Design of a Computerized Inventory Management System for Supermarkets

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Abstract: *Inventory is often the largest priced asset of a business after the fixed asset. Keeping the inventory also means keeping a tab on the realizable value, market value of all the stocks, stock in production and finished stock. This paper explores the challenges of manual inventory management system for supermarkets and infers solutions to the current challenges by designing a computerized inventory management system to order and update the stocks. The main method used for this research work is interview. Data were collected from 5 heterogeneous supermarkets and used as a tool for obtaining facts. When the goods were supplied the update of the stocks were being taken from time to time. The finding shows the challenges facing the manual system of inventory management system; the manual system requires everyday counting of items in the inventory, human errors are very prevalent during counting and recording and in case of disaster like fire or flood or poor communication, all the manual inventory records will be damaged and irretrievable. Based on the findings this paper highlights the possible solutions to the above problems; a computerized inventory management system to order and update the stocks was designed and goods were supplied to implement the possible solutions.*

Keywords: Inventory management, Stock, Goods, Order

1. Introduction

Inventory management is the process of efficiently overseeing the constant flow of units into and out of an existing stock of goods. This process usually involves controlling the transfer of units in order to prevent the inventory from becoming too high, or dwindling to levels that could put the operation of the company into jeopardy [16]. Inventory management is primarily about specifying the size and placement of stocked goods. It is a science primarily about specifying the shape and percentage of stocked goods. Inventory management is required at different locations within a facility or within multiple locations of a supply network to protect the regular and planned course of production against the random disturbance of running out of materials or goods. The scope of inventory management also concerns 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 [16]. Planning and controlling of inventory management is concerned with the following three basic questions:

1. Which items and how much of them should be on stock?
2. Where to store them?
3. How is the re-order point defined?

In this context, the planning stage deals with the question of which items should be kept on stock and which specific to stock the items has to be defined. The third question is concerned with the re-order point, of when to order in which order quantity. These questions are closely concerned with the overall research aim and the implementation of e-commerce. The initial question is about which items or spare parts should be provided to the customer to fulfill the customer needs. Furthermore, the whole distribution site and supply chain processes have to be determined. [5].

2. Aims and Objectives

Aim: To design a Computerized Inventory Management System to ascertain stock level of a supermarket, when to order for more goods, keep status and updates of transactions, thereby helping managerial decisions, progress level and stock taking.

The objectives are:

1. To study the functions of inventory management system
2. To explore the challenges being faced by the manual system
3. To design a computerized inventory management system that solves the problem inherent in the manual system with the use of Microsoft access and Microsoft Visual Basic
4. To implement the supply products data on the computerized inventory management system to ensure its functionality

3. Methodology

The main method used for this research work is interview. Data were collected from 5 heterogeneous supermarkets and used as a tool for obtaining facts. About 10 goods were ordered for and were supplied. When they are supplied the update of the stocks including supplier records were being taken from time to time. The Computerized Inventory Management System is designed with the use of Microsoft Visual Basic and Microsoft Access.

4. Scope of the Study

This research work covers stock control, management and tends to correct anomalies in business. It analyses Opening of New Stocks, stock updates and ability to view existing ones. It provides quick way of operation by capturing the manual process and automating them.

5. Significance of the Study

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 paper help provides such tools and helpful in management, control and effectiveness.

6. Difficulties in the Manual Inventory System

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 factors for these difficulties are:

1. **Time Consumption:** Manual inventory systems are time consuming, as the business owner must keep track of inventory sales on a daily basis, while updating the system manually at the end of the day.
2. **Poor Communication:** A manual inventory requires employees and managers to write down each time an item is removed from the inventory. If one employee forgets to mention that the last coffee product has been removed from the inventory, a manager expects the item to still be available for a customer during a sale. Compared with a technical inventory system, a manual inventory system does not help the communication in the workplace.
3. **Physical Counts:** A manual inventory system does not provide any number, as all numbers from the inventory are gained through physical inventory counts. One of the difficulties of running a manual inventory system is that physical inventory counts must be performed frequently to control the items in the inventory. This is time consuming and can cost the business money, if employees must come in to help out outside of business hours.
4. **Daily Purchases:** Keeping track of daily purchases is another difficult controlling measure with manual inventory systems. A manual inventory system requires the employees to write down the items sold during a single work day. This can be a difficult task, as one employee may lose the list of items sold or another may forget to write down a sale.
5. **Ordering Supplies:** A manual inventory system does not update at the end of the day with updated inventory

counts. This means you must go through the inventory items each time you need to place an order for new raw materials, products or supplies for the inventory. This can be a time consuming process, as you will physically have to go through each product box and browse through the items.

