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RFID READER AND NODE MCU SMART SHOPPING TROLLEY

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ABSTRACT

Nowadays, most people buy their food, clothing, toiletries, gardening equipment, home appliances, etc. from supermarkets. The public's desire has made the development of a wide range of locations equipped with cutting-edge infrastructure to meet the demands of customers an absolute must. From smart houses to electronic medical systems to wearable gadgets, the Internet of Things has been extensively tested in a wide range of contexts. Customers frequently encounter numerous issues and frustrations when grocery shopping, such as lengthy wait times, insufficient product information, difficulty making impulsive purchases, and a lack of a pre-set list of items. In response, these IoT devices are now being utilized to develop smart shopping carts.

Keywords: RFID Technology, NodeMCU Integration, Smart Shopping, Real-Time Billing

I.INTRODUCTION:

Recent years have seen profound structural change, impacting areas including urbanization, demography, family structures, cultural consumption habits, demographics, territorial occupancy, and access to global markets, all of which have ramifications for economic development and society as a whole. We are well into the so-called "Age of Information and Knowledge" because developments in communication and information technology have ushered in paradigm shifts in almost every facet of human knowledge. The grocery industry has recently evolved in technical, political,

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social, and economic dimensions, making it one of the most convenient and diversified companies around the globe. As a result, it is now a very significant sector of the global economy. From coordinating and exchanging information, businesses have progressed to sharing knowledge and implementing sophisticated cooperative techniques. Traditional retail procedures are becoming more efficient, transparent, and quick with the advent of new technologies like wireless networks and Radio Frequency Identification (RFID). Retailers may take use of this technology to their advantage by cutting costs and enhancing services, such as providing tailored attention to customers in a timely manner.

II. LITERATURE REVIEW

"A Novel Low-Cost Intelligent Shopping Cart" by Dr. Suryaprasad J. [5] suggests creating an inexpensive intelligent searching assistance that follows the customer as they browse the store, helps them choose an item, and alerts them to any sales or discounts that may be available. According to "Aisle-level Scanning for Pervasive RFID-based Shopping Applications" by Amine Karmouche [6], a system capable of scanning both stationary and moving objects in a store environment employing RFID Reader antennae should be developed. The RFID observations are carried out at the aisle level rather than the cart level. "Developing a Multitasking Shopping Trolley Based on RFID Technology" by Satish Kamble [7] suggested making a device that would aid a person in their daily quest by making it easier to spend less time shopping. A technology-oriented, inexpensive, readily scalable, and robust system to aid in-store shopping is the primary goal of the suggested solution. A shopping cart (trolley) is integrated with two sets of barcode scanners at separate checkpoints in J. Thanga Kumar's automated shopping cart system. Places of entrance and departure, correspondingly. The consumer may easily scan the barcodes of the items they want to buy without assistance. In the event that an incorrect entry is made, the user may access the other barcode scanner by pressing a keypad that toggles the machine's operation from adding to removing goods.

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The project's biggest flaw is that retrieving products from the cash register is a real pain with the two barcode scanners and the fence-like structures covering the trolley gate. Anyone planning to utilize the Smart Cart system at the Ankit Anil Agarwal market must first register and establish an account on the market's website. Then, via online banking or some other method, they deposit funds into this account. Consequently, the smart cart user's market account will be enriched with virtual currency.

This money's worth, together with personal details and purchasing history, will be saved in the database on the cloud. This information is available on the market website for visitors to peruse. The system's one major flaw is that it requires users to have an account at a supermarket. This program generates a centralized automated billing system for malls and supermarkets in H. Karl and A. Willing. Customers may pay their bills instantly using PID, eliminating the need to stand in line at cash registers. Because data about the products they bought is sent to a single billing system. Credit and debit cards are accepted as payment methods for customers. In this case, the 8-bit microcontroller may receive 8-bit data from an RFID reader. This might make it more challenging for programmers to write programs that are compatible with EEPROM. There are other microprocessors and microcontrollers that come with the I2C protocol already built in. You may use them to make this program even more efficient and compatible.

