# Smart Trolley for Smart Shopping with an Advance Billing System

## Prof. Shwetha M[1], Dhanush G B[2], Akshatha B R[3], Manjushri K N[4]

Associate Professor, Electronics and Communication, Dr. Ambedkar Institute of Technology, Bangalore, India [1]

Student, Electronics and Communication, Dr. Ambedkar Institute of Technology, Bangalore, India[2-4]

**Abstract**: In the current scenario, people are more attracted to buy groceries from Supermarket/Hypermarket. In such a case, finding the essential need of any customer in supermarket consumes more time and after all findings the customer need to wait in the billing queue to complete billing process of the selected product. Currently, due to the covid-19 pandemic, the customers are strictly instructed to maintain social distance but practically it is not possible especially in the billing process. To overcome this significant challenge, this research work proposes a smart trolley based on Internet of Things [IoT] with an advanced billing system that makes shopping easier and secured and also avoids standing in long queue. The proposed system consists of a smart trolley attached with LCD display, barcode scanner and a raspberry-pi. This exploratory model is intended to completely eradicate the tedious shopping interaction and administration-related issues. The proposed framework can be undoubtedly implemented at a business scale under the genuine situation.

**Keywords:** Raspberry-pi, LCD, Barcode

## I. INTRODUCTION

People developed innovation to their requirements since their subsistence. Significant goal of modernization in innovation has been in encouraging life on earth more rapid and stress-free. Currently, human life-style has changed. Day to day life of a ordinary human being has become a lot more hectic. Time has become money. So, people actually do not have much time to spend for shopping which is an inevitable thing. Thus, people prefer shopping in the malls so that they can get all the products at the same place. This saves them from going into different shops to purchase only a limited type of products.

Humans these days always go for the technology which is useful to them and have always invented a technology which will support their needs. Basically, human wants to decrease the tasks using the technology in faster and easier way in various fields available. One customary errand that individuals invest impressive measure of energy is in shopping. In the traditional shopping spaces, people want to bring around baskets.

All the products in your basket are then billed at the exit counter. So there is a long queue for checkouts and payments at the exit counter. According to survey, we can say human spend approximately 1 to 1.5 hours for shopping and most of the customers will always tend to walk out of a queue if it is long. The ongoing scenario in shopping is categorized into two types: Shopping in-individual and shopping in-absentia. Shopping in-absentia is straightforwardness in various ways including, online web shopping, mail order, teleshopping, and so on and so forth.

Shopping in-individual normally includes an individual visit to the shopping field and selecting the items taking into account a few imperatives with need, accommodation, brand and markdown/offer an so on. In modern world, in all supermarkets and malls have shopping trolley and baskets for customers to store the purchased products. When shopping is done, customers have to proceed to the billing counter.

Here, this billing process is quite time consuming and have to employ more human resource at the billing section. So in this system, 'Smart Trolley' which will reduce the time of customers & will decrease the manpower at the billing section and increase efficiency. In the world, where technology is important, the future of retail industry lies in automated devices. The proposed framework foresees to support shopping in individual that will diminish the time devoted in shopping and also theft control system. The proposed framework foresees to support shopping in-individual that will diminish the time devoured in shopping and also theft control system.

This paper expects proposed system is created on four significant technologies:

o   Barcode scanner- for reading the product information.

o   Load cell- for theft control mechanism

o   Wi-Fi for wireless communication with the base station.

o   Smart Integrating System with display and product information.

## II.   LITERATURE REVIEW

[1] Leena Thomas, Renu Mary George1, Amalasree Menon, Greeshma Rajan, Reshma Kurian, discusses an innovative concept of RFID Based intelligent system. The developed system comprises of a Server unit (SU), a User Interface unit (UIU), an in-built Billing Unit (BU) and Central unit (CU). Billing unit enable the customer pay the bill leave the shopping center, no need to wait in long queue.

[2] Purva S. Puranik, Parikshit N. Mahalle, develop the secure and smart shopping system is developed by using IoT. The secure and intelligent trolley is able to read the products information through UHF RFID reader. The developed Prototype is easy to use and economical. They highlighted the importance of a secure, confidential and integrity smart shopping system.

