



e-ISSN: 2319-8753 | p-ISSN: 2347-6710

IJIRSET

International Journal of Innovative Research in
SCIENCE | ENGINEERING | TECHNOLOGY

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

Volume 12, Issue 13, April 2023

ISSN INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA

9940 572 462

6381 907 438

ijirset@gmail.com

www.ijirset.com



IoT Based Smart Trolley Using QR Code

Mrs.G.Brinda¹, Mr.K.Nanthakumar², Mr.C.Ramanathan³, P.Bavatharani⁴, C.Sithan⁵, S.Prasad⁶

^{1,2}Assistant Professor, Department of ECE, M.P.Nachimuthu M .Jaganathan Engineering College,

Erode Dt.–Tamilnadu, India

^{3,4,5,6}UG Student, Department of ECE, M.P.Nachimuthu M .Jaganathan Engineering College,

Erode Dt.–Tamilnadu, India

ABSTRACT: Shopping is a necessity of people that covers different fields, from vegetable and grocery to clothing. Generally, people used to go separate shops to buy different types of items. Now, shops are integrated so we can find all the necessary items under a single roof, which is known as a shopping complex. Thus, this leads to the increase in the level and structure of a shopping mall. In our country, there is still an abundant need for upgrading the facilities for providing the worthiest shopping experience to customers. Customers frequently deal with difficulties and trouble while shopping. These problems also contain worrying trends about the total amount of money, inadequate information about the items that are for sale and offers of the day, and also waiting in the queue at the billing counter for the bill which leads to the wastage of unnecessary time. For resolving the problems stated above various methods are developed, but the efficiency is still considered for the betterment and improves the shopping experience. Examples of these various existing methods such as barcode technology, where the price is stored in the barcode and RFID technology are implemented.

I. INTRODUCTION

Human beings have constantly endeavored to imagine new advancements with the point that it makes our life less demanding. The main motivation behind improvement or the development of new technology has been with the aim to limit and make day to day tasks less demanding, hectic and saves time, independent of the different domain accessible. A major task on which people are discovered investing impressive amount of energy and time nowadays is shopping. Generally, most by far of the general population go through an hour or more on shopping every day. An extensive no. of potential buyers tend to leave the shopping complex seeing a long line or even after selecting the products and not buying them eventually because the customers don't want to wait in long queues. In this paper, Automated Shopping and Billing System aim to help the customer at the shopping complex which will limit the time spent in shopping significantly and simultaneously this system intends at providing a real time inventory framework so that at the backend it will be tractable to know the batch, expiry and no of items left in stock with no ambiguity left. The framework planned comprises of smart labels (Passive RFID Tags), appended to physical objects. They radiate radio waves which are encountered by the RFID reader in trolley system; the coiled antenna inside the smart labels start to emit a magnetic field around it. The smart label withdraws power from it, energizing the circuits in the tag. The label at that point sends the data that is present in the smart label by converting the radio waves to a more usable form of data. Before the customer will put an item into the trolley, it is required to register/login to the Mobile Application and be connected to the same Wi-Fi network as the trolley.

Products added into the trolley are scanned using RFID and matched with the Database and hence product name is shown on the LCD screen and the mobile application along with other important information shown in Table I. When the customer has completed the shopping the application will be redirected to the payments page, where the payment can be made by cash or card. After making the payment the customer can logout and this reduces time and effort both for the customers and shop owners.



Organized by

Dhaanish Ahmed Institute of Technology, KG chavadi, Coimbatore, India

TABLE I

DEPICTS THE INFORMATION SHOWN TO THE CUSTOMER ON THE LCD MOUNTED ON TO THE TROLLEY SYSTEM

RFID Tag ID	ITEM	EXPIRY DATE	QTY	COST
B9F1D	Lays	20/11/18	2	40
7708E	Lux (soap)	05/07/18	1	15
830F3	AXE Gold	17/04/19	1	90
48CD3	UCB T-shirt	-	1	899
D9EFA	Colgate Toothpaste	29/11/19	1	45
19008	Wella Shampoo	14/03/18	1	350
			GRAND TOTAL	1440

In this paper the aim is to develop a framework that utilizes RFID based trolley that comprises of smart labels or RFID Tags which are used to transmit data to the interrogator that is the RFID Reader and wireless transmission of the data 978-1-5386-5933-5/19/\$31.00 c 2019 IEEE 693 to the mobile application and simultaneous real-time inventory updates. The proposed system is easy to use, low-priced and efficient. As the entire framework is becoming smart, it will help profiting the both small and large scale retailers. The paper is organized as follows: Section II describes the related work. Section III presents the proposed model and the basic assumptions made. Section IV discusses the comparison of the existing system and the proposed system. Analysis and further discussion is shown in Section V. The concluding remark of the paper is given Section VI.

