

Design and Implementation of Mobile-Based Inventory Management System

Joshua J.V.^{1}, Obatomowo O.I.²*

¹*Department of Software Engineering, Babcock University, Nigeria.*

²*Department of Computer Science, Babcock University, Nigeria.*

***Corresponding Author**

E-Mail Id:-joshuaj@babcock.edu.ng

ABSTRACT

Inventory is a list of items such as property or goods in stock, as organisation grows problems also rises as varieties of items are needed to be maintained in the inventory which makes it difficult for managers of inventory to track stocks. Formal way of keeping record has to evolve as quantities in inventory grew. Advancement in mobile technology has created opportunity to respond to the needs of modern society. In this paper, we developed a mobile-based inventory management system implementable in a cross-platform environment. Waterfall process model was the design methodology for the application. Flutter was used to develop the cross-platform functionality while Firebase was the backend. The users responsible for inventory management are able to act on the go whenever the needs arise.

Keywords:-*cross-platform, mobile technology, inventory management, waterfall process model*

INTRODUCTION

The advent of technology in the dawn of the twentieth century brought about changes in business operations, as business organisations turn to technology to improve their business chances and qualities. The management of inventory has moved from manual systems to automated systems as technology evolved. Inventory control, demand supply, order and reorder points, are vital information that are of key importance to the success of businesses. Having access to this information at your fingertip has never been more important now than ever as the pace of doing business has become faster with the aid of technology. The development of a system to take proper inventory and control of items in a business that suits the modern era of technological advancement is worth understanding.

Many business activities have evolved

with new technology and various activities revolve around the mobile devices available at their disposal at this very age and time. Understanding a robust inventory system that can be accessed through a mobile device and allow business stakeholders to perform their daily activities seamlessly is worth studying. This paper takes a dive into the design and development of a platform independent mobile inventory management application that reduced paper documents, better timeline information, better monitoring and quicker resolutions are some of the advantages of implementing the proposed project in businesses. (Aswanth KK etal, 2019).

STATEMENT OF THE PROBLEM

Inventory managers, business managers, small medium and large entrepreneurs are faced with the problem of simultaneously striving to maintain optimum level of inventory items and provide adequate

services to customers as competition is rapidly growing requiring stakeholders to create product excellence and study the behaviors of customers. Inventory control and maintenance is crucial for the sustainability and growth of any business organisation. Business activity require proper record keeping of inventory and hence the need for an inventory management system. Most of times is a very daunting task as the mode of doing business has evolved, where the entirety of businesses is performed through the eyes of a mobile device, which gives rise to the development of an inventory management system that suites this age and time.

The use of smartphones has gained popularity amongst users, relegating desktop usage as most of the activities performed with desktop computers can be conveniently performed using a mobile device such as a smartphone. As the shift to mobile accelerates, it is of great importance to pay due attention to the research of proper inventory systems that are effective in this present age and time, as many organisations attest to the fact that inventory management assists in boosting their operations and business performance.

AIM AND OBJECTIVES

The aim of this paper is to design and develop a cross platform mobile inventory management application that target small and medium scale entrepreneurs to easily control inventory activities with the aid of mobile devices. The specific objectives are to

1. Design and develop a cross platform mobile inventory management application that enable users to perform inventory control activities
2. Implement the developed application

LITERATURE REVIEW

Inventory management in today's world and economy plays a major role in the overall performance of any business.

Proper management is a key requirement to maximize profit in any modern-day business due to the fact that many businesses depend on inventory to make revenues. Inventory can be said to be an idle stock of goods that contain economic values and are held by organizations or businesses for processing, transformation, or sale (Kasim, et al., 2015). Inventory management is a system that controls and monitors levels of inventory and determines what level of inventory should be maintained, when stocks should be replenished and how large the order quantity should be. The primary objective of an inventory management system is to ensure that there is always inventory in stock and avoid stock-out as effectively as possible. (Kasim et al., 2015). The best inventory system should be able to perform item auditing of value, location and final disposal of item. An inventory system can hold information to ensure complex queries can be made of the data. A basic requirement for a good inventory management system is adequate authentication and authorization. Moreover, user friendliness of a system is very important which includes ease of inventory control operations like adding data for multiples of the same item from a single order whilst validation for data entry. All data should be allocated in one database so that add, delete, edit or update information can be easily accessed by the user. Besides, proper structure of a system is vital because it is associated with the best and user-friendly systems.

