

# CHAPTER ONE

## INTRODUCTION

### 1.1 Background of Study

An inventory control system may be a set of hardware and program based apparatuses that mechanize the method of following stock (Salamudeen and Yinyeh, 2013). The sorts of inventory followed with an inventory management system can incorporate nearly any sort of quantifiable merchandise, counting nourishment, clothing, books, hardware and any other things that buyers, retailers or wholesalers may purchase.

Inventory Management System is a software application which fulfills typical stock analysis requirement for different products owned. It offers users with the interface to handle daily operations as well as historical information in a graphical manner. Also provides monthly inward management reports, monthly deliveries, and monthly returns.

This application retains a centralized database to immediately reflect any modifications made at a place.

Inventory Management System (IMS) is commonly utilized by IT Office/Department or Accounting Office of an organization, supermarkets or a University. Accordingly, hunting the essential needs for execution is the initial step of IMS structure. A few gatherings with IT Office and Accounting Office are orchestrated. Bookkeeping Office needs point by point revealing instruments, itemized order and presentation of particulars on everything, obtaining and charging data. The Information Technologies Office needs another module aside from the prerequisites of Accounting Office. The module is about the inside support and outside item administration stream. For inside upkeep stream, there will be an area. This area will be accessible for all clients. Fundamentally, a support solicitation will be made by the clients, and the IT Office will react to these requests. Finally, the demands of the end user, which are also a significant component of IMS software design, need to be considered.

Maintaining accurate levels of inventory across the organization affects several areas. Besides enhancing warehouse activities, inventory concentrations also influence buying, restocking, and selling. In addition, the buying department will frequently inspect inventory software in most

organizations to check stock levels before ordering more products. Having a precise inventory allows this department to make smarter choices at all times.

The most important benefit of a digitized inventory management system is saving time and money. Again, without a stock management scheme, numerous man-hours are wasted manually recording what products are being used for each transaction, delivering these forms to the office, and then entering the information into the billing scheme manually.

Implementing a system that updates all transactions in the store or warehouse in real-time will virtually eliminate the need to enter data manually. It is automatically updated to the accounting system as soon as the warehouse / store employee posts the transaction. This saves time in the warehouse / store as well as in the office.

This project aims to solve the issue of inventory management/stock taking by designing and implementing a system that will manage the inventory of a supermarket.

## **1.2 Statement of the Problem**

Inventory management is basic to a business achievement. The request satisfaction goals will be undermined on the off chance that there is not enough goods and materials in the stockroom.

The present inventory keeping scheme is a manual system in which customers keep ledgers, books, etc. to store data such as details of vendors, inwards, deliveries and returns of accessible products, client details as well as staff details. Maintaining historical information is very hard. Every year, periodic investments must also be purchased stationary. Some of the problems of the manual inventory system are:

- i. Projection of inaccurate demand and supply: Analysis of inaccurate needs can lead to stock piling or shortage of inventories. Manual inventory management scheme does not recognize gaps, predict future requirements, or streamline information in order to generate analytical trends.

- ii. Manual system does not integrate all company functional elements that may prove to be ineffective. Manual inventory system follows a decentralized approach; this means that data is not updated in real time and inventory levels are regularly updated.
- iii. Lack of optimization: This system has limited possibilities for growth. It is not possible to incorporate cost-control techniques, predictive analysis, or process efficiencies in a manual scheme that is difficult to manage.
- iv. Manual inventory systems do not systematically sort and label inventory. This can lead to inventory that is misplaced, unused and outdated.

### **1.3 Aim and Objectives**

#### **Aim**

The aim of this study was to design and implement a digitized inventory management system.

#### **Objectives**

The following were the objectives of the study:

- i. To design a system that provides visibility and accuracy to a business function.
- ii. To create a system that updates stock levels as soon as sales occur to enhance accuracy and enable swift replenishment of stock levels.
- iii. To create a system that provides room for growth and expansion along with the business.
- iv. To create a system that notifies as soon as stock of products drops below the threshold.

### **1.4 Scope of the Study**

The project will be concerned with a virtual inventory management system that can be used to improve the taking of stock in the university supermarket.

### **1.5 Significance of the Study**

The project will help facilitate the boost of inventory management by providing transparency and potency to a complex system. Inventory management software package is one amongst the key ways to assist management of storage and shipping solutions. The system will add ability, accuracy, and simplified data and records to processes.

## 1.6 Definition of Terms

- **COMPUTER:** an electronic device that is capable of accepting data, process the said data, produce the expected output and store the produced result.
- **Inventory:** An itemized catalog or list of goods or properties, or intangible attributes or characteristics
- **Sales report:** A sales analysis report shows the trends occurring in a company's sales volume over time.
- **Management system:** A management system is a set of policies, processes and procedures that an organization uses to ensure that it can fulfill the tasks necessary to achieve its goals
- **Automated data collection:** Systems of hardware and software used to process transactions in warehouses and manufacturing operations.
- **Automated storage and retrieval systems:** A rack row system with a dedicated retrieval unit for each row that moves vertically and horizontally along the rack picking and load removal
- **Commodity:** Used to describe classifications of inventory.

## **CHAPTER 2**

### **LITERATURE REVIEW**

#### **2.1 Introduction**

This chapter presented the proponents' collected data and information that formed part of the research literature which was very useful in the development of this study.

#### **2.2 Review of Literature**

Inventory management was described as an art based on science that ensures that an organization holds just enough inventory stock to satisfy demand (Coleman, 2000; Jay and Barry, 2006). Inventory is the availability in an organization of any stock or resources used. An inventory system is a set of policies that control and monitor inventory levels and determine what level should be maintained, how large orders should be made and when stock should be replenished.

Inventory control is the monitoring of items' storage, supply and accessibility to guarantee appropriate supply without excessive supply (Miller, 2010).

Inventory control implies material accessibility whenever and wherever needed by storing appropriate stock number and type. The complete amount of those associated operations that are crucial for the procurement, storage, sale, disposal or use of material can be called inventory management. If required, inventory managers must store and resourcefully use available storage space so that the available storage space is not exceeded. There is a responsibility to maintain accountability for inventory assets. They must fulfill the specified budget and decide what to order, how to order and when to order so that inventory is accessible on time at the best price (Benedict and Argeridis, 1999). Inventory management therefore involves planning to organize and control the flow of materials from their initial purchasing unit through internal operations through distribution to the service point (Smaros, et al., 2003).

Inventory is one of any retailer or production organization's biggest and most tangible investment. Not only can intelligent inventory management policies assist increase profit, they can also imply the difference between a flourishing or barely surviving company. The objective of inventory management is to hold inventories at the lowest possible price and to set targets to guarantee

uninterrupted supplies for continuing activities. When making inventory decisions, management must have found a compromise between the different cost component, such as the cost of inventory supply, the cost of holding inventories and the cost of sufficient inventories (Peterson and Silver, 1998; Zipkin, 2000). Inventory control, according to Miller (2010), was the activity that organizes the customers ' availability of items. To meet marketing needs, it coordinates the functions of purchasing, manufacturing and distribution. This function involves the supply of present sales products, fresh products, consumables, spare components and all other equipment. Inventory enables a company to support the customer's services, logistics or manufacturing activities in situation where purchasing or manufacturing of the items is not able to satisfy the demand. Inventory plays an undeniable row in an organization's growth and survival in the sense that failure to manage inventory effectively and efficiently will result in the organization losing customers and declining sales. Another way to achieve its organizational goals is to satisfy the requirements of the customer. In a company, customer willingness has always been a crucial problem not only in maintaining revenues but also in increasing them (Tersine, 1994; Potilen and Goldsby, 2003). Kotler (2002), argues that inventory management refers to all activities involved in the development and management of inventory levels of raw materials, semi-finished materials (working progress) and finished goods so that adequate supplies are available and over or under stock costs are low.

The main objective of inventory management is to specify the size and positioning of stocked products. Inventory management is needed at various places within a plant or at various places within a supply network to safeguard the periodic and scheduled manufacturing process from the random disruption of materials or products running out. The scope of inventory management also covers the fine lines between planned replenishment, carrying inventory costs, asset management, inventory forecasting, inventory valuation, inventory visibility, future inventory price forecasting, physical inventory, available inventory space, quality management, replenishment, returns and defective goods and demand forecasting. Balancing these conflicting demands results in ideal inventory levels, a process that is continuous as company needs shift and respond to the broader setting (Ghosh and Kumar, 2003).

Rosenblatt (1977) said: "The cost of maintaining inventory is included in the final price paid by the customer. Good in inventory represent a cost to their owner; the manufacturer has the expense of materials and labor. The wholesaler also has funds tied up." Hence, the manufacturers ' basic goal is to maintain an inventory level that will provide optimum inventory at the lowest cost. Morris (1995)

emphasized that in its broadest perspective, inventory management is to maintain the most economical amount of one type of asset to facilitate an increase in the total value of all human and material resources assets of the organization. Ogbo (2011) argued that the main objective of inventory management and control is to inform managers of how much of a good to reorder, when to reorder the good, how often to place orders and what the appropriate security stock is to minimize stock-outs. The overall objective of the inventory is therefore to have what is needed and to minimize the number of times one is out of stock.

Ghosh and Kumar (2003) had defined inventory as a stock of goods held by a company in anticipation of some future demand. Brag (2005), who emphasized that inventory management has an effect on all company activities, especially operations, marketing, accounting, and finance, also endorsed this definition. He found that there are three reasons for inventories, transactional, precautionary and speculative. The transaction motivation happens when the inventory needs to be held to satisfy the demands of manufacturing and sales. A company may also decide to hold additional stock to cover the possibility that its future production and sales requirements may have been underestimated. This is a precautionary motivation that only applies when there is uncertainty about future demand. In anticipation of making abnormal profits, the speculative motivation for keeping inventory may entice a company to buy a bigger amount of materials than ordinary. One type of speculative conduct is the advance acquisition of raw materials in inflationary times.

### **2.2.1 The Reasons for Taking Inventory**

A firm would hold more inventory than is currently necessary to ensure the firms operations. Reasons for maintaining inventories:

#### **2.2.1.1 Demand**

A retailer stays in business when the customer wants the product on hand when the customer wants it. If not, the retailer must order the item back. If the client can get the products from some other source, many choose to do so instead of waiting to allow the initial client to subsequently satisfy the requirement (by back-order). Therefore, a sale is forever lost in some cases if the products are not in inventory.

#### **2.2.1.2 Running Operations**

A manufacturer must have certain bought products (part of raw materials or subassemblies) in order to produce a product. When a company runs out of just one product, completing the manufacture of a finished goods can be avoided. The inventory of consecutive dependent activities also serves to decouple the operations ' dependence. A work-center often relies on the previous operation to provide it with work-on parts. If work stops at a work-center, for absence of job, all subsequent centers will be shut down. Each machine can operate for a limited period of time, hopefully until operations resume at the original center if the work-in-progress inventory is maintained between each work-center (kuku, 2004).

