A PROPOSED E-GOVERNMENT FRAMEWORK UTILITIES PAYMENT: A CASE STUDY FOR ELECTRICITY UTILITY

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ABSTRACT

It is very obvious that information technology is influencing every aspect of our daily life. It is also well-known, how the computer technology and computer developments are bringing-in new discoveries which can be thought of as a dream a few decades ago. The restless nature of the human-being always enforces him to unveil the new horizons of life which can make the life of mankind more luxurious. This paper proposes a new framework for the utilities payment system, which can play a vital role in the development process of developing countries. This case study introduces a very novel framework for the utilities’ payment system, especially for the electricity utility. The implementation of this framework can be very fruitful not only for the electricity department but also to bring ease for the masses as it will be very supportive to eliminate the rigged system of utilities payment. This case study proposes fully automated electricity-meters in every house. These electricity-meters are fully programmed and capable of counting the number of consumed units connected to the computerized system. The computerized system, of the electricity department, will be capable of receiving payments through e-payment shops as well as bank transfers etc. The implementation of this framework can lend a hand in the development progress of developing countries and can save a huge revenue for the country as well as manpower efforts.

Keywords: Automated Electricity-Meters; E-Government Services; E-payment shops; Technology

1. INTRODUCTION

It is very obvious that information technology is influencing every aspect of our daily life. It is also well-known how computer technology and computer developments are bringing-in new discoveries, which can be thought of as a dream, a few decades ago. The restless nature of the human-being always enforces him to unveil the new horizons of life which can make the life of mankind more luxurious. (Prattipati, 2003).

Recently, the importance of using the internet has greatly increased. Technological improvement, in telecommunications in general and in computers in particular, helped in upgrading the importance and increasing the value of online transactions. This new technology has become an important resource in many organizations and authorities. The electronic payment elevates our need to ensure security, privacy, and authentication of electronic transactions taken place on the internet. This also turns our attention towards balancing between using electronic transactions in our daily life, which reflects a great investment for both time and money, and threat arises from using it. (Peristeras, V., Tarabanis, K, 2002&2005; Sanati, Lu 2008).

Receiving electronic payments incur extra costs. When you pay for a good or service in a shop using a credit or debit card the retailer must pay a commission to the financial institution processing the card details. Additionally there will be operating costs for the system...
used to process the cards. Most of these systems are often costly, challenging to implement and sometimes technically difficult to understand. These hurdles represent a ‘barrier to entry’, which, if overcome, can give you the competitive edge. (Yousafzai, Pallister, 2003, 2005).

The payment for the domestic utilities through mobile technology removes the frustration of forgetting to recharge or to pay these service fees because it’s now possible to do it anytime, anywhere, through mobile phones. The e-Government data centre will receive requests from customers through SMS. The customer simply sends an SMS to charge or pay for a specific service and the framework integrates with the service provider’s back-end system to complete the payment transaction.

The details of the customers’ credit card information have to be registered online, which is then used as a payment tool for future recharge requests coming from their cell phones. The design of the service takes into consideration the importance of the security, performance, and reliability of such a vital public service system.

The framework offers flexibility and convenience to the citizens to make their utility payments, via the internet or by cell phone, at least one calendar day in advance of the due date. The citizens can receive an immediate acknowledgement of their payment instructions, and their bank statement will confirm that the payment was made. Citizens can initiate their utility payment 24 hours a day, seven days a week. As an added convenience, the framework allows citizens to schedule their utility payments in advance. Businesses can schedule payments up to 120 days in advance of their utility fees’ due date. Individuals can schedule payments up to 365 days in advance of their utility due date. The framework will automatically make the payments on the due date that has been indicated. Scheduled payments can be changed or cancelled up to 2 business days in advance of the scheduled payment date.