[3] Shallu Dhauta and Shashank Kapoor, The developed system uses the Li Fi technology and TFT screen display to display offers and provide billing. This system is user friendly not required any special training. The proposed system using in super mart by using radio frequency identification technologies it helps to detect items details and automatic billing, etc. This trolley easy to use and provide best customer experience.

[4] Zeeshan Ali, Reena Sonkusare, The main goal of this project is to provide a technology oriented system minimum initial cost. The developed system comprises of trolley location detection unit (CLDU), Server Communication unit (SCU), User Interface and display unit (UIDU) and Billing and Inventory management unit (BIMU). Automatic billing system provided and user friendly.

[5] Ankush Yewatkar, Faiz Inamdar, Raj Singh, Ayushya, Amol Bandale, The proposed system is used to provide a smart and intelligent shopping trolley, This trolley keep tracking the products and online transaction for payment using RFID and ZigBee.

[6] P.T Sivagurunathan  P. Seema, R. Sindhu, The modern electronic Technology is based on embedded a system, this system consists thousands of transistors which is placed on single silicon chip. This process is very time consuming. This system helps to customers to avoid waiting time at checkout counter. This helps trolley also reduces the man-power and employment cost. This intelligent trolley system is reliable and user friendly.

[7] Vishwas, Apoorva, Swati R Rsidurga Anand Rao Pawar, in this system, Billing can be generated from the shopping cart. The idea is to save customers time by providing digital billing system which you get through the registered mail of our website.

[8] Purva S. Purani, Parikshit N. Mahalle, A secure and intelligent shopping trolley system developed using IoT, Gossamer protocol can be actualized which will guarantee a much more protected framework. Having such a framework gives two advantages. Initially, it keeps clients from holding up in a long line at checkout. Also, by making the item retires brilliant stock administration turns out to be simple and productive.

[9] D. Mohanapriya, R. Mohamed Anas, P. Nandhini, N.M. Deepika, This system provides on spot scanning of the products and shows its product details on LED. This system allows clients to compare the total price with the budget in the pocket before billing.

[10] Manan Rao, The aim here is to create a system that combines the convenience of RFID tags and wireless sensing with a simple and easy tracking system that allows customers to purchase products without the hassle of waiting in queues.

## III. PROPOSED SYSTEM

The main aim of this proposed methodology is to build a working module of smart trolley that allows the customer to make his/her shopping easy and secure in this pandemic situation, the smart trolley contains of raspberry pi, Lcd touch display, and Barcode Scanner in Fig.1
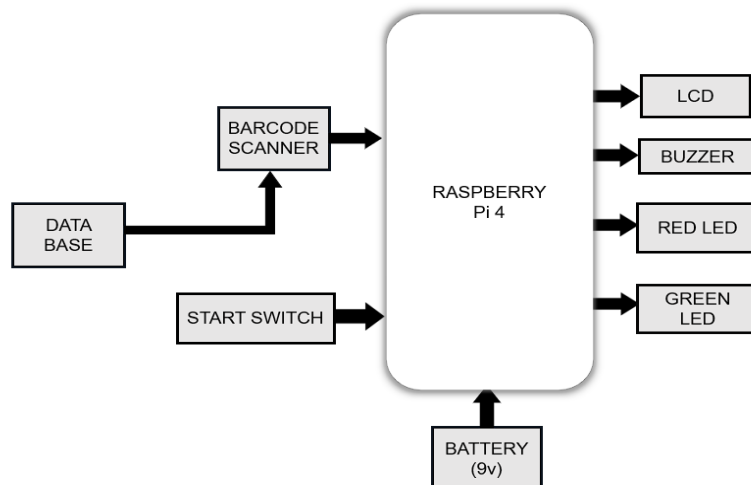


**Fig 2**: Block Diagram of proposed model

***Workflow Process - Proposed system***

Each Shopping Cart is outfitted with a standardized identification scanner, a camera, a weight sensor, a little PC for neighborhood preparation and a presentation gadget (Raspberry-Pi with LCD Screen connected) in Fig.2. The Base Station at a unified area comprises a data set that stores data of the relative multitude of items, and can speak with every one of the Smart Carts through the Wi-Fi organization.

At the point when a client begins shopping, she/he needs to login with a Customer ID and connect the Cart ID with the Customer ID, when enrolled; they can examine the items individually with the standardized identification scanner present at the cart and continue to add them to the Trolley.

