



**SVKM's NMIMS**

**Mukesh Patel School of Technology Management  
and Engineering, Vile Parle, Mumbai- 400056**

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## **Minor Project**

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## **Acknowledgement**

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## **Abstract**

Now a days interest in shopping malls is widely increasing among people. People get daily necessities from shopping malls. There is an emerging demand for easy and quick payment of bills in shopping malls. Shoppers are frustrated at locating the items on the shopping list when shopping in shopping malls and when no assistance is available in shopping. To eliminate these problems, in this minor project, AT89S52 microcontroller is attached to an RFID reader. As the user puts items in the trolley the reader on the trolley reads the tag and sends a signal to the controller. The controller then stores it in the memory and compares it with product ID. If it matches, it shows the name of item on LCD and also total amount of items purchased. The hardware is based on Arduino nano, RFID Reader Module, RFID Card and Buzzer. It eliminates the traditional scanning of products at the counter and in turn speeds up the entire process of shopping, also with this system the customer shall know the total amount to be paid and hence can accordingly plan his shopping only buying the essential commodities resulting in enhanced savings. Since the entire process of billing is automated it reduces the possibility of human error substantially. Also the system has a feature to delete the scanned products by customer to further optimize the shopping experience. The aim is to reduce the time consumption needed for the billing system.

## **Introduction**

Shopping is an essential part of all our lives and is a means of getting your daily supplies which include groceries, apparel, appliances, tools, high-end and low-end products. The market is huge and thus the demand of the public also increases day by day. When the pandemic hit the world in 2020, shopping centers were abandoned due to the fear of spreading Covid-19 further. We all thought of various ways of shopping through no-contact means. Consumers also faced issues of not bringing the exact amount of money for the items they purchase and the time-consuming waiting near the cashier for their turn. Long queues, insufficient information of the product and whether it's on sale and with the aim to reduce time consumption, we have decided to make an automated billing system which will be placed with the common shopping trolley that has been used since years.

We have come up with an innovative idea of smart trolley with automated billing system that will calculate the total cost of all the items simultaneously while shopping. The system uses RFID tags in the place of Barcode tags which are much more efficient and powerful when it comes to scanning of products. The trolley is developed using Arduino and RFID and is installed on the shopping trolley and the consumer shall scan their products themselves and the total generation shall happen on the cart itself. This shall also give an idea to the consumer on how much their shopping session shall cost them. Hence, time management and money management, both shall be taken care of. With new technologies rapidly making every walk of life smart, shopping should be made smarter too. We set a RFID reader before the exit to ensure that all the items in the cart are paid for thus making this an anti-theft system. Overall, this an efficient system to save time and reduce manual work.

## **Problem Statement**

Mostly when we go for shopping, we face long queues for billing. As well as the Super Markets require more human resource to support fast and efficient billing. The existing barcode system which is very tedious technology that scans only two items per second, with the help of RFID tags and Readers we can scan up to 40 tags per second thereby saves time. So we are going to design a microcontroller and RFID based smart shopping and billing system. This model proposes a cost effective solution to no more long queues and better customer experience.