### **2.2.1.3 Lead Time**

Lead time is the time between placing an order (either a manufacturing order given to the factory floor or a purchase order) and receiving the real ordered products. If an external company or an internal department or plant (supplier) is unable to supply on demand the required goods, the customer company shall keep an inventory of the required goods. The longer the lead time relies on the bigger the amount of products that the company must carry in the inventory.

### **2.2.1.4 Hedge**

Inventory can also be used as a hedge against inflation and price rises. Salesmen regularly call purchasing agents before a price rise becomes effective. This gives the buyer the opportunity to buy material exceeding the current need at a price lower than it would be if the buyer waited until after the price increase occurred (kuku,2004)

### **2.2.1.5 Quantity Discount**

Buying big amounts of products often gives the companies a price discount. This also often leads to an inventory that exceeds what is currently required to meet demand. However, the decision to buy in large quantities is justified if the discount is sufficient to offset the additional holding costs resulting from the excess inventory.

### **2.2.1.6 Flexibility of Inventory Service**

Inventory service flexibility offers an organization with the capacity to maintain inventory services at an accepted service level with acceptable risk and price in a predictable manner. Customers can test and appreciate this capability. Inventory management is critical in the supply chain to ensure a high level of customer service. Maintaining assets, however, is very expensive. The level of



inventory accessibility for clients is reflected in three classifications: stock of raw materials, work-in-progress inventory and inventory of finished products (Lieberman et al 2002)

Excess is wasteful on both sides, although there may be reasons for this, such as stock-out avoidance, manufacturing runs, seasonality or enhancement of customer satisfaction levels (Lieberman et al, 1999). However, to satisfy client requirements, it is critical to keep the correct quantity of the three kinds of inventory. Furthermore, inventory service flexibility can also be used to pursue high inventory utilization while reducing waste, since inventory utilization is an important indication of management efficiency and effectiveness (Caplice and Sheffi, 1994).

Inventory management in the company sector is the structuring of inner and external organizational organizations and how to leverage funds based on environmental requirements. In addition, the relationship between the company's performance, capacity and expertise has rarely been studied concurrently; the company's resource-based view argues that firm efficiency is a resource mix feature.

When resources and capacity are heterogeneous, unique, and hard to reproduce; when organizational offers generate more value or capacity for clients, competitive advantage is accomplished. Thus, differences in performance between companies result from differences in service capacities, which are further decided by the portfolios of resources or competences.

#### **2.2.1.7 Flexibility**

An organization's long-term survival is critically the organization's capacity to adapt to change (Upton, 1994). In the brief term, leadership flexibility affects the company's competitive position and can affect its general profitability. Flexibility in supply chain management may well be a potential cause for improving the effectiveness of a company and a substantial measure of the performance of the supply chain (Vikery et al, 1999). In particular, through the flexibility of inter-company inventory management, organizations can decrease dependence on forecasting when and where inventory needs to be located to satisfy client demand and enable providers to react just-in-time to demand. In the meantime, flexibilities in intra-firm inventory management can be directly linked to overall firm performance for allocating and delivering inventory control and coordination to multiple warehouse-level destinations. The supply chain organizations should see efficiency improvements as a consequence of both intra-and stock management flexibility.

Stock and Lambert (2001) proposed that the level of inventory service should be one of the common variables of the delivery service. The skill of a firm's inventory management represents directly the level of inventory service as a kind of service flexibility. On the one hand, the flexibility of intra-firm inventory management enables a company to have good stock control and maintain a high level of availability to customer requirements, thus enabling the organization to maintain a reasonable level of inventory of raw materials, work-in-process inventory and inventory of finished goods and simultaneously reduce inventory waste.

On the other side, the flexibility of inter-firm inventory management allows a company to handle stock between members in the supply chain. These flexibilities seek a reasonable level of inventory service chain based on a high level of coordination, involvement, and close communication. Through these joint efforts, supply chain organizations can prevent stocks from running out or overcrowding.

Zhang et al, (2005) argued that there is a causal relationship between flexibility and performance in inventory management. They proposed that excellent flexibility in inventory management enables companies to leverage their managerial and intra-and inter-inventory management skills and ultimately produce high levels of flexibility in inventory service. This is because flexible competence, which is an inner management focus, offers the procedures and facilities that allow a company to attain the required capacity levels. The result of an effective inventory service is to "develop service capacities as these investments will provide companies with access to various market segments, thus yielding financial returns. So, the greater the flexibility of the inventory, the greater the company's performance. The concurrent growth of flexibility in inventory management and flexibility in service will therefore strengthen the capacity of a company to enhance efficiency. This means that flexibility in inventory management is expected to have a positive impact on performance through its positive impact on service flexibility (flexibility in inventory service as a mediating variable)

## **2.3 Conceptual Review**

### **2.3.1 Inventory**

Inventory could be widely described as the inventory of products, commodities or other financial assets stored or reserved for future manufacturing or future requests at any specified time.

### **2.3.2 Classification of Inventory**

Inventory was divided into 2 classes depends on nature and purpose and from industry to industry.

#### **2.3.2.1 Direct Inventories**

It includes those items which play a direct role in the manufacturing and become an integral part of finished goods. The direct inventories are as follows.

##### a) Raw Material Inventories

i) Enables creation rate charge

ii) To give efficient mass buying

iii) For regular changes

##### b) Work in Process Inventories

i) To set up conservative part of creation

ii) To late the stock of items

##### c) Finished Goods Inventories

i) To permit adjustment of the dimension of creation

ii) For sales insurance

#### **2.3.2.2 Indirect Inventories**

Indirect inventories include those items which are necessary for manufacturing but do not become component of the finished goods production, such as lubricants, grease, oil, petrol, stationeries, and maintenance materials.

### **2.3.3 Storage for Inventory**

In the event that the organization was to deliver certain level of entire years yield inside in shorter time, they would need to colossal work and materials. So they need parcel of materials with in shorter period. The products they can get just from material stock rather, they may create in slower calendar and stock them as stock. Some kind of association may convey stock to guarantee immediately conveyance to clients.

### **2.3.4 Inventory Decisions**

The important decision that each organization needs to take in regards to stock is structure the correct amount at opportune time with least expense. Right amount implies how much amount to be requested keeping in view the interest, supply and cost angle.

The season of request will be considered based on lead time, conveying cost, utilization level and working capital positions.

### **2.3.5 Benefits of Inventory Control**

- Scientific systems of inventory control reduce inventory anywhere in-between 15% to 60%.
- Inventory consumes an adequate supply of items to customs and avoids the shortages as for as possible.
- Makes use of available capital in a most effective way.
- Protect from the risk of loss due to the charges in prices of items stocked.

## **2.4 Review of Related Works**

According to Janes, computers are amazingly dependable gadgets and ground-breaking adding machines with some extraordinary adornments applications like word handling issue for all of business exercises, paying little respect to estimate, PCs have three focal points over other kind of office hardware that procedure data since PC are quicker, increasingly precise progressively practical. Reyes pointed out that tasks would be time consuming if done manually but would be more practical with the aid of computers.

According to Disco, computers helped cautious keen arranging, sorting out, impelling and controlling. This possibly saw from an earlier time that they screen generation exercises, take care of logical issue and help land in speculative response to a huge number of include conditions.

Lewis expressed that the purpose behind utilizing PCs change from individual to individual. A portion of the PCs in business are to perform exactness, to be as efficiency, to diminish jug necks or bothers to change money streams or to simply elevate your status.

According to Sybex Inc. visual fundamental give a graphical situation wherein the clients typically planned the structures and control that become the structure square of visit application. Visual Basic help numerous valuable apparatuses that will help the client progressively profitable.

### **2.4.1 Merchandising Companies.**

A few organizations these days are occupied with purchasing instant products and exchanging it, which is generally known as marketing. These substances utilize just one record - promoting stock, where buys and offers of inventories are recorded either interminably or intermittently. Never-ending stock framework is utilized by organizations selling low-volume and extravagant products, while occasional stock framework is for modest ones. In the two frameworks, real quantities of inventories are physically checked toward the finish of the period. The former, however, only requires to reconcile it with its computed ending inventory, unlike the latter, which depends on it to determine inventory ending (Ballada, 2007). Hardware companies would therefore find it quite difficult to monitor changes in inventories involving large quantities.

### **2.5 Importance of Inventories**

As indicated by Brigham and Houston, inventories are the principle wellspring of an organization's income and benefit. Sold inventories increment either money or records receivable. The gathered money will at that point be utilized to buy stock and pay the working costs of an organization, for example, specialists, lease, protection, utilities, etc. In this manner, stock fills in as one of the life bloods of a business.

Business Finance and Philippine Business Firms book calls attention to the fact that the size of stock is identified with the size and recurrence of procurement orders. Which means, only occasionally buying in greater volumes infer higher stock dimension, lesser requesting of stock reduces expenses. Successive buying in smaller volumes, induces lower stock dimension, higher requesting and stock out expenses however lesser taking care of expense. Thus, inability to screen the stock may result to greater expense and in the end, problems. To keep away from these, stock must be kept up at a dimension that accommodates turnover and benefit, and expands rate of profitability. Plus, the working capital tied up in stock and its chance expense can be diminished. This will empower the organization to pick up the chances to procure on its capital not utilized in this thing, and keep away from stock deficiency.

### **2.6 Manual versus Computerized**

Most elements handle their business exchanges physically by account it in paper-based diaries. In any case, this can be tedious, mistake bearing and work concentrated. In addition, showcase requests which are elevated be modernization call for change in business tasks. The rise of innovations and new musings makes their old convictions and procedures wasteful and immaterial. With such progressively aggressive market, it is obvious that a few organizations began to maintain these headways and consider better approaches to endure. (Paul Franson, 1998)

According to Liberty Enerio Solomon, productivity and development must be accomplished when present day innovation is given significance. The reason is that it influences the focused capacities and the capital speculation of an organization. Moreover, the immaterial advantages of innovation, for example, work cost and outdated nature hazard decrease, speed of conveyance, and data handling, and adaptability, will enable the organization to produce more benefit and fulfill the providers and clients also.

## **2.7 Related Studies**

### **2.7.1 Inventory System Review – Waterware Group Ltd.**

The objectives were to:

- (1) Investigate the corporation's inventory control system
- (2) Provide some solutions to minimize the complexity of the system and
- (3) Make some suggestions on how to reduce over-stocking.

The stock issued as distinguished through estimation of stock's turn-over for the past five years and contrasting it and other fruitful bringing in or circulating associations. The outcomes demonstrated that the company's stock turn-over had impeded over the past five years and was well beneath different associations benchmarked.

A number of sol-based initiatives have been developed and implemented resulting in substantial financial savings for water supplies.

Constraints:

1. Did not give notification when stock is low
2. Did not update inventory in real-time

## **2.7.2 Inventory Management: A Tutorial Canadian Publications, Practical Applications and Suggestions for Future Research**

Questions:

- (1) How often should the inventory status be determined, that is, what is the review interval?
- (2) When should a replenishment order be placed? (3) How large should be replenishment order be?

