



# IOT BASED SMART SHOPPING TROLLEY WITH AUTO BILLING SYSTEM USING RFID

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## ABSTRACT

By automating checkout and cutting down on inefficiencies, the Smart Shopping Trolley is an Internet of Things-enabled technology that aims to improve the shopping experience. It is powered by an Arduino micro controller and has a bar code scanner, LCD display, buzzer, and push button. Bar code scanning is used to register products, and the LCD shows real-time updates. While the system creates a QR code for mobile payment and prints a receipt, a buzzer verifies that the scans were successful. This innovation lessens the need for human workers, expedites shopping, and lowers billing errors. It maximizes productivity and raises consumer happiness in supermarkets and retail establishments.

**Keywords:** Bar code scanner, led display, switch, push button, qrcode, buzzer, node mcumicro controller

## I INTRODUCTION

In recent years, the retail business has undergone fast growth due to increasing customer demand and urbanization. Shopping centers, supermarkets, and hypermarkets are becoming a necessary component of everyday life. Although these stores offer a large selection of products under one roof, customers typically suffer substantial hassle throughout the checkout procedure. Automation and digitalization have permeated nearly every industry, including retail, as a result of technological advancements. Conventional systems are becoming smart and intelligent thanks to technologies like wireless communication, embedded systems, radio frequency identification (RFID), and the Internet of Things (IoT). The Internet of Things (IoT)-based smart shopping trolley is one such invention that attempts to automate the billing and shopping process, making it quicker, more effective, and easier to use.

RFID technology takes the place of the conventional barcode-based billing approach in the smart shopping trolley system. RFID enables quicker and more precise product identification because it does not require line-of-sight, in contrast to barcode scanning. The shopping cart can autonomously identify items, compute the bill in real time, and send data to

a central server by combining RFID with IoT.

## II LITERATURE SURVEY

Thanks to technology developments in automation, wireless connectivity, and smart technologies, modern retail settings are changing quickly. Researchers and businesses are investigating smart technologies including RFID-based billing, IoT systems, and intelligent carts to replace conventional checkout procedures in response to growing demands for smooth customer experiences and effective operations. The main conclusions, approaches, advantages, and research gaps are highlighted in this review of the literature on smart shopping trolleys, RFID technology, IoT integration, and automated billing systems.

AUTHORS	YEAR	TITLE	WORK DONE	DRAWBACK
TK Dal, AK Tripathi	2021	A Smart Trolley for Smart Shopping	A system that is able to scan the products using RFID reader	Customer have to pay the bill manually
MR Divy, R Ramesh, M Agastha	2021	Automated billing smart trolley	Added a Bluetooth module in order to give the billing updates through app	If the product have been previously scanned, it cannot be canceled.
S. Koushika, GM Venkini, V Magha	2022	IoT based smart shopping trolley with mobile cart application	Customer can pay the bill using smart phone.	Customer can't pay the bill if the membership card not recharged

## III EXISTING SYSTEM

In the current retail scenario, most supermarkets and shopping malls follow a traditional shopping and billing system. Customers manually select products from shelves, place them in shopping carts, and



proceed to the billing counter where each item is scanned using a barcode scanner. This conventional approach has been in use for decades and is reliable, but it presents several challenges in terms of time consumption, manpower, and customer convenience. With the increase in population and urbanization, supermarkets experience heavy customer traffic, especially during weekends and festive seasons. This results in long queues at billing counters, customer dissatisfaction, and inefficient use of resources. Although some automation exists in the form of barcode scanners and POS systems, on manual intervention.

Block Diagram

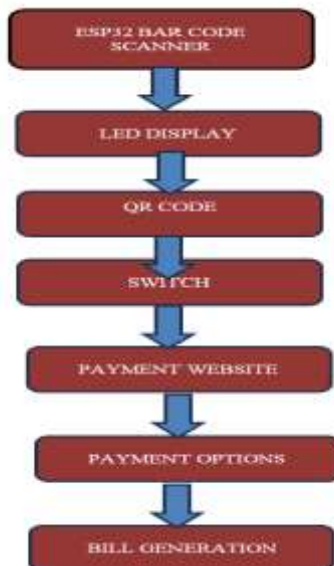


FIG 1. BLOCK DIAGRAM OF EXISTING BARCODE -BASED BILLING SYSTEM

**Working of the Existing System**

**Step-by-Step Operation:**

1. The customer enters the store and takes a shopping trolley.
2. Products are manually selected and placed in the trolley.
3. The customer proceeds to the billing counter after shopping.
4. Each product is individually scanned by the cashier.
5. The barcode scanner reads the product code.
6. The billing system fetches product details from the database.

7. The total bill is calculated and displayed.
8. The customer completes payment using cash/card/UPI.

**IV PROPOSED SYSTEM**

The proposed system introduces an IoT-based Smart Shopping Trolley with Auto Billing using RFID technology, aimed at overcoming the drawbacks of the existing barcode-based billing system. This system automates the entire shopping and billing process by integrating RFID tags, microcontroller, IoT communication, display unit, and billing server.

In this system, every product in the supermarket is embedded with an RFID tag containing a unique identification number. Each shopping trolley is equipped with an RFID reader, microcontroller, LCD display, wireless communication module, and power supply. When a customer places a product into the trolley, the RFID reader automatically detects the product and updates the bill in real time.

