AUTOMATED INVENTORY MANAGEMENT SYSTEM

BY

OGIEVA IGBINOSA NONSO

PSC1707541

DEPARTMENT OF COMPUTER SCIENCE,

FACULTY OF PHYSICAL SCIENCES,

UNIVERSITY OF BENIN,

BENIN CITY, NIGERIA.

DECEMBER, 2022.

AUTOMATED INVENTORY MANAGEMENT SYSTEM

BY

OGIEVA IGBINOSA NONSO

PSC1707541

A PROJECT SUBMITTED TO THE DEPARTMENT OF COMPUTER SCIENCE, FACULTY OF PHYSICAL SCIENCES, UNIVERSITY OF BENIN IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR BACHELOR OF SCIENCE (B.SC) DEGREE IN COMPUTER SCIENCE

DECEMBER, 2022.

APPROVAL

This project work is hereby approved by the Department of Computer Science, Faculty of Physical Science, University of Benin, in partial fulfilment for the award of Bachelor of Science (B.Sc) Degree in Computer Science.

_____ _____

MISS LINDA O. USIOSEFE **DATE**

PROJECT SUPERVISOR)

_____ _____

PROF.MRS. A.O EGWALI **DATE**

HEAD OF DEPARTMENT

CERTIFICATION

This is to certify that **OGIEVA IGBINOSA NONSO** with matriculation number **PSC1707541** carried out this project work under my supervision and its adequate in scope and content for the award of the University of Benin, Bachelor of Science Degree in computer science

_____ _____

Miss LINDA. O. USIOSEFE **DATE**

PROJECT SUPERVISOR

DEDICATION

This project work is dedicated to God the Almighty

ACKNOWLEDGEMENT

My humble gratitude goes to Almighty God, for beginning and ending this course of study. I am indeed greatly humbled by his faithfulness and grace.

To my parents, Mr. and Mrs. Ogieva, my siblings, Peace, Osas and Uyiosa and my loved ones. I love you all and to my entire course mates in Computer Science Department. Thank you all.

My gratitude goes to my lecturers who were always there to support me, special thanks to my supervisor Miss. Linda. O. Usiosefe for her support and guidance during the course of this project study.

I also want to acknowledge all the staff and colleagues in the department of Computer Science for their contributions towards the accomplishment of this study.

I would like to extend my warmest thanks and appreciation to the university of Benin for the opportunity to complete my undergraduate studies.

TABLE OF CONTENT

LIST OF FIGURES

LIST OF TABLES

ABSTRACT

Inventory management is one of the activities the stock manager undertakes to ensure optimal services of goods to effectively achieve its function. This obligation could only be made possible by automating the current manual and paper based inventory system. A web based inventory management system was proposed. A literature review was conducted on three technologies used in the inventory management that is Radio Frequency Identification (RFID), Barcode Technology and Near Field Communication (NFC). A review was also undertaken on the related works to identify the concept that could be adopted in the proposed system. A baseline study was performed to understand the challenges faced in the inventory management of goods. The results of

the baseline study were analyzed and found that the challenges were attributed to the current manual inventory management system mainly due to human errors, incorrect inventory reporting and pilferage of items. The proposed prototype system was developed and tested and proved to be faster, efficient and more reliable than the manual and paper based system.

CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND OF STUDY

Inventory is a very critical component in every organization and it requires serious managerial consideration since it ties up a lot of firms' capital. However, Inventories are essential for keeping the production continuous whereby moving inventories keep the market going and the distribution system intact. According to David and David (2002), these

functions include providing a cushion to prevent against stock-outs and therefore if there is a constant and efficient supply of inventory, it will reduce the chances of uncertainties or lack of stocks and the costs that relate to stock-outs and if this is well achieved, it will enable any firm to attain a competitive advantage over competitors. Donald (2006), points out that there is failure in the firms' systems since most of them are not computerized and such firms tend to have huge inventories due to poor planning. The failure leads to problems of daily sales accounting since there can be errors in the amounts received in relation to the amounts sold and numerous problems are also encountered in demand forecasting since material managers are not able to predict the exact amount of inventory to maintain so as to meet the customer's demand. Automated inventory systems usage has had little application and this has resulted in problems that come as a result of stock shortages and it is for this reason that various researches have been carried out pertaining to Inventory Management Control Systems. Every organization holds something in stock; organizations such as manufacturers, healthcare institutions and other service providers place stock in a subsidiary position rather than a central position. Inventory is still an important element in operational

effectiveness and often appears in the balance sheets as the biggest of the current assets, holding up a lot of cash. Current stock is very expensive and it is unacceptable in many organizations to hold up excess stock (Adams, 2005) for products in high demand, a continuing drive to reduce stock to the desired levels is needed to combat the natural tendency of increasing stock unnecessarily. Some of the advancements on constructive approaches to minimizing of the stock quantities in an organization as advanced by Donald (2006) include making forecasts more accurate and this is done by ensuring that records are right and that there is better planning and arranging for inventories to be delivered just in time instead of stock piling. This can also be done by devising ways of reducing ordering costs, production setup costs and lead-times so that optimum quantities are maintained. Various ordering policies can also be used, like blanket (call off) orders, capacity booking orders, part period balancing and economic order quantity. The method used depends on the industry, the usage, the production technique and the cost of ordering (Andrew and Whitney, 2006).

1.2 STATEMENT OF THE PROBLEM

The current system operates manual inventory system, from stocks, products, ordering and purchases etc. recorded in a book. This is faced with errors, incompleteness, and insufficient data for analysis. Information regarding stocks, products, sales and purchases are still in black and white which is not properly organized and managed. From the wholesalers to retailer bills, tickets, vouchers, receipts of products are recorded in a book but further operations are not being properly handled. As a result it is difficult in processing, updating and managing.

The process of manually looking for the inventory available in stock is really time consuming and cumbersome that includes the person responsible to see how many materials are in the inventory, how many materials have been ordered and received and keep the record of the time that will take for the suppliers to process orders and other various tasks included in inventory. The recording of sales and cash received are done manually on a book that appears rough, thus the books are exposed to physical damage, information can be lost and dust particles are accumulated. The long list supply order waiting to be attended to on daily basis.

The control system is time consuming, less accurate and less efficient and the environment is not user friendly. Inaccuracies often ensue from human error. The manually system is quite tedious and can be reduced or eliminated with the introduction of the proposed system.

1.3 AIM AND OBJECTIVES OF THE STUDY

The aim of the research is to develop a web based inventory management system to ascertain stock level of a supermarket, when to order for rhore goods, keep status and updates of transactions, thereby helping managerial decisions, progress level and stock taking, which shall be achieved through the following objectives:

I. To explore the challenges being faced by the manual system
II. To propose a solution to the problems identified.
III. Analyze and design a solution that fulfills the client's needs.
IV. To design and implement the proposed based on the requirement of the new system.

1.4 SIGNIFICANCE OF THE STUDY

In today's highly competitive business environment, organizations from all industries are striving to achieve effectiveness, cost efficiencies and economies of scale. Most of these organizations hold inventory so as to meet their customers' needs. However, managing these inventories in order to achieve their objectives has posed a great challenge to the firms. Stock management, maintenance and control are a vital tool in any business. The tools which management use in its control is of vital importance. To know when to place order for a new item and update current status will depend on how information processing is handled. This project help provides such tools and helpful in management, control and effectiveness.

1.5 RESEARCH METHODOLOGY

The main method used for this research work is interview. Data will be collected from UBTH cooperatives store. The Computerized Inventory Management System is designed with PHP and MYSQL serving as the backend.

1.6 SCOPE OF THE STUDY

The scope of this study covers the UBTH Cooperatives Store, and its customers which include retailers, distributors and the general public.

Automation: this is the use technology or computers to control and process data reducing the need for human intervention.

Database: this refers to a large store of related data on a computer that user can access and modify.

Password: this is a secret code that must be entered into a computer to enable access to its applications. It is made up of numbers, letters, special characters or a combination of any of the above categories.

Inventory control system: a list of orders to be filled prompts workers to pick the necessary items and provides them packaging and shipping information. **Computerization:** this is the conversion of a manually operated system to a controlled,

Processing: This is dealing with something according to an established procedure.

CHAPTER TWO

LITERATURE REVIEW

2.1 INVENTORY MANAGEMENT SYSTEM

Inventory is a very expensive asset that can be replaced with information which is a less expensive asset but to do this, the information has to be accurate, timely, reliable and consistent. When this happens, you carry fewer inventories, reduce cost and get products to customers faster (David, 1996). This therefore implies that inventory management is very important if a company wants to achieve a balance between efficiency and responsiveness.