Objectives of concern to inventory managers:

1. Cost minimization (with or without discounting)
2. Profit maximization (with or without discounting)
3. Maximization of rate of return on stock investment
4. Determination of a feasible solution

Constraints:

1. Supplier constraints – Minimum order sizes, limitations on certain pack sizes, maximum order volumes (especially in tight supply systems), limitations on replenishment conditions.
2. Marketing constraints – minimum tolerable customer service levels
3. Internal constraints – storage space limitations, maximum budget for inventory purchases during a period, maximum workload (number of replenishment per period), personnel involved
4. Did not update inventory in real-time

Objectives and constraints is important in the applicability of solution obtained.

Costs:

1. Replenishment cost – cost incurred each time a replenishment action is taken
2. Carrying cost – cost of borrowing the capital tied up or foregoing its use in some other investment, warehouse operation cost, insurance, taxes, potential spoilage or obsolescence
3. Costs of insufficient supply in short-run – backordering cost or loss, goodwill
4. System control cost – training, new system, changing plans costs

## **2.8 Synthesis**

The research mentioned above was necessary to determine how the scientists fulfilled the inventory management criteria:

(1) Establish a system of accounting for inventory

(2) Make decisions regarding how much and when to order, and consequently make a program for it.

The following requirements according to Production and Operation Management 1998 are needed to achieve these:

1. A system to keep track of the inventory on hand and on order
2. Knowledge of lead times
3. Classification system for inventory items

These related literatures and studies will guide the researchers in making the necessary program to effectively and efficiently comply with the requirements stated above.

## **2.9 Conceptual Framework**

In able to develop the proposed system, the researchers took the above-mentioned studies for consideration. These studies added to the ideas and concepts necessary to be able to complete this study.

The specialists planned a Computerized Inventory System for Southbest Sales Center utilizing the stock framework. This program expects to effectively screen the stock records of Southbest Sales Center since the proprietor had just utilized the conventional stock tallying, the physical checking. A worldview recognizes a program's information, yield and the preparing steps required to change the contributions to the yields. The Input-Process-Output (IPO) model created by Harris and Taylor (1997) was used to guide the study in general.

The researchers had the knowledge in programming, and the cycle of the inventory system. They used Visual Basic 6.0 and their knowledge on the aforesaid topic.

The administrators are the proprietor of the business focus and one of his administrators/staffs. They are viewed as approved to login. The proprietor is in charge of checking the stock framework and the administrator is in charge of refreshing the stock records. The framework can be gotten to each time the proprietor needs to. The framework means to make the stock checking simpler.



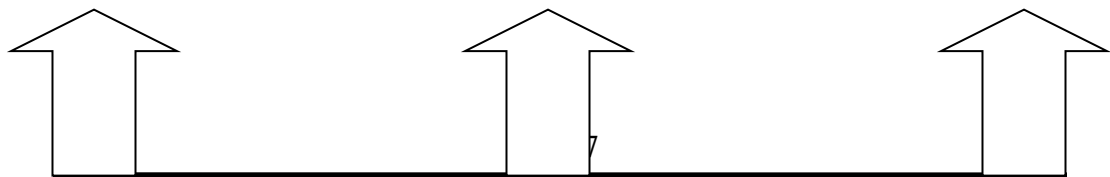
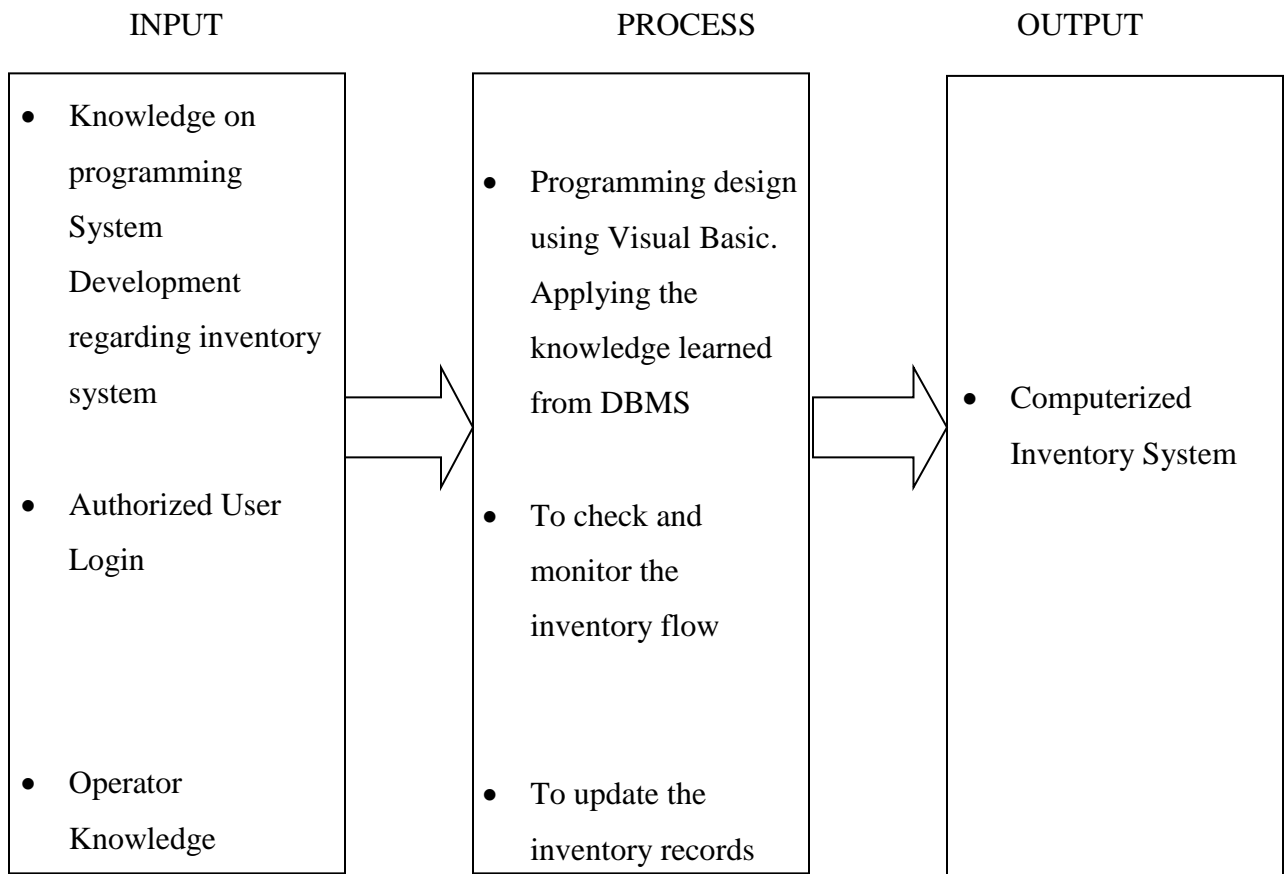


Figure 2.1: Conceptual framework

### **2.10 Theoretical Framework**

Inventories, to be sure were viewed as one of the organization's arms and legs that demonstration mostly for the age of income and benefit. Stock administration is one of the basic perspectives in business tasks that an organization needs to accomplish with extraordinary precautionary measures and exactness. Regardless of whether clearance of inventories, buys, misfortune buys because of robbery, ruined merchandise, item deficiency and other stock issues can straightforwardly include impact the benefit articulation's primary concern.

The desire of the administration to improve the stock framework brought forth the advancement of different procedures and techniques in regards to stock tallies and support of stock framework with the guide of new innovative advances.

Figure 2.2 shows how cash outflows are converted into goods, sell those goods to customers, collect the receivables then ends up with cash inflows. This only shows the essentiality of inventory in the business operation cycle.

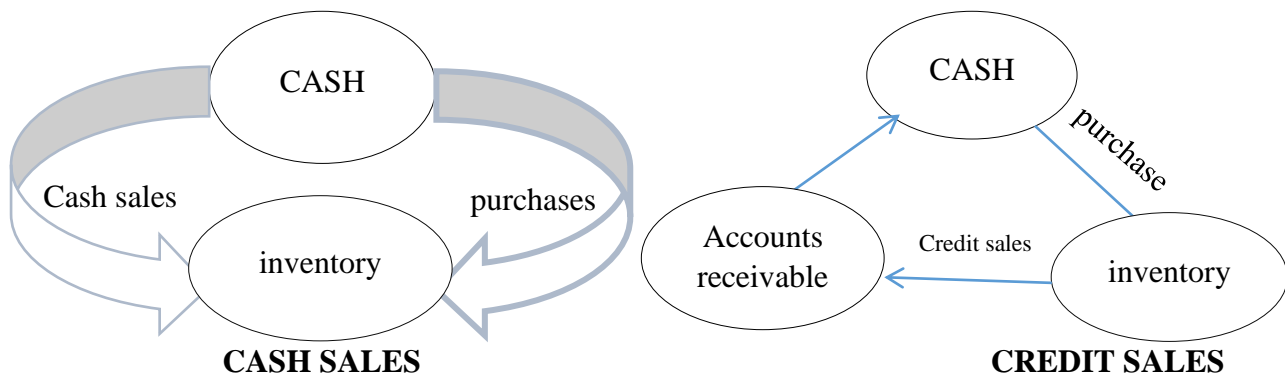


Figure 2.2: Inventory cycle

Source: Ballada W. and Ballada S.(2007) Basic Accounting Manila  
DomDane Publishers

According to the 2010<sup>th</sup> edition of the book of Guerrero, managing inventories was critical to evade waste and abuse because of its exorbitant amount, and misfortunes due to its deficiency. In this way, the accompanying procedures are utilized to appropriately deal with the correct number of stock inflows and surges. The following are the Economic Order Quantity (EOQ) and the Reorder point.

EOQ mirrors the amount of request important to get the best cost while keeping the stock at a suitable dimension to guarantee continuous creation, that is, where requesting and conveying expenses can be limited. EOQ might be processed by duplicating the yearly interest to the expense per request increased by 2, and isolating the numerator respect the conveying cost per unit. In the interim, Reorder Point decides the dimension of stock by which reordering must be made. This is figured by adding the Lead Time Usage to Safety Stock. At the point when the stock achieves the reorder point, the business must request stock equivalent to the monetary request amount (EOQ), in the two cases.

## **CHAPTER THREE**

### **METHODOLOGY**

#### **3.1 Introduction**

This chapter of the study focused on how the research was done, how the software was developed and to whom it was developed.

#### **3.2 Analysis of the Existing System**

The existing system in the case study was the manual File Processing System (FPS) wherein stock was taken by writing down the available stock beforehand (sales begin on that day), and then writing down each purchase detail at every purchase. This system was time wasting, inefficient and slow. With this system, the cashier did not know how much stock was available at any point in time.