To deal with every one of the instances of error/deceptive nature, the plan incorporates the utilization of a weight sensor at the truck. Furthermore, cart-to-cart correspondence is empowered that permits the clients to share their shopping list with their accomplice along these lines empowering them to shop in equal without copying their buys. When the client finishes shopping, she/he at that point continues to the installment counter to cover the bill sum.

Also, the grocery store the board will actually want to dissect the shopping practices of different clients. Primary design of the proposed framework shows up at significant business experiences. These will be very beneficial for the retail locations. By and large, this framework will guarantee that the clients will appreciate the shopping experience and come all the more frequently to shop.

## IV. IMPLEMENTATION

In our model we have Raspberry pi that is the core of the framework. It is associated with LCD shows and a standardized tag scanner. A battery is associated with the raspberry pi that assists with running the framework. It has two areas: transmitter segment and collector segments. First introduce the force of the unit then it is prepared to use for the client. On the off chance that the client needs to buy any item, he/she needs to place the item in the streetcar. When the item falls in the streetcar with the assistance of Barcode per user it peruses the Barcode Tag put on the item. This Barcode per user is associated with our Raspberry Pi Kit which will be shown in the touch and checks for the item from the worker. On the off chance that the data gets coordinated, the expense of item, name of item and the complete bill show on the LCD. Assuming the client needs to eliminate any item, he/she just eliminates that item from the touch screen which appears in the LCD showing the name of item, cost of the item and the complete bill.

Streetcar is given ESP which has the same capacities as ZIGBEE and ETHERNET. ESP moves the data to the fundamental worker which is in the reach. This principle worker has its own cloud from which the proprietor can get to the data from any place and whenever with the assistance of client ID and secret phrase. This is the idea of the Internet of Things (IOT).

## V. RESULTS AND DISCUSSION

From the analytical report generated from the Customers point of view - waiting time in supermarkets, its easily understandable that after the implementation of the proposed system there is a drastic change in wait time for Billing. When compared with the Previous/Existing method it clearly states that the wait time is 2x times greater than the proposed model in fig3.
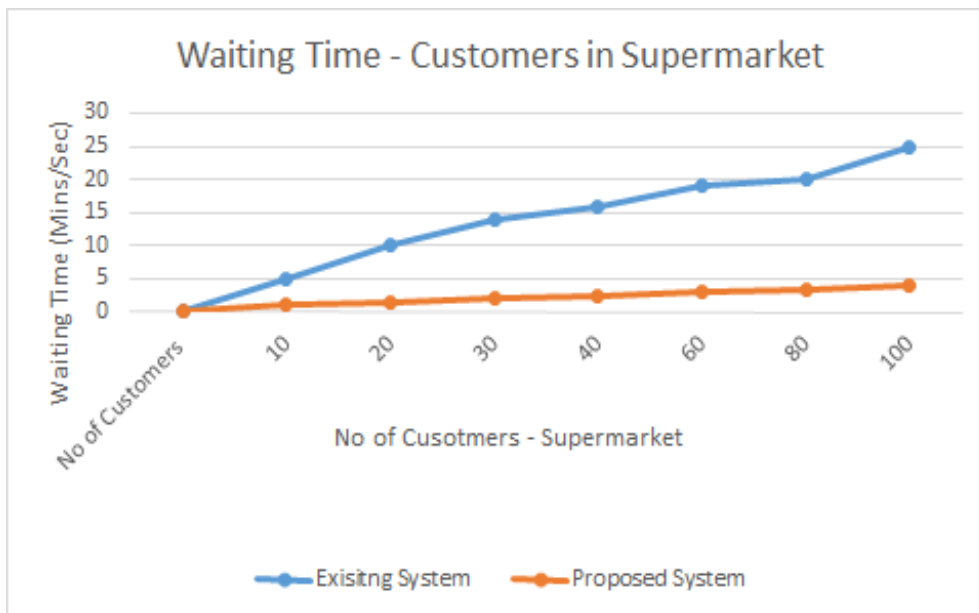


