Smart Management Scheme for the Efficient Control of Industrial Inventory

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Abstract

To fulfill the growing demand of industrial goods, companies are keeping more inventories as a business trick. As keeping inventory database management system is very costly, industrial companies are switching to the manual management system which is done with unfriendly report usually. This research investigates the influence of a database management system for industrial inventory and developed a system which will be very less costly to launch, more efficient and more reliable. Visual Basic 2017 has been used to develop the front-end of the software. SQL server has been used to create the back-end of the software. The system has an error of zero tolerance because the scheme of coding of the database and debugging the codes guarantees that the errors can be specified and solved within very less time. The system will reduce costs, number of errors and make the whole management more versatile. This database system has been developed also to determine the Economic Order Quantity (EOQ) and Reorder Level (ROL) and also to decrease the stock-outs. This inventory database management system is newly treated and can also be used for various vending under vendor managed inventory. This work will also help the researchers to compare the automated system of keeping inventory with a manual approach.

Keywords

EOQ, Efficient, Database, Inventory Management

1. Introduction

Recently, inventory management is an important concern for every industry. With the improvement of modern technology, companies are becoming automated with the help of modern systematic approach (Anthony & Augustin,

2017). The management of inventory of modern vending systems with product change under the procurement view, order-up-to strategy raises a process of deciding something especially. The process includes the measurement of procurement views of good sat vending systems (Atieh et al., 2016). Furthermore, storing inventories largely maintained to fulfill the customer demand of sales in organizations measure the amount of organization's success. For this, a proper system for inventory management is necessary (Burja & Burja, 2010). And this is fulfilled only by an automated system. An automated inventory management system (IMS) requires less effort, gives more reliability and shows efficient results as compared to the manual system (Talapatra et al., 2020). But making a database management system like IMS into fully automated is very costly. As a result, most of the companies follow traditional manual system for inventory management which creates unfriendly report of the real pictures of purchase, sales and all everything related to the industrial inventory (Miguel et al., 2011). Due to these phenomena, company faces serious stock-outs resulting in customer dissatisfaction and sometimes it has to manage a large number of inventories resulting in a huge inventory holding cost (Seifermann et al., 2014). Also, many companies have many branches all around the country and sometimes in the outside of the country. When management of inventory is imperfect, the tasks of the industries are affected negatively as the presence of huge inventory rises to higher costs and decreased cash flow (Corbett, 2001).

Therefore, the requirement for automating the inventory system rises from the issue that traditional system may create human faults which may influence the inventory utilization (Haddara, 2014). However, by automating an inventory database system, the Company can be more profitable. In order to develop the system, a deep study on the system must be done. Many researches showed that an inventory system can be developed also by using an Enterprise Resource Planning (ERP) (Goonatilake & Maldonado, 2018). ERP is nothing but software which manages business by which an industry can utilize to collect, store, analyze and manage data from various business activities. It also gives integrated idea of main business processes by utilizing a common database (Kilic et al., 2015).

The goal of this research is to develop the inventory management system which requires less cost so that most of the companies can launch it easily. From this web-based software, a company could calculate the required EOQ for every item in the stores automatically and easily. This will also help to know when an order has to be placed for an item automatically after selling. The Company will also know if there are adequate products in the store to fulfill the customer demand.

Actually, an efficient database management system requires a proper software. And, any software should be selected focusing on the requirements of the system (Park & Yoo, 2012). In this research, the most significant need was that the developed system should ensure to recover huge capacity of information and also ensure to merge the order numbers in the same way to expiry, admitting and

actuating date and giving back to dealer.

The database part of the system acts the main function for recording for both inventory department and manufacturing department, for that reason the coming and outgoing are studied and treated on what goods have reached for the inventory department and what goods are required for manufacturing department (Kang & Gershwin, 2005).