**ELECTRICAL (Z) LIMITED**  
STOCK CARD

No. 01

LOCATION					ART. GROUP				
DATE	DOC. NR.	IN	OUT	BAL.	DATE	DOC. NR.	IN	OUT	BAL.
TOTAL BF					11/01/09	GRN 19026	09	-	09
17/01/09	GRN 13613	09		09	17/01/09	JIC		05	04
20/01/09	JIC 20350		09	NIL					
31/12/08	STOCK TAKE			NIL	31/12/08	STOCK TAKE			NIL
					31/12/08				NIL
11/01/09				NIL	11/01/09	GRN 14316	10		10
10/10/08	STOCK TAKE			NIL	22/01/09	JIC 23532		10	NIL
					15/01/09	JIC 24556		10	-10
					03/01/09	JIC 24653		10	-20
21/12/08	GRN 13276	15		15	03/01/09	GRN 14552	10		-10
					03/01/09	GRN 14554	10		NIL
					14/01/09	JIC 24715	10		10
					16/01/09	TOTAL CP			10

ITEM CODE 26211010150 TYPE NR 26MM PVC DESCRIPTION COUPLINGS

Figure 3.1: Manual inventory management

Source: Accounting diary (2010), stock accounting softwares and systems

### **3.3 Limitations of Existing System**

It is generally known that manual process is quite tedious, time consuming, less accurate in comparison to computerized processing. The present system is obviously not an exception as all these problems are experienced in its use. The current system put in place was very inefficient and redundant as the massive workload placed on the cashier makes them prone to error, and detailed information on each purchase cannot be taken. The issues with the current system were outlined as followed:

1. Detailed information on each transaction could not be taken.
2. Amount of stock in real-time could not easily be known for any given item.
3. No outlined system or process for each purchase (lack of consistency).
4. Massive workload leaves cashier prone to human error.
5. No system put in place to alert the cashier when stock is low or finished.
6. Time Consuming and very tedious.
7. All information was not placed separately thus; relevant data could not be extracted from it.
8. Lot of paper work resulting in slow data processing.
9. It was difficult to find records of past transactions due to manual file management system.
10. Lack of security to the files and information pertaining to inventory records, thus the data may be inaccurate and volatile as anyone can gain access to it and manipulate or even falsify information written in the store records.
11. All the data and information could not easily be extracted and put in a document of excel file, thus the information was not portable.

### **3.4 Proposed System**

The proposed system was a digitalized inventory management system which will keep stock, notify when stock is low, update stock in real-time to keep accurate records of inventory.

### **3.5 Justification of Proposed System**

The proposed system served to accomplish certain tasks and bring solutions to some of the problems faced in the existing system. This newly proposed computerized system gave these facilities:

1. Manually operated system changes into computerized system.
2. Friendly user interface that is easy to understand.
3. Time saving.
4. Save paper as information was stored digitally.
5. Connecting to database so we use different type of queries, data report and data logging, allowing for the data to be mined and useful information gain.

#### **3.5.1 Advantages of Proposed System**

1. Creates a structured system that formats all the information involved in each purchase with a time stamp.
2. The data is easily approachable and readable.
3. Data security and access control, ensuring that only users with authorized access can view, store and manipulate the data in the inventory system.
4. Records can easily be searched for a found with the click of a mouse.
5. An alert system implemented will allow the user be informed whenever stock is low or finished, giving the user accurate knowledge of the level of stock on ground.
6. Data and information can be easily extracted from the new system, thus making the information very portable and convenient to transfer.



### 3.6 Software Development Life Cycle

Within a software organization, SDLC is a method followed for a software project. It comprises of a comprehensive plan describing how particular software can be developed, maintained, replaced and modified or enhanced. The life cycle describes a methodology for enhancing software quality and the general process of growth.

The figure below is a graphical depiction of a typical SDLC's different phases.

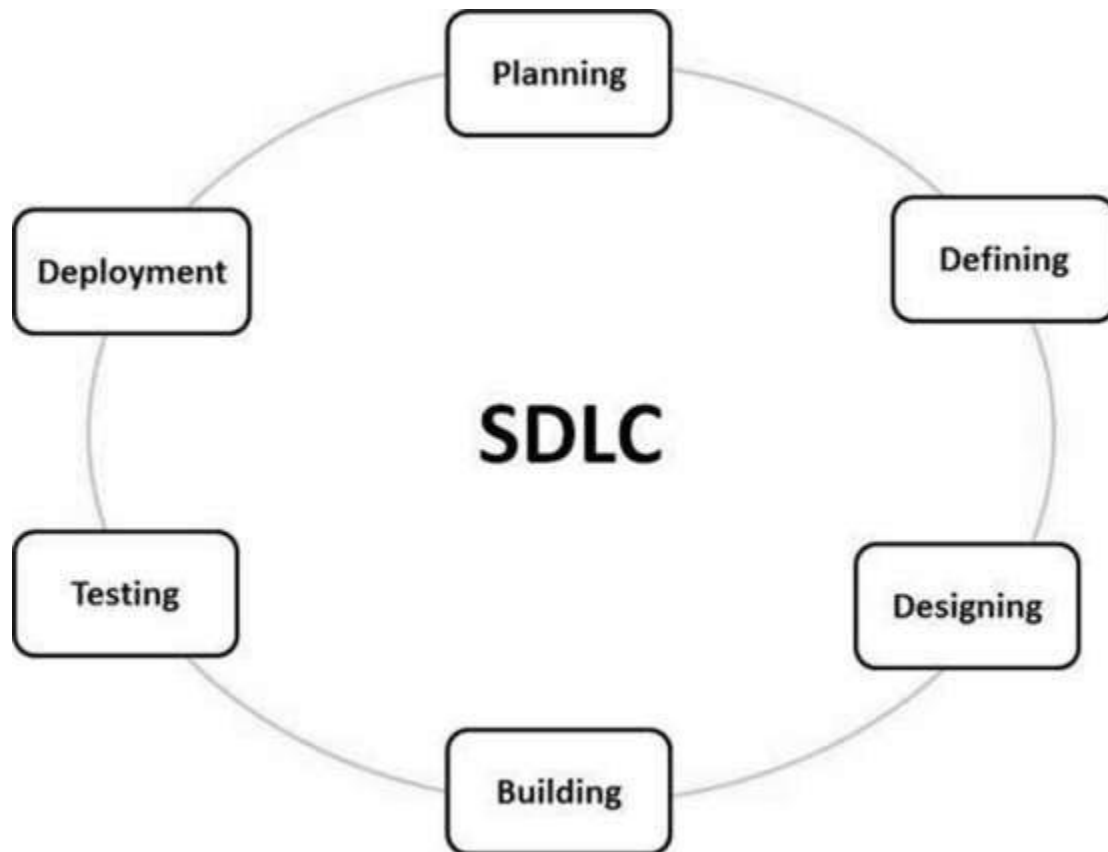


Figure 3.2: Stages is the software development life cycle

source: Kazim Ali (2017) A study of software development life cycle process models  
international journal of advanced research in computer science

### **Stage 1: Planning and Requirement Analysis**

The most important and fundamental stage in SDLC is the requirement analysis. It is carried out by senior team members with client inputs, marketing department, market surveys, and business domain specialists. This data is then used in the economic, operational and technical fields to plan the fundamental project strategy and perform the feasibility study of the item.

The planning phase also includes planning for the quality assurance criteria and identifying the hazards connected with the project. The technical feasibility study results in defining the different technical methods that can be pursued to effectively execute the project with minimal hazards.

### **Stage 2: Defining Requirements**

Once the requirement analysis is completed, the next step is to obviously describe and document the specifications of the item and obtain approval from the client or market analysts. This is achieved through a SRS document (Software Requirement Specification) consisting of all the product specifications to be designed and created during the life cycle of the project.

### **Stage 3: Designing the Product Architecture**

SRS (System Requirement Specification) is the reference for product architects with the best architecture to develop the product. Usually more than one design approach for the product architecture is suggested and documented in a DDS (Design Document Specification) based on the requirements specified in SRS.

All key stakeholders review this DDS and select the best design strategy for the product based on multiple parameters such as risk assessment, product robustness, design modularity, budget and time limitations.

A design strategy obviously describes all of the product's architectural modules along with its communication and representation of information flow with (if any) internal and third party components. With the minimum of details in DDS, the internal design of all the modules of the proposed architecture should be clearly defined

#### **Stage 4: Building or Developing the Product**

The real development begins in this phase of SDLC and the product is constructed. During this point, the programming code will be produced as per DDS. If the design is carried out in a comprehensive and structured way, it is possible to generate code without much trouble.

Developers must follow their organization's coding rules and programming instruments such as compilers, interpreters, debuggers, etc. are used to produce the code. Various programming languages of high standard such as C, C++, Pascal, Java and PHP are used for coding. Regarding the type of software being created, the programming language is selected.

#### **Stage 5: Testing the Product**

This stage is usually a subset of all the stages as the testing activities are mostly involved in all SDLC stages in the modern SDLC models. This phase, however, relates to testing only the product phase in which product defects are reported, monitored, corrected and retested until the product reaches the quality standards specified in the SRS.

#### **Stage 6: Deployment in the Market and Maintenance**

Once the item has been tested and is prepared for deployment, it is officially published on the relevant market. Sometimes the deployment of the item occurs in phases as per the organization's business strategy. The product can be published in a restricted section first and tested in the actual company setting-UAT (User Acceptance Test).

The product can then be published as it is or with suggested improvements in the targeting market segment depending on the feedback. After the item is published on the market, the current client base will be maintained.

### **3.7 SDLC Models**

Different life cycle models for software development are described and designed and followed during the phase of software development. These models are also referred to as Process Models for Software Development. "Each process model follows a series of distinctive steps to guarantee achievement in the software development process.

Following are the most important and popular SDLC models followed in the industry:

1. Waterfall Model
2. Iterative Model
3. Spiral Model
4. V-Model
5. Big Bang Model

Other related methodologies are Agile Model, RAD Model, Rapid Application Development and Prototyping Models.

#### **3.7.1 Process Model**

The SDLC model used in this project was the Waterfall model.

#### **3.7.2 Waterfall Model**

The first Process Model implemented was the Waterfall Model. It is also known as a model of a linear-sequential life cycle. Understanding and using it is very easy. Each phase must be completed in a waterfall model before the next phase can begin and the phases do not overlap.

The model of the Waterfall is the oldest SDLC method used to develop software.

In a linear sequential flow, the waterfall model shows the software development process. This implies that any stage in the process of growth starts only when the earlier stage is full. The stages do not overlap in this model of waterfall.

#### **3.7.3 Waterfall Model Design**

Waterfall strategy was the first SDLC model to be commonly used in software engineering to guarantee project success. The entire software development process is split into distinct stages in the "The Waterfall" method. Usually, in this Waterfall model, the result of one stage functions sequentially as the input for the next stage.