## **Literature survey:**

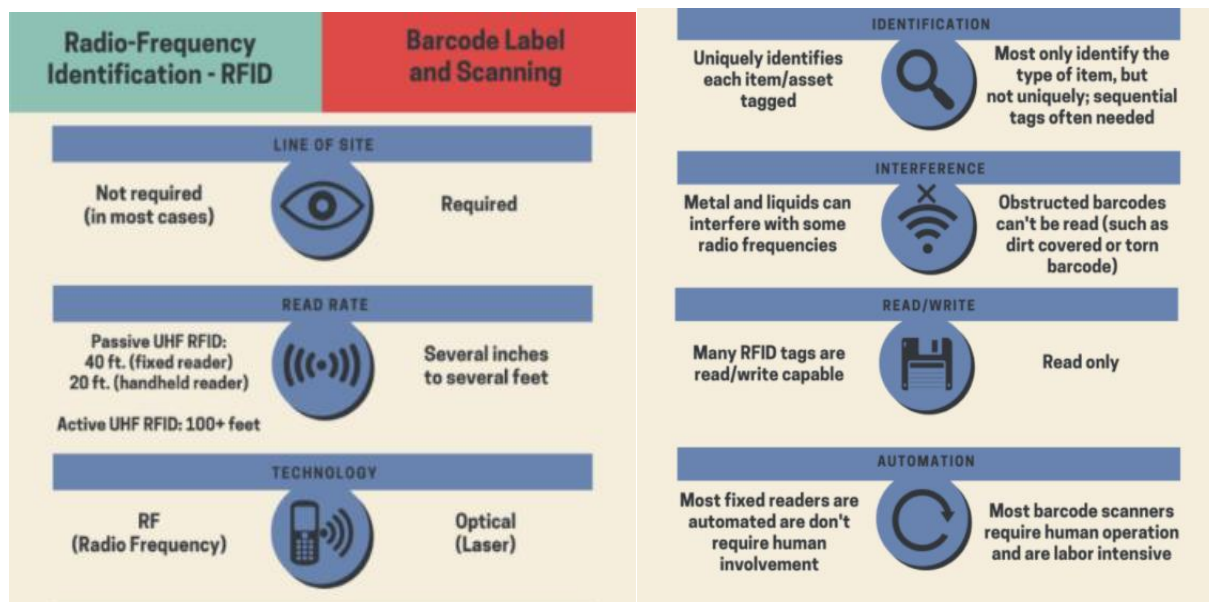
In today's world, time is very important, therefore our primary objective is to save time that is wasted by people, waiting at billing counters. We have seen long queues in the supermarket that takes most of the time. While shopping consumers face many problems like worrying that amount of money brought is not sufficient, incomplete information about of the items. Other than this they have to select the best product out of thousands of products. Also, want to revolutionize the entire shopping mechanism in the supermarket and attract number of customers reduce the labor cost.

At present, we are using the process of shopping in malls with help of barcode scanners and bill total is done here by scanning the purchased items one by one, which takes a lot of time to total one customer's bill. Its scanning range is only from a few inches to a few feet and can read products only one at a time. Barcodes are read only type and can't be overwritten. Barcodes also require a heavy amount of man-power which is not always convenient. This is a comparatively slower process which results in long queues and big-time rushes especially during holiday and festival seasons.

The innovation that we are willing to bring is an efficient system through which we would no longer need to wait in long queues for billing and scanning our products.

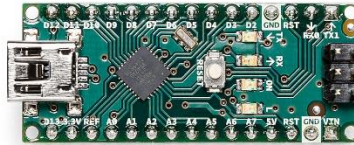
## Existing System

While billing by having the barcode scanner we need to detect every barcode attached to every item in purchased item list. When all the items get scanned the price and quantity of items is automatically get into the system and then the bill is generated. Customers can pay bill through credit/debit cards or by cash. But it is a time-consuming process for the billing purpose, so that the waiting time to pay the bill is increased. To overcome on the time-consuming process the RFID based smart trolley is proposed.



## Components and their use:

**Arduino Nano:** It comes with a crystal oscillator of frequency 16 MHz. It is used to produce a clock of precise frequency using constant voltage. It has a wide range of applications and is a major microcontroller board because of its small size and flexibility. This board can be interfaced with other Arduino boards, Arduino shields, Raspberry Pi boards and can control relays, LEDs, servos, and motors as an output.



**RC522 RFID Reader:** this module is designed to create a 13.56MHz electromagnetic field that it uses to communicate with the RFID tags (ISO 14443A standard tags). The reader can communicate with a microcontroller over a 4-pin Serial Peripheral Interface (SPI) with a maximum data rate of 10Mbps. It also supports communication over I2C and UART protocols.

