Proposed Prepaid System for Electricity Bills in Iraq

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Abstract - The process of paying the electricity bill and charging it is one of the main challenges in the management and distribution of electricity in Iraq. The traditional method in the electricity bills system includes an employee to read the electricity meter. He makes a periodic visit to each house to take readings. There are many problems for this method such as taking wrong readings, having no meter reading and having homes in very remote areas. In addition to the high amounts and costs involved and a huge amount of money is lost due to theft. In this paper, design and implement a program that solves the problem of collecting electricity bills in Iraq through the prepaid system. This system employ web page application using C# with ASP.Net. the system consists of interactive interface that allow the easy treat by the user. So that, the user can know the amount of monthly consumption of electricity and the amount of monthly consumption of electricity, the amount of what remains in the account and provides the system the possibility of re-packing and cut of the electricity from homes in case of depletion of the account. The system is controlled by an administrator in the server of electricity distribution company. In this way, there will be a kind of clearness between the electricity distribution department and the consumer and guarantee the rights of both parties through an integrated software system. Also, the system divide the users to several classes depending on their consuming and adapted a penalty strategy to the company that provide electricity, these penalty in an appropriate manner applied in case of power shutdown.

Keywords—prepaid system; Web development; Algorthim for Elictricity bill.

I. INTRODUCTION

In several countries, the electricity billing process is time consuming, annoying and expensive. Where, the electric company team came to each home and collect the bills. This need to read the conventional meter in each home. This mean that the pay of bills is done after consume the electricity power (5). In addition, one of the failures facing this process is the wrong taken readings of meter the problem of the remote home and the expensive large number of employees to collect the bills manually. Also, the robbery was caused by the user using the meter. Some companies used a wireless techniques that used a meter with ZigBee sensor to be available for saving billing values rather than using GPRS to saving billing values for remote meter(6)(7).

Often, consumer consumption is irresponsible and uncontrolled because there is no attention sent to him to inform him how much it is spent. For that, some private sector companies resort to government subsidies to maintain a reasonable electricity price (8). One of the problems that cause weakness of revenue is illegal electricity consumption and surpassed. For that, the consumption is based on a regular basis that's will help ensure billing accuracy and theft detection (9). The prepaid process in some countries by some companies collects electricity bills from consumers before they consumed it. In addition, the prepaid process allows the possibility to recharging and exchange the information between the electricity companies and consumers (10).

In Iraq, demand is increasing for electricity consumption because of the excessive use of electricity. It is necessary to alert the consumer to the amount of electricity consumed. The consumer consumes electricity during the month and then

calculate the electricity bill at the end of the month by reading the electricity meter for the hotel or apartment or institution or other, this process in the invoice account done manually and has a lot of disadvantages and problems. Some of these problems are:

- The need for a large number of employees engaged in the collection of electricity wages.
- The absence of house owners cause repetition of going to the customer home for collecting electricity fees.
- The electricity bill could be damaged or lost when left somewhere in the absence of the beneficiary.
- The delay in payment of electricity fees by the beneficiaries or from government departments, companies and some industrial projects.
- The existence of remote areas difficult for the employee to access.
- Some users modify the meter to reduce the measures of the used electricity and in return pay a few wages does not match the real amount of energy consumed.
- Some tenants do not pay the electricity bill and after moving from the rented nouse, the bill accumulated on the house owner.

In Iraq, work began on the privatization of electricity, so it became necessary to work to preserve the right of the consumers of electricity and the right of company.