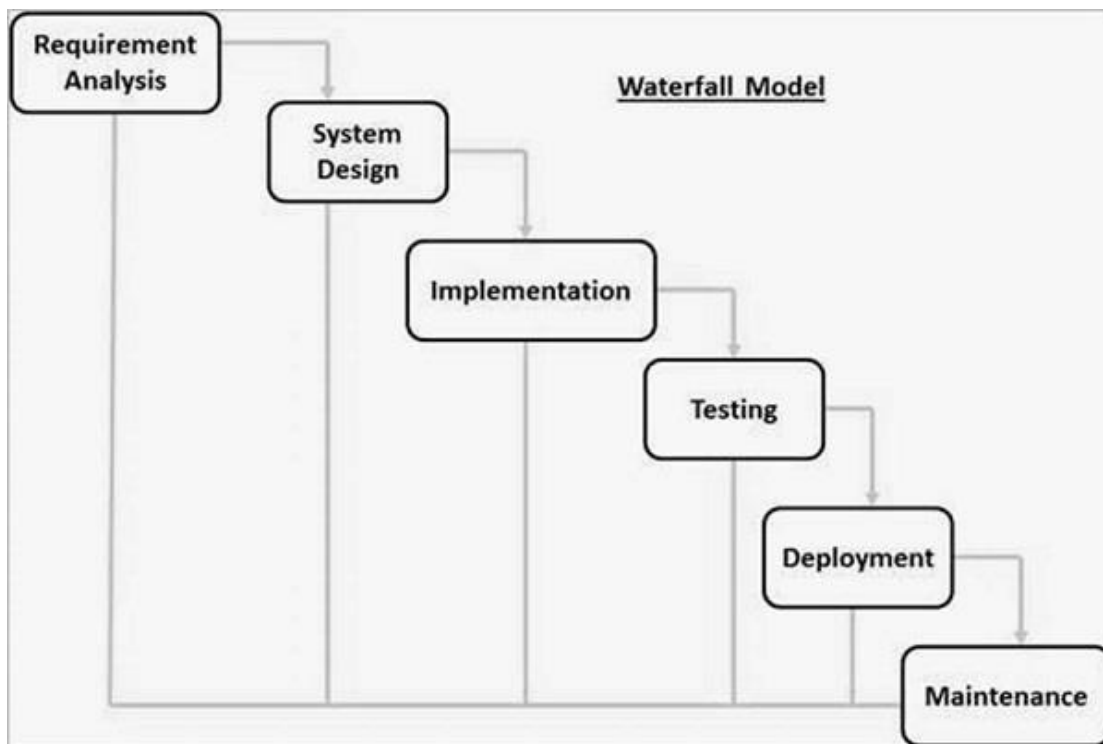


Figure 3.3: Sequential phases in waterfall model

Source: Kazim Ali (2017) A study of software development life cycle process models  
international journal of advanced research in computer Science

The sequential phases in Waterfall model are:

1. Requirement gathering and analysis: In this stage, all possible system requirements to be created are recorded and recorded in a specification document for requirements.
2. System Design: In this stage, the requirement specifications are explored from the first stage and the design of the scheme is prepared. This system design helps specify the demands of the hardware and system and helps define the general system architecture.
3. Implementation: The system is first created in tiny programs called units with inputs from the system layout, which are incorporated in the next stage. Each unit is designed and tested for its functionality, known as Unit Testing.
4. Integration and Testing: After testing each unit, all the units created during the execution stage are incorporated into a scheme. The entire system will be screened for any faults and failures after integration.
5. Deployment of system: After testing each unit, a system incorporates all the units generated during the implementation phase. After inclusion, the whole system will be tested for any flaws and failures.
6. Maintenance: In the client setting, there are some problems that arise. Patches are published to solve these problems. Some better versions are also published to improve the product. Maintenance is performed in the client setting to produce these modifications.

All these stages are cascaded into each other in which advancement is seen as continuously flowing down through the stages (like a waterfall). The next phase starts only after the set of goals for the previous phase has been achieved and it is signed off, so the name "Waterfall Model." Phases do not overlap in this model.

### **3.7.4 Waterfall Model – Application**

Every developed software is distinct and needs an appropriate SDLC strategy based on inner and external factors to be followed. Some circumstances where it is best to use the Waterfall model are –

1. Requirements are recorded, clear and fixed very well.
2. Definition of the product is stable.
3. It is recognized that technology is not dynamic.
4. There is no need for ambiguity.
5. There are ample resources available with the necessary skills to promote the product.
6. The project is short

### **3.7.5 Waterfall Model – Advantages**

The benefits of developing waterfalls are that they allow departmentalization and control. For each phase of growth, a timetable can be set with deadlines and a product can continue one by one through the development process model stages.

Development passes from idea through design, execution, testing, assembly, troubleshooting, and ends up being operated and maintained. Each development stage continues in strict order.

Some of the Waterfall Model's significant benefits are as follows:

Simple and simple to comprehend and use The stiffness of the model makes it simple to handle. Each stage has particular outcomes and a process of evaluation.

1. One phase at a moment is processed and finished.
2. Works well for larger projects where there is a very good understanding of demands.
3. Stages that are clearly characterized.
4. The milestones were well recognized.
5. Easy to set up duties.
6. There is a good documentation of the process and outcomes.

### **3.7.6 Waterfall Model – Disadvantages**

The drawback of the growth of the waterfall is that it does not allow much reflection or modification. Once an application is in the testing phase, it is very hard to go back and alter something in the design phase that was not well-documented or thought about.

The Waterfall Model's significant drawbacks are as follows:

1. During the life cycle, no operating software is generated until late.
2. High risk and uncertainty amounts.
3. Not a nice model for projects that are complicated and object oriented.
4. Poor model for lengthy projects that are ongoing.
5. Not appropriate for projects where there is a moderate to elevated danger of altering demands. Therefore, with this process model, risk and uncertainty are high.
6. Progress in phases is hard to measure.
7. Cannot fulfill changing demands.
8. Throughout the life cycle, adjusting scope can end a project.
9. At the very end, integration is performed as a "big-bang," which does not allow any techno to be identified.

### **3.8 Methodology**

This project is implemented with the aid of the Microsoft Visual Studios 2017 and Microsoft SQL Server 2014. The technologies involved are:

1. C-sharp Programming Language - a programming language developed by Microsoft, this is the programming language that this entire is mostly built upon. It essentially is the back bone of this project and most of the coding done is written this language.
2. Standard Query Language (SQL) - this is a programming language implemented to facilitate the transmission of data and queries between the C-sharp code of the front-end of the application and the Microsoft SQL server. It is one of the most popular query languages in use today and is implemented all over the world because of its robust and extensive vocabulary.



3. Windows .NET Form Application (with MVC) - this, with individual authentication implemented will allow for user login system with personal accounts which will provide appropriate security and privacy for user information and safe guard the data stored in the inventory system. Also, the Model View Controller (MVC) compartmentalizes the application for easy debugging, maintenance and upgrades. The MVC segments the application into the Model (where the models for the database, the relationships and structures are defined), the View (where all the views and forms with their functions and perks are set and defined) and finally the Controller (that defines the interaction and communication between the Model and View and finally facilitates the communication between the entire application and the database with support from SQL to send and receive queries to the Microsoft SQL server database).

4. Microsoft SQL Server 2014 - the SQL Server implemented in this desktop application for storing the information involved in tables and formatting them for convenient access, manipulation and storage. It allows for queries to be sent and screened, thus providing security to this system with a username and password with which private access is guaranteed

5. Microsoft Visual Studio 2017 – this is the Integrated Development Environment used in the course of this project’s development.

### **3.8.1 Categories of Design**

The planning and architecture of this project is thoroughly broken down and subdivided into several categories. This decomposition is necessary in order to have a full grasp of the processes involved and measures taken to ensure its success. The design categories are divided as such:

1. Interface Design - designs and plans with regard to user input and queries, outlining exactly what kind of input can be given or expected from the user. Also, designs and plans with regard to the application output and feedback.
2. Database Design - designs and plans with regards to database schema, architecture and overall inter-relation.

### **3.8.1.1 Interface Design**

A proper layout or plan for this stage of design is quite essential as it is necessary to have a full understand of the problem's needs and a full understand of what kind of input should be requested from the user. The input is divided into multiple panes or views for different aspects of this solution.

Problems addressed the input forms and their designs are given below:

1. Sign In and Security - An essential problem to be addressed as sensitive information regarding stock and inventory should not be openly disclosed. Thus, a system is put in place to give proper access control and only allow authorized users access to the information stored in the system.

The form implemented below shows the Sign In form implemented for security and proper access control. It shows a 'username' text-box and a password text-box with a Sign In button.

Login



**Username :**

**Password :**

[Forgot Password?](#)

Figure 3.4: Sign-In form view for the digitized inventory management system

A second issue addressed is that of the profile creation. This feature is included to allow designated users access with their peculiar Sign In details access to the application and the data stored. It is also implemented to manage profiles created within the application.

The form implemented below shows the Profiles form implemented for profile creation and profile management. It shows a list of profiles and their details, with a pane to add and delete users.

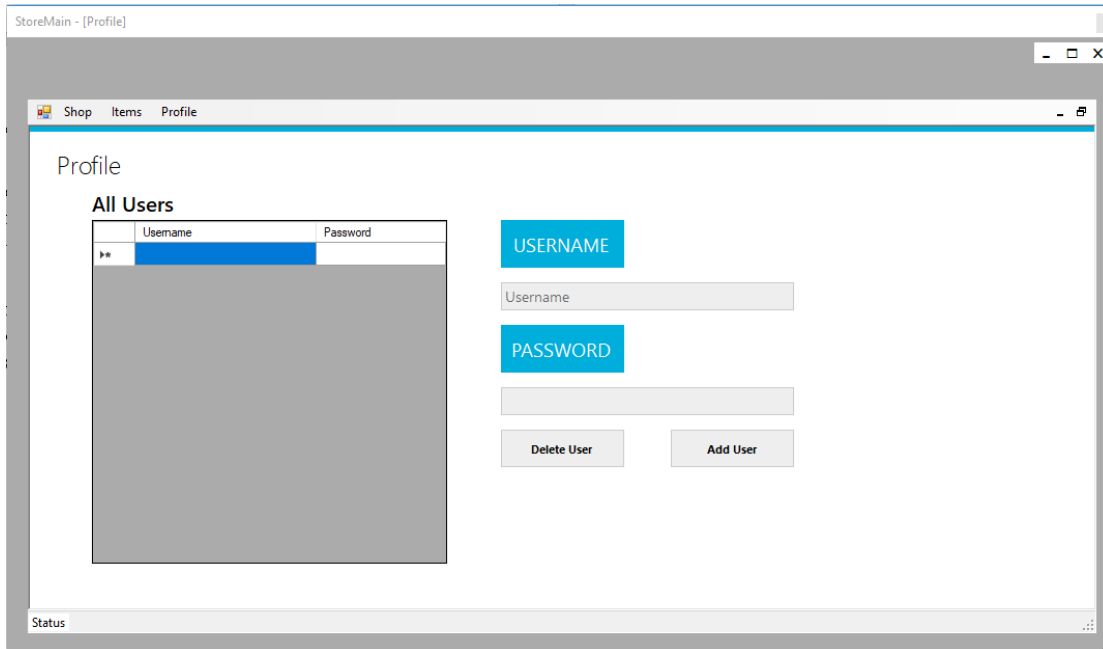


Figure 3.5: Profile view for the digitized inventory management system

2. Inventory - Another problem tackled with this solution is that of the actual inventory management. This application thus organizes and places all items in stock into a sorted list (as per user preference), in which items can be searched for and manipulated. Each item is assigned a particular and unique item ID (Item Identification) by which it can be uniquely identified and differentiated from similar, dissimilar, related and unrelated items.