II. RELATED WORKS

This section depicts the related work that has been conducted in the previous years related to the use of Radiofrequency Identification in shopping. Different authors have presented their views and ideas related to this field, also have developed working models that can be of use to the retailer and the customer. In the end benefitting both from the customer as well the retailers point of view. Suryaprasad et al. have proposed a novel approach for low cost automated shopping cart. It was developed as loweffort shopping aid that helps the buyer to seek and select items and educate the client on any offers available on the items as they search shopping complex. Karmouche et al. have proposed to build up a framework that can examine dynamic and static items in the shopping space utilizing RFID Reader antennas. It was developed in a way rather than directing the RFID perceptions at the level of individual trolleys. Bill et al. in an examination done by the University of Arkansas, Information Technology Research Institute, it demonstrates the business value and also advantages of labelling the products with RFID for the day to day activities at any big retail location. The investigation was led in the denim classification utilizing the RFID labels rather than the barcodes. The examination results demonstrated that the stock exactness of the store was enhanced by 27% and the under stock products was reduced by 21% and decreasing the over stock by 6%. The administration analyzed the time taken for tallying the items both by barcode and RFID technology. The scanning of 10,000 products when finished by RFID took 2 hours whereas performing the same job by barcode reader took 53 hours subsequently demonstrating a 96% drop in the product tallying time. Raju Kumar et al. created framework comprising of 3 key parts/modules (a) Server Correspondence part (SCC) (b) User Interface and show segment (UIDC), and (c) Automatic charging segment (ABC). SCC builds up and keeps up the association of the shopping basket with the primary server. UIDC gives the UI and ABC handles the charging in relationship with the SCC. These 3 modules are incorporated into an implanted framework and are tried to fulfill the usefulness.

Zeeshan Ali et al. [5] developed a product to help a man in regular shopping as far as lessened time spent while obtaining an item. The fundamental objective is to give an innovation arranged, temperate, effectively adaptable, and tough framework for helping shopping face to face. Bhumkar et al. created a smart application which is based on the Trolley number and total amount of purchased item and replacing the existing reward point system which is based on cards by Android application. Aarti et al. came up with an idea to deal with the problems being faced during the day to day shopping. The idea of utilizing the android cell application with the products getting scanned the very moment they are kept into the shopping trolley. The aggregate amount is ready by the time and directly delivered to the buyer’s e-



Organized by

Dhaanish Ahmed Institute of Technology, KG chavadi, Coimbatore, India

mail, cutting the time of standing in long streams for the transaction to be made. Therefore the whole idea displays a tremendous potential of IOT system. AnkushYewatkar et al. proposed a smart shopping cart system that monitors bought items and furthermore online transactions for billing utilizing RFID and ZigBee. The framework will likewise give recommendations for products to purchase based on customer’s purchase history from a centralized system. In this system, every item in Mart will have RFID tag, and each trolley will have RFID Reader and ZigBee joined to it. There will be a centralized system for the recommendation and online transaction as well. In addition, also there will be RFID reader at the exit of the mall for hostile to burglary. K. Prasiddhi et al. proposed a system with principle objective to give a vigorous innovation ease, high effectiveness and effectively versatile framework for making the way toward shopping easy. The framework comprises of 4 key modules (i) Product Detection Product Detection (PD) (ii) Product Recommendation (PR) (iii) Budget Setting (BS) and (iv) Automatic Billing (AB). Abdelaziz El Mahboul et al. developed a concept called (Smart Shopping Cart) and it involves primary server and one automated shopping basket, with RFID reader intended for scanning the data from tags of the products added into the cart, with the assistance to the communication connect with the said server. JB Mahajan et al. proposed a shopping system with the use of NFC. Therefore, the time required to buy and billing will be decreased as the buyer can buy the items directly from his Android NFC empowered Mobile. The given system’s goal is to help customers who’s much of the time is spent visiting the Mall to purchase items on week after week or month to month premise. Barcode and RFID are two unique types of innovation that are utilized for reading and gathering information. Although, Barcode and RFID have risen up out of similar roots, Auto Identification which is a general class of Advances that are 694 9th International Conference on Cloud Computing, Data Science & Engineering (Confluence) utilized to recognize different products but they are significantly different in many ways.