David, (1996) explains the following objectives of inventory management: maximizing customer service, maximizing the efficiency of purchasing and production, maximizing inventory investment and maximizing profit. It is worth noting that meeting these objectives requires balancing short-term as well as long term objectives. Whether used to provide customer service or to achieve efficiencies, the need to carry inventories conflicts with the management's desire to minimize inventory investments. For instance, long production runs tend to create inventories;

marketing people want stocks of a larger variety of products and options to serve a broad customer demand.

High levels of inventory also take up space in factories and distribution centres, thus incurring additional costs of storage, insurance, and so on. Reconciling these conflicting objectives is a primary goal of inventory management. Inventory Management systems and inventory control processes provide information to efficiently manage the flow of materials, effectively utilize people and equipment, coordinate internal activities and communicate with customers (Wolcott, 2000).

Graman and Magazine (2006), argued that today, the cost of holding inventory, extensive product proliferation and the risk of obsolescence, especially in rapidly changing markets, make the expense of holding large inventories of finished goods excessive and that high demand items naturally have safety stock assigned to them, but in many organizations there are so many very-low-demand items that keeping any stock of these items is unreasonably expensive, so they argue that companies must now provide good service while maintaining minimal inventories. Therefore, inventory management approaches are essential aspects of any

organization. Wallin et al. (2006), has argued that that a typical manufacturing firm spends on average, 56 cents out of every dollar of revenue to cover the direct cost of purchased goods, and Monczka et al. (2002), and Handfield (2002), have argued that this percentage figure is higher for the typical wholesaler or retailer. Wallin et al. (2006), argued that a firm carrying $20 million in purchased goods inventory woulci incur an additional $6-7 million in material handling and inventory holding costs, but once these direct and indirect costs are reduced, the firm's net profits increase. Therefore, organizations from manufacturing to wholesale to retail require effective inventory management. However, inventory management in the manufacturing organizations needs special attention.

Wanke and Zinn (2004) states that inventory management approaches are a "function of product, operational and demand related variables such as delivery time, obsolescence, coefficient of variation of sales and inventory turnover" and that logistics managers are more likely to decentralize inventory in order to stock product close to the customer's facility if the customers demand a reduced delivery time. On the other hand, Imai (1998), states that organizations that have a long lead time of

production, in turn leading to a large amount of inventory, means that there is no flexibility to meet changing customer orders on a day-today basis. Therefore, the problem with this inventory management decision is that "when the forecast is off-which is usually the case companies may be left with a volume of unsold products or its market may evaporate overnight when consumer preferences change or when a competitor comes up with a new and better product" (Imai, 1998). Therefore, for an organization to adopt the right inventory management approach, this inventory management approach is necessary in order to gain more customers through customer satisfaction, and in order for the third party logistics provider organization to operate effectively through the preferable approach. Imai (1998) has argued that there is a "push", "pull" and "just in time" inventory management system. The just in time system is based on the "pull" from the market, and this "pull production is based on a short, slim production line with the shortest possible production lead time, which allows the company to respond to the fluctuating orders from the market" (Imai, 1998). "Thus system ensures that the minimum-required number of the popular models is always in stock, (and) in addition to increasing flexibility and reducing inventory to the minimum, the number of

operators on the line can be drastically reduced, (and so) as a result, the overall cost of operations can be drastically reduced" (Imai, 1998). Yang et al (2004) has argued that supply chains have evolved from traditional forecast-driven push to demand-driven pull systems over time, and that postponement is playing an increasingly important role in a supply chain. Yang and Burns (2003) argued that postponement fosters a new way of thinking about the supply chain and Van Hoek (1999), identified that postponement is an important characteristic of modern and competitive supply chains. Chan et al. (2002), states that "Many companies have realized that important cost savings can be achieved by integrating inventory control and transportation policies throughout their supply chains". Therefore, these companies need to ensure they have an optimal replenishment plan, being an inventory and transportation strategy, in order to minimise total inventory and transportation costs over a finite planning horizon (Chan et al., 2002). These undisclosed companies, as explained by Chan et al. (2002), rely on external third party logistics providers for the transportation of goods from suppliers through warehouses to retailers. "This cost structure, representing quantity discounts, volume-based price incentives, and other forms of economies of

scale, has a major impact on the replenishment strategy. It usually reflects either incremental or all-unit discount effects, leading to the following types of cost functions" (Chan et al., 2002). has described that when a consumer places an order, "the order goes to the fulfillment operation, the distributor, the manufacturer, or ji combination of the above (where) it is then picked, packed, handed to a shipper, and delivered to the customer" (Tarn et al., 2003). The consumer who orders quickly expects delivery also quickly, but when the merchandise is not there, a consumer may not return, a lost sale has just been created and this places increased pressure on managing demand and planning up and down the supply chain (Tarn et al., 2003). The most common inventory management method is inventory speculation (Wallin et al., 2006). Bucklin (1965), has explained this by stating that a firm would purchase items and physically hold this inventory within its storage facilities before there is a demand from the consumer. There are several advantages to this inventory management method being that there is an ability to respond quickly to demand or requirement as well as the ability to protect itself against fluctuations in prices (Wallin et al., 2006). Rietze (2004) argues that inventory postponement refers to delayed decision-making about a product, and that it is beneficial to delay

commitment to product-specific characteristics as late as possible in order to avoid a mismatch between orders and inventory on hand. Bucklin (1965), supported this explanation agreeing that a firm operating under an inventory postponement approach would deliberately delay the purchase and the physical possession of inventory items until demand or usage requirements are known with certainty. Wallin et al. (2006), has elaborated this point by stating that through inventory postponement, a firm can minimise the risk of inventory obsolescence, reduce the opportunity cost of having capital tied up in these items, and avoid acquiring inventory storage and tracking expenses since this inventory is physically located with the supplier. Byoungho (2004), identified five inventory control/ record system. According to him, the ideal inventory and proper merchandise turnover will vary from one market to another. Average industry figures serve as a guide for comparison. Too large an inventory may not be justified because the turnover does not warrant investment, Billington et al (2004). On the other hand, because products are not available to meet demand, too small an inventory may minimize sales and profits as customers go somewhere else to buy what they want where it is immediately available, Byoungho (2004). Wanke and Zinn (2004) state that

the most profitable policy is not to optimize one of these at the expense of the others. In a general stores environment the service will normally be taken as 'availability ex stock', whereas in a supply to customer specification, the service expected would be delivery on time against customer requested date, Chan et al (2002). The second target, inventory costs, requires a minimum of cash tied up in stock. This target has to be considered carefully, since there is often the feeling that having any stock in stores for a few months is bad practice. In reality, minimizing the stock usually means attending to the major costs: very low value items are not considered a significant problem. Low inventory can also be considered in terms of space or other critical resources, Van (1999). According to Yang et al (2004), the improvement in stock control has been slow and gradual, created by new technology, financial need and competitive pressure. Those companies who can tighten their control faster than the average will flourish, but those which do not keep up with the average, even if they are improving, will gradually dwindle. The trick of the good stock controller is to meet the objectives simultaneously, not one at a time, and of course 'the better the control the smaller the cost, the lower the stock levels, and the better the customer service1. One of the dichotomies of inventory control is

that at item level, the more stock the better the availability. However for the whole inventory, experience has shown that the businesses with the highest stock are often those which have the worst availability, Yang et al (2004). These observations are not in conflict if the causes are considered. Stock outs result from holding too little stock of the offending lines, because the forecasts, monitoring or controls are inadequate. High stock levels arise because too much stock has been purchased through bad forecasting, monitoring or controls. High stock and poor availability are caused simultaneously as a result of poor control. The problem rests with the inventory controller and the solution is in improved techniques, Yang et al (2004). Inventory control, according to Ozer, (2003), is the activity which organizes the availability of items to the customers, goes on to states that conventional supply organization will have many departments including sales, purchasing, finance, quality assurance, contracts and general admi nistration. In some cases there will also be manufacturing, distribution or support services or a variety of industry specific activities. Each of these has a particular view of the role of stock control.

2.2 THE CONCEPT OF AUTOMATION

Vijay (2004) defines automation as a technology dealing with the application of computers for the production of goods and services. Automation is broadly classified into manufacturing and service automation. The main reasons why many firms automate is to curb the problems of shortage of labour, high cost of labour, need to increase productivity and to reduce the manufacturing lead-times. All this put together, it implies that automation leads to lower operational cost and improved customer service. Inventory can appear in many places in the supply chain, and in several forms such as raw materials inventory, work-in-process (WIP) or finished goods inventory. The major challenge faced by many supply chain managers is establishing an efficient and effective inventory management system for their organizations (Brason et al, 2005).