Inventory management in its basic form dates back to 1200BC during the trade of shells and precious metals (Fryer, 2020). With the evolution of commerce and the advent of various phases of commerce and markets, the merchants of the time would have to make do with the available technology to take down a record of inventory. A recorded period of inventory management being practiced was the

period before the industrial revolution. (Dashboardstreams, 2020)

Thomas Muyumba et al (2017) developed a Web based Inventory Control System for spare parts in the Zambia Airforce using cloud architecture and barcode Technology. The major gap is the use of a cloud base storage in relation to the nature of the organization as the organization is a government organization and with cloud storage privacy is questioned due to the sensitivity of information.

Yvette E. Gelogo et al (2014) developed a mobile enterprise inventory management system using component-based design. The drawback is that the target market was not stated in this paper.

CONCEPTUAL FRAMEWORK

Generally, inventory is made up of three basic elements; raw materials, Work-In-Progress, and finished goods (Kasim et al., 2015). The implementation of this project is focused on inventory management for finished goods, which refer to the stock sitting in storage waiting for sale or delivery to customers.

Inventory covers a large range of items. There are different motives for holding inventory;

- Precautionary motive
- Speculative motive

Precautionary motive is geared towards reducing the risk associated with changes in the demand and the supply, while the speculative motive takes lead from the change in the price, as prices fluctuate.

With the aid of proper knowledge, data from the inventory management is used in analyzing demand and deciding when to order for new inventory. Inventory models used to manage different types of demand can be classified into two types which is dependent demand and independent demand.

Dependent demand is the demand for raw materials and components while independent demand usually is the demand for finished goods that comes from outside customers.

Based on the demand of each organization, different models will be adopted in different types of demands and different market scenes.

Basically, there are four types of demand which are low/medium demand, high demand, constant demand and unknown demand

REQUIREMENTS GATHERING AND ANALYSIS

In the planning for the development of this application, a feasibility study was carried out with the aim of getting all necessary requirements among a sample group of small and medium scale entrepreneurs, understanding the existing system of inventory management employed by these sample group and also finding out challenges they have with the existing system in operation. From the feedback, it was evident that this proposed system would go a long way in assisting the smooth operation of their businesses and further improving the productivity. All features to be implemented in this application are general in nature, as the needs are similar across board. For this project it was gathered that the application should be able to:

- Manage the stock movement
- Manage stock profiling
- Manage stock history
- Manage account accessibility/security

Since the requirement for this system to be effective is known, we move on to the system design phase where various system design aids are adopted to further clearly state the design and architecture of this application.

SYSTEM MODEL AND DESIGN

The system development model adopted is the waterfall model. The waterfall model is one of the earliest models in which phases are executed sequentially. The life cycle of software development starts with the first stage and moves down through the various

stages until the last stage: implementing the software in a live environment. All stages in the waterfall model are cascaded so that each stage will start only when all tasks identified in the previous stage are complete as shown in Figure 1.