In this paper, we propose a system based on the use of the prepaid method, which depends on the charge card of the electricity like to the mobile card based on the value based on the number of units used by the consumer. Where we use a web page containing the user name and password for each user, through which any user can access to his account and be able to fill the units he needs. The consumer gets a scheme that includes three categories A, B and C, which are divided by the number of units assigned to each category that indicate to the consumer of category. “A” means that the consumer uses electricity optimally. Class “B” indicates a slightly excessive use of electricity. Category “C” Indicate that the consumer exceeded the upper limit of “A” class units, if the consumer approaches to category “B”, the consumer will receive an alert message Indicates that the consumer exceeded the threshold for category “A” and therefore attention paid. If the consumer reaches category “C” then a message will be send to the consumer alerting the consumer that their increment percentage on the electricity bill. In the case of approaching the entry into force of the number of units shipped, an alert message will be send to the user for the recharging and the number of remaining units. Finally, in the event of a power outage, the investor company must compensate the consumer with a number of units determined by the administrator of the page as penalty.

II . GLOBAL SYSTEM FOR MOBILE (GSM)

GSM abbreviation for Global System for Mobile Communication is the second generation of mobile digital communications systems. This generation has a capacity that is several times higher than the analogue system and offers more service features, high quality and low cost. Europe has begun to operate the system with a bandwidth of 900 MHz for cell phone service. The GSM initially used originally to describe switched circuit network for full duplex voice telephony to replace first generation analog cellular networks. The GSM expanded over time to include first circuit switched data transport, then packet data transport via GPRS (General packet radio service). The GSM is succeeded by the third generation (or "3G") UMTS standard developed by the 3GPP (1). It is a protocol for data transmission, which depends on the use of SIM card similar to the mobile card to store important data so there is no need to communicate between the client and the company directly, and the GSM is responsible for sending warning messages and the electricity bill to the customer (2). This GSM Modem-RS232 built with Dual Band GSM/GPRS engine-SIM900A, works on frequencies 900/ 1800 MHz. The Modem is coming with RS232 interface; The GSM system does not have a keyboard and a display interface to handle it but accepts certain commands to perform its function through a serial interface (3). This GSM system used in the proposed system, as a black box without any modification from our side.

III. RELATED WORKS

In the few recent years, there has been a need for pay management systems and electronic billing. That’s making its development process and adding facilities to it a necessary task in this field. Many researchers and developers have recently developed these systems.

An automated billing process is introduced by T. Sravanthi et al. They used the 8051 microcontroller as Central Processing Unit. And used GSM to transfer information and LCD (Liquid Crystal Display) as an interface. The system disconnected the power supply to the house in case of non-payment of electricity bills. In this system the customer reserved a message of his requirements daily or weekly or by the customer request(4). Subhasis Kar et al. developed a Prepaid Energy Meter based on SMS. The system prevented thefts on power lines. Also, can generate and connect electric power recharge techniques. The

system used GSM to send SMS (Short Messaging Service) warning message to customer when his balance reached fifty units. SMS will be sent to the customer to make recharge if the balance reached a zero unit (5).

Santhosh et al. introduced a prepaid system as well as a power meter with a "renesas controller" technology and GSM for recharging. The system gives a possibility to change the amounts of power consumption charge during a different time. The user can see the remaining units number and receive a warning message when the power recharge amount is approaching to a lower level. A buzzer is used when the it have a low balance. If the balance is reaches a 0, there is an addition unit will be added to the balance as a chance to user to recharge. The power will cut off if there is no response (3).

Suresh and Au Thien developed wireless prepaid energy meter that managed and query for every house using JADE-LEAP Agent. This agent calculated the consumed energy and the maximized balance range by querying the energy meter that used mobile devices. The agent send a message to warn the customer when the meter reading closed to a threshold value. Then, if the customer is not response, the agent will cut off the energy power. In addition, the multi-agent system can manage and transfer the power units and monitor the process in real time automatically (6). Vidyashree developed a Smart meters that's used the GSM network to manage, monitor, turn On and Off energy, prepaid consumption and detect the theft of energy, that's using microcontroller unit and LCD. The system used an observer meter to solved the problems of Shorting the Phase Line, cut off the Nonaligned Line, Whole Meter Bypassing and the energy theft. The system also used AMR to control the connect and disconnect if the customer pay the fees and alarm if the electricity is cut. Also, AMR monitors the user's power load in any time and send SMS message to the server if the consumption of the power is up than a specific value (7).