III. EXISTING SYSTEM:

One potential new development in the area of Supply Chain Optimization is a smart shopping cart that uses Arduino and RFID. Customers will be able to save a lot of time and avoid the huge lines at the supermarket and shopping center by using this strategy. The client may save money by using the system as well. When scanning items, the system makes use of radio frequency identification tags rather than barcodes, which are far more powerful and efficient. The hand basket or trolley must have the Arduino and RFID device installed

IV. PROPOSED SYSTEM:

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The consumer will be responsible for scanning their own items; the software will automatically calculate the total and show it in the shopping cart. This will also provide customers with a strategy for how much their specific shopping experience will cost. Therefore, we will attend to the matters of time and money management. Five distinct parts make up the project. A brief overview of the system is provided in the main portion. The second part of the presentation will focus on shopping systems and, by extension, the analysis of similar current systems. The system's implementation is described in the third section. The outcomes acquired by use of the Arduino and RFID-enabled gadget are shown in the fourth section. The summary and future scope of the system are provided in the conclusion, which concludes the work.

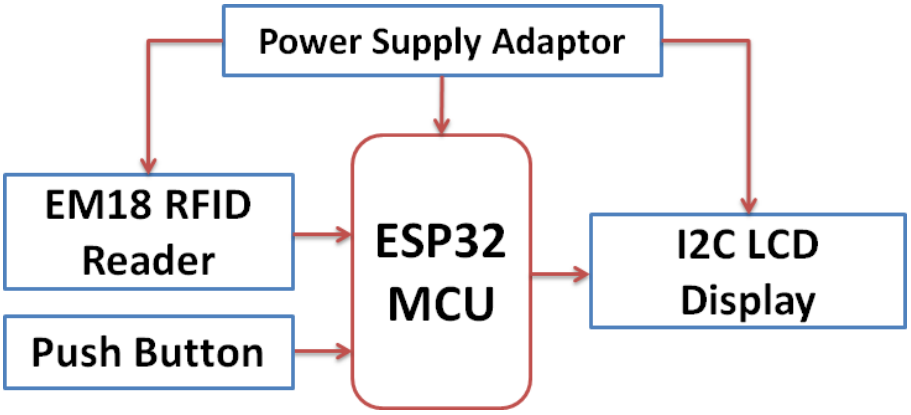

Figure 1: System Block Diagram

V. WORKING METHODOLOGY

In order to identify products, people often use barcodes, which are visual representations of data that can be scanned and read for information. Barcodes are a kind of product tracking technology that consist of a series of lines that hold code. There are a number of benefits to using this barcode instead of others. Compared to

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RFID tags, barcodes are more affordable and can be printed directly on paper or plastic. It provides more precise results compared to others. Additional benefits of using a barcode scanner include reduced processing time (the scanner can read barcodes accurately in a matter of seconds) and simplified customer service due to the scanner's streamlined internal processes.

One, the mall will use radio frequency identification tags on all of the merchandise. A person's card will be read by an RFID reader when they put items into the shopping cart.
2. The reader then transmits this code to the Arduino Uno, which analyzes it further and transmits it to the cloud, where the product database is stored. A savvy e-commerce software then retrieves the information and shows it on the go. The WEBSITE displays the item data, including name, price, and total cost of goods, that are entered into the cart.
3. The total will be adjusted when we add the products, taking into account their price. So, it concludes the billing. At the same time, every detail is shown on the WEBSITE.
4. More so, if we want to remove an item from the cart, we may do so by hitting a button and then scanning it again. A total sum will be shown on the WEBSITE when the cost of the eliminated goods has been subtracted. 5. There will be a unique identification number for each trolley. By scanning RFID tags, the intelligent shopping cart could automatically detect what items were added to it. When an item is added or taken out of stock, a buzzer may be set to sound an alarm.
6. The data obtained from the server is sent to the app and website using the NodeMCU ESP8266. It is a program that allows you to access databases that are hosted in the cloud. Section 3.2: ESP32 Introduction If you're new to microcontrollers and embedded systems, Arduino is a fantastic platform to start with. You can create a ton of projects, for fun or for money, using a bunch of inexpensive sensors and modules. The Internet of Things (IoT) is one of many new project concepts and implementations made possible by technological advancements. This platform allows for the interchange of data via the connection of various "things" or gadgets over the internet. While

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commercial and industrial IoT projects often employ considerably more complicated implementations of technologies like Machine Learning, Artificial Intelligence, Wireless Sensor Networks, etc., the DIY community tends to concentrate on home automation and smart home applications when it comes to Internet of Things (IoT) projects.