The form implemented below shows the Inventory form implemented for item creation, modification and deletion. It shows a list of Items and their details, with a pane to add, update and delete items.

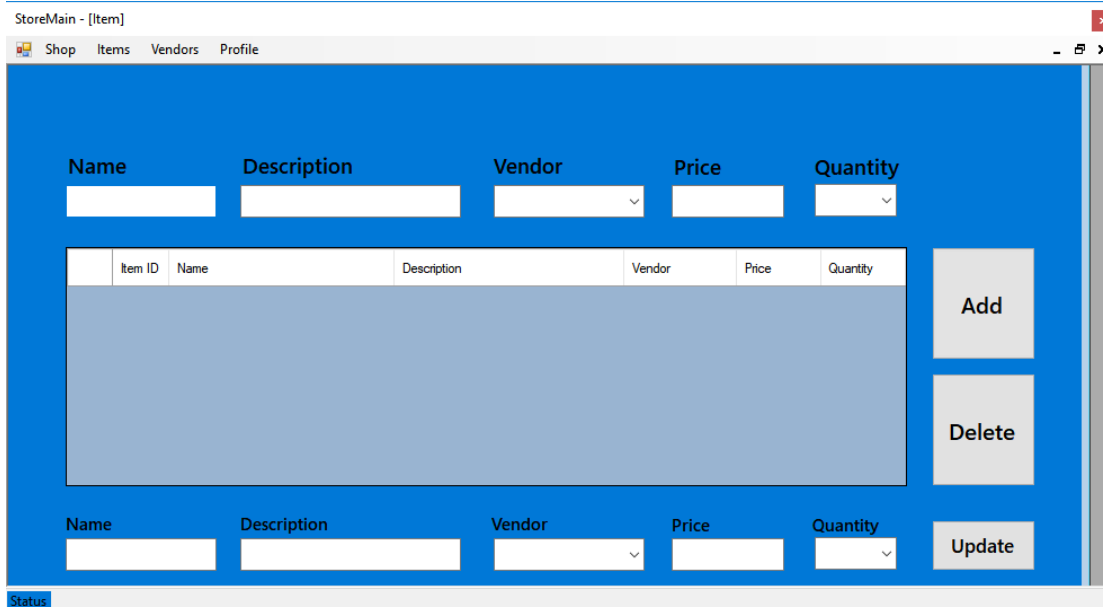


Figure 3.6: Inventory view for the digitized inventory management system

3. Sales - this interface is created to allow the purchase/sale of items in the store. At this point of sale, items are removed from the main inventory and receipts can be printed at each sale.



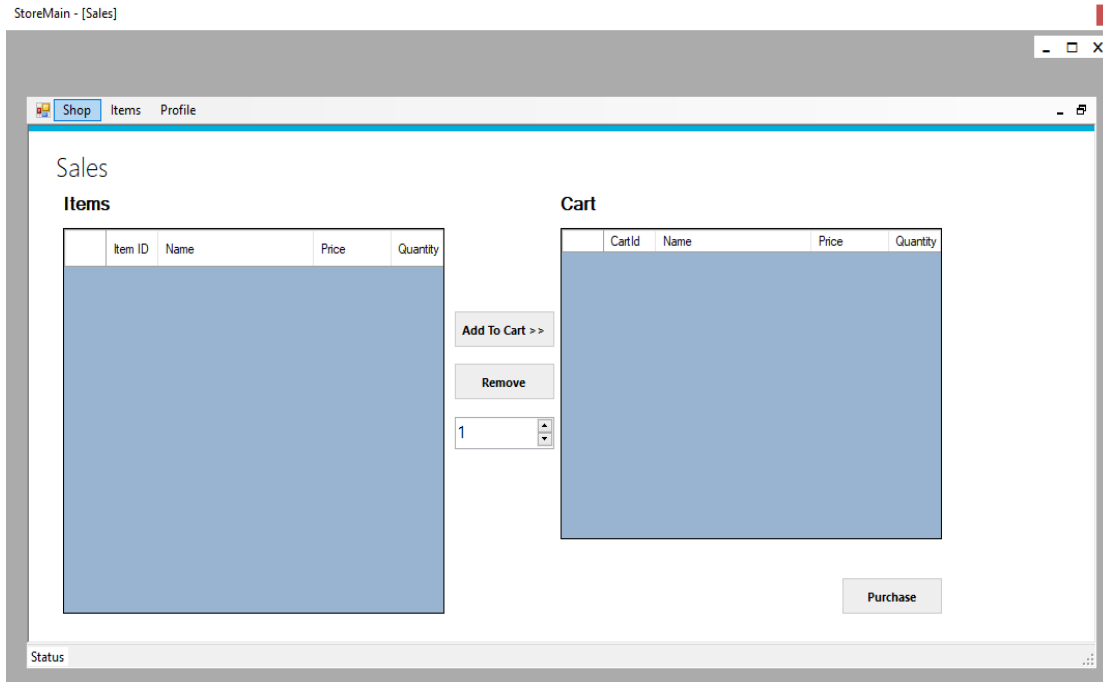


Figure 3.7: Sales view for the digitized inventory management system

## **3.8.2 Requirements**

### **3.8.2.1 Functional Requirements**

1. It should be able to take inventory
2. It should be able to record sales
3. It should be able to give notice when stock is running low
4. It should be able to allow for login
5. It should be able to show product information and prices

### **3.8.2.2 Non-Functional Requirements**

1. It should be readily available at point of need
2. Should have minimal occurrence of failure
3. It should be portable and have compatibility with the OS
4. Navigation and accessibility of various modules should be fast

### **3.8.2.3 System Requirements**

#### Hardware requirements

1. Pentium Dual-Core Processors
2. 1GB of RAM
3. 160GB of Hard Disk

#### Software requirements

1. Suitable 32/64bit Windows environment

### 3.9 Use Case Diagram

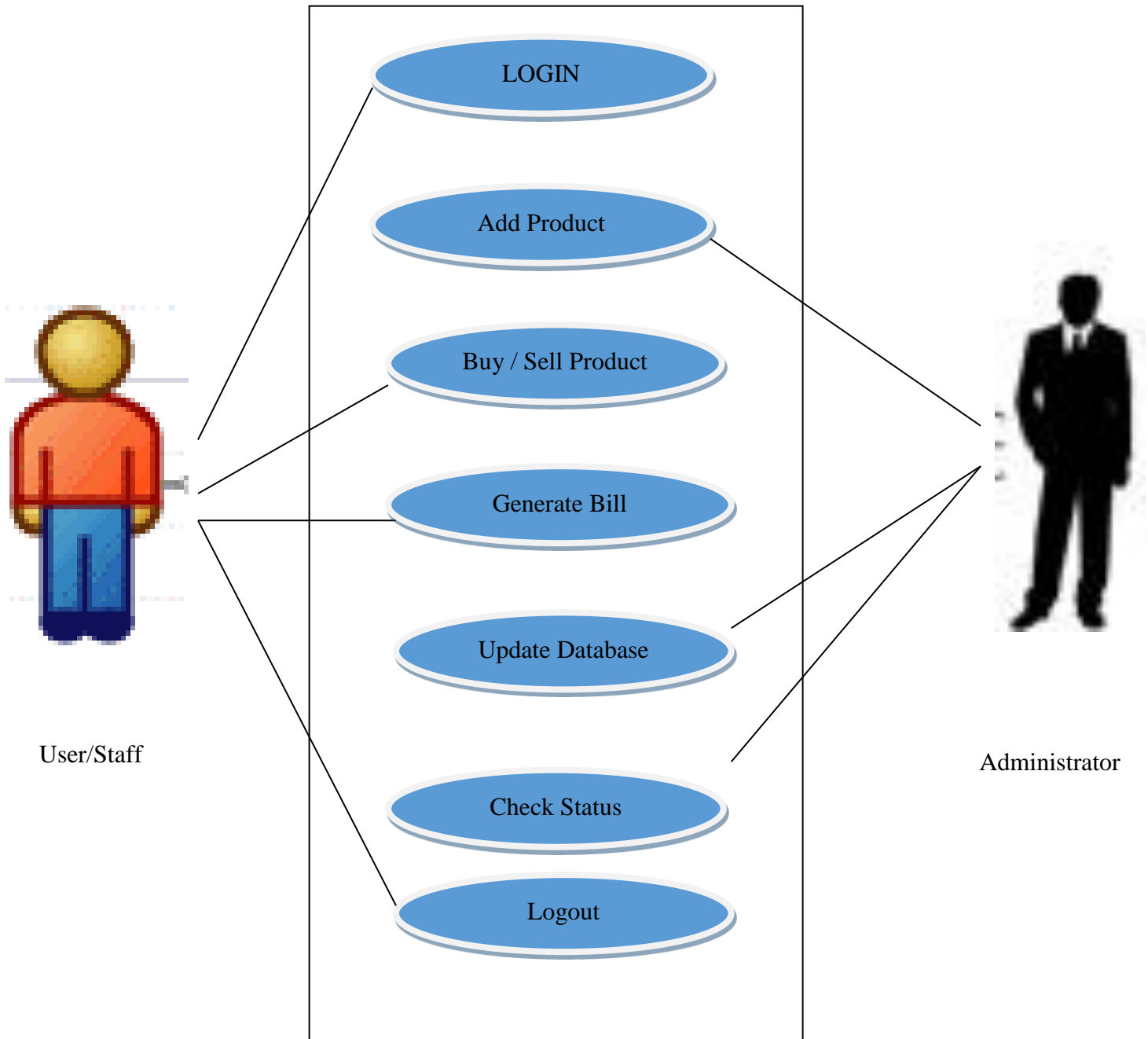


Figure 3.8: Inventory view for the digitized inventory management system

## CHAPTER FOUR

### RESULT AND RESULT DISCUSSION

#### 4.1 Introduction

This chapter embodied the result of the software and the tests made during the course of the program.

#### 4.2 Data Analysis

These included the

1. Items table
2. Cart table
3. Inventory table
4. All users table

##### **Items Table**

This table is used to view all the products available at the point of sales in order to place in the cart. It contains:

1. Item ID: This is a unique number given to each product in the inventory to distinctively identify them.
2. Name: This contains the names of each product available in the inventory.
3. Price: This is the specific price of each item being sold in the store.
4. Quantity: This shows the number of each items available in the store

##### **Cart Table**

This table serves as the section which shows the products being bought by a customer and keeps record of all sales. It contains:

1. Cart ID: This serves as the reference number or unique identification number for each purchase.
2. Name: This specifies all the goods bought in each sale cart.
3. Price: This specifies the price for all the goods bought in each sale.
4. Quantity: This is the amount of each product bought during the sale.

## **Inventory table**

This table shows the actual inventory of the store. It shows the various products available in the store. The table contains:

1. Item ID: This is a unique number given to each product in the inventory to distinctively identify them.
2. Name: This contains the names of each product available in the inventory.
3. Description: This describe the type of product and its features.
4. Vendor: This shows the maker/ producer or from where the product is gotten.
5. Price: This is the specific price of each item being sold in the store.
6. Quantity: This shows the number of each items available in the store.

