

# Smart Billing System using IoT

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## ARTICLE INFO

### Article History:

Accepted: 05 April 2023

Published: 27 April 2023

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### Publication Issue

Volume 10, Issue 2

March-April-2023

### Page Number

856-860

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## ABSTRACT

Modern society is centered around electricity. And now that the world will be digitized, power is highly important. significant feature. The main responsibility of the electricity board is to produce and provide electricity, but it is also crucial to gauge how much power is being consumed by consumers who are taking readings and creating invoices. Currently, taking a reading and creating bills require physical labor. It takes a lot of time. One of the main issues in India is power theft. When a user doesn't pay their bills on time, an employee of the electrical board may manually switch off the power. In this instance, user or employee corruption sometimes results in the loss of the electricity board. In some places, cameras are also employed to take readings, although the system is highly complex and not very user-friendly. We designed a wireless IOT (Internet of Things)-based system for smart electricity meters and billing in order to eliminate all of these issues. We also employed relays to turn off an unpaid user's power supply, which was managed wirelessly in accordance with the IOT principle. Reading will be done automatically, and users will receive a message over GSM.

**Keywords:** Internet of Things, GSM, Electricity board, Electricity bill, Reading.

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## I. INTRODUCTION

Smart Billing System using IoT (Internet of Things) is a modern way of managing the billing process of various services or products. It is designed to automate the billing process and make it more efficient, accurate, and cost-effective. The system uses IoT devices and sensors to collect data on usage,

consumption, and other relevant information in real-time. This data is then processed and used to generate accurate bills for customers. The Smart Billing System using IoT has numerous benefits, such as reducing human error in the billing process, improving customer satisfaction by providing accurate and timely billing information, and reducing operational costs by automating the billing process [1]. The

system can be used various industries such as utilities, telecommunications, and transportation, where billing accuracy and efficiency are critical.

The IoT devices used in the Smart Billing System include sensors, meters, and other data collection devices that gather information on usage and consumption. The data is transmitted wirelessly to a central server where it is processed, analysed, and used to generate bills for customers. The system can also be integrated with other systems such as customer relationship management (CRM) systems to provide a more comprehensive solution [5]. Overall, a Smart Billing System using IoT is an innovative solution that can help businesses streamline their billing process, reduce costs, and improve customer satisfaction.

Energy data can't be easily retrieved using the conventional metering approach, and data logging solutions are expensive. Consequently, this overview provides information about the design and development of System for smart energy metering (SEM). A boom for remote control and monitoring of a household energy metre is the SEM system. On demand or on a regular basis at predetermined intervals, the SEM system provides information on metre readings, power outages, total load consumed, and power analyses via the Internet via cloud servers utilising Wi-Fi. The Global System for Mobile Communication (GSM) network is used by the concerned Energy Provider Company to send and receive this billing information [3]. Without a visit from a person, the energy provider gets the metre reading in a split second. SEM reduces the quantity of conventional visits needed by energy provider company staff. This technology not only lowers staff costs but also improves the accuracy of metre readings and significantly cuts down on time [4].

This can be done by using a microcontroller unit, which continually monitors and stores the readings from the energy metre in a permanent (non-volatile) memory space. For remote Energy Metre monitoring

and control, this device additionally uses a GSM modem.

## II. LITERATURE SURVEY

Smart billing systems are designed to automate the billing process by utilizing the Internet of Things (IoT) technology. The aim of this literature survey is to provide an overview of the research studies on smart billing systems using IoT [7].

"Design and implementation of smart billing system using IoT" by P. R. Paliwal et al. (2020)

The authors proposed a smart billing system using IoT which can monitor electricity consumption and generate bills automatically. The system consists of smart meters, IoT gateways, and a cloud server. The system uses the MQTT protocol for communication between the smart meters and the cloud server.

"A smart billing system for electricity using IoT" by M. B. Iqbal et al. (2019):

The authors proposed a smart billing system that uses IoT to monitor electricity consumption and generate bills automatically. The system uses a microcontroller-based smart meter and a cloud-based billing system. The system also includes a mobile application for users to monitor their electricity consumption and pay their bills.

"Design of a smart billing system for water consumption using IoT" by S. Ahmed et al. (2021):

The authors proposed a smart billing system using IoT for water consumption. The system consists of smart water meters, a gateway, and a cloud-based billing system. The system uses the Lora WAN protocol for communication between the smart meters and the gateway.

"A smart billing system for gas consumption using IoT" by M. B. Iqbal et al. (2019)

The authors proposed a smart billing system for gas consumption that uses IoT to monitor gas consumption and generate bills automatically. The system uses a microcontroller-based smart gas meter and a cloud-based billing system. The system also includes a mobile application for users to monitor their gas consumption and pay their bills.

"Smart billing system for renewable energy using IoT" by S. O. A. Adelusi et al. (2020):

The authors proposed a smart billing system using IoT for renewable energy sources. The system monitors energy production and consumption using smart meters and generates bills automatically [6]. The system also includes a mobile application for users to monitor their energy consumption and pay their bills.

The literature survey shows that smart billing systems using IoT are gaining popularity due to their ability to automate the billing process and provide real-time monitoring of energy and water consumption [8]. The studies reviewed in this survey demonstrate the feasibility and effectiveness of using IoT technology for smart billing systems. However, there is still scope for further research to improve the accuracy and efficiency of these systems.

### III.COMONENT DETAILS

#### Arduino Controller

Arduino is an open-source platform used for building electronics projects. Arduino consists of both a physical programmable circuit board (often referred to as a microcontroller) and a piece of software, or IDE (Integrated Development Environment) that runs on your computer, used to write and upload computer code to the physical board. The Arduino platform has become quite popular with people just starting out with electronics, and for good reason. Unlike most previous programmable circuit boards, the Arduino does not need a separate piece of hardware (called a

programmer) in order to load new code onto the board you can simply use a USB cable.