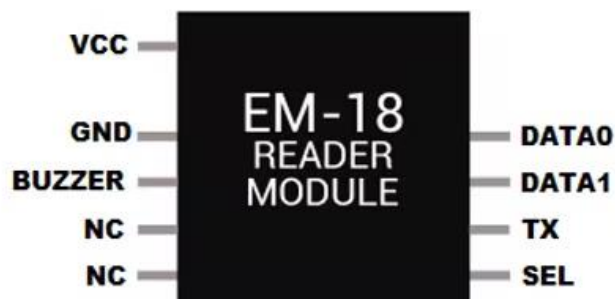




**RFID tags:** Passive RFID tags are attached to the products and are scanned by the reader attached to the cart. The data (product name, RFID number and cost) corresponding to respective card gets displayed on the LCD. Other important user information like customer name, contact number, email id, RFID number and balance are also entered.



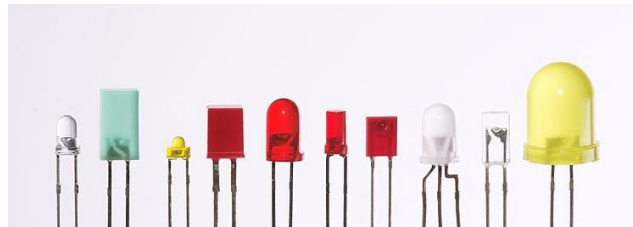
**EM-18 Module:** EM18 Reader is a very popular RFID module that can read the ID information stored in the RFID tags. The RFID tags stores a 12 digit unique number which can be decoded by an EM18 reader module, when the tag comes in a range of the Reader. This module has an inbuilt antenna that operates at a frequency of 125 kHz and a 5v DC power supply is required to power it up.



**Jumper Wire:** is an electrical wire or group of them in a cable with a connector or pin at each end. Wires are used to connect components to each other on the breadboard or other prototypes, internally or with other equipment or components, without soldering.



**A light-emitting diode:** LED is a semiconductor light source that emits light when current flows through it. Electrons in the semiconductor recombine with electron holes, releasing energy in the form of photons.



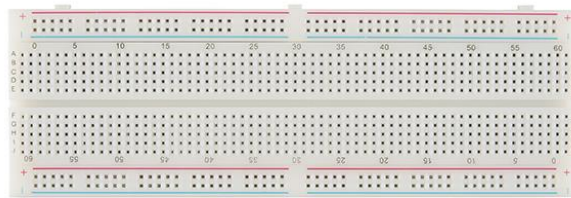
**Push Buttons:** The push button switch is usually used to turn on and off the control circuit, and it is a kind of control switch appliance that is widely used.



**LM016L:** LCD displays the information i.e. cost, RFID product number and name of the product when the product is scanned by the RFID reader. Up/down switches are interfaced with the microcontroller which can be used to view all the purchases.



**Breadboard Module:** A breadboard is a solderless construction base used for developing an electronic circuit and wiring for projects with microcontroller boards like Arduino.



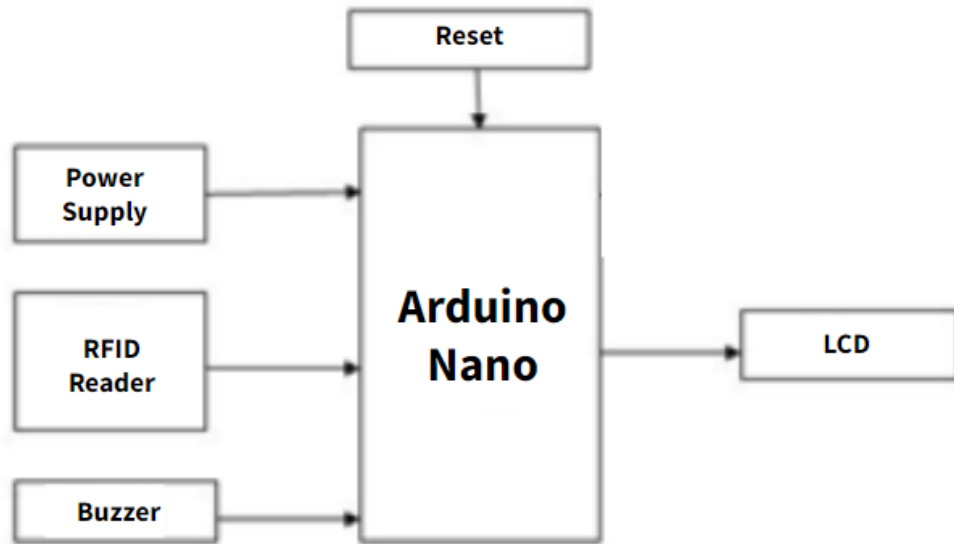
**Buzzer:** It is basically a tiny speaker that you can connect directly to an Arduino. You can make it sound a tone at a frequency you set. The buzzer produces sound based on reverse of the piezoelectric effect.