In order to effectively automate inventory management, several systems have been developed so as to ensure that firms, supermarkets included, hold the right quantities of stock so as to strike a balance between the costs involved and customer satisfaction. Such systems include Materials Requirement Planning (MRP), Vendor Managed Inventory (VMI), Radio Frequency Identification (RFID), Enterprise Resource Planning (FRP),

Electronic Point of Sale (E-POS), and E- Procurement (Ken et al. 2010; Simchi- Levi et al. 2009 and Sople, 2010).

2.3 RADIO FREQUENCY IDENTIFICATION (RFID)

The RFID systems provide a powerful technology for tracking the movement of goods throughout the supply chain. RFID systems use tiny tags with embedded microchips containing data about an item and its location to transmit radio signals over a short distance to special RFID readers then pass the data over a network to a computer for processing. The RFID tag is electronically programmed with information that can uniquely identify an item plus other information about the item such as its location, where and when it was made and its status during production. Embedded in the tag is a microchip for storing the data. The rest of the tag is an antenna that transmits data to the reader (Ken et al, 2010). .

In inventory control, RFID systems capture and manage more detailed information about items in the warehouse or in production. If a large number of items are shipped together, RFID systems truck each pallet, lot or even unit item in the shipment. This helps the firm to improve their ability to see exactly what stock is stored in warehouses or on retail store

shelves. Of course, the largest benefit can be achieved from implementing RFID at the product level. For example, with RFID, you can store information in your data base about when particular package of beef was packed, which cow it came from, which firm it was from and where it was slaughtered. Such data could be provided in real time across the supply chain as pallets role into the warehouse or items roll of the shelves (Simchi-Levi, et al, 2009). Retailers are expected to be the main beneficiaries of RFID implementation. Researchers have found that retailers will mainly benefit in three primary areas: reduced inventories, store and warehouse labour reduction, and reduction in stock out.

2.4 BAR-CODING

A barcode is an optical machine readable representation of data about the object to which it attaches. Barcodes are used for identification, handling, retrieval and storage of goods in warehouses and stores. It is the most popular technology in many applications. Individual inventory items, cartons or unitized packages are affixed with a barcode that can be read by a barcode scanner attached to an online computer system. Barcode is assigned to a particular inventory item to show its identity during storage,

retrieval and dispatch. Barcodes are further used for communication of dispatched items for the preparation of bills by accounts departments apd making periodic reports on inventory status and sales. The barcodes facilitate the tracking of specific items in the warehouse during inventory auciit or material pick up. They also help in tracking a consignment during transportation/ inspection at the customer end. The information that may be required generally relates to the country code, manufacturer's name, product details, date of manufacture, material content, and so on. The details are required at the users end for inventory management and are in machine readable codes in the form of bars and spaces (Sople, 2010). Optimized use of barcodes within the supermarkets will therefore help inventory managers identify their products with ease, serve customers faster and efficiently and also reduce the time and expenses of stocktaking at the end of every financial year.

2.5 ELECTRONIC POINT OF SALE (E-POS)

The point of sale (POS) system connects scanning equipment and the retailer's inventory management systems. Goods marked with a barcode are scanned by a reader, which in turn recognizes the goods. It notes the

item, tallies the price and records the transaction. POS provides an instant record of transactions at the POS. Thus, replenishment of products can be coordinated in real time to ensure that stock-outs in the retail store are avoided. With EPOS technology, companies can be able to settle bills, use electronic printouts and smart sense coupons, respond to on-line alerts and information and take a more customer focused approach (Janat, 2009).

With EPOS, managers are now able to spend more time maximizing the potential of their staff and are more visible to their customers. Managers have a visible presence at the shop counter, they have the time to sell the benefits pf the new technology and inform customers how they can benefit. They also have more information about the efficiency and productivity of their staff and any cash discrepancies that may arise (Pollit, 2007). Cassidy (1994) cites the benefits of EPOS as including reduced check out time and error, improvements in inventory management through reduced stock outs, inventory levels, shrinkage and forced markdowns, and an ability to track costs directly to specific products. David and Alex (1994) contend that EPOS technology allows substantial cost savings and gives more real time information on sales of goods, patterns of stores traffic,

and the popularity and profitability of every line carried. It also enables the sales of any item to be calculated at any time as well as increasing customer service.

CHAPTER THREE

SYSTEM ANALYSIS AND DESIGN SPECIFICATIONS

3.1 SYSTEM ANALYSIS

System analysis is the process of analyzing a system with a view of bringing out the problems of the existing system and consequently proffering an alternative method using a computerized system to curb the problems in the system.

The system analysis process is usually broken down into two major activities, which are

1) System investigation.
2) Documentation finding.

3.1.1 SYSTEM INVESTIGATION

For an existing system to be understood, facts about that system must be compiled. The exert input, operations, process, and output of the system must be determine. Such data is usually gathered by conducting in-depth interviews with users of the system and by observation of the existing

system during its operation or by studying documents usually generated in the course of operation of the system.

3.1.2 DOCUMENTATION OF FINDING

After investigation of a system to find out facts about its functionality, these data are analyzed and the result is an informal description of the system being studied. This informal description will form the basis for the design of a new system. It is therefore critical that the analyst of the gathered data be carried out meticulously.

3.2 ANALYSIS OF THE EXISTING SYSTEM

The existing system is one that has been manually operated over the years. It is a system in which all the methods of controlling inventory is of a manual approach. Critical analysis of this system reveals that it is prone to errors. Careful analysis also shows that due to the complexities of the manual system, records of inventory kept are inaccurate and manually operated in such a way that requires the clerk to register sales on a book, thereby making a staff handle many jobs at a time. An example is a staff trying to register sales and at the same time rushing back to face a queue of impatient retailers waiting to be attended to. This makes the place so

crowded with customers with just one person attending to them. Sometimes, due to unavailability of staff, customers who have other things to do, end up missing their various appointments. As a result of this, the attendant finds it very difficult to have an accurate record as pressure is being mounted on them. The attendant might end up writing an order meant for another customer and have it delivered to the wrong person.

The UNIBEN Faculty of Agriculture Staff Multi-Purpose Cooperative Society Limited (FAGCOOP) operates manually and has not adopted a computerized mode of operation. This generates inadequate records or exercise improper management of the company and in extreme cases, the company may lose her customers. Improper management of the company and in extreme cases, the company may lose her customers.

3.3 LIMIATIONS OF THE EXISTING SYSTEM

As we know, manual inventory control systems are quite tedious, time consuming and less efficient and accurate in comparison to the computerized system. The FAGCOOP has the following problems/weaknesses.

a) Compilation of inventory records consumes a lot of time and manpower.
b) Some records get lost over time while some are not easily found.
c) It involves lot of paperwork and data processing is very slow.
d) The environment is not user friendly.
e) The system does not calculate and give financial reports at a glance and as such, the degree of decision making in urgent matters is not applicable.
f) The system is unable to detect faults within the system in case of rectifying fraud.
g) It takes a long time for mistakes to be rectified and sometimes throws the system into confusion.

3.4 PROGRAM DESIGN

The major fact taken into consideration in the design of the new system is the automation of the inventory control system for effective management. In the course of the design, the daily report on customer order status are captured, databases were created to keep customer order.

3.4.1 Input Specification

Inputs are raw materials that are fed into the computer for processing. The system accepts input through the mouse and the keyboard. The registering of the data of records is done via the mouse and keyboard. The mouse plays an important role in closing windows, validating password. The keyboard is used to enter text and values into the boxes.

3.4.2 Output Specification

An output is the information or result obtained from processing data which has been fed into the computer e.g. screen, printer etc. The major output documents here will be the accounts and financial reports and also customer order reports.

3.4.3 Processing

There are items which are sold and distributed to customers. An order is placed by the customer-required details which are item name, quantity, and delivery time. The order processing executes, looks up the stock of each item to find out which is available or not and then fulfils the order. After formalities are fulfilled, bill is generated by the system and sent to the

customer by printing an invoice. The work area is automated and maintained by the management to generate a more efficient system.

3.4.4 Login Form

Once the software is run (the proposed software), the login form appears, and to access other features of the software (i.e. going to the main form), username and password must be inputted.

3.5 ADVANTAGES OF THE NEW SYSTEM OVER THE OLD SYSTEM

1) Volume of data:

The newly design system can handle large volume of data compare to the manual system that find it difficult to handle voluminous data.

2) Complicated calculations:

The computerized system can handle complicated calculations unlike the manual type that is prone to error when computing total inventory.

3) Consistence:

Data and information are free of redundancy, the information in' the database will be consistent when changes are made in the database.