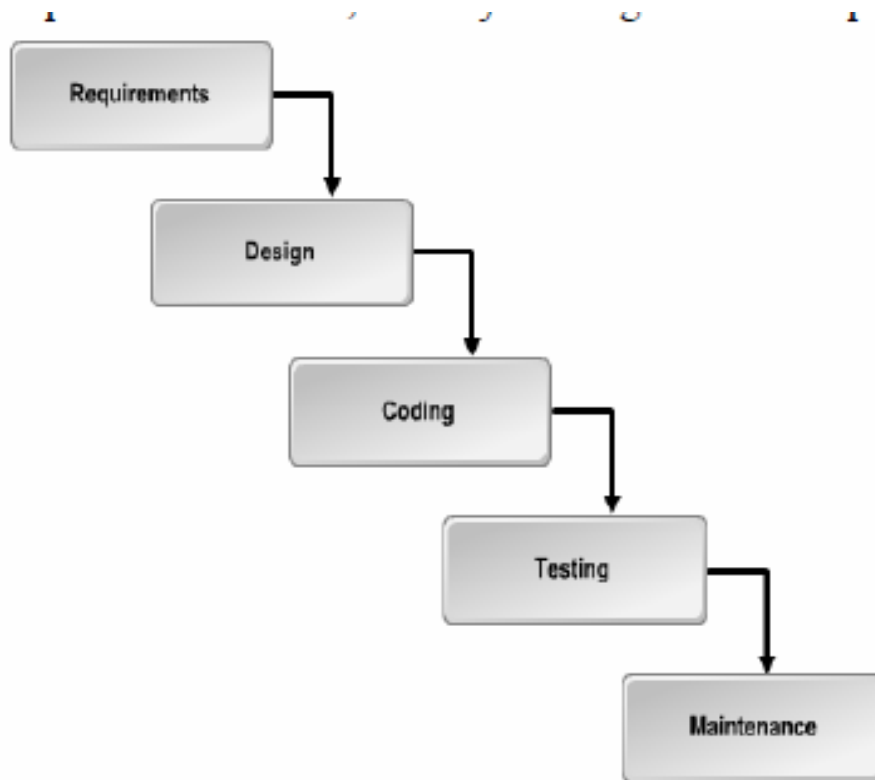


Fig.1:-Waterfall Model

The phases in the waterfall model do not overlap with each other, thereby making the model quite easy to use. The use case diagrams, sequence diagrams, and flowcharts are all part of the system design phase.

A use case diagram is a graphical tool used in illustrating the interaction of different actors with the system. With a detailed look into the requirements for this system, we can deduce the following in Table 1 while Figure 2 and Figure 3 shows the use case diagrams for the actors

USE CASE DIAGRAMS

Table 1:-The actors in this system and their respective goals

Actors	Goals
Inventory management system	Authenticate logins and inventory control activities, and provide inventory reports
Small & Medium scale entrepreneurs	Assign login to users in the organization, perform authentication of control actions
Sales assistant	Perform inventory control activities (stock profiling, stock movement), login to account
Account / Audit officer	Perform audit of the inventory system, request for inventory reports