7. Data Flow Diagram of the Manual and Computerized System

The DFD Diagram for Inventory Management System is a data flow diagram of graphical representation and commonly used also for the visualization of structured design data processing through an information system, it's an important technique for modeling process aspects with a system's high-level detail by showing what kinds of data will be/how to input and output from the system, where the data will come from and go to by sequentially, and where the data result will be stored through functional transformations. The system is shown as a single process that provides data to the financial system. it both provides data to and gets data from Manager, Supplier and Customer.
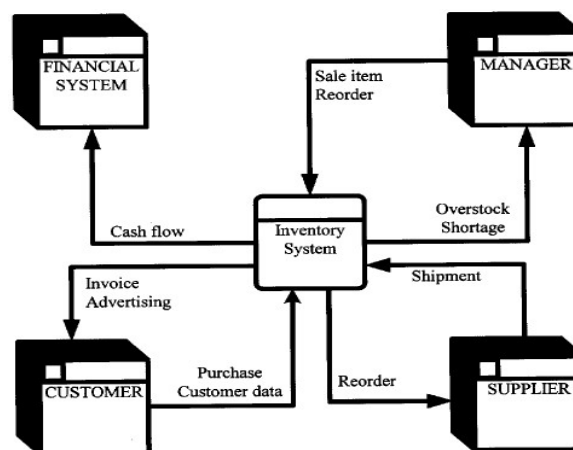
7.1 Data Flow Diagrams

Figure 7.1: Data Flow diagram of the manual system
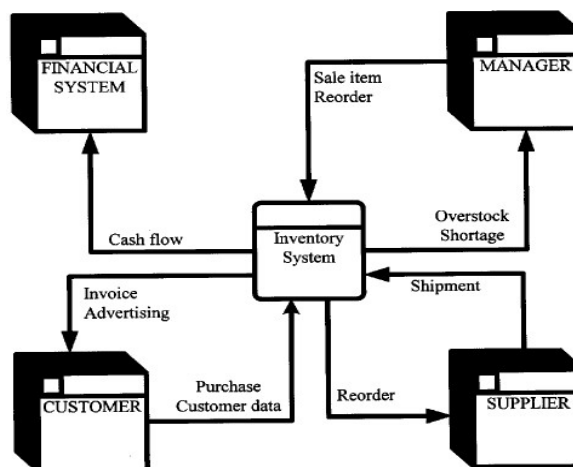

Figure 7.2: Data Flow diagram of the computerized system

The figure above (Fig. 7.1) shows the complete inventory circle system, activities and processes the inventory system undergoes. We have five interconnected systems: which are the Customer, Financial System, Manager, Supplier and the

Inventory system. In the Customer System an Advertised product is purchased by the Customer, the customer's data is manually recorded at the inventory and invoice is issued in respect to the goods purchased. The Financial system records the transaction details and Cash Flows, the Manager of the company Records the Sale Item, checks the stock level to avoid Shortage and Overstock and issue an order if there is shortage of stock and the product supplied is not what was ordered, he will then Reorder for more. The Supplier of the product from the manufacturer checks the wholesaler's order and Reorder and makes the Shipment or delivery of goods. Each stage and activities in the figure above takes manual inventory of the processes. The same thing is experienced in the Fig 7.2 above, but the manual record taking in the former is electronically handle in the new system called Computerized Management System which handles the New stock, Stock order, Stock update, Product or Item Search to check availability and Stock Report.

8. Program Analysis

The program starts with a login page as a measure to ensure security. In which if it is successful, will display the splash screen after which it will automatically display the main menu form. The user has the option of choosing from the onscreen menu options. Which are the New Stock, Update Stock, Search and View options. The user form will capture records regarding stock details. Which are stored in the database, retrieved and viewed later.

8.1 Program Implementation

This is the stage in which the developed system is tested and it is expected that the system will perform the required task as to meet the need of the end-user. System implementation involves activities such as:

1. Training end-users,
2. Setting up implementation environment and
3. Performing the conversion or change over.

8.2   Application Program Structure

Program design: Program design deals with logical procedures follow to achieve the desire goal of this project work as it is aimed to solve a particular problem. It could be a set of instruction in a logical way to achieve a particular task. Program design also implies the production of professional software, which was designed with Visual Basic and Microsoft Access. The program is normally run in Microsoft Visual Basic Environment or the executable file installed (Cannot be upgraded). When the program starts it displays a splash screen form (Display information about the software), after some time, it displays a login form that has a username and a password. On acceptance into login in, it displays the splash screen and main menu. Where you can choose any of the option of modules you want to run.