4) Accuracy:

Accurate information is obtained from this process and available in demand at any time. Updating of record can be carried out simultaneously.

5) Fast response in processing:

Fast response of information processing can be carried out easily than the manual method. It creates an environment for real time data processing.

6) Minimize fraud:

The computerized system minimized the issue of fraud, unlike the manual that is prone to fraud by power officials.

3.6 SYSTEMS DESIGN

System design is the stage in computerization where the necessary things needed by the proposed system will be specified.

It consists of the following:

i. Use Case Diagram

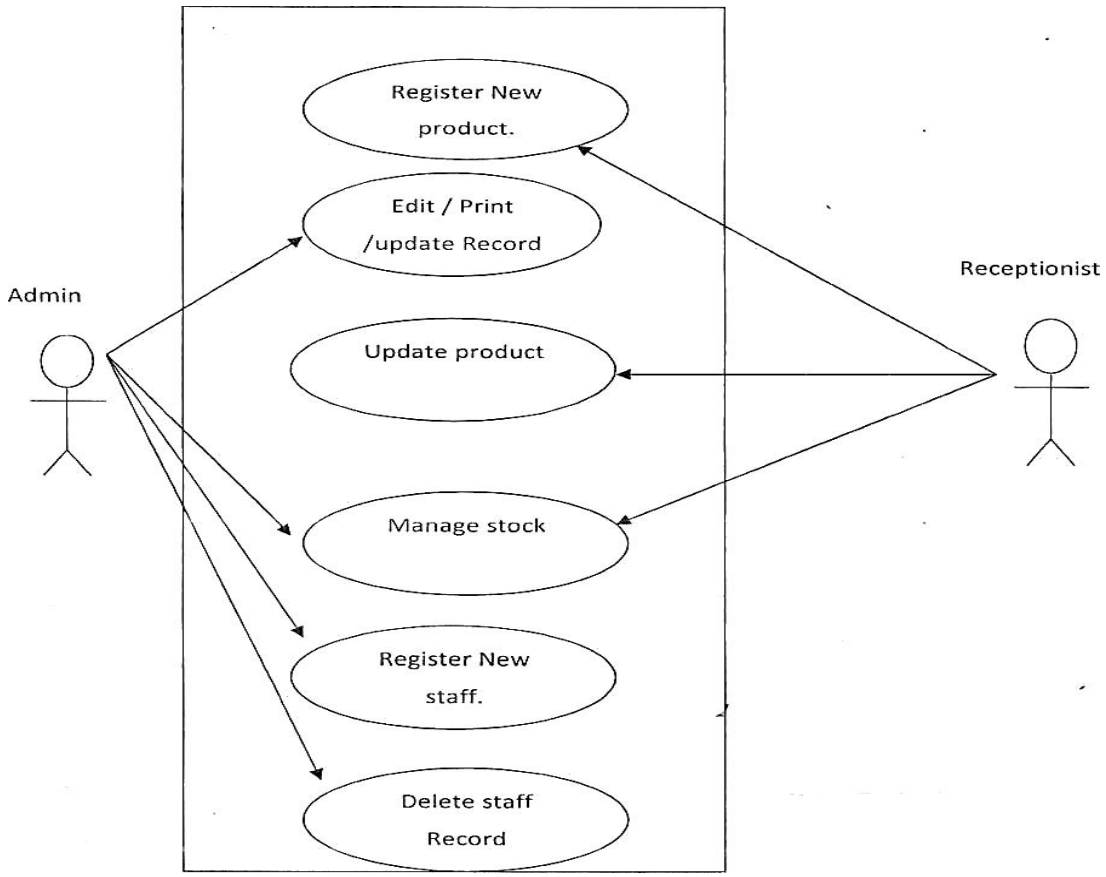
ii. System Model Design

iii. Sequence diagram

iv. Class Diagram

3.6.1 USE CASE DIAGRAM

Inventory control system



3.6.2 SYSTEM MODEL DESIGN

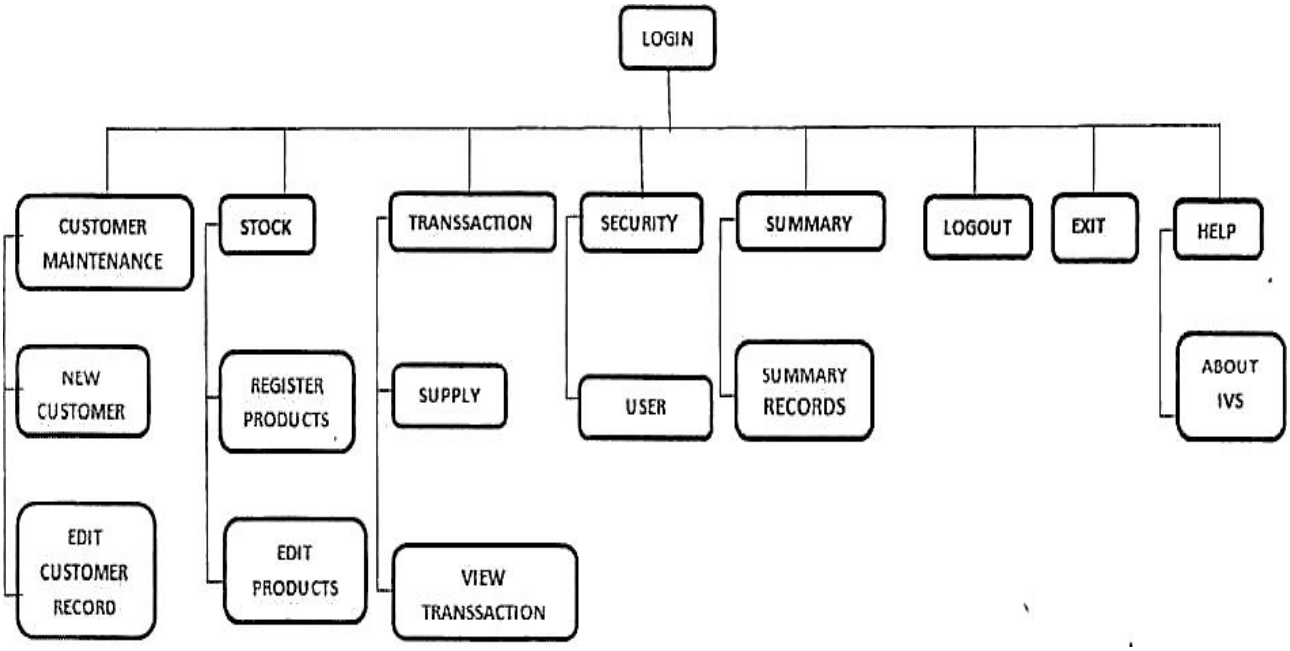


Fig 3.2 Data Model Design for fagcoop inventory Management System.

This diagram breaks down what is contained in the software .when the software is run, the login form appears and the user must input the information required by the software to allow access to all its features which are; username and password. Once information is inputted, the user can finally gain access to its features (i.e. software). After passing through the login form, you find the customer maintenance button which contains two forms, the register new customer form and edit customer record form. The next button youTl see is the stock button which carries aiso two forms;

the register product and edit product form. The next button that youTl see is the transaction button that houses two forms; the supply and view transaction form. Another button youTl see is the security button which carries only one form; the user form. Next button is the summary button which also carries only one form; summary records form. The next

feature to be seen is the logout button, when clicked takes the user back to the login form thereby putting the system on some sort of lock mode. The next feature to be seen is the exit button, when clicked on, closes the entire software. The next button seen is the help button which contains only one form; about IVS.