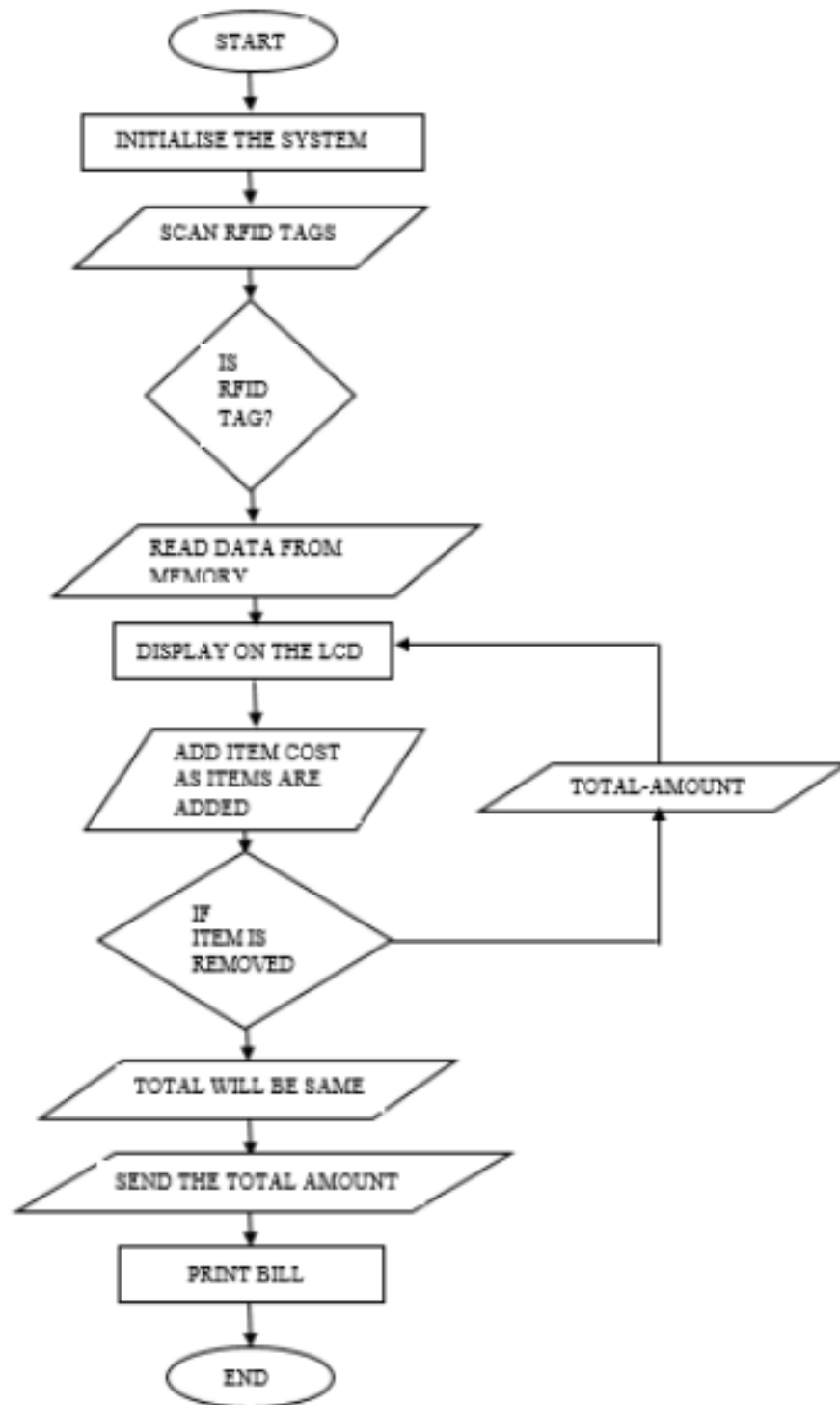
**Battery:** A battery is a device that stores chemical energy and converts it to electrical energy. We use 9V battery.