Whatever Internet of Things (IoT) project you're working on, from a simple hobby project to a large-scale industrial one, one thing is essential: you need Internet access. At this point, devices like the ESP8266 and the ESP32 become relevant. The ESP8266 is a fantastic choice if you want to include Wi-Fi into your projects. But ESP32 is the best option if you want to construct a whole system with a plethora of capabilities, like as Wi-Fi and Bluetooth networking, high resolution analog-to-digital converters, serial communication, and many more. So, what exactly is an ESP32? Espressif Systems, makers of the well-known ESP8266 SoC, have released a new low-cost System on Chip (SoC) microcontroller called ESP32. Both single-core and dual-core variants of Tensilica's 32-bit Xtensa LX6 Microprocessor with built-in Wi-Fi and Bluetooth are available; it is the successor of ESP8266 SoC. Comparable to ESP8266, ESP32 has inbuilt RF components like as a power amplifier, low-noise receiver amplifier, antenna switch, filters, and an RF balun, which is a major plus. Since there aren't many extra components needed, creating hardware around ESP32 becomes a breeze.

VI. HARDWARE DESCRIPTION

REGULATOR POWER SUPPLY: Embedded circuits like a regulated power supply may transform fluctuations in alternating current (AC) into a steady DC voltage. An AC supply is transformed into DC with the aid of a rectifier. Its job is to ensure that a circuit or device that is sensitive to fluctuations in power supply may get a consistent voltage (or, less often, current). The controlled power source's output is usually direct current (DC), however it might be alternating or unidirectional.

LIQUID CRYSTAL DISPLAY:

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Liquid crystal display is the abbreviation for this technology. A wide variety of circuits and gadgets, including mobile phones, calculators, computers, televisions, and more, make use of this particular kind of electronic display module. Most multi-segment light-emitting diodes and seven-segment displays use them. There are no restrictions on displaying bespoke characters, special effects, animations, etc., and the module is cheap, easily customizable, and has animations. A liquid crystal display (LCD) screen is a kind of electrical display module that may create a visible picture. A fundamental module often used in do-it-yourself projects and circuits is the 16×2 LCD display. The display will have 16 characters per line over two lines when the dimensions are 16×2.

RFID READER EM18:

In order to detect the existence of radio frequency identification tags, a wireless identification system called radio frequency identification (RFID) is used. To identify the presence of people, objects, etc., RFID technology is utilized, similar to a bar code reader. While radio frequency identification (RFID) technology just requires bringing RFID tags into range of readers, barcode technology requires maintaining the barcode in front of the reader in order to optically scan it. Additionally, unlike most RFID, barcodes may become damaged or unreadable. One of the numerous uses for radio frequency identification is in attendance tracking systems, where each user wears a unique tag that shows their attendance. Many businesses now utilize radio frequency identification (RFID) to provide access to authorized personnel only. Embedding a tag—which has a unique ID—on items also helps with the automated toll collecting system on highways. The RFID system consists of two primary components. RFID tag number one: an embedded microchip with a radio antenna on a substrate that stores a 12-byte unique identifier.

RFID Reader:

Its primary function is to decipher IDs stored on RFID tags. The reader detects when an RFID tag is within range, scans its unique ID, and then serially sends the data to a microcontroller or personal computer.

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RFID readers are equipped with transceivers and antennas. For the most part, it remains in a motionless state.

Fig.2:EM18 RFID Chip

EM18 RFID Reader:

The EM18 is an RFID scanner that can decipher tags with a frequency of 125 kHz. Following tag reading, it sends a unique identifier serially via UART or Wiegand format to the microcontroller or PC. Data recorded on RFID tags, which have an identifier of 12 bytes, may be read by an EM18 RFID reader. The EM18 RFID reader is not sight-dependent. Additionally, its identifying range is really small, measuring just a few millimeters at most.