## **All Users table**

This table contains the users and login information of those who have access to the system. It contains:

1. Username: This is the name used by the user to log into the system.
2. Password: This shows the password of each user.

## **4.3 System Testing**

Testing is the main control metric used in the growth of software. Its fundamental function is to detect software errors. The output is a document that is usually textual and not executable during requirement analysis and design. Computer programs that can be executed for testing purposes are available after the coding phase. This means that testing must not only reveal errors that were introduced during coding, but also errors that were introduced during the previous phase. The aim of the test is therefore to detect the demands, design and coding mistakes in the programs.

### **4.3.1 Objectives of testing**

First of all, objectives should be clear.

1. Testing as a program execution method in order to detect mistakes.

2. Test instances are intended to carry out testing. A test case is a specific artificial situation that exposes a program to find errors. So a successful test case is one that discovers mistakes that have not been found.
3. If testing is performed correctly, it will detect errors and we will have software developed according to specifications after fixing those errors.

The objective above implies a dramatic change of point of view. The move is contrary to the commonly held view that a successful test is one in which there are no errors. In fact, our goal is to design tests that systematically detect different error classes and do so with minimal time and effort.

#### 4.5 Result of Test Cases

Test case ID	Test Objective	Test Procedure	Test Data	Expected Results	Passed/Failed	Comments
Test_1	To check for login error	Click Submit Button without entering data.	1. Without entering any Username. 2. Without entering any password.	Message “Enter username” and “enter password”	Passed	
Test_2	To login	Enter correct username and password and click “Login”	With correct Username and Password	Software window opens.	Passed	
Test_3	To check if sales window opens	Click on sales button	All data will be Visible.	Items and carts table is shown	Passed	

Test case ID	Test Objective	Test Procedure	Test Data	Expected Results	Passed/Failed	Comments
Test_4	To check if product can be added to cart	Click on the product and click add to cart and select the quantity.	Product is highlighted	Item gets added to cart	Passed	
Test_5	Add Item to inventory	Click on Inventory and input required information then click on 'Add Product'	Data include name of product, description, price and quantity	Created product appears in Items list	Passed	
Test_6	Add User to Users list	Click on Profile and then input a username and password then click 'Add User'	Username and password	Created User appears in All Users list	Passed	
Test_7	To remove Users from users list	Click on Profile, click on the username to be removed and click on delete user	Username and password	Chosen User gets deleted from the All Users list	Passed	

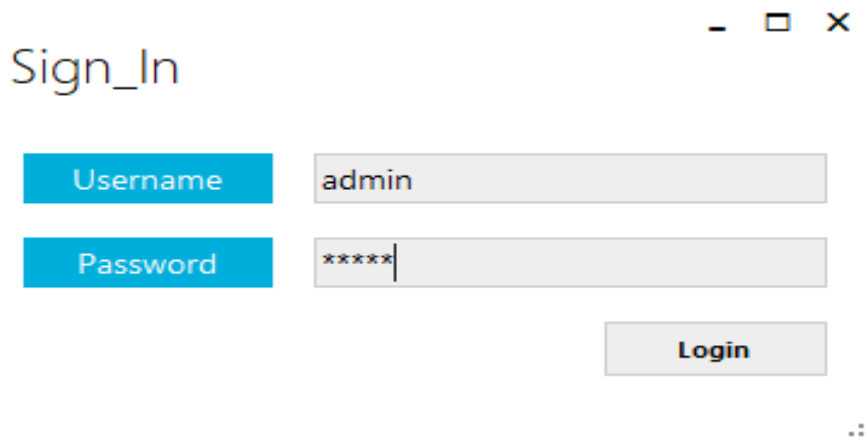


Test case ID	Test Objective	Test Procedure	Test Data	Expected Results	Passed/Failed	Comments

Table 4.1: Test cases and results

## 4.6 Result

Result 1: This figure below shows the sign-in page



The image shows a screenshot of a web application window titled "Sign\_In". The window has standard OS window controls (minimize, maximize, close) in the top right corner. Below the title, there are two input fields. The first field is labeled "Username" and contains the text "admin". The second field is labeled "Password" and contains six asterisks "\*\*\*\*\*". Below these fields is a "Login" button. The entire form is centered on the page.