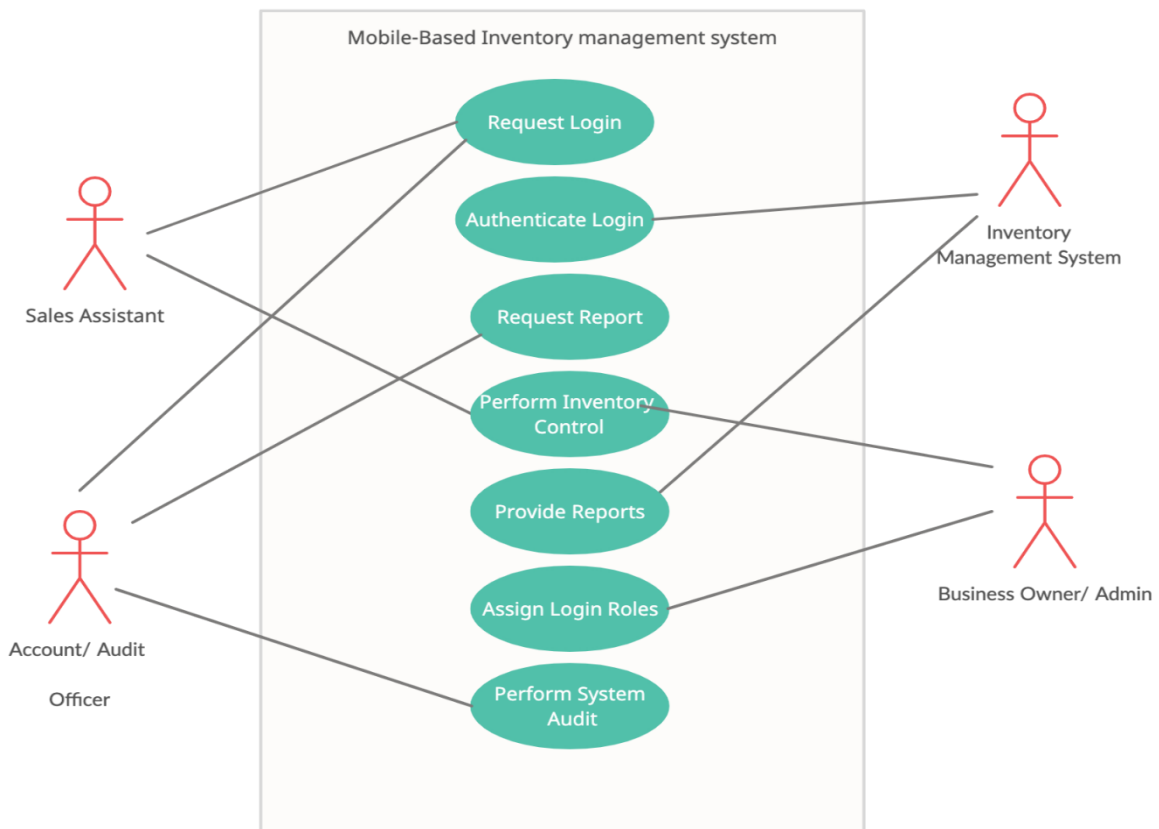


Fig.2:-Use Case Diagram

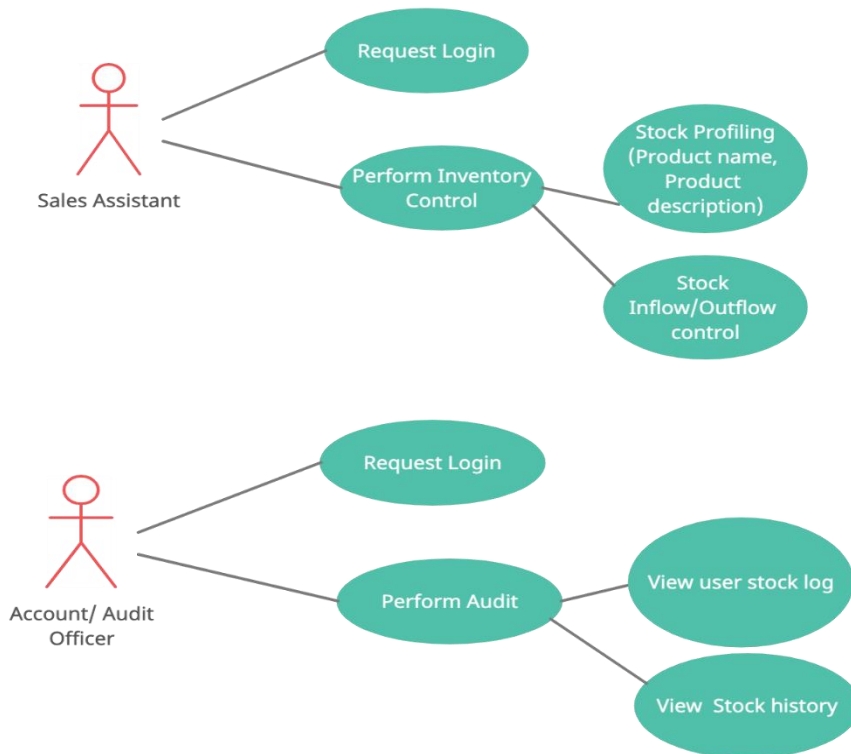


Fig.3:-Actor Activity use case diagram

FLOWCHART

A flowchart is described as a design tool used to graphically illustrate the process data flow within a particular system (Mahdi, 2013). It is a good tool for illustrating key operations within the

process of data flow within a system.

Figure 4 describes the process data flow for administration operations, while Figure 5,6 describe process data flow for system and inventory audit respectively.