## Block Diagram



## Flow chart:

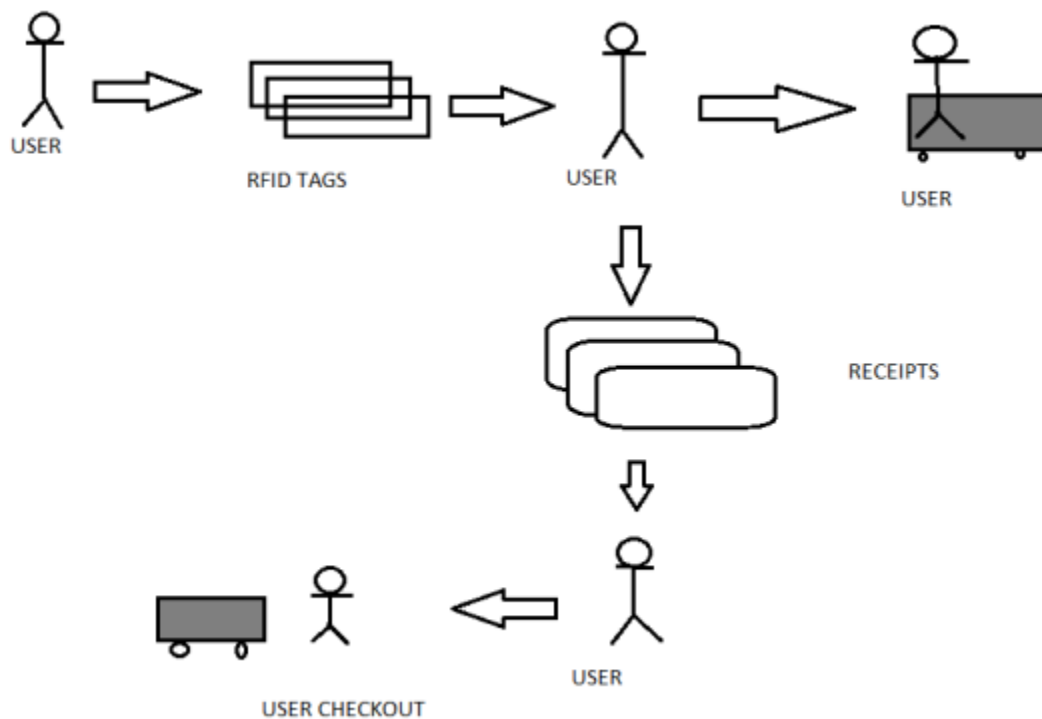


## Methodology

1. All the products in the store will be RFID Enabled with the help of tags. Whenever a person will put a product in the cart. It has to be scanned using a RFID Reader.
2. The reader will send the information to the microcontroller which will read the details like Item's Title, Cost and other information. After processing, the complete information like Name, Cost, Quantity, etc. will be displayed on the LCD Screen.
3. As we keep putting items in the cart. The details on the LCD will keep updating and give out the final amount. Additionally, if anyone changes his/her plan and want to remove any item from the cart, then that amount can be mechanically removed and subtracted from the entire amount and item removal message is displayed on LCD.
4. The RFID tags which will be used are 125kHz passive sort tags. The tag will be attached to the object. RFID tags have of a very small system consisting of a microchip and an antenna. RFID tags are available in all sizes and shapes. Communication between the tags and readers take place wirelessly and does not necessarily require a line-of-sight communication. The RFID tag can be read through almost any medium. The reader of RFID tag emits a low power radio emission field that is employed to power up the tag. Hence it can pass on all the data that is contained on the RFID chip.
5. LCD can be considered as Human-Machine Interface module in this system as it helps the customer to view the information which is being processed. It shows information regarding Insertion of an item, removal of an item, item's cost and total quantity and bill.
6. At the billing Counter, the cashier counts the total number of items and collects cash and the total bill is provided to the customer.