TABLE II

A COMPARISON MATRIX PRESENTS CONTRAST BETWEEN BARCODE AND RFID TECHNOLOGY

S.No	Barcode	RFID
1	Individual is required to read barcode on item.	Automated reading of RFID tag from item.
2	Line of sight required to a read barcode.	No line of sight required to peruse RFID.
3	The coherence of barcode can be debilitated by soil, dampness, scraped area, or packaging contours.	RFID labels are not influenced by such conditions.
4	Short reading extent. Barcode does not have READ and WRITE ability	Long reading extent. RFID tag having READ and WRITE capacity

Table II : depicts a comprehensive analysis Barcode and Radiofrequency technology, the purpose to show this comparison is to depict the drawbacks of the barcode system and how the new and proposed RFID technology is proving advantageous to overcome the problems faced in the barcode technology [12].

IV. PROPOSED MODEL AND ASSUMPTIONS

This section illustrates the hardware requirements precisely along with their specifications used. Figure 1 and 2 depicts the flowchart of the proposed framework explaining how the system will function.

Figure 1. Depicts the working of the Proposed Trolley section Figure



Organized by

Dhaanish Ahmed Institute of Technology, KG chavadi, Coimbatore, India

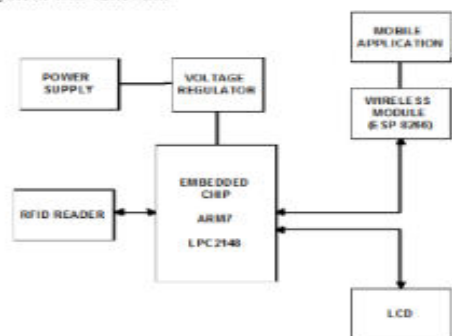


Figure 1. Depicts the working of the Proposed Trolley section

2. Depicts the working of the Proposed Mobile Application

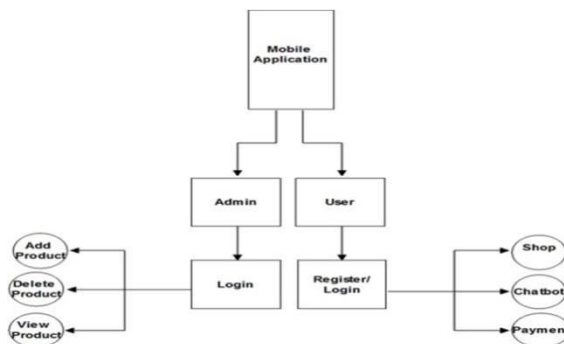


Figure 1 illustrates the block-diagram containing the subsystems of trolley section and receiver (billing) section. Every subsystem is interfaced precisely to shape an entire unit. This framework comprises of a micro-controller- heart of the system, merged with Radiofrequency Identification Reader, a wireless module ESP 8266, Radiofrequency Identification Tags, and Liquid Crystal Display (LCD) with alphanumeric displays i.e. 16x2, shaping up the hardware framework and mobile application connected to the server wirelessly shaping up the software framework. The products or items that will be put into the trolley system each have a distinctive ID number. Google Firebase is used to create and maintain the database at the server end. Figure 2 illustrates the mobile application which is developed for the admin and customer, first the user will have to register if they are using it for the first time otherwise they can login directly.

