

Smart Shopping Trolley

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Abstract — The project proposes an innovative solution for RTO The Smart Shopping Trolley is an innovative solution aimed at enhancing the retail shopping experience by automating the billing process, providing real-time budget management, and detecting product expiration dates. The system utilizes RFID technology or barcode scanners to automatically read product details as items are added to the trolley, eliminating the need for manual checkout scanning. A built-in budget alert feature allows customers to set a spending limit, providing notifications as they approach or exceed their budget, thereby promoting mindful shopping. Additionally, the system checks the expiration dates of perishable items, alerting users if any product is nearing its expiry, which reduces waste and ensures product freshness.

Keywords: RFID Technology, Smart Shopping Trolley

I. INTRODUCTION

A Smart Shopping Trolley project aims to enhance the shopping experience by incorporating advanced technology to make the process faster, more efficient, and user-friendly. The trolley will be equipped with sensors, RFID (Radio Frequency Identification) tags, or barcode scanners. As customers add items to the trolley, it automatically reads the product's price and adds it to the virtual bill.

The trolley can be integrated with a budget management feature where the customer can set a spending limit. As items are added, the system keeps track of the total spending and provides alerts when the customer is nearing or exceeding the budget. The trolley can detect the expiry dates of perishable products to notify customers if any item is close to expiring.

II. LITERATURE REVIEW

A. Smart Trolley Shops for You.

These are Shopping trolleys with their own checkout consoles attached. With the help of console you scan the selected item and drop it in respective trolley will automatically add the items details to the person's database. The trolley is launched in US and Australian supermarkets.

Console allows you to download shopping list and backed by network of in store sensors, warns you when you are approaching an item you wish to buy. It will advertise shop specials as you pass them, and you can scan your loyalty card into the system as well. You can even place a deli order and receive a message when it is ready for collection. Self-service checkout systems are being trailed by all the big supermarket chains, and they are proving to be popular as an alternative to the old-fashioned manual checkout.

B. First intelligent Shopping Trolley at 2005 Retail Business Technology Expo

The new wireless shopping technology is the latest development in Fujitsu's range of U-Scan self-service products which demonstrate Fujitsu's integrated approach to reaching customers in stores. Running these systems in isolation creates a lot of issues with data replication. It could take large retailers up to 10 days to change prices across all their stores in every device. With integrated approach, prices can be changed nationwide within a day. Digital media networks content now in 3D.

The Retail Business Technology Expo will also host the Australian launch of Fujitsu's new 3D design technology for use with its locally developed digital media networks product TEL entice. Dramatic interactive 3D product and information messages and send these to devices on their digital media network such as large store screens, kiosks and trolleys to reach customers in a new and engaging way. Fujitsu Australia will demonstrate the 3D technology at the Expo with product messages projected from a 3D-capable LCD screen. A software application for in-store grocery, liquor general merchandise channels.

III. PROBLEM STATEMENT

In modern retail environments, consumers face various challenges while shopping, such as keeping track of their budget, avoiding the purchase of expired products, and experiencing delays at checkout due to manual billing processes. Traditional shopping trolleys offer no technological support to address these issues, leading to inefficient shopping experiences and customer dissatisfaction.

This project aims to develop a "Smart Shopping Trolley" system that enhances the shopping experience by integrating features like budget alerts, expiration alerts for products, and an automatic billing system. The trolley will assist shoppers in real-time, helping them stay within their budget, avoid purchasing expired or soon-to-expire items, and experience faster checkout through automated billing. The goal is to provide a seamless, efficient, and user-friendly shopping experience, ultimately benefiting both customers and retailers.

IV. OBJECTIVES

- 1) Develop a Budget Tracking System: Implement a feature that allows the trolley to alert customers when their selected items exceed a predefined budget limit, helping them manage their expenses effectively during shopping.
- 2) Incorporate Expiry Date Detection: Create a system that can scan and identify product expiration dates, providing real-time alerts for soon-to-expire or expired products to

prevent customers from purchasing items that may no longer be safe to consume.