VII. SOFTWARE DESCRIPTION

Embedded C Programming:

Every embedded device we use on a daily basis—from our phones and washing machines to our digital cameras—is built on embedded C programming. There is software integrated in every CPU. To begin with, the embedded software is crucial since it determines how the embedded system operates. When programming the microcontroller, embedded C is the language of choice.

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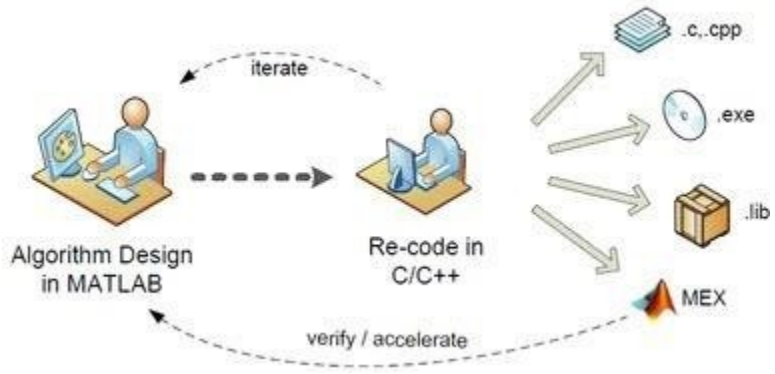

Embedded C Programming

In the past, assembly level programming was the norm for developing embedded programs. Having said that, they were not portable. This drawback was eventually remedied with the introduction of high-level languages like as COBOL, Pascal, and C. C, on the other hand, gained and maintains widespread support for embedded devices. Not only is the written C code more simpler to comprehend, but it is also more scalable, portable, and dependable.

C Language: Dennis Ritchie designed the C programming language in 1969. Every collection of statements that performs a specified activity is called a function, and this collection contains one or more functions. C is a middle-level language because it can handle both low-level and high-level applications. It is important to understand how random access memory (RAM) is organized before delving into the specifics of embedded C programming. Notable linguistic traits

• The C programming language is characterized by its extensive library of keywords, data types, variables, constants, and more.

• The word "Embedded C" is used to describe a programming language that is compatible with a certain kind of hardware.

• The C language has several extra header files that make it compatible with embedded systems. From one controller to another, these header files could alter.

• The microcontroller 8051 is used. In order to code for embedded systems, designers need to understand the underlying hardware architecture. When it comes to managing and monitoring external devices, these apps are crucial. Additionally, they manage and

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use the microcontroller's internal architecture, including its interrupt handling, timers, serial connection, and other functions.

VIII. PROJECT RESULT

Embedded debugging may be done at several levels depending on the available resources. From the most fundamental to the most complex, you may roughly group them into these types: Using the basic shell of the embedded OS (like Forth or Basic) for resident interactive debugging - The Remedy Debugger and other debug servers are compatible with heterogeneous multi core systems, and external debugging, which uses logging or serial port output, lets one track operation via a flash monitor. Hardware known as an in-circuit debugger (ICD) may be connected to the CPU using a Nexus or JTAG interface. Although this is often reserved for specific debugging capabilities, it does allow external control of the microprocessor's operation. An in-circuit emulator allows you to manipulate the microprocessor down to the smallest detail by first emulating it and then replacing the actual one. Using a complete emulator, which also allows debugging on a conventional PC, you may handle and modify any aspects of the hardware. A programmer is usually able to load and run software using the tools, see the code executed by the processor, and initiate or terminate its operation, unless external debugging is an issue. You may see the code in two different formats: assembly code and source code.