3.6.3 Sequences Diagram

It is an interaction diagram that describes a sequence of interactions between objects. It shows how objects communicate with each other in terms of sequences of messages. They also indicate the lifespan of objects relative to those massages. Figure 3.3 show the sequence diagram of the proposed system

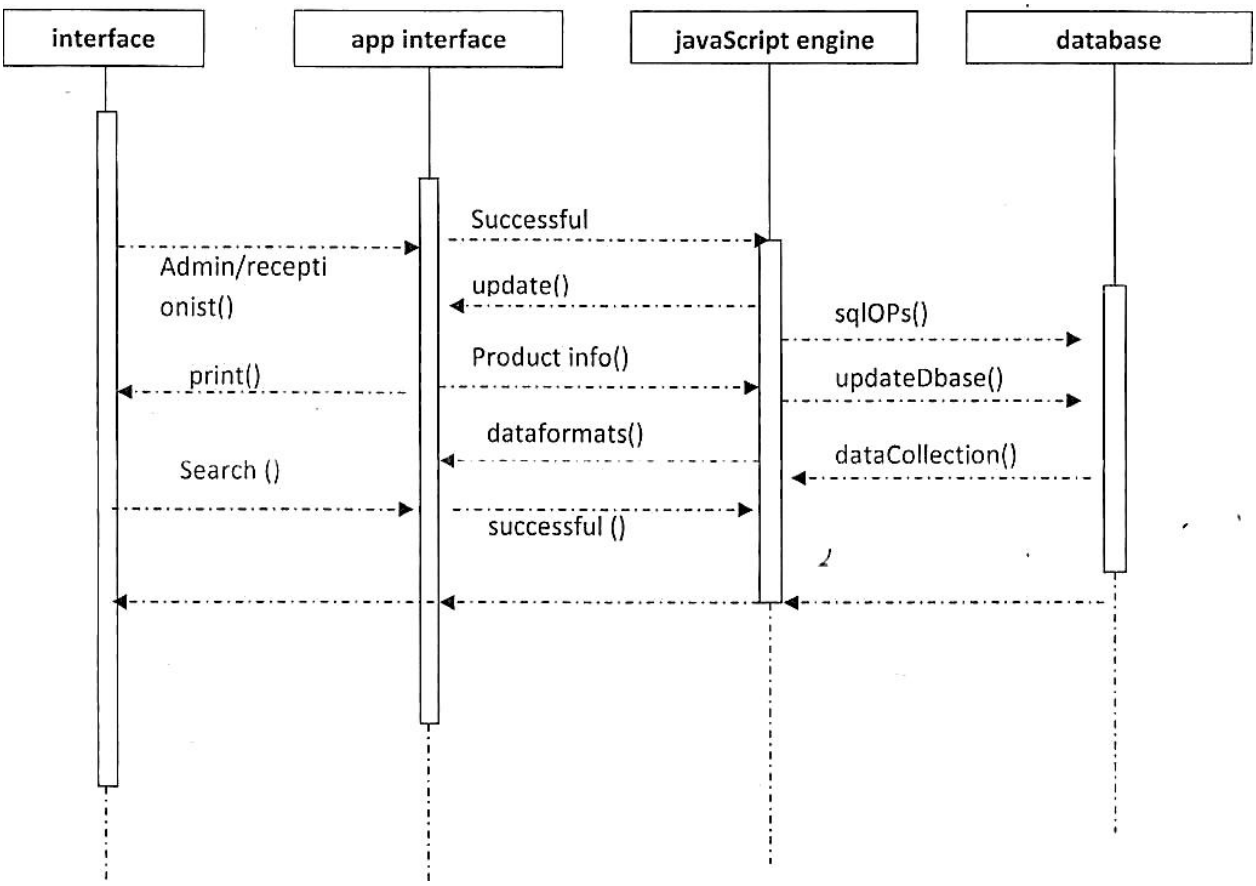


Fig 3.3: Sequence diagram for the proposed system.

3.6.4 CLASS DIAGRAM

Unified Modeling Language (UML) is a standardized general-purpose modeling language in the field of software engineering. The standard is managed, and was created by, the Object Management Group. UML includes a set of graphic notation techniques to create visual models of software-intensive systems. We make use of class diagrams here to represent our model for the proposed system operations

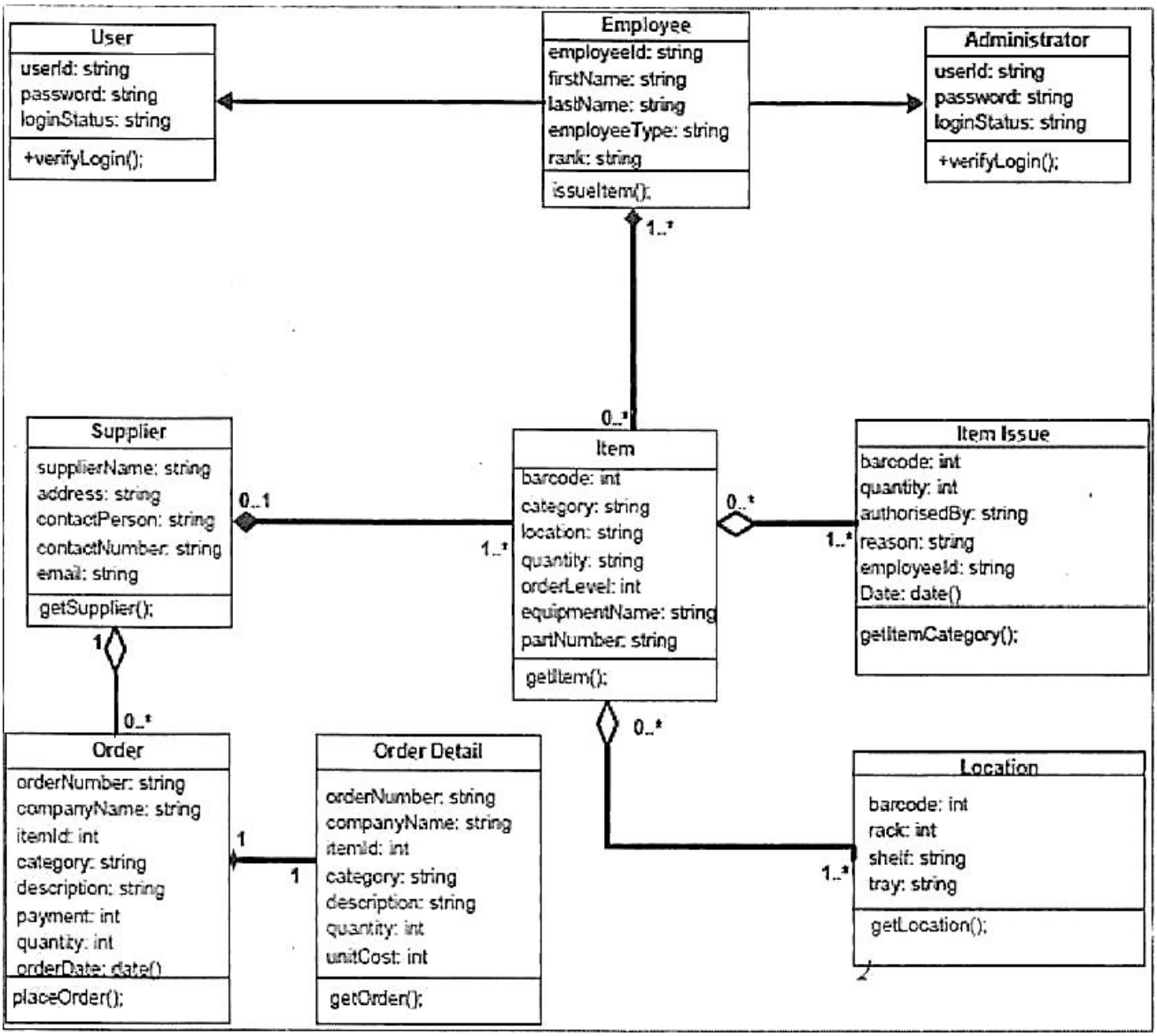


Figure 3.4: the use case diagram of the proposed model

3.7 DATABASE DESIGN

Files used in this project are made up of different data types. Some of the files are designed and linked with database. There are several advantages

of storing data in database and Microsoft Access database was used in this project design.

a) All data is stored at one location when a database is used, all tables are stored in a single file thus, and we need not deal with separate buttons usiiag the single database file. Though all data is stored in a single file, distinctions exist because tables are used since each table is stored as a separate entity in the file.
b) It is possible to define relationship between tables and these are also stored in the database.
c) It is possible to define validation at fields as well as table level and this ensures accuracy of data being stored.
d) Query, report, sorting etc. are also used.