- 3) **Enable Automatic Billing:** Design a smart billing system that automates the checkout process by tracking items as they are placed in or removed from the trolley. This will eliminate the need for manual scanning at the checkout, reducing wait times and enhancing the overall shopping experience.

V. PURPOSE

The purpose of the Smart Shopping Trolley project is to revolutionize the traditional shopping experience by leveraging technology to enhance convenience, efficiency, and customer satisfaction. This system aims to address common challenges faced by shoppers, such as overspending, purchasing expired products, and long checkout times, by providing real-time solutions through automated processes.

By integrating features like budget alerts, expiration tracking, and automatic billing, the smart trolley will help consumers make informed purchasing decisions, stay within their budget, and complete their shopping quickly and efficiently. Additionally, it will benefit retailers by improving operational efficiency, reducing checkout bottlenecks, and enhancing customer engagement with an innovative shopping tool.

VI. AIM

The Smart Shopping Trolley system aims to revolutionize the shopping experience by integrating advanced technology to provide real-time assistance and convenience to shoppers. Its primary features include budget alerts, product expiration warnings, and an automatic billing mechanism, each designed to enhance customer satisfaction while also benefiting retailers. The budget alert functionality allows the trolley to monitor a customer's total spending as items are added, providing alerts when the total approaches or exceeds a preset budget. This feature can help shoppers manage their expenses by suggesting cheaper alternatives or highlighting discounted products.

Product expiration warnings add another layer of utility, as the system can identify items nearing or past their expiration date using sensors or RFID tags. By prompting customers to choose fresher products, it ensures food safety and reduces waste. For retailers, this capability assists in stock rotation management, minimizing losses from expired goods. The automatic billing feature simplifies the checkout process by scanning items as they are placed in the trolley, allowing for seamless payment at the end of the shopping trip. This reduces checkout times and can be further enhanced by integrating mobile payment options for added convenience.

Implementing the Smart Shopping Trolley involves combining hardware components like sensors, RFID readers, weight sensors, touch screens, and payment systems with software that can manage data, provide recommendations, and integrate with the store's inventory management system. Machine learning could be employed for advanced features like product detection and personalized recommendations. Reliable network connectivity is crucial to ensure real-time data transfer and synchronization between the trolleys and the store's backend systems. Overall, this project represents a

blend of software development, hardware integration, and possibly artificial intelligence to deliver a fully functional smart shopping solution.

VII. NEED

The need for a Smart Shopping Trolley stems from the desire to improve the shopping experience by addressing common issues like overspending, purchasing expired products, and long checkout lines. It provides budget alerts, expiration warnings, and automatic billing, streamlining the process for customers and enhancing efficiency for retailers.

This technology-driven solution responds to the growing demand for convenience and speed in modern retail environments.

VIII. SCOPE

The Smart Shopping Trolley project aims to revolutionize the retail experience by integrating advanced hardware and software capabilities to assist customers throughout their shopping journey. The system will incorporate barcode or RFID scanners and various sensors to automatically detect items placed in the trolley, enabling real-time tracking of the products selected. As customers shop, the trolley will calculate the total cost and provide budget alerts, helping shoppers stay within their spending limits. Additionally, the system will include features to detect product expiration dates, triggering timely alerts to ensure customers are aware of any soon-to-expire items. Automatic billing will streamline the checkout process, eliminating the need for traditional cashier lines and reducing waiting times. The project will emphasize a user-friendly interface, allowing for easy interaction and seamless integration into different retail environments. Scalability will be a priority to adapt the system for various store sizes and inventory management requirements. Furthermore, data security and privacy will be maintained throughout the process to protect customers' information and shopping habits, ensuring a safe and efficient shopping experience.