8.3   Application Program Element

The Integrated Development Environment element of the application program is designed to handle user friendly interface. It make use of forms where controls are placed

serving as the front – end. While the Database is serving as the back – end. And the application program is rich also with components and references that can be used and work behind the scene of your program.

8.4 Summary of Test Conducted

The following tested was conducted on the following;

1. New Stock
2. Update of stock
3. Searching and viewing a particular product and supplier

9. Data Analysis

9.1 Input Design

In any organization, institution or any system of operation there is always an input into the system which keeps a system going, if the input is wrong definitely the output will be wrong. This design is meant to handle data about a particular product or stock in the Supermarkets.

Table 9.1: Table for the Input Design to add new product record

Field Name	Data type	Field Size
Order Number	Integer	15
Product Number	Integer	10
Product Name	Text	30
Supplier Number	Integer	15
Supplier Name	Text	40
Quantity Order	Integer	20
Quantity Received	Integer	20
Date Order	Text	15
Date Received	Text	15
Received By	Text	30

Table 9.2: Table for the Input Design to Add to the Stock

Field Name	Data type	Field Size
Supplier Number	Integer	15
Name	Text	35
Middle Name	Text	20
Surname	Text	20
Address	Text	40
Contact Number	Integer	15
Company Name	Text	35
Company Address	Text	35
Company Contact	Text	30
Note	Text	40

Table 9.3: Table for the Input Design to Add Supplier Record

Field Name	Data type	Field Size
Product No	Integer	10
Product Name	Text	30
Product Supplier	Text	40
Category	Text	30
Product Price	Integer	20
Quantity	Integer	20
Product Description	Text	35

10. Result

The result of the test is stored in the database. Especially the details of the report will be generated in a form showing the details of available stocks and products.