Table 3.1 RECEPTIONIST TABLE

S/N	**FIELD NAME**	**DATA TYPE**	**LENGTH**
1.	REGNO	VARCHAR	**20**
2.	FIRSTNAME	VARCHAR	**20**
3.	LASTNAME	VARCHAR	**20**
4	SEX	VARCHAR	**2**
5	DATE_OF_BIRTH	DATE	**25**

6	KINNAME	VARCHAR	**25**
7	MOBILENO	VARCHAR	**25**
8	EMAIL	VARCHAR	**40**
9	ENTRYDATE	DATE	**20**
10	REGDATE	DATE	**20**

Table 3.2 CUSTOMER TABLE

S/N	**FIELD NAME**	**DATA TYPE**	**LENGTH**
1.	FIRSTNAME	VARCHAR	**20**
2.	LASTNAME	VARCHAR	**20**
3.	EMAIL	VARCHAR	**25** 2
4.	MOBILE	VARCHAR	**15**
5.	USERNAME	VARCHAR	**25**
6	PASSWORD	VARCHAR	**10**

Table 3.3 PRODUCT TABLE

S/N	**FIELD NAME**	**DATA TYPE**	**LENGTH**
1.	PRODUCT NAME	VARCHAR	**20**
2.	PRODUCT TYPE	VARCHAR	**20**
3.	DETAILS	VARCHAR	**25**

4.	DATE	VARCHAR	**25**
5.	ID	INT	**25**

CHAPTER FOUR

SYSTEM IMPLEMENTATION AND TEST

4.1 INTRODUCTION

This chapter deals with the implementation and testing phase, which constitute the main part of the new system. The software and hardware required for, the implementation of postgraduate information management system are as follows:

4.2 SOFTWARE REQUIREMENT

The software required for implementing the online convicts crime record system are:

I. Operating system: Windows 7/windows vista/windows xp
II. Programming language: PHP, MySQL
III. Web development tool: Apache2Triadl.54 for windows, Adobe for Dreamweaver CSS
IV. Word processor: Microsoft word (Ms Office 2007)

4.3 HARDWARE REQUIREMENTS

For the development of this project, the following hardware requirements have been considered.

Development end:

Processor: Pentium IV or higher RAM : 256 MB

Space on disk: 250MB or higher Application end:

Device: Android phone with version 2.3 or higher

Space to execute: 3 MB 4

The hardware requirements are as follows:

Minimum system requirement; 1 gigabyte (GB) RAM (32-bit) or 2 GB RAM (64-bit)

1 gigahertz (GHz) or faster 32-bit (x86) or 64-bit (x64) processor 16 GB available hard disk space (32-bit) or 20 GB (16-bit)

RECOMMENDED SYSTEM REQUIREMENT

Intel (R) core 2 Duo CPU T5670 @ 1.80 GHz processor, 3.0 GB RAM or higher.

4.4 UNIFIED MODELING LANGUAGE (UML)

Unified Modelling Language {UML) is a standard modelling language used for modelling software systems of varying complexities. UML provides a set of notations and rules for creating simple, well-documented and easy to understand software models. Grady Booch, James Rumbaugh, and Ivar Jacobson developed UML, which is a standard modeling language and the first version was released in June 1996 (Booch, Rumbaugh, and Jacobson, 1996). UML Is a non-propriety language the goal of UML is:

- To provide a simple and ready-to-use expressive visual modelling language that allows the user to visualize the system
- to be process independent
- to be language independent

UML enables system engineers to create a standard blueprint of any system. It provides a number of graphical tools that can be used to visualize a system from different viewpoint. These multiple views of the system that are represented by using diagrams together depict the model of the system.

UML can be used to depict different aspects of a software intensive system through various kinds of view. The views typically used are:

I. **User view:** represents the goals and objectives of the system from a user's viewpoint

II. **Structural view:** represents the static's or idle state of the system

III. **Behavioural view:** represents the dynamic or changing state of the system

IV. **Implementation view:** represents the distribution of the logical element such as source code structure and un-time implementation structure of the system.

V. **Environment view:** represents the distribution of the physical elements of the system. The environment view depicts nodes that form a part of the physical hardware requirement for the deployment of the system.

4.5 FEATURES OF PHP (HYPERTEXT PRE-PROCESSOR) AS A PROGRAMMING LANGUAGE

A computer language is used to write or code computer programs, for this reason, computer languages are referred to as programming languages. Common programming languages have the following features:

® The language should contain inbuilt data structures and data types

- The language should have a syntax that is consistent, natural and promotes the readability of the programs.
- The ability to freely format a program, which allows the programmer the freedom to use the techniques, such as indentation and blank lines to highlight the structure and improve the readability of the program.
- The language should allow the user of meaningful identifier to name program objects, and should have a consistent syntax.
- A language should have clarity and simplicity
- A language should support the concept of data hiding, inheritance, polymorphism, dynamic binding and user-defined data types.

4.6 JUSTIFICATION OF THE PROGRAMMING LANGUAGE

The choice of programming language here is guided by the following characteristics;

- Availability of resources and support for maintaining programs such as libraries
- cross-platform capabilities
- networking capabilities
- Good memory management.
- Simplicity
- Security

The programming language chosen by the researcher to build the program in this project is PHP {Hypertext pre-Processor formerly known as personal Home Page Tools} as it supports the above features, therefore it is the language of implementation in this project.

Choosing it because of its server-side nature is mainly for security and ability to protect program code from users who may wish to exploit it. By

being server-side, all the users get at their end is the HTML, resulting from the output of the PHP Code execution.

Its sole purpose of existence {which is to build dynamic web pages} is a factor that makes it very popular programming language to use. servers using PHP For their dynamic content are cheaper than web servers using other technologies because PHP is free and its interpreter is even open source, meaning programmers may get the PHP source code and make modifications on it that best suit their needs and compile the code.

4.6.1 HTML {HYPERTEXT MARKUP LANGUAGE}

The simplest explanation of how HTML works derives from full expansion of its acronym: Hypertext Makeup Language. Hypertext refers Jto one of the World Wide Web's main properties - the capability to jump from one page to another, no matter where the pages are located on the web. Makeup language means that a web page is actually a heavily annotated text file, the basic building blocks, such as <Strong> and <p>, are known as mark-up elements or tags, An HTML page, is a set of instructions {the tags} suggesting to your browser how to display the enclosed text and images.

The browser known what kind of page it is handling based on the tag that opens the page, <html>, and the tag that closes the page </html>.

4.6.2 MYSQL

MySQL, pronounced either "My S-Q-L or My Sequel." is an open source relational database management system, it is based on the structure query language {SQL}, which is used for adding, removing and modifying information in the database. Standard SQL commands, such as ADD, DROP, INSERT, and UPDATE can be used with MySQL. MySQL can be used for a variety of applications, but is most commonly found on web server. A website that uses MySQL may include web pages that access information from a database. These pages are often referred to as "dynamic". Meaning the content of each page is generated from a database as the page loads. Websites that use dynamic web pages are often referred to as database-driven, many database - driven website that use MySQL also use a web convicting language like PHP to access information from the database. MySQL commands can be incorporated into the PHP code, allowing part or all of a web page to be generated from database information.

Since both MySQL and PHP are both open source {meaning they are free to download and use}, the PHP-MySQL combination has become a popular choice for database- driven websites.

MYSQL was chosen for the following reasons:

- Its portability, as it works on different platforms, uses multi-layered server design with independent modules.
- Security, as it has a privilege and password system that is very flexible and secure.
- Connectivity, as clients can connect to it using several protocols.
- Localization, as servers can provide error messages to clients in many languages.

4.7 INSTALLATION AND CONFIGURATION OF WEB DEVELOPMENT TOOLS

The tools used for the development of the online convicts crime record system includes PHP, MYSQL, PHP, My Admin (all these are available in the Apache2Triadl.54 Server) and Abode Dreamweaver.

The procedure and configuration are as follows

1) Download Apache2triadl.54 server from http://www.Apache2Triadl.54server.com/en/
2) Click on download and select the appropriate version to download, which is based on the system configuration.
3) This downloads the installer setup, you double click on it, and then the wizard will guide you through the installation of Apache2Triadl.54 Server contents that is MySql, PHP.

The choice of programming language here is guided by the following characteristics;

- Availability of resources and support for maintaining programs such as libraries

4.8 JUSTIFICATION OF THE PROGRAMMING LANGUAGE

- cross-platform capabilities
- networking capabilities
- Good memory management.
- Simplicity
- Security

4.9 IMPLEMENTATION

The new system is designed to be put into efficient use. Here, we will look into the various technical aspects that influenced the successful implementation of this system and determine the effective operation of the system. System implementation follows the approval of the system proposals and its objectives, thus it is to arrive at a satisfactory, implemented, completed, and function evaluated automated system. It also embodies the preparation of resources including equipment's and personnel.

The supplier login password and identification is entered, he checks, tracks order, dispatch order on customer and sends invoice after which he updates records. The customer studies and makes a list of requirement, places the order, makes payment and receives his invoice.

4.9.1 LOGIN FORM

This is the first form that appears when the software is run. The user is required to provide the information (i.e. username & password) needed in order to the access the features of the software. This is shown in figure 4.1.