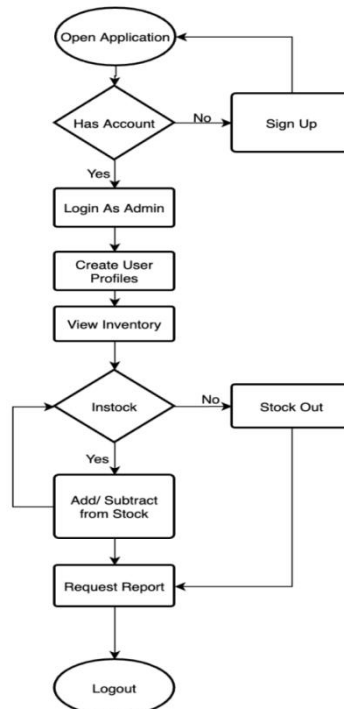


Fig.4:-Flowchart of Admin operations

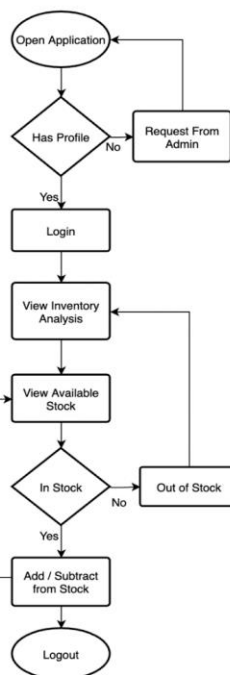


Fig.5:-System user flowchart

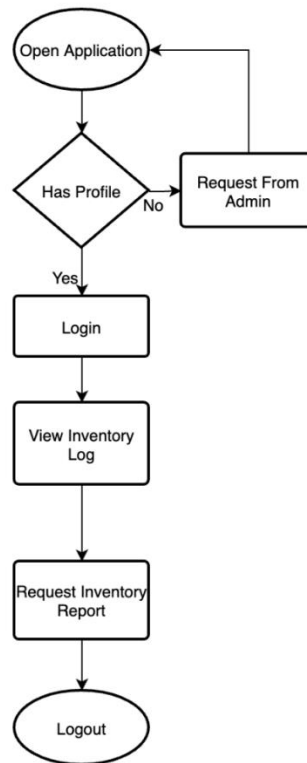


Fig.6:-Inventory audit flowchart

SYSTEM IMPLEMENTATION

The development of this application followed the blueprint laid down in the methodology phase of this project all stated functionalities and requirements were implemented.

The system interface was designed using

Flutter as the interface. The user interfaces are user friendly and easy to use. The various screens in their functionalities are described as follows.

Figure 7 consist of screenshots of both the application icon on the device it is installed on and the landing page when the application loads up.

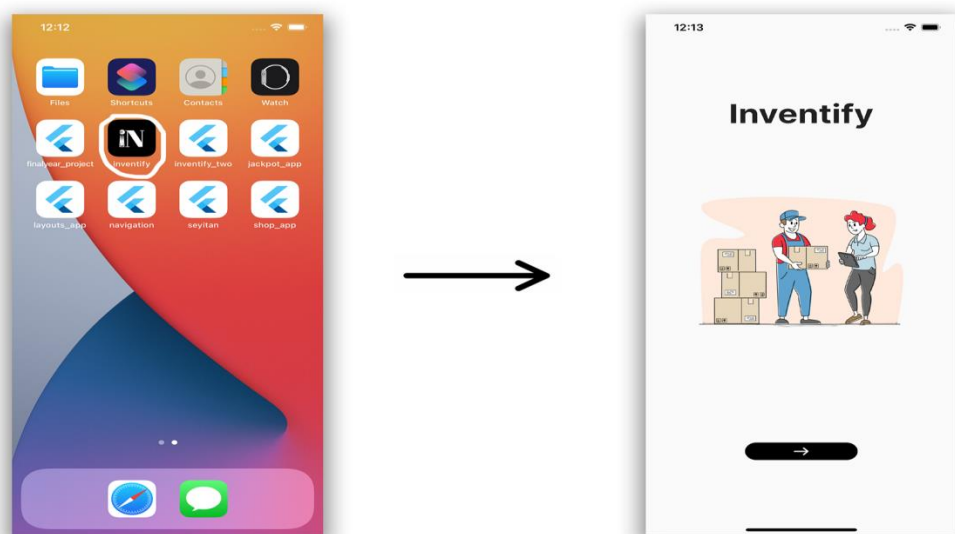


Fig.7:-Icon screen and landing page

Figure 8 is the screenshots of the application signup and login screen as shown below