In this paper, a new possibilities and additional facilities proposed for a prepaid system in Iraq.

IV. THE PROPOSED SYSTEM

The system consists of a special database and there is a record for each customer within the Iraqi Ministry of Electricity. Each customer has a serial number, which is the same number as in the receiver of the electricity service. It is known that there are several types of subscriptions (participations or known as account), including commercial, industrial, residential and others.

The database in this system is consists of an information about the customer as: his name, address, email, phone number, subscribe type, customer balance and last deducted amount and date. The proposed system used by electricity administration from a side and a customer from another side. The admin has the right to access to the customer account and know his consumption amount. In case of decrease the customer balance near to the threshold value, the system send a warning message automatically. Then shutdown the power in the case of non-response from a customer. Also, the admin can print daily reports of consumed unit to each class, the amount of the consuming power to each province, the customers those have reached the threshold value, customers those must recharge them balance and the customers those abstain to recharge the balance and cut off the electricity power from them.

In addition, the admin have the right to cancels (eliminates) the subscription (participation or customer account) and confiscation the meter of the customers those abstain to recharge the balance for a long time. The admin can receive the customer's complaints, where the system provides feedback ability and send the maintenance teams if that required.

The system provides a penalty property that is can be determined by a specific amount of units added to the customer balance depends on the time of power interruption. This penalty will include the customers those already connected and have a balance. The penalty is determined using the following suggested equation:

The added units= number of interrupted power in minutes * unit cost / 50 … (1)

In this system, the customer can know the amount of his daily consumed units for electricity power, recharge his balance using prepaid property, communicates with the company and send the complaints directly by his account. In addition, the customer can develop a plan to rationalize consumption to reduce the expenses by display a report for his daily-consumed units.

The process of viewing the used units from electricity meter sent by using GSM to the company's server to update the specific customer information periodically and according to his serial number. In figure (1) the use case of the proposed system shown, where all the functions that can be done by the system is illustrated and all the roles that can be played by admin and costumer clarified. Figure (1) illustrated the use case of the proposed system.