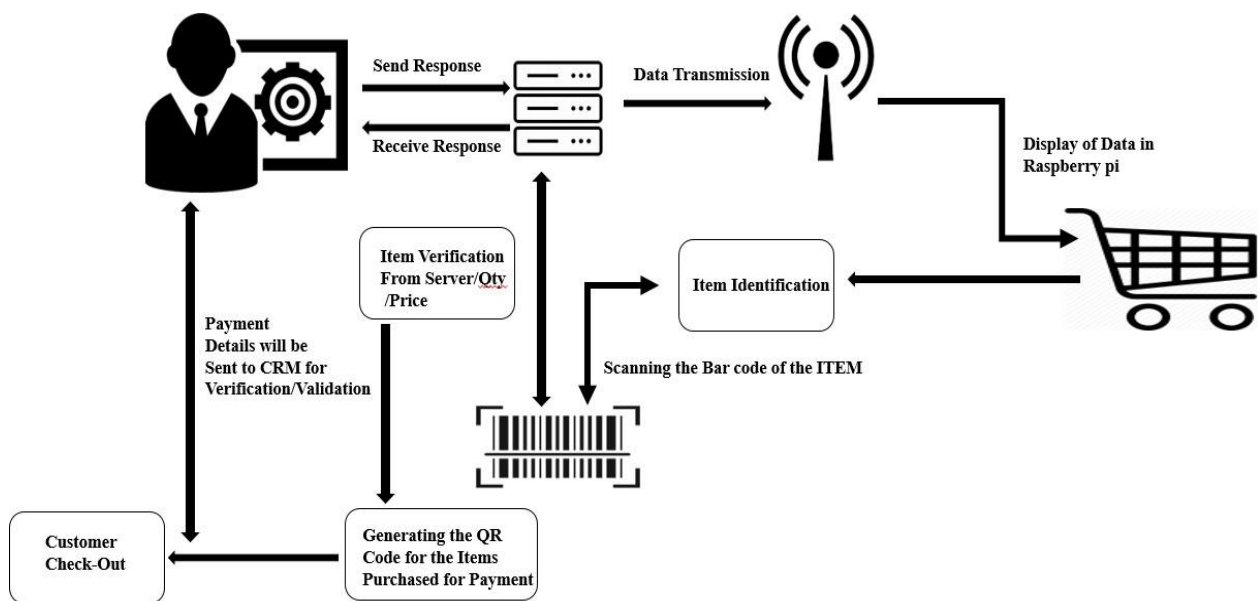**Fig 3:** Waiting Time analysis



**Fig 4:** Work flow diagram

The main focus of this study is to facilitate both supermarkets and customers. The proposed Architecture of this study provides the hardware and software solutions that help the supermarket to improve the quality-of-service issues and eliminate the time-consuming process of the shopping. The retail industries invest further in exploring the potential of these technologies for the novel services for their customers. These novel services attract a huge number of customers that increase revenue as well. The innovation of the proposed study is the architecture model and services that come together to provide eco- friendly services in cost-effective manners.

Our proposed system will allow customers to interact with the products, The customer can also get his/her previous shopping history, the shopping list management modules are added to the Mobile Application which help the customer to manage the shopping list and get the best product according to his/her preference. This experimental prototype is designed to eliminate time-consuming shopping process and quality of services issues.

The average waiting time per 10 Customer's Ratio there is a differentiation with existing and proposed model is about 4 mins' delay can be avoided in approx.

This self-billing device are emerging technology that can provide us many benefits. This can save resources and time. Nowadays all the people are aware of UPI payments and as our system's main method is UPI transaction it will be a lot easier and a lot faster. The utilization of LCD in this cart makes it easy to understand. LCD shows the name of item, cost of item and complete bill. Programmed charging is done in cart so it saves the hour of the client and lessens the surge at the charging counter. It likewise diminishes labor. On account of the utilization of IOT it will likewise accommodate the proprietor. If this prediction becomes a reality, then the company that uses the technology today might gain a competitive advantage in the future.

## VI. CONCLUSION

This self-billing device are emerging technology that can provide us many benefits. This can save resources and time. Nowadays all the people are aware of UPI payments and as our system's main method is UPI transaction it will be a lot easier and a lot faster.

The utilization of LCD in this cart makes it easy to understand. LCD shows the name of item, cost of item and complete bill. Programmed charging is done in cart so it saves the hour of the client and lessens the surge at the charging counter. It likewise diminishes labor. On account of the utilization of IOT it will likewise accommodate the proprietor. If this prediction becomes a reality, then the company that uses the technology today might gain a competitive advantage in the future.