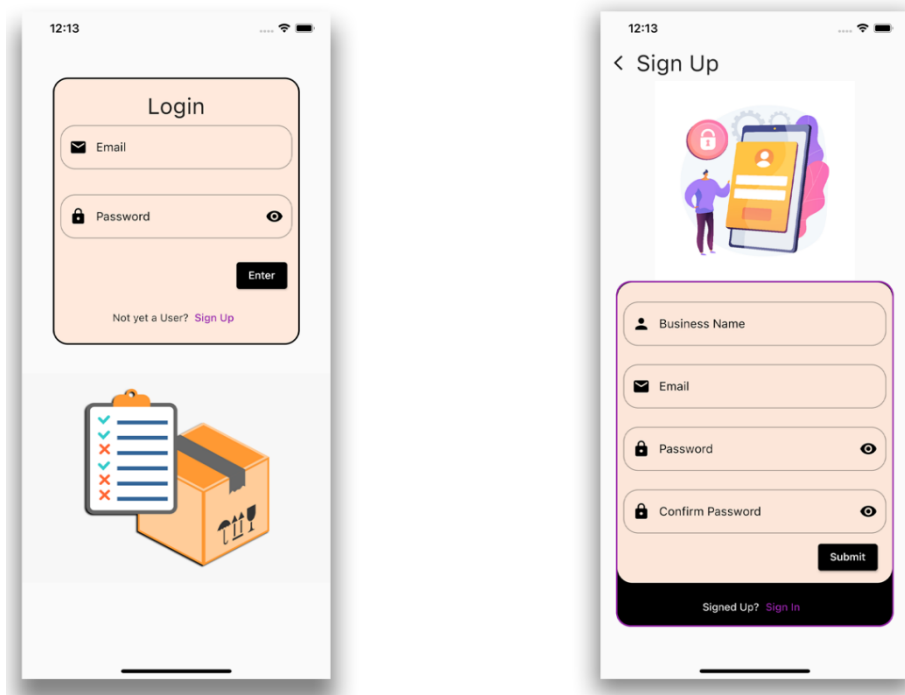


Fig.8:-Sign up and login screen

Figure 9 is the home and navigation bar screens

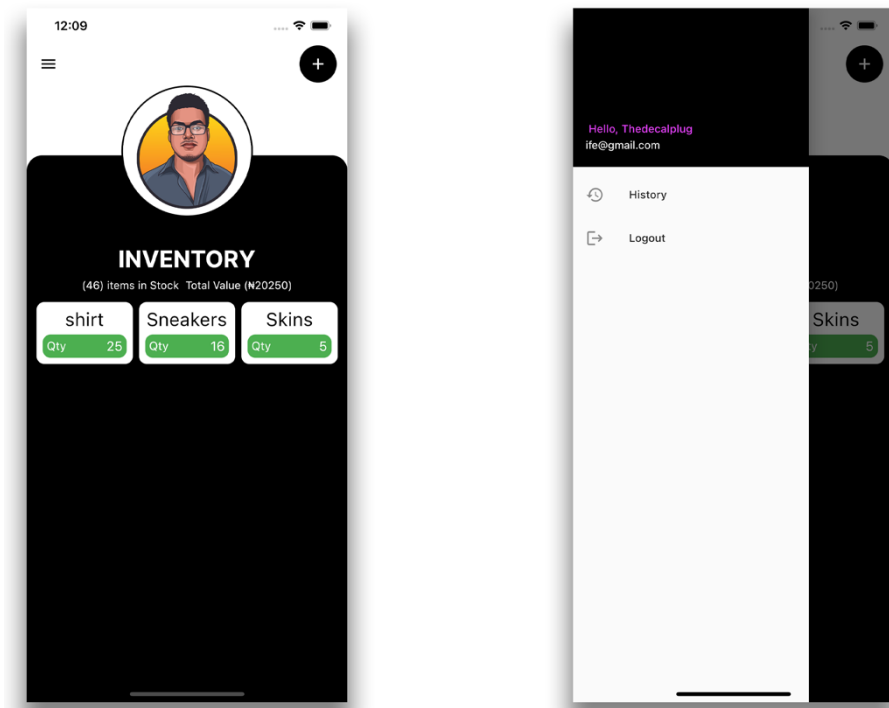


Fig.9:-Home and navigation screen

Figure 10 displays screenshots of the Add Item to inventory page which is displayed

when the button on the top right corner of the home screen is pressed, this screen has

text fields where users can add information of the new item to and when the Add

button is pressed, the item details would be displayed on the home screen.