A database management system is a store of information from where the data can be retrieved, updated and managed (Olsen & Sætre, 2007). An inventory database system is developed here for the respective company. In this regard, Visual Basic 2017 has been used to develop front-end of the software and SQL server has been used to create the back-end of the software. This server-based database will help the company to be more efficient and productive by reducing the manual task level that also reduces the error rate. It will also help the company by providing necessary data required to keep the inventory in control and to fulfill the customer demand timely. In this research systematic process of all sections like main database design, purchase has been demonstrated. The interactions of all software parts will also be shown in detail. This research will add a new window for future researchers to work with automated inventory management scheme. Benefiting from cost analysis, time and motion study will help to the applicability of the developed system. This study is one-of-a kind study which examines the influence of a data base management system on inventory management system in an organization, which is not explored enough in previous studies specially for an under developing country like Bangladesh.

2. Methodology

2.1. Database Design

We mainly consider two stages for creating a software, first the database creation and then customize the system by programming it and writing some codes. Here the process of database design involves arranging data into a series of relationship. It includes the relationship between purchasing products and selling products. It also includes some mathematical equations to calculate Economic Order Quantity (EOQ), Safety Stock, Re-order Level (ROL) etc. Visual Basic 2017 has been used to develop the front end. Using visual basic programming language, user interface can be created easily by programmers and codes can be used easily in graphical environment (Ya'acob et al., 2014). Comparing with other languages, it can be said that visual basic may be slow sometime but many things that are critical in other languages can be easily solved by visual programming (Ravinchandra et al., 2016). Then the other end used is SQL server database that confirms total protection and no loss of data or no corruption. Before creation of the software, the current system of inventory management of a company and process within it is analyzed. After analyzing the current system, three main processes were identified; purchasing products from the supplier, update necessary information about the new products and selling products to the customer

and update it again. A schematic overview of the database system is illustrated in **Figure 1**. Here, purchasing process of a product, selling process along with safety stock and Economic Order Quantity and updated information regarding inventory levels are considered.

2.2. Login Form Design

To keep privacy of data and for security, a user login form is developed. It is directly connected with the server. By developing this, only authorized person's access is ensured. Some selected employees of the company in purchase and selling department have only the access of this information database system as all data are very confidential. So individual identification is given for the selected employee. After only giving the correct identification and password the user interface of next operation will be started. Along with employee ID and password, branch should also be given properly. Both purchase and sale operation can be done automatically by database software framework. Above discussions are shown briefly in **Figure 2**.

2.3. Purchasing Process Design

Purchasing process starts with entering the input into the inventory database system. The input is stored in the inventory database system. Then the application calculates safety stock and economic order quantity based on the data given to the application. An overview of the purchasing process is illustrated in **Figure 3**.
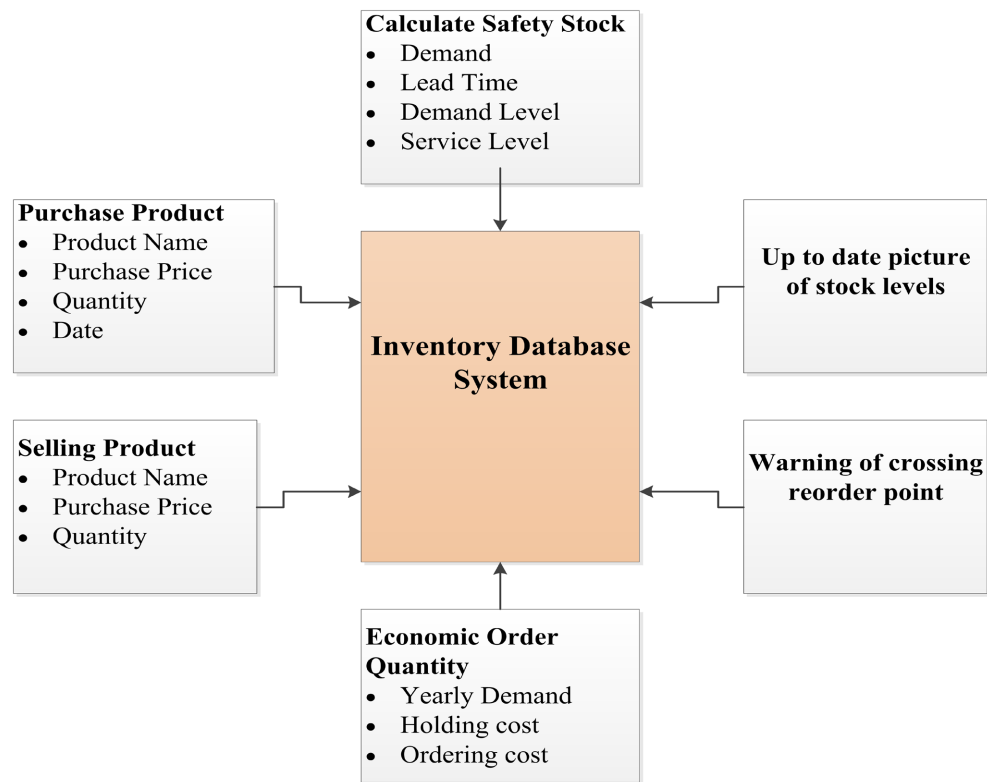