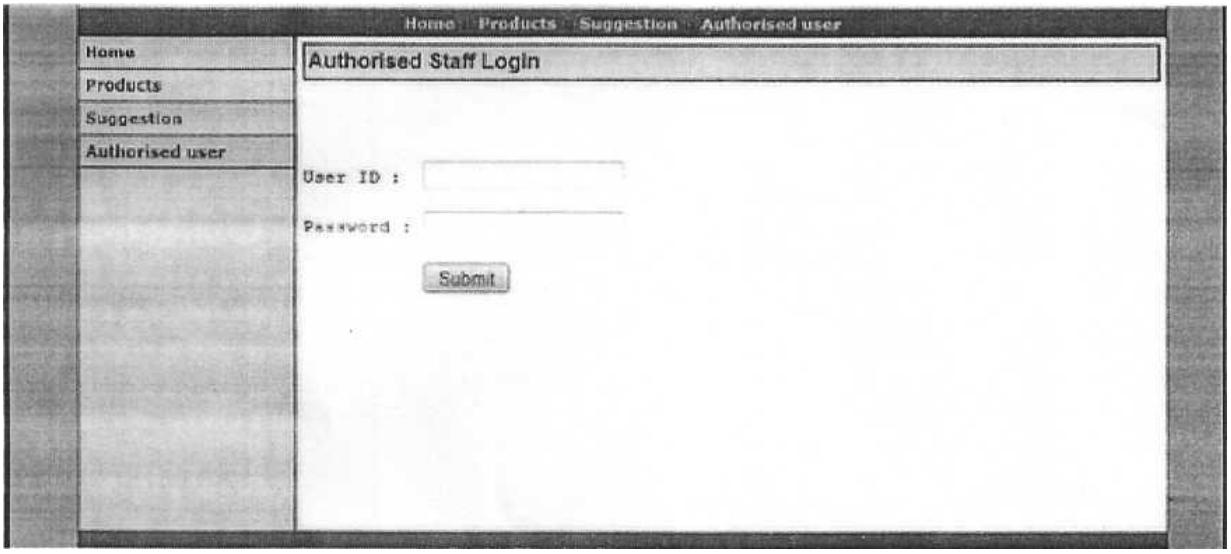


Figure 4.1: login page PRODUCT ENTRY PAGE

This enables us to register the different product in the database. Information about each product such, product name, price, quantity, status of the product or goods, category of the product, etc are then enter into the database.

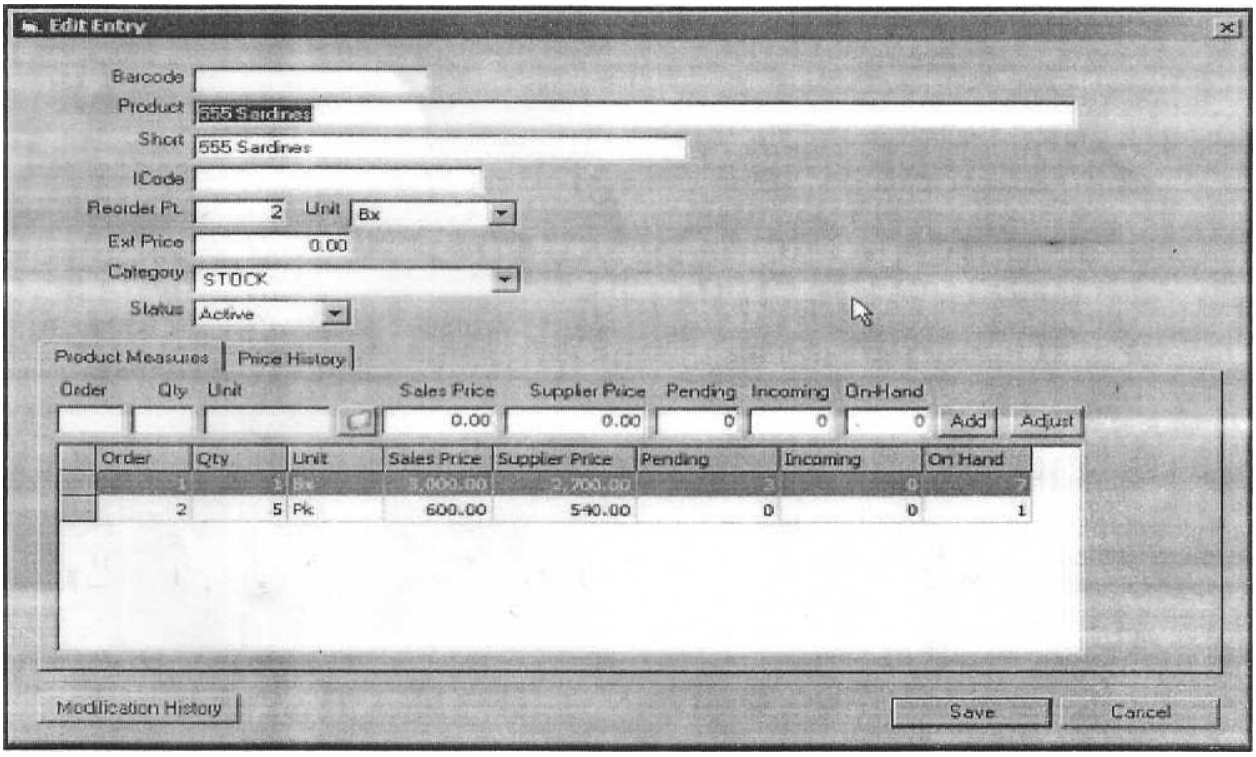


Figure 4.2: product registration page.

SUPPLIER PAGE

This form enables us to get the details of the supplier, such as name of supplier, email, telephone number of our supplier. This form enables the user make orders for the type of product they want to purchase including the quantity required. This form also helps in the calculation and summary of the amount the customer is to pay for purchasing the good(s). This is shown in figure 4.3

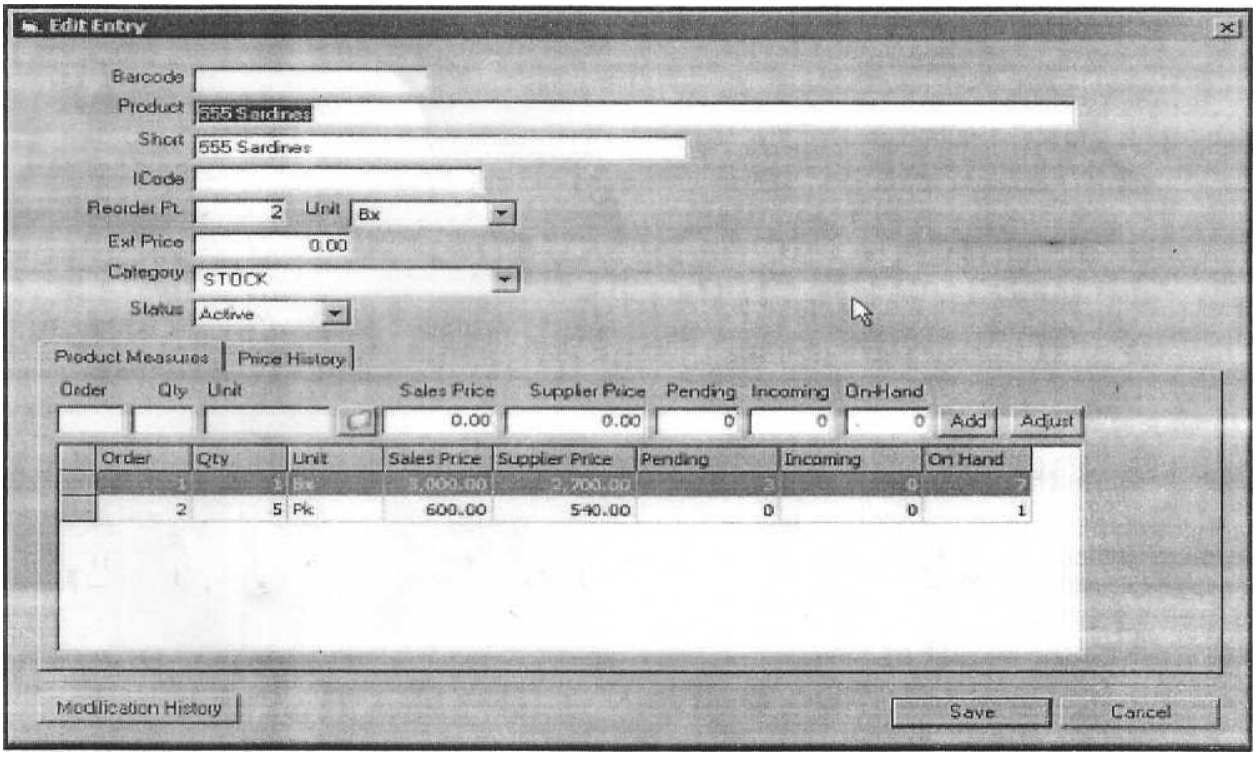


Figure4.2: product registration page.