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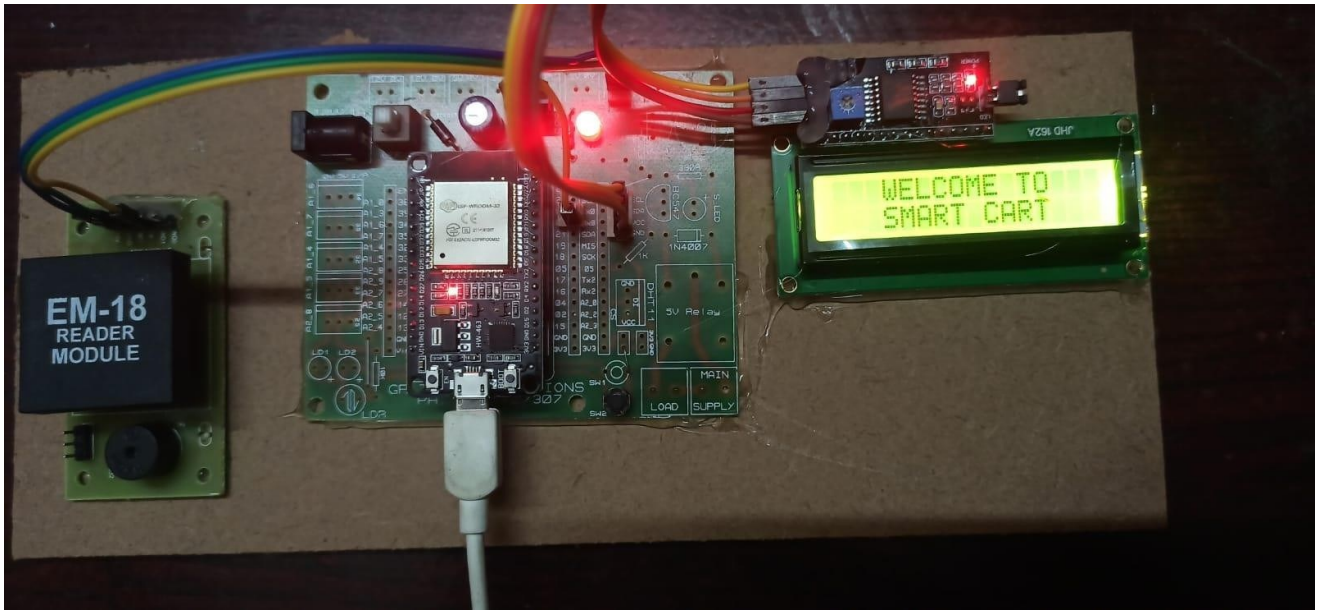