Figure 1. Overview of inventory management software.
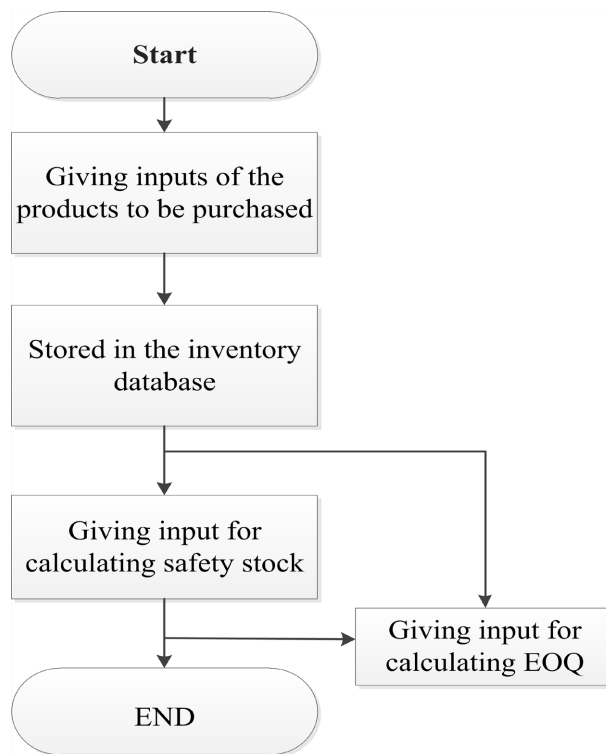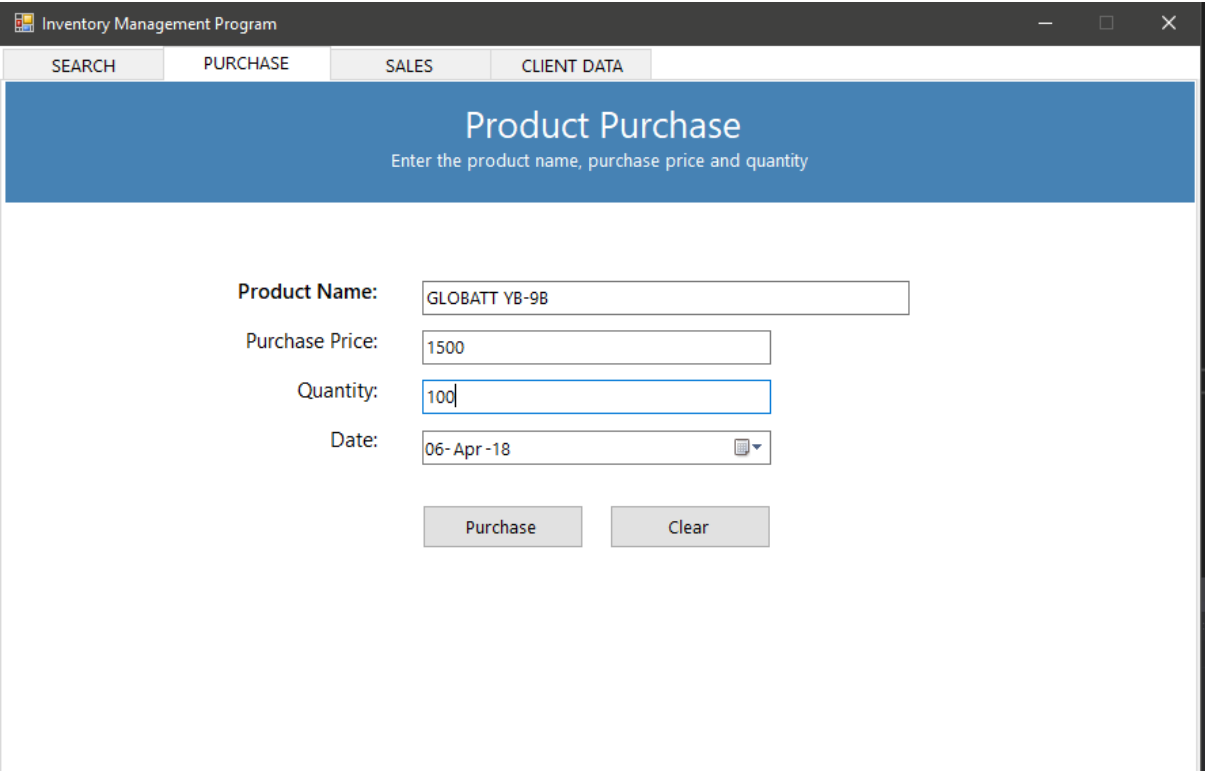
Figure 2. Login form design.