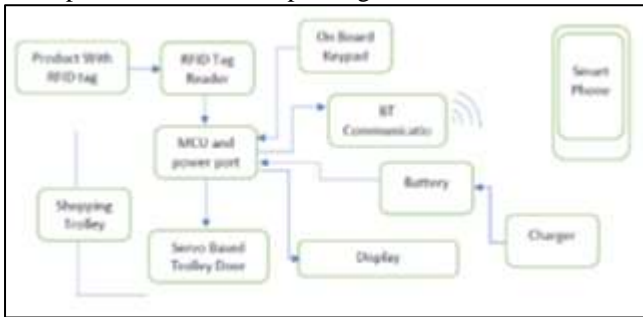
IX. PROPOSED SYSTEM

The proposed Smart Shopping Trolley system is designed to transform the traditional shopping experience by integrating modern technology for enhanced convenience and efficiency. The system will consist of a smart trolley equipped with RFID or barcode scanners, weight sensors, and a digital display interface. When customers place products into the trolley, the scanners will automatically read the product information, including price and expiration date, while the weight sensors will verify the item's presence and quantity. The digital display will show real-time updates on the total cost and notify the user if a selected product is nearing its expiration date.

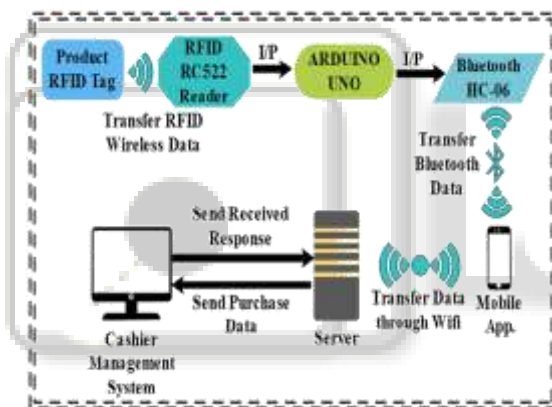
The system will also include budget tracking functionality, allowing customers to set a spending limit before shopping. As items are added, the trolley will calculate the running total and provide budget alerts if the total approaches or exceeds the preset limit. The checkout process will be automated, with the trolley communicating wirelessly with the store's billing system to generate an electronic receipt. This eliminates the need for traditional checkout

lines, as payment can be processed directly via the trolley's interface or a connected mobile app.

The software will feature a user-friendly interface, ensuring intuitive navigation for shoppers of all ages, while the back-end system will support scalability to accommodate different retail settings, from small grocery stores to large supermarkets. To address security and privacy concerns, the system will employ data encryption and access controls to safeguard customer information and transaction data. Overall, the Smart Shopping Trolley aims to provide a seamless, efficient, and secure shopping experience, reducing time spent in stores and improving customer satisfaction.



X. SYSTEM ARCHITECTURE



This diagram illustrates a Smart Shopping Trolley system that uses RFID and Bluetooth technologies to automate the shopping process:

- 1) **Product RFID Tag:** Each product has an RFID tag attached to it, which contains unique product information such as the item ID and price.
- 2) **RFID RC522 Reader:** The trolley is equipped with an RFID reader (RC522), which reads the information from the RFID tags as products are placed into the trolley. The RFID reader transfers the data wirelessly.
- 3) **Arduino Uno:** The RFID reader sends the product information to an Arduino Uno microcontroller, which processes the data. The Arduino acts as the main control unit.
- 4) **Bluetooth HC-06 Module:** The processed data is then transferred from the Arduino to a Bluetooth module (HC-06), which sends the data via Bluetooth.
- 5) **Mobile App:** The Bluetooth module communicates with a mobile application. The app receives the data for further processing, such as displaying the list of items in the trolley, the total cost, or any alerts.

- 6) **Buzzers:-** The Buzzers are used to provide alerts of expired products also the alerts are provided if the budget limit exceeds.
- 7) **Cashier Management System:** The server communicates with a cashier management system to handle purchase data. When a customer completes their shopping, the cashier system receives the details of the purchased items and processes the payment.