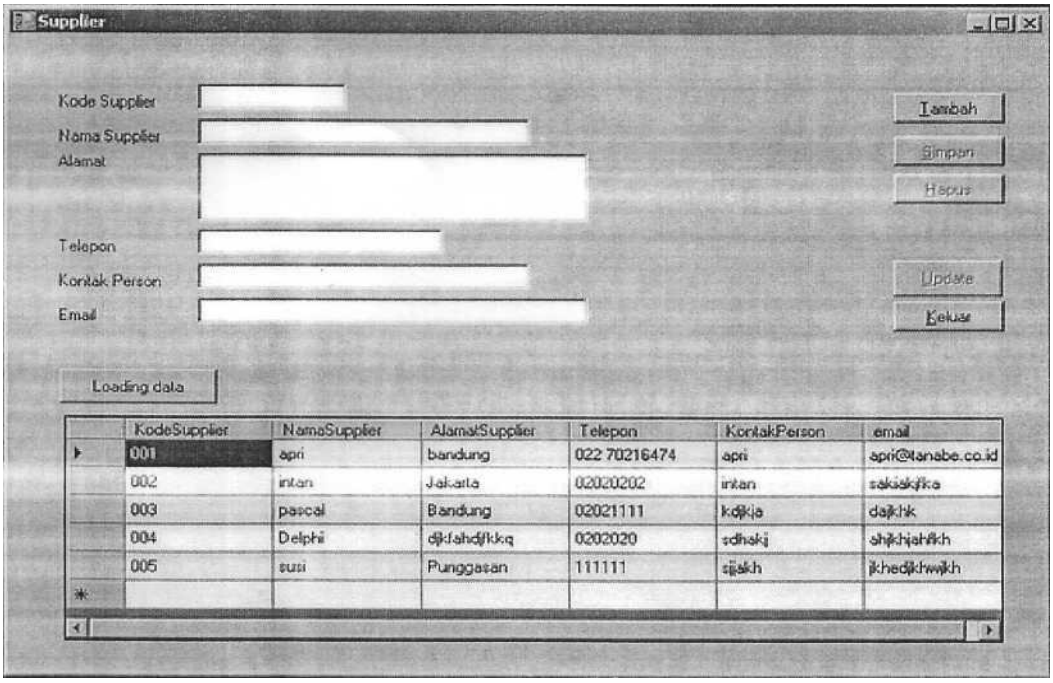


Figure4.3: the login page

THE SHOPPING INVOICE PAGE

This page display the shopping invoice form customer request for, such as product name, price, quantities, total amount as shown in figure 4.4.

Figure4.4: shopping invoice page

4.10 TESTING

Testing is one of the most important phases in the software development procedure activity. In software development life cycle (SDLC), the main aim of testing process is the quality because quality gives guarantee about software; the developed software is tested against attaining the required functionality and performance. During the testing process the software is

worked with some particular test cases and the output of the test cases are analyzed whether the software is working according to the expectations or not. The success of the testing process in determining the errors is mostly depends upon the test case criteria, for testing any software we need to have a description of the expected behaviour of the system and method of determining whether the observed behaviour confirmed to the expected behaviour. For our application we perform testing based on that some of the test cases are listed in below table:

Table 4.1: Administrator Test Plan

TEST	ACTION	RESULT
Administrative login	**Enter wrong user name and password into the data field**	**The system denies access and display login**
	Enter wrong username or wrong password into the data field	**Access denied: system display invalid login**
	Enter correct username and correct password in the data field	**Access granted: system authenticate and grant right/privileges to access the system.**

Table 4.2: Student Basic Information Test Plan (Input data Field Validation)

TEST	ACTION	RESULT
RECEPTIONIST (INPUT DATA FIELDS)	**1. INPUT PRODUCTNAME/ PRODUCT ID**	
	a) Alphanumeric characters: enter alphabetic, numbers and special character in	**The characters entered is display in the data field**
	b) product Name and Product ID data field blank.	**Blank data field display in the data field**
	2. INPUT ITEM a) Select Product type from a drop down menu	Option select display in the data field. The word "PRODUCT" is display in the data
	3. INPUT DATE OF PRODUCT EXPIRATION a) Select date of from calendar in the data field	date is calculated and display in the data field The text "date" is display in the data

CHAPTER FIVE

SUMMARY, RECOMMENDATIONS AND CONCLUSION

5.1 SUMMARY OF FINDINGS

It can be observed that computer applications are very important in every field of human endeavor. With this new system, the difficulties encountered with the manual inventory control system are overcome. The automated inventory control system reduces the workload of the staff, saves time and increases efficiency. The records of the company are safe and secure, distribution process is well managed, errors are minimized, and reports generated for management are accurate thereby increasing the profit margin.

5.2 RECOMMENDATIONS

This system will be useful since it is computerized and will promote effective, efficient and improve service delivery thereby promoting profit oriented manufacturing. The employment of computer personnel for an effective maintenance of the system will enhance a maximum output of this package.

5.3 CONCLUSION

The benefits of using an automated inventory control system cannot be over emphasized. While developing the system, conscious efforts was made to create and develop software using the available tools, techniques and resources that would generate a proper system. While implementing this system, an eye has been kept on making it as user-friendly, as cost-effective and as flexible as possible. The automation of the inventory system is an improvement on the manual operation as nothing can substitute a good inventory control system.

REFERENCE

Adam, A. K. (2005)' A secure and optimal qr code," *international journal of engineering research & management technology*, vol. 1, no. 5, pp. 36-43.

Adrew, H. A. And Whitney (2006), " determination of inventory control policies at urafiki textile mills co ltd in dares-salaam, Tanzania, *business and economics journal*, vol. 2011, pp. 1-9.

Brason, F., S. M. K. Jamal, A. Omer and A. A. S. Qureshi, (2005). "cloud computing solution and services for RFID based supply chain management," *scientific research: advances in internet of things*, vol. 3, pp. 79-55.

Bucklin, n. (1965), ' 'improving business logistics using barcode scanners," *international journal of computer applications*, vol. 50, no.15, pp. 1-5.

Byoungho, C. (2004), "near field communication," **international journal of advanced research in computer science and software engineering**, vol. 4, no. 8, pp. 899-905.

Cassidy, M., (1994). RFID concept: principles and practice. New York: John Wiley and Sons ltd.

Chan D. and Van Hock E (1999), "3d barcodes: theoretical aspects and practical

Chan, S., Jyothi and K. Bhargavi, (2002) " classification of DNA barcodes based on image processing techniques: a study," *international journal of pharma and bio sciences*, vol. 7, no. 3, pp. 773-780.

David A. and David Karamasa (2002), "factors affecting the e-commerce adoption by small hotels: a comparative case study," *international journal of e-adoption (ijea)*, vol. 4, no. 1.

David, B And Alex D.J. (1994). Applying automated inventory control systems in manufacturing industries. London: D.P publications ltd.

David t. (1999) "implementation of e-kanban system design in inventory management, "*international journal of scientific and research publications*, vol. 4, no. 9, pp. 1-4.

Donald, K. A.(2006), " effective survey on two-dimension color barcodes for mobile applications," *international journal of scientific engineering and applied science (Ijseas)*, vol. 2, no. 1, pp. 195-198. 1 edition.

Graman, I. O. and Magazini. w. (2006), "the impact of effective inventory control management on Organisational performance: a study of 7up bottling company Nile mile Enugu, Nigeria," *Mediterranean journal of social sciences*, vol. 5, no. 10, pp. 109-118.

Hundfield O. (2002), "A RFID based inventory control system for Nigerian Supermarkets, "*International journal of computer applications* (0975 - 8887), vol. 116.

Imai, 1. (1998), "the advantages and disadvantages of barcodes and radio frequency identification in supply chain management," school of information technology and Computer science. University of Wollongong. Implementation," the international society for optical engineering (proceedings of spie).

Janat, P. (2009), "cloud computing: security issues and research challenges," *international journal of computer science and information technology & security*, vol. 1, no. 2, pp. 136-146.

Ken S. Mathaba A., A. Smith and m. Adigun (2010), "the use of RFID and web 2.0 technologies to improve inventory management in south African enterprises," *electronic journal information systems evaluation,* vol. 14, no. 2, pp. 225-241.

Monczka S., M. Taylor, J. Irland and A. (2002) Mehta, "RFID technology in forensic evidence management, assessment of barriers, benefits and costs," national institute of standards and technology.

Ozer H. A. (2003) "near field communication (NFC) Ijcsns *international journal of computer science and network security*, vol.12 no.2, pp. 93-99. w