Figure 3. A simplified diagram to illustrate the main phases of purchasing process.

After doing the login, the main form of the software opens. The main form consists of four functions such as purchase options, sales options, search options and client data. Purchase option consists of product name, product price, quantity and date. This information is stored in the database and used in the several stages. Here, two buttons called purchase and clear are available. Purchase button is used to store the data in the database and clear button is used to clear the form. Figure 4 shows the details about purchase design.

Then if purchase button is clicked, the monthly demand form is opened from which EOQ, safety stock and ROL is calculated and stored in the database. Here for example, demand forecast for 6 months is given of GLOBATT YB-9B. Then as inputs demand period, lead time and service level are given to calculate safety stock of the product. When safety stock button is clicked, the value of the safety stock will appear for GLOBATT YB-9B. And set ROL button is clicked to calculate the ROL of this product and it is updated in the database. When selling a product, it will indicate if there the remaining items are below the ROL. Then the Annual demand, cost per order and holding cost are entered into the form to calculate EOQ. Here, these data for GLOBATT YB-9B are entered. When EOQ button is clicked, the optimum order quantity is appeared in the form. This is shown in Figure 5.

2.4. Sales Process Design

The sale option consists of product name, price, quantity to be sold and the date

Figure 4. Purchase process design.

Figure 5. Calculating EOQ.

in which the product is sold. Then this information is stored in the inventory database and the quantity of the product is updated. There are two buttons in the sale option Sale button is used to update the database and calculating reorder point and clear button used to clear the form. Refresh button is clicked before entering data to update the purchase data in the software. This is briefly shown in **Figure 6**.

Then the supply button is clicked. If the amount to be sold is in the inventory, a dialogue box is appeared of successful sales. And if the remaining items fall below the re-order level, then a warning of reorder is given. **Figure 7** illustrates this briefly.

2.5. Search Option

Search option is used to find out the number of products in the inventory after selling. It also shows the purchase price, unique batch no, branch of the product. First three letters of the product are entered and click search, then all the information about that product is appeared. This is shown in details in **Figure 8**.

2.6. Client Data

Client data is developed to store all the relevant information about employers, suppliers, vendors, stockholder and others who are connected with this operation.

Figure 6. Product sales design.