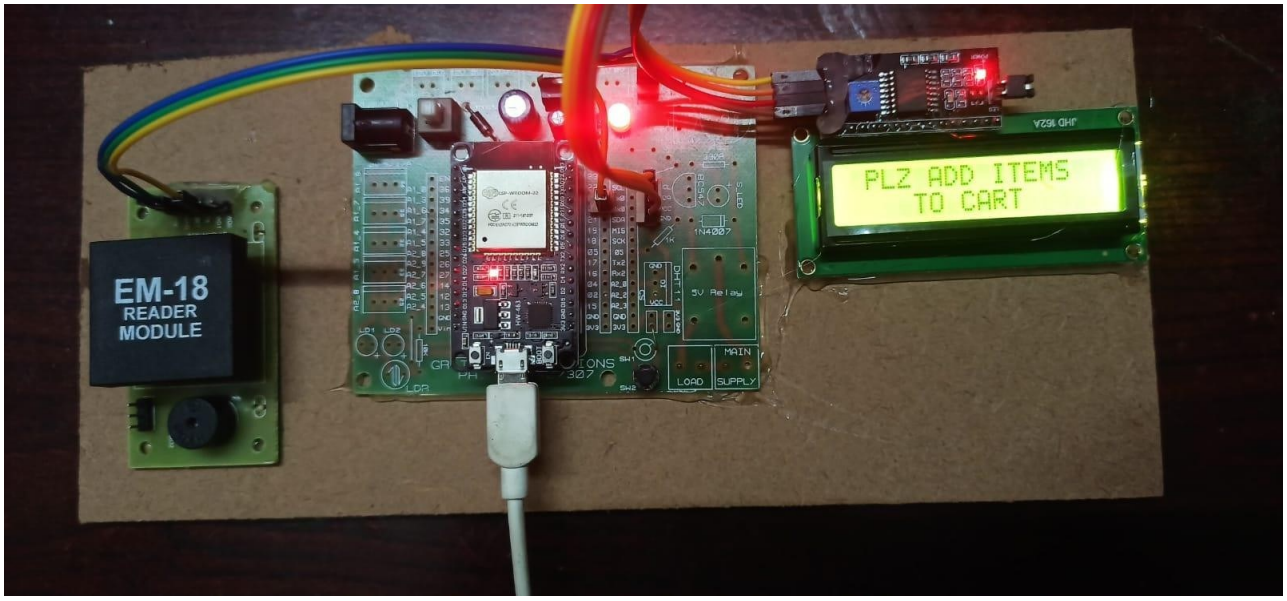

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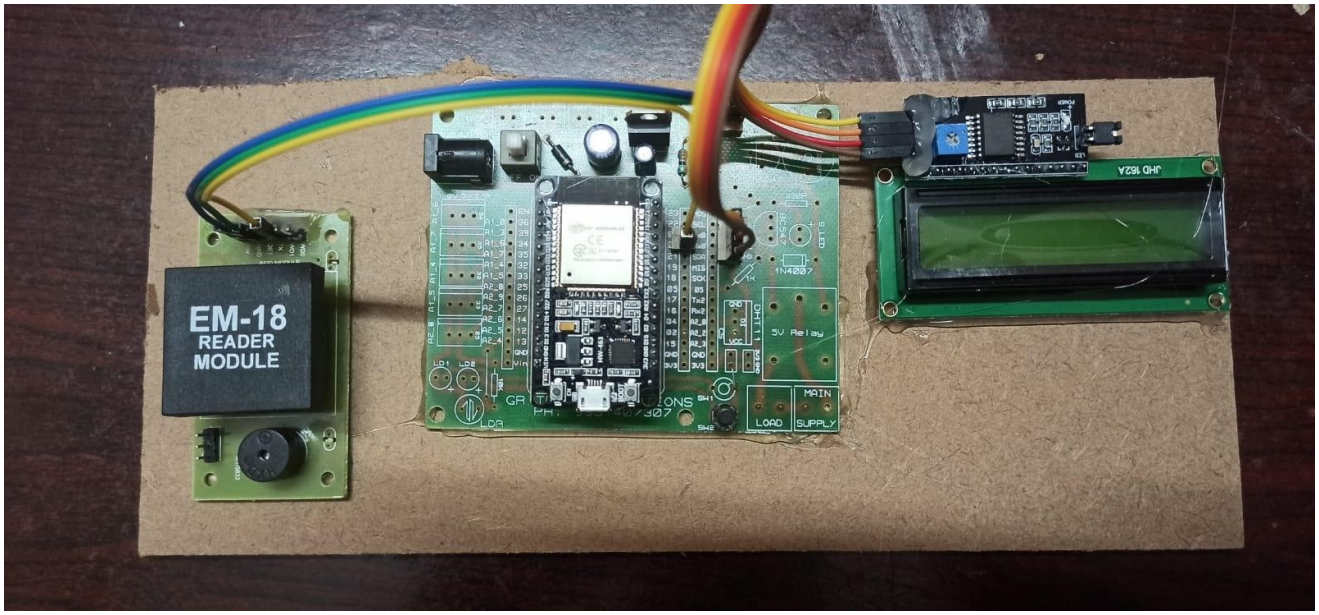

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Smart Shopping Cart using IoT

ITEMS	QUANTITY	COST
Biscuit	1	35
Soap	1	38
Rice(1KG)	1	55
Tea(50g)	1	45
Grand Total	**4**	**173.00**

Pay Now

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IX. CONCLUSION

In this project RFID used as security access for the object which there by increases the observation performance. This implementation begins with an automated central billing system in shopping malls and supermarkets. With this, customer no longer has to wait near counter for payment of bills because of their purchased product information getting transferred to central billing unit. This speed up the billing process and makes it much easier. In addition to this ability, the mechanism also assures identification of cases of the inspired by cheater customer which makes the system more reliable and attractive to both shopper as well as seller. This will take the shopping experience toa whole a new level.

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