10.1 Sample Outputs for Inventory Management
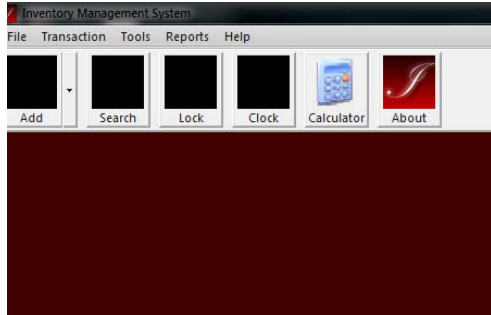

Figure 10.1: The Login Interface
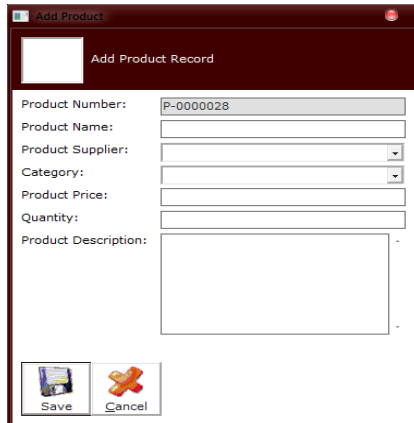

Figure 10.2: System main menu
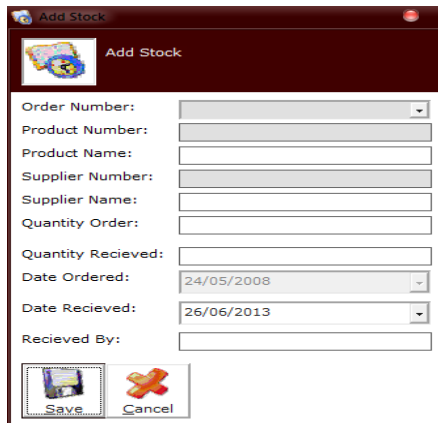

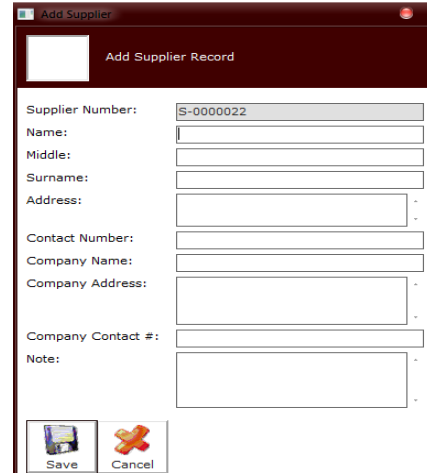**Figure 10.3:** Add Product Record

Figure 10.4: Add Stock

Figure 10.5: Add supplier Record

Figure 10.1 above is the login interface for the stock keeper to have access to the inventory management system. The system is protected from unauthorized user and the system main menu interface is shown in Figure 10.2. Table 9.1 shows the input template to add a new product record while Figure 10.3 is the design template to add product to the record. Also, Table 9.2 above is the input template to add product to the existing stock while Figure 10.4 is the design template to add product to the existing stock. Also, Table 9.3 above is the input template to add supplier record while Figure 10.5 is the design template to add supplier record. The search for any existing product and supplier record can be performed with the use of Figure 10.7 and the template can be updated by the store keeper with the use of the menu below the template. Figure 10.6 and Figure 10.8 depict the reports of the existing product record and supplied record.
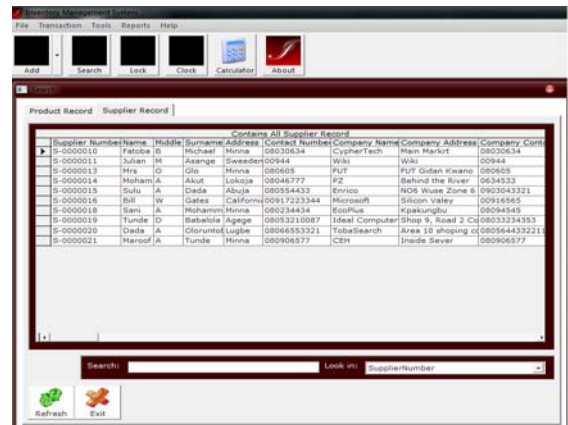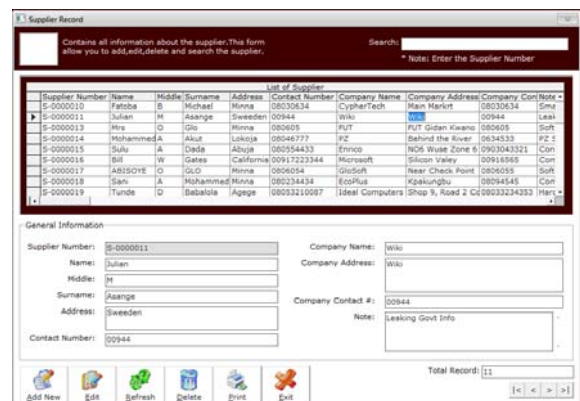

Figure 10.6: Supplier Report Records

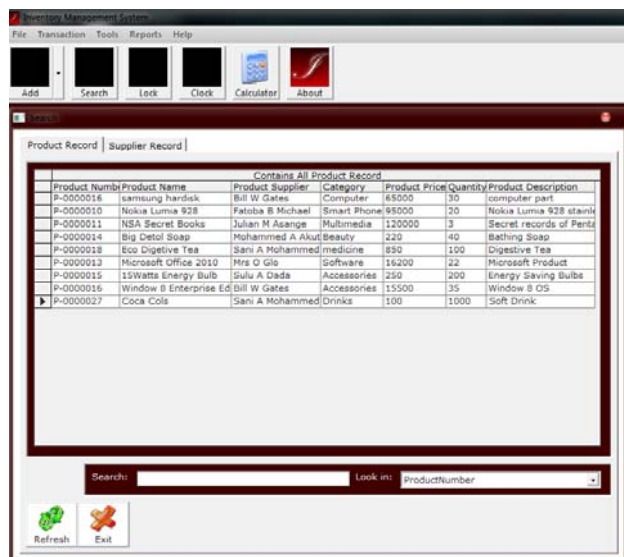**Figure 10.7:** Search for a Supplier Input Record

Figure 10.8: Product Input Record

10.2 Performance Evaluation

The program is tested with supply of 10 products to the supermarkets viewed from the database on the stock report form. The test will be carried out on their system after an installation of Visual Basic 6.0 with Microsoft Access package installation in the system. The system will be evaluated based on the information that is supplied by the stock keeper.

10.3 Program Maintenance

The program may be maintained on the ground that the system requires an upgrade. When there is a new field to be added or a new form to be added in other to serve users well. And since it is not compiled as a standalone it can be maintained any time by changing or removing some codes or adding new one

11. Recommendation

It is recommended that this research work should be implemented in supermarkets. Effort should be made by supermarkets to ensure that all records regarding the items are properly entered in to the system. It is also recommended that the computerized system should replace the manual system of stock recording and processing in order to hasten managerial decision.

12. Conclusion

This research has designed a Computerized Inventory Management System to ascertain stock level of a supermarket, when to order for more products, keep status and updates of transactions, thereby helping managerial decisions, progress level and stock taking. But there is always a room for improvement in any software no matter how efficient the system may be. The important thing is that the system should be flexible enough for future modifications. The system has been factored into different modules for the management of inventory system to make system adapt to the further changes. Every effort has been made to cover all user requirements and make it user friendly.

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