

Simplified Barcode-Based Point Of Sales And Inventory Management System With Replenishment Decision

Edward B. Panganiban, Jenefer P. Bermusa

Abstract: The world today is full of innovations. Every year, people can see and discover different inventions such as gadgets, machines, electronics, and many others which are timely in this generation which makes these inventions to become life easier. Technology is used mostly by people in schools, jobs, and offices every day. Through this, the authors established a paper that applied technology for grocery stores. The grocery store companies have many targets. Through their business plans, they typically detail those targets well before the start of new fiscal years. These companies can best reach their goals by staying customer-focused, offering their customer-wanted products and services. That is why most grocery store firms also developed comprehensive marketing plans to achieve their key goals. Marketing strategies help the owner identify their target customers better and shop the concept better. With these problems, the researchers came up with an idea, which is to develop a system entitled "Simplified Barcode-based Point of Sales and Inventory Management System with Replenishment Decision". The main purpose of the study is to help the groceries in inventory, quantity, and sales as well as in receiving reports promptly and to give a better and exclusive way for communication. The researchers developed the system based on the conceptual framework and system architecture established after determining the problems in the existing problem. The researchers used alpha, beta, and acceptance testing in order to test the functionality of the system. The functionalities of the system were conducted that serves as a testing process. During the pilot test, the respondents rated the system into a "strongly agree" description in terms of its functionality, reliability, and usability which confirmed that the system accomplished its objectives.

Index Terms: Point of Sales (POS), inventory, management, barcode, computerized, simplified, replenishment

1 INTRODUCTION

The grocery store companies have many targets. Through their business plans, they typically detail those targets well before the start of new fiscal years. Such businesses can better achieve their targets by remaining customer-focused, delivering their customer-wanted products and services. That is why most grocery store companies have built detailed marketing plans to achieve their key goals. Marketing strategies help the owner identify their target customers better and the definition of the shop. To improve the current system in some small grocery stores, the researchers established a study entitled "Simplified Barcode-based Point of Sales and Inventory Management System with Replenishment Decision" for a grocery store. A Real-time Tracking Point of Sale, Inventory and Sales Management and an upgraded system was established to the Grocery Point of Sale, Inventory, and Sales Management System. The system allows the administration to manage and track the stock and sales. The system also can maintain and organized records according to the desired outcome. It can also create user accounts for security reasons. It also has the following additional features: User-Friendly, CPU-Friendly, Data Safety, Special Roles and Permissions. The established system used a barcode system integrated with an inventory management process for records keeping of products. Barcode technology is a marking system with spaces and bars that are written side by side on the item, such as paper.

The barcode consisted of dark bars and spaces read through a barcode scanner. The barcode scanner then produces a set of unique numbers. This system can maintain and organize records and can also create multiple accounts for security reasons. Finally, this study was conducted to make the inventory management system simple as much as possible in accordance to the demand of the client.

2 METHODS

2.1 Conceptual Framework

Figure 1 shows that if the client will purchase to

Admin/Owner/Staff and accepts it after the client requested for purchase. After that, the Admin/Owner/Staff will log in to the system and the system will send requests from the database and then the system responds if account exists and can retrieve password if ever forgotten. After logging in, the admin/owner/staff can manage inventory by adding, updating or deleting inventory records the same with sales. The system can generate receipts and sales reports. The system can also view all the inventory and sales management. The system only allows the admin/owner/staff to be the user.

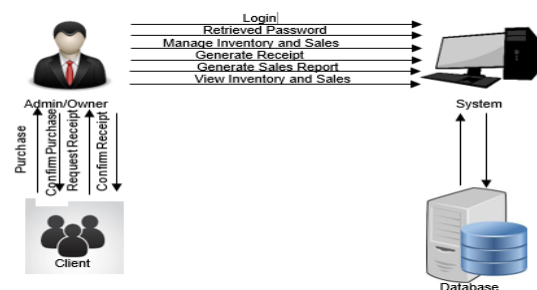


Fig.1 – Conceptual Framework

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2.2 System Architecture

Figure 2 shows that if the client will purchase to Cashier and accepts it after the client requested for purchase. After that, the Cashier will barcode the item to generate the system and then the system will send requests from the database and then the system responds to the product description and price. After payment sales will generate in the database. After that, it will print the official receipt.