Figure 4.1: Sign in page

Result 2: The figure below shows the sales page

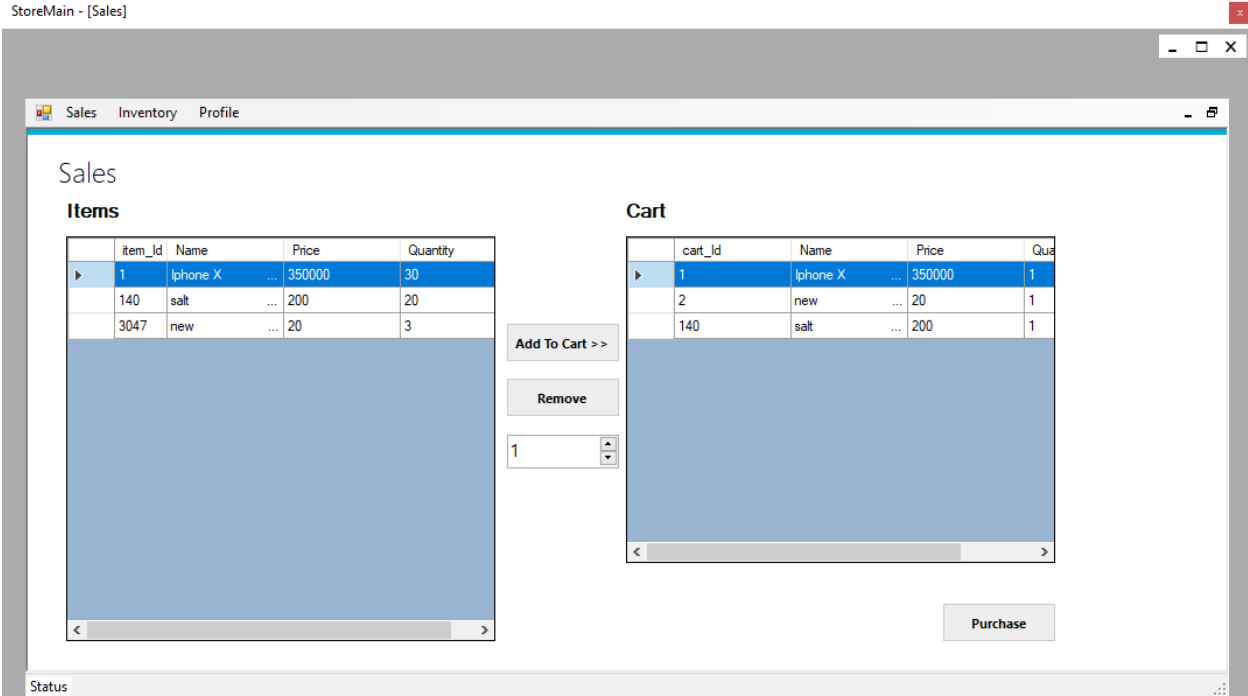


Figure 4.2 Sales page

Result 3: This shows the Inventory page

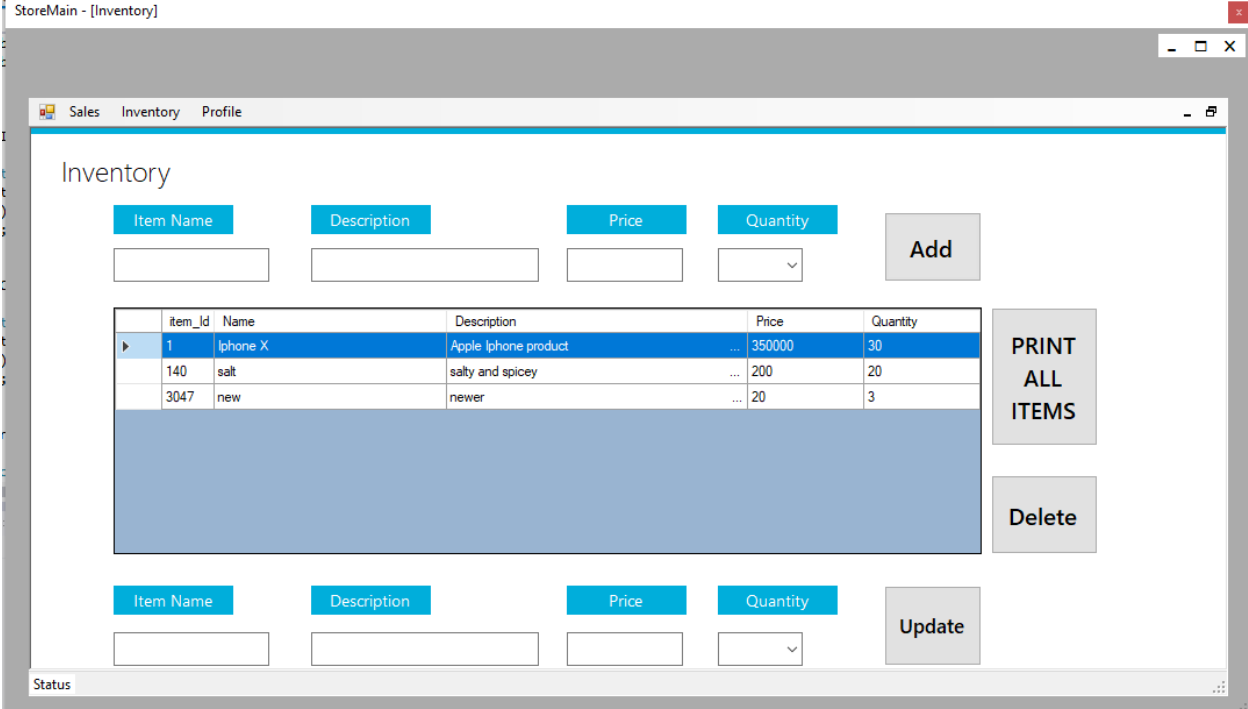


Figure 4.3: Inventory page

Result 4: This shows the Profiles page

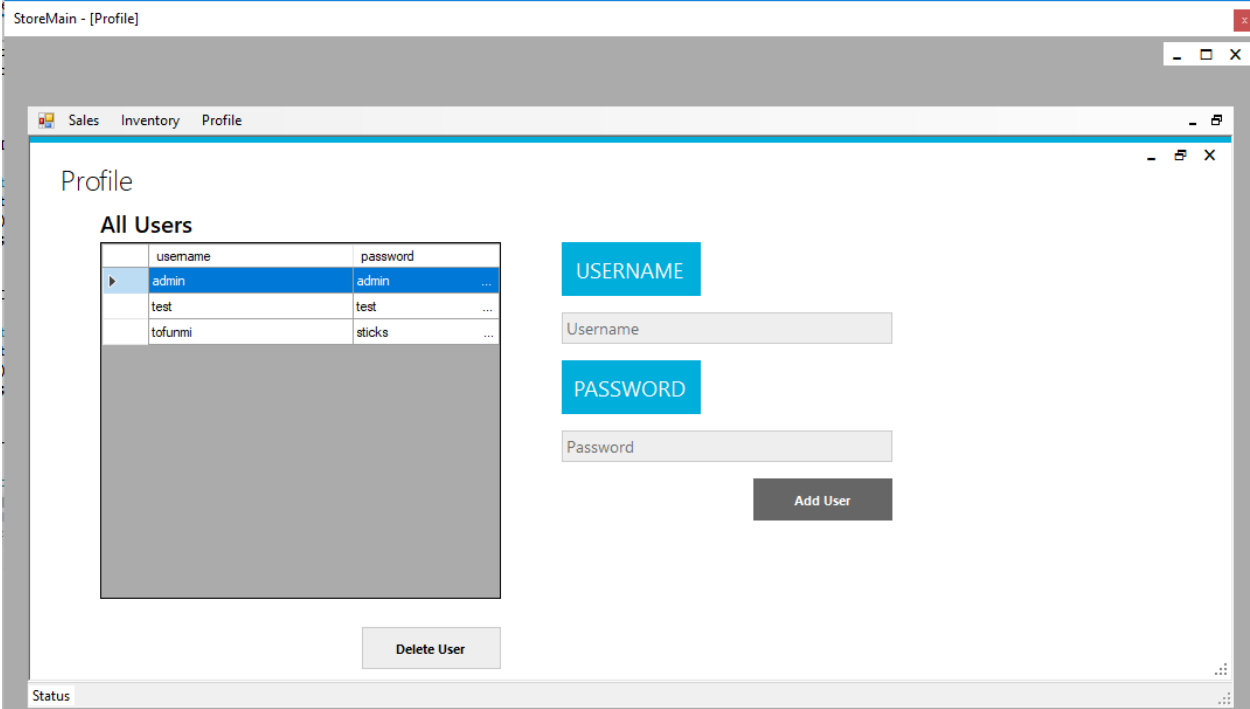


Figure 4.4: Profile page

## **CHAPTER FIVE**

### **SUMMARY, RECOMMENDATION AND CONCLUSION**

#### **5.1 Summary**

Having checked on the challenges experienced through the manual method of managing of inventory, this proposed system was accepted to assist make taking of inventory easier and more accurate. The inventory management system provided astonishing advantages to businesses because it helped in lessening of workload and decrease of information mistake. It could capture information, store, and see, add and erase stock into the database when required.

#### **5.2 Contribution to Knowledge**

The main contribution of knowledge was the ability to implement an Inventory Management System using the C# and SQL programming languages. Also helped gain more knowledge in the use of Microsoft Visual studio, Microsoft SQL Server and Windows .NET Form Application.

#### **5.3 Limitation**

1. The system was not user friendly on tablet and mobile devices
2. Due to constant fluctuation of prices, constant price change is needed

#### **5.4 Recommendation for Further Study**

It is suggested that supermarkets still practicing the manual framework, switch to the electronic framework since it is more effective and less demanding to utilize. Also, since the use of electronic framework is in vogue in this generation, supermarkets who utilize the electronic framework will reach the world standard.

#### **5.5 Conclusion**

This project took a look at the various problems associated with the existing system which were improper documentation, loss and mismatch of sales records, time wastage amongst others. With all these problems being critically analyzed, a solution was embarked on, to eliminate these problems. With the design of the Inventory Management System, such problems are considered to be eradicated. In conclusion Inventory Management System not only provides an opportunity to the supermarkets to enhance their operations, it also can increases the profitability of the organization and businesses would be able to significantly improve the operational control and thus streamline

operations. This would enhance sales and record response time as it automates the process of collecting, storing and retrieving records of sales and inventory.

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## APPENDIX

```
using System;
using System.Collections.Generic;
using System.ComponentModel;
using System.Data;
using System.Drawing;
using System.Linq;
using System.Text;
using System.Threading.Tasks;
using System.Windows.Forms;

namespace Store
{
    public partial class StoreMain : MetroFramework.Forms.MetroForm
    {
        private void StoreMain_FormClosing(object sender, FormClosingEventArgs e)
        {
            Application.Exit();
        }

        public StoreMain()
        {
            InitializeComponent();
        }
    }
}
```

```
bool check1 = true;
bool check2 = true;
bool check3 = true;
Sales Window1 = new Sales();
Inventory Window2 = new Inventory();
Profile Window3 = new Profile();
```

```
private void opening1()
```

```
{
    Window1 = new Sales();
    Window1.MdiParent = this;
    Window1.Show();
}
```

```
private void opening2()
```

```
{
    Window2 = new Inventory();
    Window2.MdiParent = this;
    Window2.Show();
}
```

```
private void opening3()
```

```
{
    Window3 = new Profile();
    Window3.MdiParent = this;
    Window3.Show();
}
```

```

private void shopToolStripMenuItem_Click(object sender, EventArgs e)
{
    if (check1 == true)
    { opening1(); check1 = false; }
    else
    {
        if (Window1.IsDisposed) { opening1(); }
        else { Window1.Focus(); }
    }
}

private void itemsToolStripMenuItem_Click_1(object sender, EventArgs e)
{
    if (check2 == true)
    { opening2(); check2 = false; }
    else
    {
        if (Window2.IsDisposed) { opening2(); }
        else { Window2.Focus(); }
    }
}

private void profileToolStripMenuItem_Click(object sender, EventArgs e)
{
    if (check3 == true)
    { opening3(); check3 = false; }
}

```

```

        else
        {
            if (Window3.IsDisposed) { opening3(); }
            else { Window3.Focus(); }
        }
    }
}

}

using System;
using System.Collections.Generic;
using System.ComponentModel;
using System.Data;
using System.Data.SqlClient;
using System.Drawing;
using System.Linq;
using System.Text;
using System.Threading.Tasks;
using System.Windows.Forms;
namespace Store
{
    public partial class Sign_In : MetroFramework.Forms.MetroForm
    {
        public Sign_In()
        {
            InitializeComponent();
        }
    }
}

```

```

}

private void button1_Click(object sender, EventArgs e)
{
    //To-do Check login username and password

    SqlConnection con = new SqlConnection("Data Source = MACHINE; Initial Catalog =
Store; Integrated Security = True");

    SqlDataAdapter sda = new SqlDataAdapter(@"SELECT *
FROM[dbo].[Users] Where Username = '"+usernameTextbox.Text+"' and Password =
 '"+passwordTextbox.Text+'", con);

    //FROM[dbo].[Users] Where Username = 'admin' and Password = 'admin@123", con);
    DataTable dt = new DataTable();
    sda.Fill(dt); //done with DB connection

    if (dt.Rows.Count == 1)
    {
        this.Hide();
        StoreMain main = new StoreMain();
        main.Show();
    }
    else
    {
        MessageBox.Show("Invalid Username and Password!", "Error", MessageBoxButtons.OK,
MessageBoxIcon.Error);
    }
}
}
}

```

```

}
using System;
using System.Collections.Generic;
using System.ComponentModel;
using System.Data;
using System.Data.SqlClient;
using System.Drawing;
using System.Linq;
using System.Text;
using System.Threading.Tasks;
using System.Windows.Forms;

namespace Store
{
    public partial class Sales : MetroFramework.Forms.MetroForm
    {
        public Sales()
        {
            InitializeComponent();
        }

        private void addtocartButton_Click(object sender, EventArgs e)
        {
            SqlConnection con = new SqlConnection("Data Source = MACHINE;" + " Initial Catalog =
Store;" + " Integrated Security = True");

```

```

//the logic
con.Open();

var sqlQuery = @"INSERT INTO[dbo].[Cart] ([cart_id] ,[Name] ,[Price] ,[Quantity])
VALUES ('" + itemsdataGridView.SelectedRows[0].Cells[0].Value.ToString() + "','" +
itemsdataGridView.SelectedRows[0].Cells[1].Value.ToString() + "','" +
itemsdataGridView.SelectedRows[0].Cells[2].Value.ToString() + "','" + numericUpDown.Text +
"')";

SqlCommand cmd = new SqlCommand(sqlQuery, con);
cmd.ExecuteNonQuery();

int sum = Convert.ToInt32(itemsdataGridView.SelectedRows[0].Cells[3].Value.ToString()) -
Convert.ToInt32(numericUpDown.Text);

con.Open();

sqlQuery = @"UPDATE [Item] SET [Quantity] = '" + sum + "' WHERE [item_Id] = '" +
itemsdataGridView.SelectedRows[0].Cells[0].Value.ToString() + "' ";

SqlCommand cmd1 = new SqlCommand(sqlQuery, con);
cmd1.ExecuteNonQuery();

//Reading the stored data
numericUpDown.Text = "1";
this.cartTableAdapter1.Fill(this.storeDataSet6.Cart);
this.itemTableAdapter.Fill(this.storeDataSet2.Item);
}

private bool IfItemExists(SqlConnection con, string itemname)

```

```

    {
        SqlDataAdapter sda = new SqlDataAdapter(@"SELECT * FROM[dbo].[Item] WHERE
[Name] = "" + itemsdataGridView.SelectedRows[0].Cells[1].Value + "" ", con);

        DataTable dt = new DataTable();

        sda.Fill(dt); // this comment is cuz i haven't reconnected my Microsoft Sql server and
database

        return true;
    }

    private bool IfCartExists(SqlConnection con, string itemname)
    {
        SqlDataAdapter sda = new SqlDataAdapter(@"SELECT * FROM[dbo].[Item] WHERE
[Name] = "" + cartdataGridView.SelectedRows[0].Cells[1].Value + "" ", con);

        DataTable dt = new DataTable();

        sda.Fill(dt); // this comment is cuz i haven't reconnected my Microsoft Sql server and
database

        return true;
    }

    private void cartdataGridView_MouseDoubleClick(object sender, MouseEventArgs e)
    {
        SqlConnection con = new SqlConnection("Data Source = MACHINE;" + " Initial Catalog =
Store;" + " Integrated Security = True");

        con.Open();

        var sqlQuery1 = "";

        if (IfCartExists(con, cartdataGridView.SelectedRows[0].Cells[1].Value.ToString()))
        {
            sqlQuery1 = @"DELETE FROM [Cart] WHERE [Name] = "" +
cartdataGridView.SelectedRows[0].Cells[1].Value.ToString() + "" ";

```



```

    }
    SqlCommand cmd3 = new SqlCommand(sqlQuery1, con);
    cmd3.ExecuteNonQuery();
    con.Close();
}
private void Sales_Load(object sender, EventArgs e)
{
    // TODO: This line of code loads data into the 'storeDataSet6.Cart' table. You can move, or
remove it, as needed.

    this.cartTableAdapter1.Fill(this.storeDataSet6.Cart);

    // TODO: This line of code loads data into the 'storeDataSet2.Item' table. You can move, or
remove it, as needed.

    this.itemTableAdapter.Fill(this.storeDataSet2.Item);
}
private void makePurchase_Click(object sender, EventArgs e)
{

}

}
}

```