The mobile will have to be connected to the same network as the trolley to send the information which will include product name, price, and quantity as shown in Table 1 from the trolley to be viewed in the mobile application. The Firebase database contains all the information of the products available for purchase which can be manipulated (addition, updation and deletion) by the DBA only. The next step is, the customer puts any item that contains a Radiofrequency Identification tag attached to it into the trolley system, it will identified and data will be gathered. This data at that point transferred to the mobile application. At the server end, the database is compared with the Radiofrequency Identification smart label ID number that is put into the trolley and every one of the items and their details such as Tag ID, name, price, and expiry in that specific database are recovered furthermore, sent back to the mobile application. Data communicated through server will be saved for that moment in the micro-controllers memory and afterward showed on the display unit fastened on the trolley.

Buyer would be able to select the item with data being 9th International Conference on Cloud Computing, Data Science & Engineering (Confluence) 695 appeared on the display unit. Each item will be distinguished utilizing smart labels. As the items are chosen, included into the shopping trolley the Radiofrequency Identification reader will recognize an item, it’s cost is added to the invoice which is being stored in the memory of the micro-controller. Also, if the buyer would like to replace an item from the trolley system then the buyer presses delete and removes that particular item. Items and its price will get removed from the invoice and a message showing the item has been removed from the trolley system is displayed on the LCD. After finishing the shopping, the customer needs to choose the payment option



Organized by

Dhaanish Ahmed Institute of Technology, KG chavadi, Coimbatore, India

from the mobile application. This generates a grand total of all the items that are put into the trolley after being confirmed about the purchase of all the items in shopping trolley. The created invoice is then transferred to payments page to get the automated bill to be given to the customer. The framework is worked around ARM7 LPC2148 32 bit small scale micro-controller.

A. Proposed Algorithms This section depicts a brief about the working of both the software as well as hardware working of the system. Algorithm 1 and 2 giving an effective analysis of the framework by explaining the logic of the system designed. The algorithm designed in a sequential manner describing each action of two main areas: front end and the: backend.

<u>Algorithm-1. Hardware configuration</u>	
Prerequisites: all the modules-trolley section, receiver section and the mobile should be connected well to each other with sufficient power and voltage supply.	
S1.	Begin
S2.	Initialize the controller and LCD
S3.	If (tag detected)
S4.	Read Tag_code
S5.	If (Compare code = stored code)
S6.	Add item cost to total bill
S7.	Return to step 2
S8.	Else
S9.	Display not in database
S10.	Exit
S11.	End If
S12.	Else
S13.	Return to S3
S14.	End If
S15.	END

Output: Total amount displayed on LCD and transaction processed.	
S1.	Begin
S2.	Welcome screen displayed
S3.	If (continue)
S4.	Display menu with different options
S5.	IF (sales person is clicked)
S6.	Display sales person login area
S7.	Logged in with different options
S8.	Adding, modifying and removing item
S9.	Option for searching items according to category or Name
S10.	Pay the bill
S11.	IF (registered)
S12.	Redirected to payment gateway session
S13.	ELSE
S14.	Payment registration form
S15.	Customer logs out by submitting the exit button
S16.	END



VI. CURRENT V/S PROPOSED SYSTEM

This section depicts the comparative analysis of the current system and proposed system. The objective of presenting this comparison is to show the drawbacks of the current system and how the proposed system addressing the drawbacks. Table III shows a comprehensive correlation between the current and proposed system.

TABLE III

A COMPARISON MATRIX PRESENTS CORRELATION BETWEEN CURRENT AND PROPOSED SYSTEM

S.No.	CurrentSystem	Proposed System
1.	Barcode technology is used for billing.	RFID technology is used for billing.
2.	Each customer has to go to the billing desk to know the grand total of all the items to be purchased.	With the help of LCD unit mounted on to the shopping trolley, every customer gets to know the grand total simultaneously while adding or removing the products in the trolley itself.
3.	Getting product information is difficult and time consuming.	Getting product information like MRP, expiry date, etc. is easy and no extra time is needed.
4.	According to a survey conducted, due to the existing model every customer has to wait in long queues to pay the bills which leads to wastage of time and loss of customers for small and big retailers.	With the utilization of mobile application technology the bill is wirelessly communicated to the server and when the customer comes at the billing section, the bill is generated saving the time and reducing the rush.
5.	Low product cost but overall expenses are much high.	Product is little expensive but overall expense is much low.