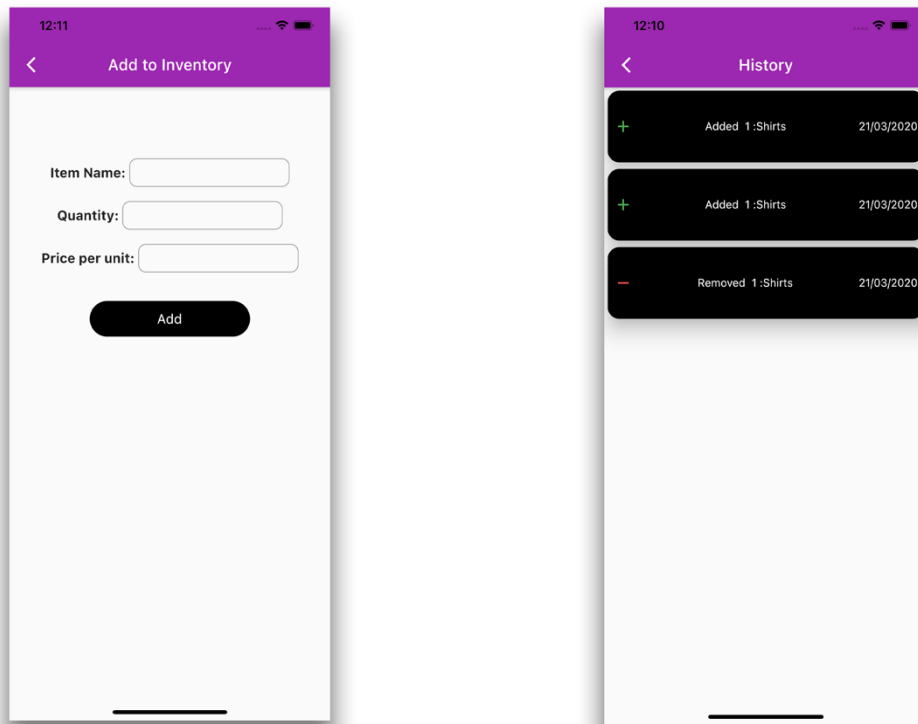


Fig.10:-Add item to inventory screen and history screen

Figure 11 is the screenshots of the Item view screen and the Add to Item on Tap screen. The Item view screen is displayed when a user clicks on the item in the home screen, this screen contains information on the particular item and provides users with

an interface to perform inventory operations such as add to item, remove from item and set minimum stock level. Figure 12 is the screenshots for remove item and set stock level.