Figure 1: Arduino Controller

#### ESP8266 Wi-Fi Module

The ESP8266 Wi-Fi Module is a self-contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your Wi-Fi network. The ESP8266 is capable of either hosting an application or offloading all Wi-Fi networking functions from another application processor. Each ESP8266 module comes pre-programmed with an AT command set firmware, meaning, you can simply hook this up to your Arduino device and get about as much Wi-Fi-ability as a Wi-Fi Shield offers. The ESP8266 module is an extremely cost-effective board with a huge, and ever growing, community.

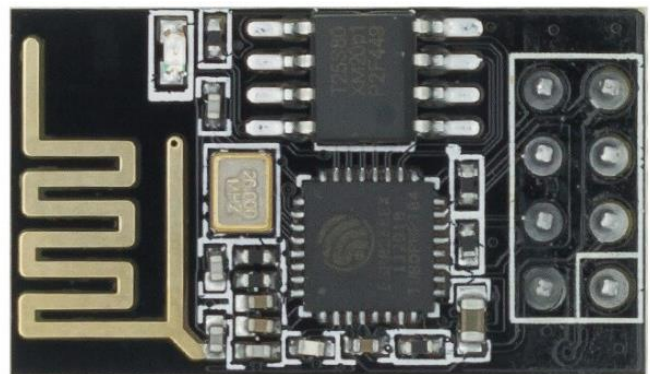


Figure 2: ESP 8266 Wi-Fi Module

#### SIM 900A GSM Module

SIM900A GSM Module is the smallest and cheapest module for GPRS/GSM communication. It is common with Arduino and microcontroller in most

of embedded application. The module offers GPRS/GSM technology for communication with the uses of a mobile sim. It uses a 900 and 1800MHz frequency band and allows users to receive/send mobile calls and SMS. The keypad and display interface allows the developers to make the customize application with it. Furthermore, it also has modes, command mode and data mode. In every country the GPRS/GSM and different protocols/frequencies to operate.



Figure 3: SIM 900A GSM Module

### Energy Sub Meter

Submeters are simply sensors that measure the flow of energy, fluid, or gas in more detail than a utility bill provides. Modern utility meters are often capable of capturing this greater detail, usually at 15-minute intervals, but few utilities offer this enhancement to their customers.



Figure 4: Energy Sub Meter

### IV.METHODOLOGY

A Smart Billing System using IoT involves the use of sensors and other IoT devices to collect data on the usage of utilities such as electricity. This data is then processed and analysed to generate accurate bills for consumers. Due to this concept, it provides a well-planned cost management of electricity billing. The existing energy billing systems are discrete, inaccurate, expensive and time-consuming. They are also time and labour consuming. This system measures the power consumption through the opto-coupler sensor unit. After getting the power consumption the Arduino controller will detect the unit pulse and the unit will be converted as per our currency based on government tariff values and displayed on the LCD screen for a specific user. Smart electricity billing system also reduces the error made by humans while taking readings to a large extent and there is no need to take the reading in it. According to the power consumption, the amount will be displayed on the LCD screen. This data also sends to IoT server through ESP8266 wi-fi module.

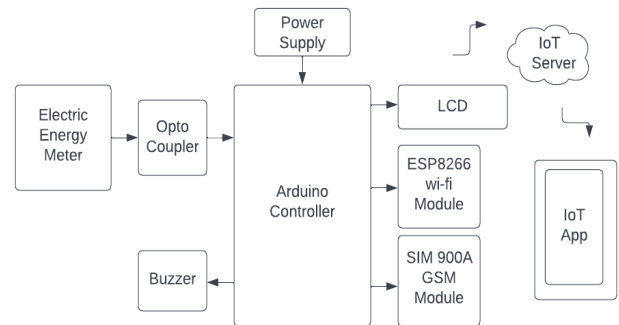


Figure 5: Block Diagram

### V. RESULT

The use of IoT in a billing system can bring several benefits such as improved accuracy, faster processing, and reduced costs. By integrating IoT devices such as smart meters, sensors, and other connected devices into the billing system, it becomes possible to collect and analyse data in real-time, allowing for better

insights and decision-making. One potential outcome of implementing a smart billing system using IoT is that customers can receive more accurate bills. The use of smart meters can enable the tracking of energy usage in real-time, eliminating the need for manual meter readings, which can often result in errors. This not only improves the accuracy of bills but also saves time for both customers and utility companies.

## VI. CONCLUSION

Smart billing systems using IoT have revolutionized the way utility companies bill their customers. This technology has enabled companies to collect data in real-time, which can be used to optimize their operations and improve customer service. With IoT-enabled smart meters, customers can monitor their energy consumption in real-time and make adjustments to reduce their bills. Additionally, IoT technology can detect anomalies in usage patterns, which can help companies detect and prevent energy theft. Overall, smart billing systems using IoT have brought increased transparency, efficiency, and cost savings to the utility industry. As the technology continues to evolve, it is likely that we will see even more advanced applications that further improve the way companies bill their customers.

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## Cite this article as :

Shaikh Abrar, Firoz Akhtar, Tushar Joshi, "Smart Billing System using IoT", International Journal of Scientific Research in Science and Technology (IJSRST), Online ISSN : 2395-602X, Print ISSN : 2395-6011, Volume 10 Issue 2, pp. 856-860, March-April 2023. Available at doi : <https://doi.org/10.32628/IJSRST523102138> Journal URL : <https://ijsrst.com/IJSRST523102138>