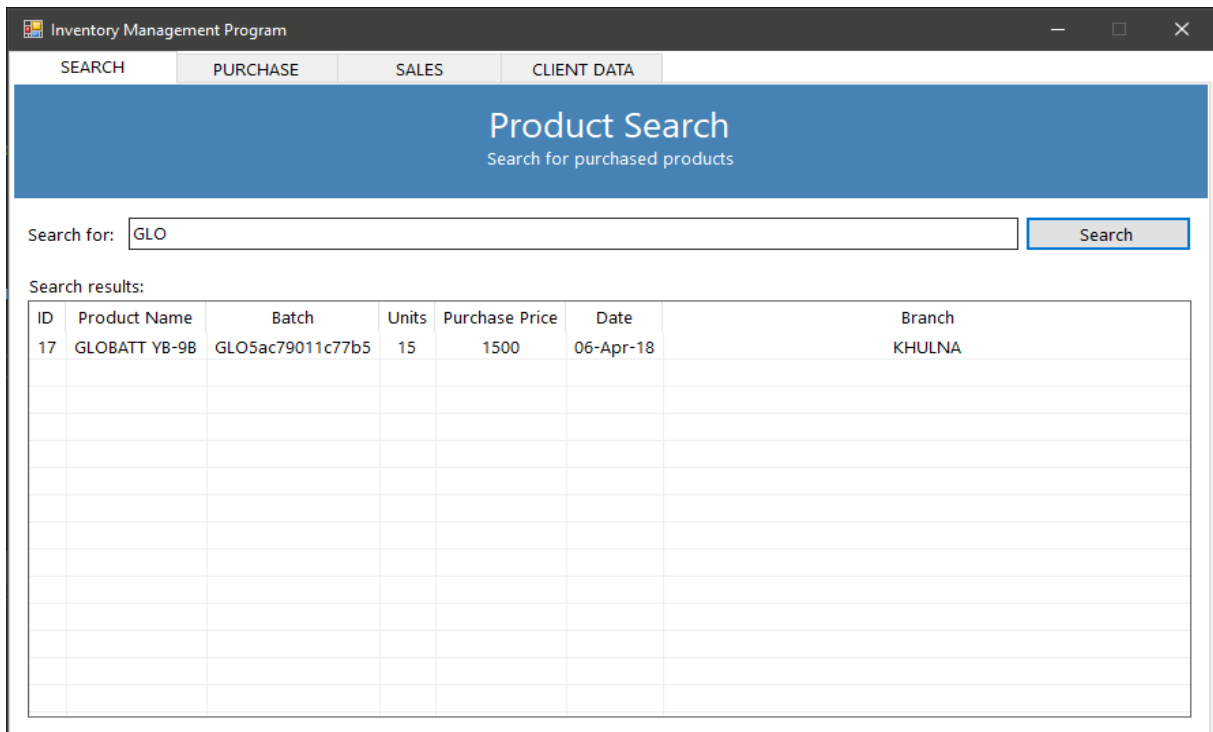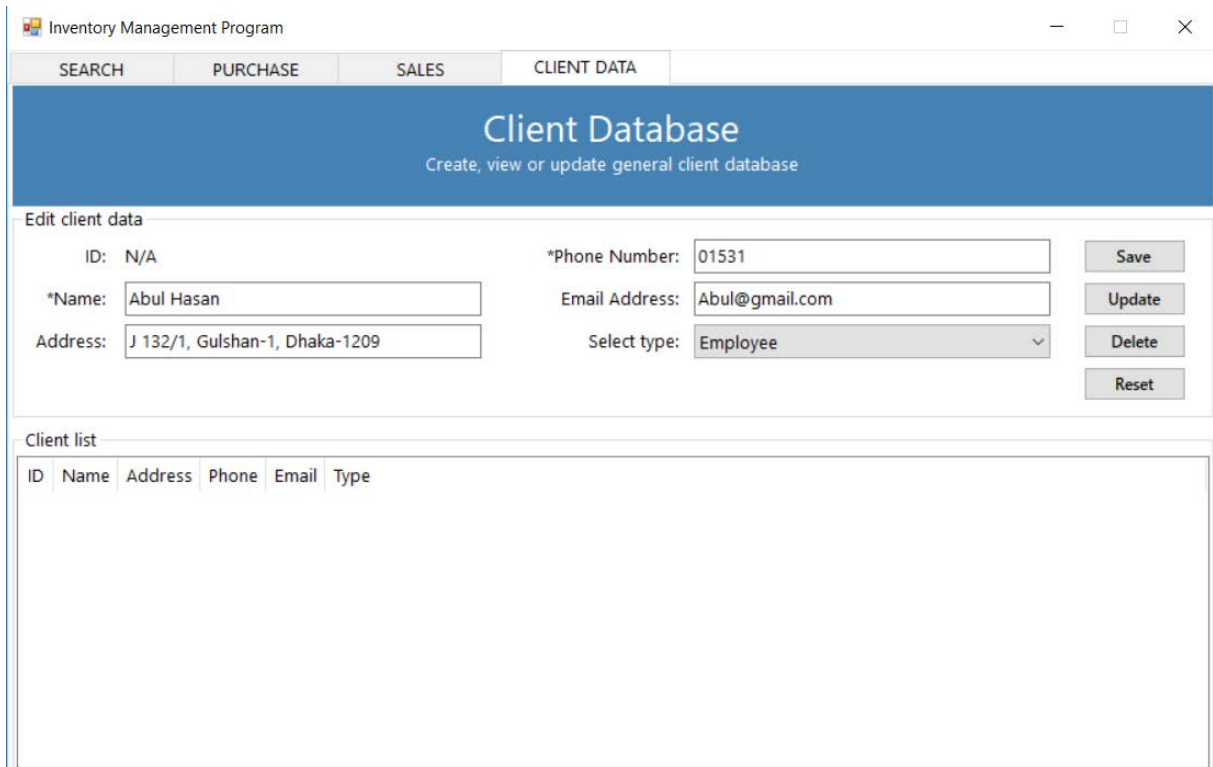**Figure 7.** Calculating reorder point.