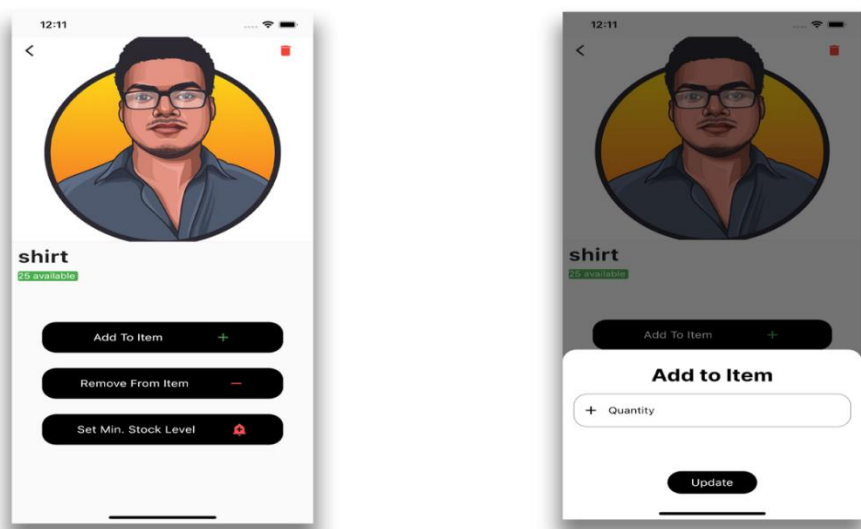


Fig.11:-Item view screen and Add to Item screen

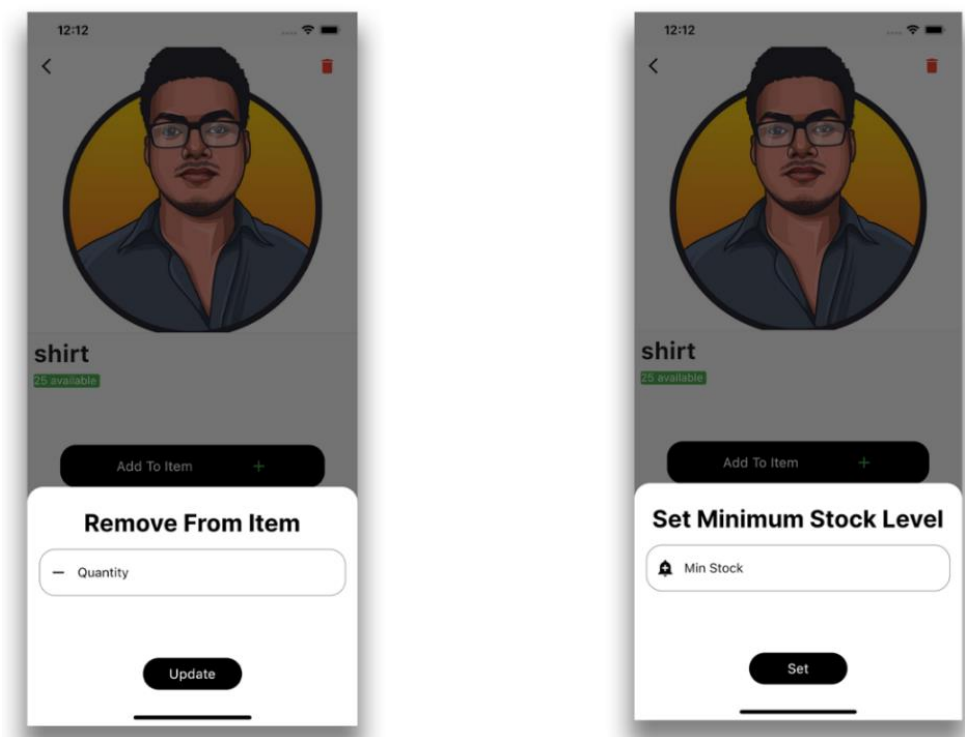


Fig.12:-Remove from item screen and set minimum stock level screen

CONCLUSION

This paper focused on the design and development of a mobile cross platform inventory management application.

Inventory management is very important and vital to the success of organisations and businesses. The deployment of the end product of this application to the target market would be positive as it would assist business owners, managers and employees to improve their productivity and further improve the chances of the organisations in the competitive market as the speed of getting access to inventory information is a major factor in pushing an organisation ahead of their competitors.

REFERENCES

1. Aswanth, K.,K.,Ganesan & V.Kavitha, D. (2019). Web Based Inventory System. *International Journal of Computer Science and Mobile Computing*, 18-24.
2. Kasim, H., Zubieru, M., & Antwi, S. K. (2015). An assessment of the inventory management practices of small and medium enterprises (SMEs) in the Northern Region of Ghana. *European Journal of Business and Management*, 7(20), 28-40.
3. Fryer, V., 2020. [Online] Available at: <https://www.bigcommerce.com/blog/commerce/#the-history-of-commerce-from-trading-shells-to-buying-iphones>.
4. Dashboardstreams, 2020. [Online] Available at: <https://dashboardstream.com/the-history-of-inventory-management>
5. Muyumba, T., & Phiri, J. (2017). A Web based Inventory Control System using Cloud Architecture and Barcode Technology for Zambia Air Force. *International Journal of Advanced Computer Science and Applications*, 8(11), 132-142.
6. Gelogo, Y. E., & Kim, H. (2014). Development of mobile enterprise inventory management system application with CBD. *Int. J. of Software Engineering and Its Applications*, 8(1), 385-396.

7. Joshua,J.V., Okolie, S.O., Awodele, O., Agbaje, M.O. (2014). A Survey of Software Process Models. *Research Journal of Computer Systems Engineering – RJCSE*. (5), Article C212.
8. Mahdi, A. Y. (2013). Algorithm and Flowchart. Retrieved from faradars.org: <https://faradars.org/wp-content/uploads/2015/07/Algorithm-and-Flow-Chart.pdf>