**Objectives of the Proposed System**

The main objectives of the proposed system are:

- To eliminate long billing queues
- To provide real-time bill generation
- To reduce manpower dependency
- To improve shopping experience
- To prevent theft and billing fraud
- To enable seamless digital payment
- To utilize IoT for real-time data synchronization

**BLOCK DIAGRAM**

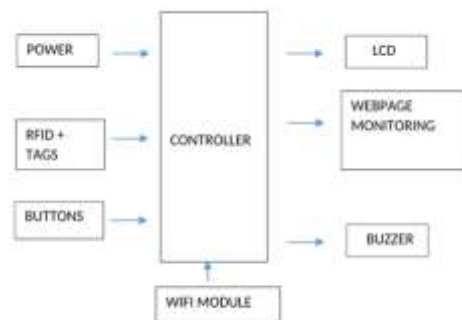


Fig 2. Block Diagram Of Iot Based Smart Shopping Trolley With Auto Billing System Using Rfid



We developed a software that updates the bill on the server after scanning the product tag on the RFID scanner

- With the integration of IOT we will get to know the stock availability of a particular product
- If the product is already scanned then the customer can remove it by double scanning the product tag
- Customer can also pay the total bill using smart phone through digital payment.

### V HARDWARE DESCRIPTION

#### ARDUINO UNO

In order to create digital devices and interactive objects that can sense and control both physically and digitally, Arduino is an open-source hardware and software company, project, and user community that designs and manufactures single-board microcontrollers and microcontroller kits. Anyone can build Arduino boards and distribute its software thanks to its products' GNU Lesser General Public License (LGPL) or GNU General Public License (GPL) licenses.



Fig 3. Arduino Uno Board

#### RFID READER MODULE

The distinctive digital information on the tag is decoded using an RFID reader. The RFID reader transmits an electromagnetic wave, which acts as the input for the tag. The peculiar arrangement of metallic pins is activated by these electromagnetic waves. An RFID reader module plays a crucial role in an RFID-based smart metro system by enabling automatic fare collection and seamless passenger authentication. It works by emitting a radio frequency signal that powers up nearby RFID tags embedded in smart cards or tokens. When a passenger taps their RFID card near the reader at the metro entry or exit gate, the module reads

the unique identification number stored in the card. This data is then transmitted to a central processing system, which verifies the passenger's credentials, deducts the appropriate fare from their account, and grants access. The process is contactless, quick, and efficient, reducing congestion and improving overall commuter experience. Additionally, RFID readers can store transaction logs and help in monitoring travel patterns, enhancing both security and service optimization in the metro network.



Fig 4. RFID READER MODULE

#### RFID READER

RFID stand for Radio-Frequency identification. It refers to a technology, where digital data is encoded in RFID tags and decoding by an RFID reader using radio waves. RFID is similar to barcoding in which data from a tag is decoded by an RFID reader device. The RFID technology is used in various applications like inventory management, attendance system, door lock system, access to restricted areas, etc.



Fig 5. RFID READER

#### RPS

Maintaining the set output voltage even in the face of input voltage variations or shifts in the attached load is the primary role of a regulated



power supply.



Fig.6 RPS

### LCD

LCD is an electronic display module and has a wide range of applications. A 16X2 LCD display is very basic module and is very commonly used in various devices and circuits. A 16X2 LCD means it can display 16 characters per line and there are 2 such lines.



Fig 7. LCD

### BUZZER

Something that vibrates or buzzes is called a buzzer. In most cases, an electronic component is utilized to provide an audible signal or alert for a variety of purposes.



Fig 8. BUZZER

### ESP8266

ESP8266 is a highly integrated chip designed for the needs of a new connected world. It offers a complete and self-contained Wi-Fi networking solution, allowing it to either host the application or to offload all Wi-Fi networking functions from another application

processor.



Fig 8. ESP8266

### VI RESULT

Only authorised individuals with valid RFID cards will be able to access the parking lot, according to the circuit diagram above, which depicts the design of an RFID-based smart auto parking system utilising an Arduino Uno. The LCD display shows information about the slots' availability when the circuit is turned on. The Arduino will permit the automobile to park in the secured area if the card number matches the number that is stored in the database. Information on slot occupancy is shown on the LCD screen with the use of infrared sensors inserted into each slot. The LCD screen also shows a greeting along with the cardholder's name. The LCD screen shows information about the available slots, such as the free slot number, as the automobile pulls in. To stop numerous admissions using the same card, there would be an exit gate and another RFID reader when the vehicle left the parking lot. Additionally, this stops cars from entering from the departure side. The number of available slots is updated as the vehicle exits the parking lot, and the LCD display reflects this. Examining the current public transport ticketing system reveals that it is extremely time- and money-consuming. In order to create an online and mobile application for metro train management, this paper suggests a ticketing system. The operation would be fully automated, efficient, modernised, and reasonably priced if it were successful. The



proposed method can be used to toll gates, bus tickets, and other places. Considering the usefulness of the RFID system described in this study, as well as the feasibility and efficiency of implementation

## VII CONCLUSION

The results obtained from the implementation and testing of the IoT Smart Shopping Trolley with Auto Billing using RFID confirm the effectiveness of the proposed system. The project successfully achieves automated billing, reduces human effort, minimizes billing errors, and enhances the shopping experience. With further improvements and large-scale deployment, this system can be effectively used in supermarkets and smart retail stores.

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