The RFID technology will be considered not quite recently a basic achievement of some exploration, but rather a proficient result for organizations, that’ll decide the visibility on enhancing the organizations task/activities in right way. The proposed framework can fundamentally improve the way of shopping, in this manner assisting and saving the time of customer. In the future, the system developed will help the retail shopping complex have reduced queues of customers waiting at the billing counter, and hence the reduction of cost, error rates and shopping life cycle. The Radio-



frequency Identification framework which is being considered to be expensive in the present scenario will become an affordable approach in the coming years.

VII. ANALYSIS AND FURTHER DISCUSSIONS

The proposed system is easy to use, low-priced and efficient. As the entire framework is becoming smart, the necessity of labor will diminish, along these lines profiting the retailers. Increasing number of customers can be benefited simultaneously eventually, proving to be a great advantage to the retailers and customers as well. The Mobile Application can be modified in such a way that will enable users to interact with an AI platform, with the use of chatbots and recommendation system, which deliver customized responses to customer enquiries. Further, once a person introduces the application, they can utilize their cell to check in utilizing a QR code at the storefront facade before entering. Checking in utilizing the application enables the store's AI to track the trolley. At the point when the shopping is finished, people can simply leave the store, and the entire charge of their products bought will be transacted through their saved account. The scope can be expanded even more with slight modifications in following ways:

- Furthermore, mounted micro-controller, greater display module and a facility to pay the bill without making a beeline or getting into the trouble of stream of people for getting the bill paid by utilizing a swapping card in this way giving the purchasers better resources, boosting consumer satisfaction and improving efficiency to significant levels.
- This innovation can be utilized at air terminals on account of its wireless nature and its capacity to guarantee better security.
- The sales and the inventory can be managed using this framework even in far off sites where this is not possible.
- With the coming of advanced frameworks, trolleys will in the long run replace sales people. Accordingly, better and more net revenue.

VIII. CONCLUSION

The expected goals were effectively accomplished in the proposed system. It will be safe to use, will require minimal effort and won't need any exceptional knowledge to be given to the representatives. This paper audits the current improvements and distinctive technologies that have been utilized for item ID, total invoice, and so forth. The design of the framework that can be utilized as a part of the shopping in the retail stores to spare time, vitality and cost of the purchasers. Current patterns depicts towards quick development of the Radiofrequency Identification in the following decade. In the year 2017, the aggregate Radiofrequency Identification market is worth \$11.2 billion, up from \$10.52 billion of every 2016 and \$9.95 billion of every 2015. Later on, depending on the positive results of the investigations, the next step will be to progress with the usage of the model for proposed engineering for testing in a genuine retail store such as BigBazaar or Debenhams as RFID is an innovation that can possibly enhance lives to an exceptional surge.

REFERENCES

- [1]. J. Suryaprasad, B.O. P. Kumar, D. Roopa and A.K. Arjun. "A novel lowcost intelligent shopping cart." Networked Embedded Systems for Enterprise Applications (NESEA), 2011 IEEE 2nd International Conference on. IEEE, 2011.
- [2]. Karmouche, Amine, and S.AYassine. "Aisle-level scanning for pervasive RFID-based shopping applications." Computer Systems and Industrial Informatics (ICCSII), 2012 International Conference on. IEEE, 2012.
- [3]. C.H.Bill, S.M.Rebecca and M.Yana "Item-Level RFID: Future Direction – Current Status", 2008.
- [4]. Raju Kumar, K. Gopalakrishna, K. Ramesha on "Intelligent Shopping Cart" in International Journal of Engineering Science and Innovative Technology (IJESIT) Volume 2, Issue 4, July 2013.
- [5]. Zeeshan Ali, ReenaSonkusare., " RFID based Smart Shopping: An Overview.", International Conference on Advances in Communication and Computing Technologies [2014].
- [6]. Automatic Billing Trolley using RFID and ZigBee with Android Application Rewarding System. International Journal of Research In Science & Engineering Volume 1 Issue 6.
- [7]. J. D. Jadhav, ShitalGaddime, KiranHiware, Neeta Khadtsarer. , "A Fast And Smart Shopping Experience Using Android And Cloud." International Journal of Innovative Research and Advanced Studies (IJIRAS) [2016].



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

 9940 572 462  6381 907 438  ijirset@gmail.com



www.ijirset.com

Scan to save the contact details