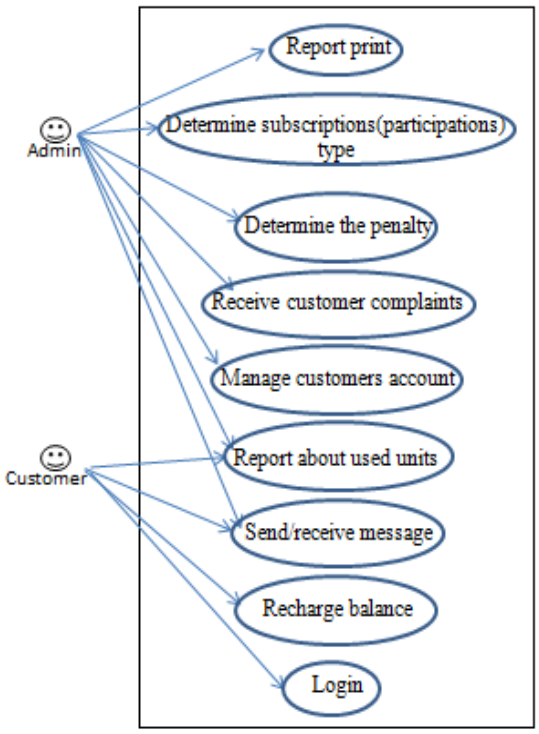


Fig.1 use case of the proposed system

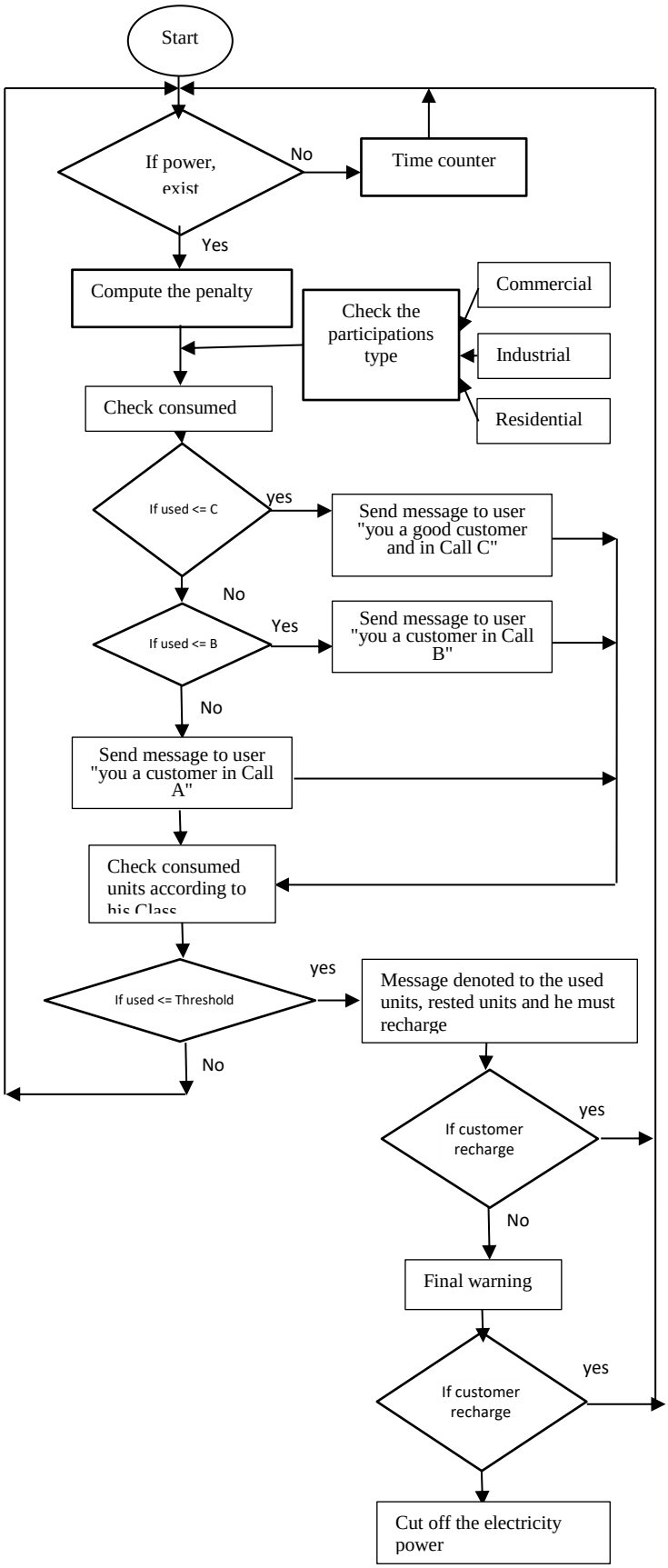
Figure (2) depict the proposed system flow chart, where this flowchart illustrate how the system conducted and how the flow of data done within all procedures within entire system.

V. RESULTS

After implementing the proposed system by using asp.net with C# programing language, we apply validation and verification test for the developed web site and we found it perform all functions correctly with required quality factors of security, reliability, consistency, Integrity, maintainability, and updatability where the system can be updated directly by adding new functionality as required in futures.

VI. CONCLUSION

From this work, we conclude that the perfect solution of electricity problems in Iraq that mentioned previously can be done by a reliable and secure system that reserve all customer and company rights. The clear information, statistics reports of power consuming and required fees play a perfect role to solve these problems, the main Idea of our proposed system is “pay and play” where the customer depose money in his account and then get electricity serves. In addition to that, the penalty procedure on companies in case of power off make customer satisfy.



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