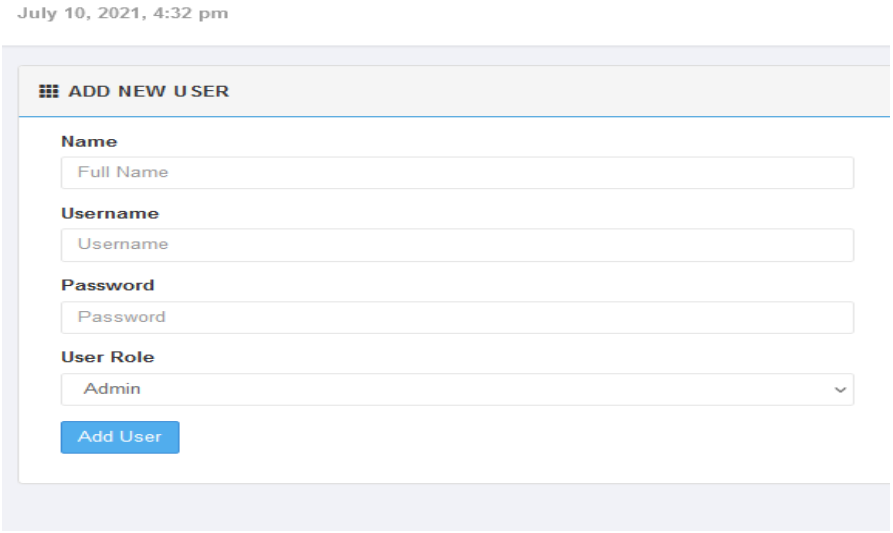

Figure 8: Add new user form

Add New Category Page
This interface allows the system administrator to add the new categories of products as well as view other categories.

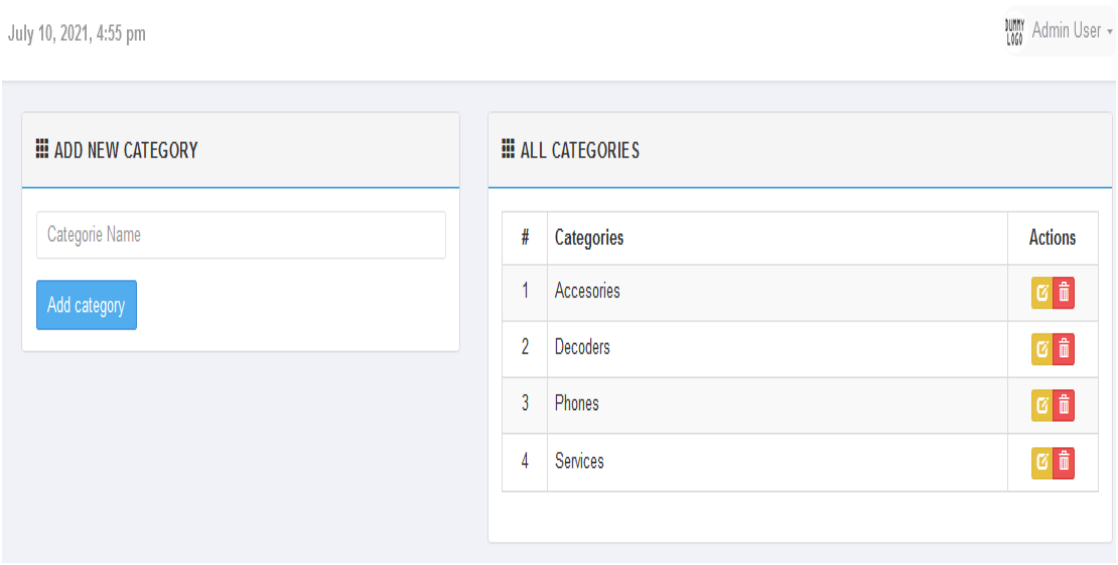

Figure 9: Add new category page

Edit My Account

This interface allows the management or system admin to edit the login credentials of the system and other system users.