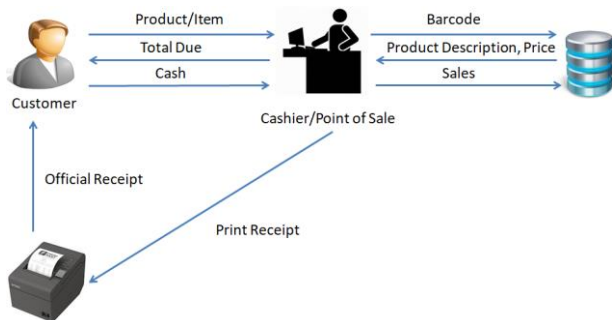


Fig.2 – System Architecture

3 LITERATURE REVIEW

Most companies requires an inventory system whether manual or computerized. This process in their workplace is very important to keep track of their products that includes raw materials, office supplies, goods and other tangible things. The inventory system is made use for predictability, demand fluctuations, supply reliability, price protection, and discounts. Inventory can be made work-in process, raw materials and finished goods [1]. In grocery stores, this kind of system must be used to monitor the availability of the products being sold. Computerized inventory system starts with Point-of-Sale (POS) system. POS system serves as an aid for the regular monitoring of the products, the status of the orders, the percentage of stocks available, and warehouse inventory [2]. More research shows that a POS device streamlines the process of loading inventory into a database after transactions have been completed, allowing companies to manually handle inventories [3]. POS information can also be used to produce projected sales trends based on prior request. This could affect work orders which "should then be measured as to how much customers are likely to expect, so POS results can be used to anticipate what consumers will purchase" [4]. Projections are a very powerful tool when determining how to price goods and when to add or remove additional products because the level at which items are sold is known. A POS system is a way of automatically gathering and aggregating sales data, that can then be used to provide a multitude of sales figures including: regular reports with historical information, one-month trend statistics, highest level-selling types, edge-margin customers, top-margin products, client category by revenue, highest-selling goods and day-to-day sales [5]. Inventory management system can provide reliable and existing inventory reports based on sold and damaged goods which can be accessed either from a company computer (software package) or through a POS terminal (Software as a Service) [6] Almost all grocery stores employed barcode technology as an alternative to keyboard entry. A bar code is a component of Advanced Authentication Systems storing data in real time. This is a sequence of vertical bars or a visual strip pattern that can (largely depends on the length

and pattern) represent letters and numbers in a form that a bar code reader can easily recognize and decode [7]. This system involves barcode technology for simplification purposes. In addition, this study includes expiration date to help the stores determine what products are to be disposed ahead of time. Forecasting the products expiration date is very important to decide what to do and for the inventory control. In inventory management, the control of inventory is very significant. Control can be managed through its expiration date. A significant percentage of the food products have finite lifespan and when these commodities reach their expiry dates, the degradation risk keeps increasing and nears 100 percent at their expiry dates. Once the people buy these kinds of goods, they also verify the best before date of the commodities and seek to purify the chase that is later than the expiry date before they can keep the goods for a considerable period of time. Consequently, in addition to the appropriateness of a product's price, the maturity date of the item is equivalently essential in order to retain customers throughout purchase or sale [8]. Every product has an expiration date especially on food products. Food products may not be ideal in fairly good condition for humanity after this time period. Therefore, within their lifespan, suppliers / vendors want to market this kind of items. If they are unable to sell these products within the maximum lifespan, then they completely lose the amount spent. Hence, the researchers made a point of sale system with an inventory system that includes the validity of the products. Through this system, it can monitor products which are near to its expiration date. This will serve as an aid for the replenishment decision to be made by the company management. This system will be of big help most especially to the grocery stores to avoid spoiled items and to maintain the quality of their products

4 RESULTS AND DISCUSSION

This paper conducted a research about a point of sale inventory management system which includes the feature of inclusion of expiration date in the system. This expiration date is very essential for the replenishment decision strategy and to sustain the quality of the products being sold. The major component of this study is the development of software and its evaluation. The next discussion are the results of the developed software and the evaluation of the system as to functionality, reliability and usability.

4.1 Software Development

Figure 3 is the actual interface of the system administrator. The system administrator is also the system user. The interface displays several functions of the system such as the administrator account function which manages all the administrator account kept in the database. The Create New user Account function is used to create an account when a new staff will come. The user management function used to manage the staff's account. Inventory Management used to manage the products. The Low stock notice will glow red if there's a low stock product. The reports function used to report the transaction receipt. The interfaces also display the name of the current logged in account in the system. The current date and time are also displayed on the administrators' interface. The logout function allows the administrator to exit from the system.



Fig. 3 – System user interface

4.2 RESULTS OF TESTING

Administrator’s account registration test

The account creation tests were conducted for accounts of administrators and sub-users as illustrated in Figure 4. The table shows 3 examples of system administrator’s account and 2 examples of sub-users that were successfully created in the system’s database. The UserID column pertains to the database account ID per record stored in the database. The LASTNAME and the FIRSTNAME columns are the personal information of the account Staff. The Role columns are about the registered staff to be utilized by the system administrators and sub-users when opening or accessing the system. The Status column is about the user status that is active. The table is a detailed summary of the administrators and sub-users account wherein tests were done to verify its reliability.

UserID	Firstname	Lastname	Role	Status
03	Jose	Rizal	Admin	PERMANENT
04	Carl	Ocumen	Manager	ACTIVE
05	Eric	Salum	Cashier	ACTIVE
06	Ra	Fronda	Stockman	ACTIVE

Fig. 4 – Account creation test for system user

Encoding and Printing of barcode

For encoding and printing of barcode, figure 5 shows sample 18 instances that were successfully encoded and printed. The BARCODE column is the barcode of the product per record. The Product ID, Quantity, Product Description, Category, Cost, Price, Re-Order Level, Date columns are about the information of the Product. The table showed that the issuing of barcode and recording has obtained the desired output.