## Working

The project is based on the concept of Radio Frequency Identification. The products are determined by the RFID Reader with the help of tags placed on the products. The data is contained in the Arduino Nano which helps the entire model to run. It can be considered as the heart of the project. The LCD display helps the user to know the details such as product title, cost, etc. of the product which is scanned at that instant of time. It also helps in displaying the final bill to the user. The push buttons help to delete any item from the cart as well as initiate the final billing at the end of shopping. The LEDs help to indicate the user whether the cart is accepting products or not. The Green LED indicate the user can put another product in the cart. The Red LED indicates that either the system is processing the last scanned product, or the cart capacity is full. The buzzer will sound whenever a product is scanned. The buzzer will beep once for successful scan and will beep twice if the product is not recognized.





## **Advantages**

1. There's no more queue for billing hence guarantees real customer satisfaction.
2. Bill calculation at trolley itself, saving time and effort.
3. Low chance of traffic and mismanagement.
4. Reduction in support staff.
5. Cost efficient.

## **Limitations**

1. Materials like metal & liquid can impact signal.
2. Sometimes not as accurate or reliable as barcode scanners, further modifications are required.
3. Cost – RFID readers can be 10x more expensive than barcode readers.
4. Implementation can be difficult & time consuming at the initial stage.

## **Applications**

The main application of this system is proposed to be used in shopping malls/retail stores in order to lessen the billing time at the cashier counter especially during peak hours. In addition, it helps customers while shopping with family members, to carry out effortless shopping and billing. It can be utilized anywhere like shopping markets, retail stores where the barcodes are used, which provides a great solution to avoid long wait.

A similar concept can be used to track the employees entering and exiting an office area extending the application to mark their attendance as well. The concept can also be applied to segregate parcels from a conveyor belt itself by placing RFID tags on the parcels.

other applications include:

- Consumer appliances
- Office automation
- Medical electronics
- Computer networking:
- Telecommunications
- Wireless technologies

## **Future scope**

There are a few challenges that can be resolved to make proposed system more efficient by using a more sophisticated microcontroller, larger display system, GPS to track the product, internet facility inside the card to browse the offers facility of payment within the cart by using swapping card can be used to make cart more advance and to provide consumer a better shopping experience. We can increase the range of our RFID reader which will ease the process of product billing. A billing system can be introduced on a LCD Panel. Author could have provided autonomous shopping carts which move to the section as customer click on a map on either the cart screen or on a mobile application. Also, the stock of all products could be updated in real-time, so that customers get to know which products are not available at the moment, saving their time. Future advancements could also include use of enhanced RFID readers that operate in high frequency which can read multiple tags simultaneously. Mobile application can be developed to avoid smart card and GSM.

## Conclusion

***“Creativity is thinking up new things. Innovation is doing new things.”***

*-Theodore Levitt*

The intended objectives were successfully achieved in the prototype model developed. The developed product is easy to use, economical and does not require any special training. This project simplifies the billing process, makes it swift & increases the security using RFID technique. This will take the overall shopping experience to a different level. In this project RFID card is used as security access for product. If the product is put in to the trolley means it will shows the amount and also the total amount. In this project RFID card is used for accessing the products. So this project improves the security performance and also the speed. This project also best suit for present fast growing RFID technology. Evidently RFID has outsmarted barcodes by its accuracy, fast response and durability. This concept has erased the tradition of customer relying on the shopkeeper for acquiring information about products. Billing is completely avoided which in turn saves time for the customer and makes process easy for shopkeeper. It avoids queue for customer since billing is completed in the trolley. It reduces one third of the overall investment of the shopkeeper for billing department.

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