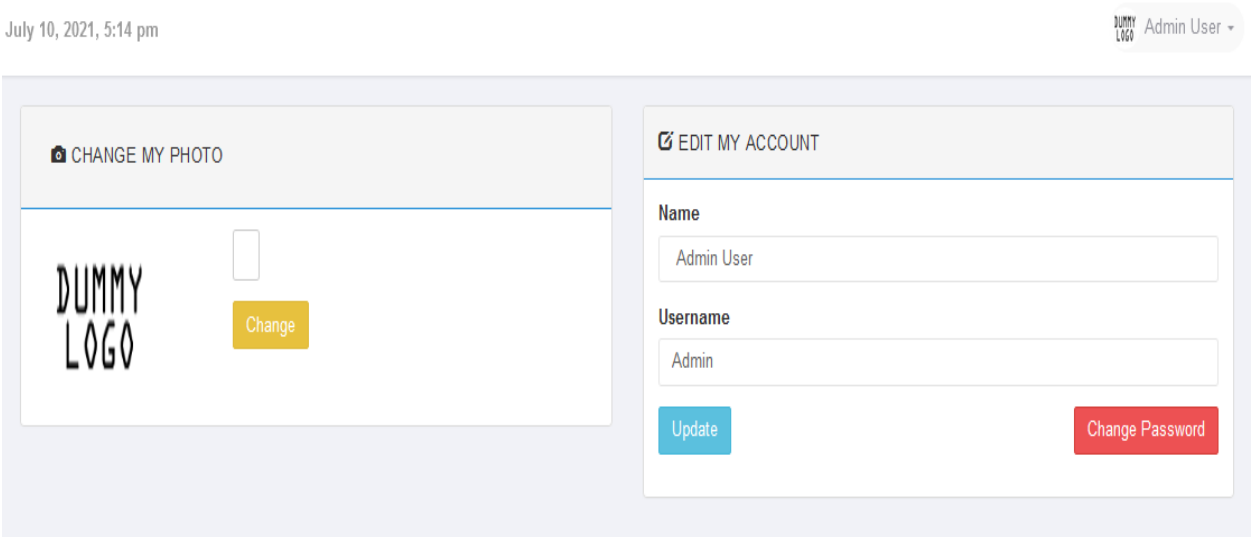

Figure 10: Edit my account form

System Testing

The output was displayed on the monitor after running the test using different sets of data, or after executing the programme. The output was then printed on paper.

Integration

System integration is the process of successfully assembling a system's various parts, assemblies, and subsystems and getting them to function as a unit to accomplish the system's objectives. The Login form, Main form, Transaction History form, New Transaction form, Manage Stock form, and Change Password form were all successfully designed, and they were all integrated to create the entire system.

Operating the new system

This section of the project explains the job performed by the program developed. First, the various inputs listed above were entered, and then the program processed that data and gave out the required output as the transaction output. It gives results based on what is entered as the input. For this reason, all inputs must be correct and valid. This is a detailed explanation of the operation carried out by the system on the job that it is required to do. It is the passing of control in the system and the performing of the task required to do. All these are expected to be done within a second to show the system's efficiency.

The system's operation enables the entire inventory control calculation or stocktaking to be done with greater accuracy and in a shorter period. It processes data keyed in a remarkable moment of time, far less than the manual process. The central processing ensures the program instructions are carried out in the proper sequence, and the interpretation is in accordance with the expected output. Also, the company's information will be much safer and easier to access once this prototype is used.

CONCLUSION

This research has created a computerised inventory management system for Sangkemi Global Nigeria Limited, to track the quantity of mobile phones and their accessories in stock, when to place additional orders, the status and updates of transactions, and the number of employees, all of which

will aid in managerial decisions, level of progress, and stock taking. The system was adaptable enough to accommodate changes in the future. In order to make the system more adaptable to future changes, it has been incorporated into various inventory management system modules. It is recommended that the computerised system created in this study take the place of the manual stock recording and processing system to make life easier for people.

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