Product ID	Quantity	Product Description	Category	Cost	Price	Re-Order Level	Date
102308	20	Coke 20ml	Beverages	10.00	15.00	10	2019/04/25
1111111	194	Sorte	Beverages	10.00	18.00	50	2019/04/09
123	22	daids	Canned Goods	323.00	22.00	222	2019/04/17
123456	50	canned Com	Canned Goods	50.00	80.00	20	2019/02/17
2212	33	33ea2	Canned Goods	2.00	1.00	2	2019/04/17
2233	22	Zda	Canned Goods	222.00	222.00	333	2019/04/17
2312	131	daid	Canned Goods	33.00	22.00	22	2019/04/17
3214354	88	Tanlilo	Dry Goods	20.00	50.00	10	2019/02/17
400589319725	96	NIUSA Body lotion 400ml	Personal Care	65.00	120.00	50	2019/02/01
444444	12	caracmal shampoo	Personal Care	1000.00	2500.00	5	2019/03/29
4800016082603	100	Marsa Eates 2lb	Dry Goods	3.20	6.00	50	2019/04/25
480006211291	90	Hansen Mocha Sndwch 31g	Dry Goods	4.10	6.00	60	2019/02/01
480088192456	99	Reaxona Motion sense 50ml	Personal Care	87.00	93.00	50	2019/02/01
4801981118588	95	Sorte 300ml	Beverages	20.00	25.00	50	2019/02/01
5555555	100	Marsacore	Personal Care	20.00	50.00	10	2019/03/20
565656	50	shampoo	Personal Care	19.00	50.00	10	2019/03/20
8851932393041	96	Ponds White beauty milk scander.	Personal Care	35.00	45.00	50	2019/02/01
9090909	87	kocho lead Cofes 90ml	Beverages	22.00	45.00	25	2019/04/12

Fig. 5 – Issuing of barcode and recording test

4.3 Final prototype

Figure 5 is the prototype result of the established study. The figure includes the system hardware components used. The system software is installed on the server. The display screen serves as an output device for managing and viewing the records in the system. The barcode scanner is used to capture the barcode of the Product ID. The thermal printer is used for printing the receipt with a barcode. The system keyboard and system mouse are used to navigate the system.



Fig. 5 – Final prototype

4.4 Software Evaluation

Evaluation forms were given to the respondents to weigh in the system’s functionality, usability, and reliability. The number of respondents was 50 which composed of customers using the statistical analysis used is the 5-point Likert Scale. Table 1 illustrates the average perception of the respondents based on the functionality of the system. The results showed that most of the respondents strongly agree on the questions related to functionality with an overall weighted average of 4.59. On the other hand, table 2 is a tabulated perception of the respondents pertaining to its usability. The summarized result showed an overall weighted average of 4.70 which indicates that the respondents describe the usability of the system as “strongly agree”. Lastly, table 3 is the tabulation about the perception of the respondents in terms of the reliability of the system. The overall weighted average of 4.64 points out that the respondents strongly agree that the system is reliable.

Table 1. Functionality Evaluation Result

Criteria	Weighted Average	Description
The system registered new accounts easily and securely.	4.69	Strongly Agree
The system shows an error message for the unsuccessful registration of accounts.	4.35	Moderately Agree
The system displays the product number when the product barcode is scanned.	4.63	Strongly Agree
Overall Weighted Average	4.59	Strongly Agree

Table 2. Usability Evaluation Result

Criteria	Weighted Average	Description
The system is simple and understandable.	4.58	Strongly Agree
The system needs less supervision.	4.87	Strongly Agree
The system’s functions can	4.64	Strongly Agree

be remembered easily.

Overall Weighted Average 4.70 Strongly Agree

Table 5. Reliability Evaluation Result

Criteria	Weighted Average	Description
The system is still operational even with encountered.	4.69	Strongly Agree
The system can be restarted once there is a failure of functions.	4.72	Strongly Agree
The system keeps a complete and reliable record after recovery.	4.65	Strongly Agree
The system can back-up and retrieve records when there is a power failure.	4.52	Strongly Agree
Overall Weighted Average	4.64	Strongly Agree

4 CONCLUSION

Based on the conducted software development and its evaluation, it was proven that the project system entitled "Simplified Barcode-based Point of Sales and Inventory Management System with Replenishment Decision" operates its intended functions and it is an effective system in monitoring inventory and sales management. It was tested in a grocery store and rated with strongly agree according to its usability, functionality and reliability. This system also includes expiration date entry for replenishment decision purpose and for the maintenance of the quality of the products. This study concluded that it is a must that expiration date must be embedded in any inventory system for companies with food products. This will not only for the quality of the food products but also for the safety of the customers.

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