Figure 8. Product search.

Figure 9. Client data.

This form consists of name of the person, address, phone, email and his/her position. This is illustrated in **Figure 9**.

3. Result and Discussion

In case of implementation of the software, the core functions of the inventory management system have been illustrated by the various parts of the software like purchase, sales, search etc. The software fulfills the whole process starting from customer orders to handing over to the dealers. The top management and also any authorized person can know the overall update of the inventory level of the company. Also, companies having many branches not only all over the country but also outside the country, can give such updates to its management personnel by developing this software. As a result, the whole inventory management process will become more well-furnished, efficient and reliable. As the Economic Order Quantity (EOQ), Reorder Level (ROL) changes with time and situation of the market and thus stock-out time also changes, it will be very beneficial if this information is updated in the whole company including all branches with time. And this demand has been fulfilled by our software which is already illustrated. Also, the system is designed in such a way that it can store very large number of data for further use. Every small parts of the system are interconnected with each other, as a result a proper order comes without any replica and errors in the system. When a product enters to the system, a unique ID is stored in the database for that product and from this step the whole process starts. When new information of any product comes, the database is automatically updated and old data is stored for further backup. The information is so arranged in the database, any authorized personnel whose have login ID and password can see the whole information of any product by a single click.

4. Conclusion

The developed inventory database software helps to create a stage to organize the inventory data most efficiently. For any business, customer satisfaction is most important. To achieve this satisfaction, every problem considering the product must be identified. The inventory application helps us to identify different problems related to the product such as stock out, how much to order and when to order. If the product needs to be fully available in the market, then the application program shows the way to achieve it. The database system replaces manual method of data entry which reduces the cost and number of errors. After using the application software and solving all the problems related to the product, the whole inventory management system becomes more versatile. The development of inventory management software will help any kind of organizations to handle the inventory activities more easily. By implementing this, any organization can keep the information about purchase and sales of the products more easily.

Limitations

Like other studies, this study has also some limitations. This study does not consider some aspects like demand variations in seasonal index, which can be cru-

cial for some industries. Besides, this study used Visual Basic 2017 for creating interface of the data base system which may not be applicable for some industries. Furthermore, this study does not consider the retailer information in the database, which is also a limitation of this study. Considering these limitations, researchers can be motivated to do further research on this field.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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