In future Focus, we planned to upgrade the trolley with dynamic motors that can be attached to the Wheel and generate power and can be backed up to utilize it for the IOT kit attached to the trolley.

The smart shopping cart and application provides customers a fast and easy shopping experience. With the implementation of features like driverless and web application it is very convenient for customers to shop anything at a faster rate. The smart shopping cart and mobile cart application can be easily operated and managed by customers. With this the customers need not wait in long queues to pay bill. With the simple mobile cart application customers need not cross verify the bill amount as done in traditional shopping.

Instead, the bill is automatically computed in the application after the items are scanned. It also helps for people who are unable to read as they won't require any additional assistance during shopping. They just have to scan the products and pay the bill using the application. This smart cart is a unique and user-friendly solution for easy and fast shopping.

The proposed model can be easily used by the user which decreases the time required for paying the bill. As each product is added to the trolley bill will be automatically generated. As the whole system is becoming smart, the requirement of man power will decrease thus benefiting the retailer. In the mall, theft will be controlled using this smart system, which adds the cost efficiency.

The time efficiency will increase phenomenally since this system will eliminate the wait in queues. As the total bill amount will be sent to both billing section and to the user, so user will directly pay the total bill. This model can be used in any supermarkets, shopping malls, clothing showrooms and provides user friendly shopping systems.

**Future Scope**

➢ The Smart Trolley was designed to function as a mobile self-checkout system providing users the flexibility to make transactions from it within the retail store.

➢ The project implementation will help all the people who are shopping in the supermarket and face problem of standing in a long queue for final billing.

➢ The device is simple to operate and does not need any help.

➢ This project is mainly useful for middle class people who face difficulties while shopping in supermarket.

➢ The project implementation is easy, very economical and will reduce the billing time.

➢ In our project we designed automated shopping trolley for billing system, which can be use in any supermarket and by any person easily.

## REFERENCES

[1]. M. Shahroz, M. F. Mushtaq, M. Ahmad, S. Ullah, A. Mehmood and G. S. Choi, "IoT-Based Smart Shopping Cart Using Radio Frequency Identification," in IEEE Access, vol. 8, pp. 68426-68438, 2020, doi: 10.1109/ACCESS.2020.2986681.

[2]. Karjol S., Holla A.K., Abhilash C.B. (2018) An IOT Based Smart Shopping Cart for Smart Shopping. In: Nagabhushan T., Aradhya V., Jagadeesh P., Shukla S., M.L. C. (eds) Cognitive Computing and Information Processing. CCIP 2017. Communications in Computer and Information Science, vol 801. Springer, Singapore.

[3]. A. Sutagundar, M. Ettinamani and A. Attar, "Iot Based Smart Shopping Mall," 2018 Second International Conference on Green Computing and Internet of Things (ICGCIoT), Bangalore, India, 2018, pp. 355-360, doi: 10.1109/ICGCIoT.2018.8752971.

[4]. Rong Chen, Li Peng and Yi Qin, "Supermarket shopping guide system based on Internet of things," IET International Conference on Wireless Sensor Network 2010 (IET-WSN 2010), Beijing, 2010, pp. 17-20, doi: 10.1049/cp.2010.1020.

[5]. Zeeshan Ali, Reena Sonkusare, "RFID based Smart Shopping: An overview", ISBN:978-1-4799-7318-7, Advances in Communication and Computing Technologies (ICACACT), Aug 2014.

[6]. "ZBar bar code reader," http://zbar.sourceforge.net, [retrieved: July 2, 2013].

[7]. J. Awati and S. Awati, "Smart Trolley in Mega Mall," vol. 2, Mar 2012.

[8]. P. Castillejo, J.-F. Martinez, J. Rodriguez-Molina, and A. Cuerva, "Integration of wearable devices in a wireless sensor network for an e-health application," IEEE Wireless Communications, vol. 20, no. 4, pp. 38–49, 2013.

[9]. A. Yewatkar, F. Inamdar, R. Singh, A. Bandal et al., "Smart cart with automatic billing, product information, product recommendation using rfid & zigbee with anti-theft," Procedia Computer Science, vol. 79, pp. 793–800, 2016.

[10]. L. Tan and N. Wang, "Future internet: The internet of things," in 2010 3rd International Conference on Advanced Computer Theory and Engineering (ICACTE), vol. 5. IEEE, 2010, pp. V5–376.