XI. EXISTING SYSTEM

Existing systems for smart shopping trolleys typically integrate various technologies to enhance the shopping experience. For instance, some supermarkets have implemented trolleys equipped with RFID or barcode scanning technology that allows customers to scan items as they shop, providing a running total of their purchases. Additionally, certain solutions utilize weight sensors to detect when items are added or removed from the trolley, ensuring accurate billing. Some smart trolleys also feature displays that notify shoppers of product information, including expiry dates, as they add items. Companies like Amazon have explored similar concepts with their "Dash Cart," which automatically tracks items and provides a seamless checkout experience. These existing systems demonstrate a growing trend towards integrating IoT and mobile technologies.

XII. ADVANTAGES

- **Budget Management:** Users can set and monitor their spending limits, receiving alerts when they approach their budget, which encourages mindful shopping and financial discipline.
- **Expiry Alerts:** The system can notify shoppers about products nearing their expiry dates, helping reduce food waste and ensuring customers purchase fresh items.
- **Automatic Billing:** The automatic billing feature streamlines the checkout process, minimizing wait times and enhancing efficiency by allowing customers to pay directly through the trolley or a mobile app.
- **Enhanced Shopping Experience:** By integrating technology, smart trolleys provide real-time information about prices and product details, making shopping more convenient and informed.
- **Reduced Errors:** The use of scanning technology minimizes human errors associated with manual entry at checkout, ensuring accurate billing.
- **Contactless Shopping:** By integrating mobile payments and reducing the need for direct interactions at checkout, smart trolleys contribute to a safer shopping experience, especially in the context of health concerns.
- **Sustainability Benefits:** By promoting better inventory practices and reducing food waste through expiry alerts, smart trolleys contribute to more sustainable shopping behaviors.

XIII. DISADVANTAGES

- **High Initial Costs:** Developing and implementing smart trolley systems can be expensive due to the technology, sensors, and infrastructure needed, which may deter some retailers from adopting them.

- Maintenance Costs: Regular maintenance and updates of the technology and systems are necessary to ensure smooth operation, adding to long-term costs for retailers.

XIV. APPLICATIONS

- 1) Retail Supermarkets.
- 2) Online Grocery Services.
- 3) Food Markets and Farmers' Markets.
- 4) Food Delivery Services:
- 5) Pharmacies.

XV. CONCLUSION

In conclusion, the Smart Shopping Trolley system represents a significant advancement in the retail shopping experience, combining innovative technology with user-centric design to enhance convenience and efficiency for both customers and retailers. By integrating features such as budget alerts, product expiration warnings, and automatic billing, the system not only empowers shoppers to make informed purchasing decisions in real time but also streamlines the checkout process, reducing wait times and improving overall satisfaction.

For retailers, the system provides valuable insights into consumer behavior, facilitates better inventory management, and helps minimize losses due to expired products. As the retail landscape continues to evolve, the Smart Shopping Trolley stands out as a transformative solution that addresses the needs of modern consumers while driving operational efficiency for businesses. Ultimately, this project has the potential to redefine the shopping experience, creating a more seamless, informed, and enjoyable environment for all stakeholders involved.

REFERENCE

- [1] Chandrashekhar P, Ms.T. Sangeetha "Smart shopping cart with automatic central billing system through RFID and zigbeeel", IEEE 2014
- [2] Hubert, M. blut, C. Brock,C.Backhaus and T.Eberhardt "Acceptance of smart phone based mobile shopping: mobilebenefits, customercharacteristics, perceived risks and the impact of application context",IEEE 2018
- [3] A conference paper on "Iot Based Smart Shopping Malll" by 1 Ashok Sutagundar, Masuda Ettinamani, Ameenabegum Attar
- [4] A conference paper on "Internet of Things (IOT)Based Smart Shopping Center " RFID, by Ajay Kumar, shlok Srivastava and U. gupta.
- [5] A conference paper on "IoT Applications on Secure Smart Shopping System "by Ruinian Li, Tianyi Song, Nicholas Capurso, Jiguo Yu, Jason Couture, and Xiuzhen Cheng