This case study proposes fully Automated Electricity-Meters in every house. These Electricity-Meters are fully programmed and capable of counting the number of consumed units on the 25th day of every month and sending it to the computerized system of the Electricity Dept. with the Meter reference. Then there will be a message generated by this computerized system with the detail of consumed units, payable amount with any other necessary detail and will be delivered to the home inhabitant’s mobile number according to the meter references. The computerized system of electricity dept. will also be capable of receiving payments through e-payment shops as well as bank transfers etc.

2. E-GOVERNMENT

E-government is a general term describing the use of technologies to facilitate the operation of government and the disbursement of government information and services. The concept of e-government has increased so rapidly that now the availability of public information & government services is so common that any one can access these services “anytime, anywhere” in the world. It is convenient and cost-effective for businesses, and beneficial to the public by getting easy access to the most current information available without having to spend so much time, energy and money to get it. E-government helps in simplifying processes and makes access to government information more easily accessible for public sector agencies and citizens.

Furthermore, E-government allows citizens to interact with computers to achieve objectives at any time and any location. This eliminates the necessity for physical travel to government agents sitting behind desks and windows, who are often paying full attention to drinking tea rather the citizens. Improved accounting and record keeping can be noted through computerization. On the administrative side, access to help find or retrieve files and linked information can now be stored in databases versus hardcopies stored in various locations. Individuals with disabilities or conditions no longer have to be mobile to be active in government and can be in the comfort of their own homes. The proposed case study is
also an effort in making the basic utilities payment procedure time-saving and hurdle free in developing countries.

Since the 1990's economies experience changes because of information and communication technologies. (Kuchelmeister, 1999) These changes take place in the public sector too. The use of information and communication technologies enables the development of Electronic Government and causes an improvement of the relationship between administration, citizens and business. (Sattelberger-Sochor, 2000; Meir J., 2001/01; Wraight C, Wraight P., 2000).

E-Government includes all administrative measures at all levels (union, states and local governments) to improve the requirement satisfaction for citizens (qualitative improvements in many spheres of life) and businesses and to optimize the business processes within the administration (structural changes). In reaching these targets there are used information and communication technologies. (Aichholzer G.; Schmutzer R., 1999; Europäische Kommission, 1998; Gesellschaft für Informatik, 2000). Possible interaction partners in the area of Electronic Government are Government, Citizens / Customers and Business. (Muralt H., 2000).

E-Gov Services showcases research dedicated to the rapidly developing field of electronic service in the public sector. Citizens expect and demand such services matching private-sector services in every aspect of quality, quantity, and availability in a 24/7 and year-round fashion. Government agencies all over the world are deploying electronic services that have the capacity to meet these emerging service needs and demands. (Scholl, H.j., 2003). Proponents of e-government argue that online government services would lessen the need for hard copy forms. (Dezayas, Heidi, 2008). Due to recent pressures from environmentalist groups, the media, and the public, some governments and organizations have turned to the Internet to reduce this paper use. The United States government utilizes the website http://www.forms.gov to provide “internal government forms for federal employees” and thus “produce significant savings in paper.”(Scholl, H.j., 2003). The proposed framework can lend a hand in saving manpower efforts and can save a huge amount of revenue for the government as there will be no need of paper to print the electricity bills. It will save the papers as well as printing efforts.

In the proposed framework it is assumed that there is a metric that counts the electricity value in buildings, more specifically in each home; this counter is connected to a server in the information technology department in the ministry of electricity; this server is connected to a website where citizens/clients perform payment. Our framework is concerned with the website and a mobile application that will remind the customer about the payment date. We aim to deliver efficient interactive services to the citizens via cell phone and internet.

3. THE PROPOSED FRAMEWORK

The United States government utilizes the website http://www.forms.gov to provide “internal government forms for federal employees” and thus “produce significant savings in paper.” The proposed framework can lend a hand in saving manpower efforts and can save a huge amount of revenue for the government as there will be no need of paper to print the electricity bills. It will save the papers as well as printing efforts.

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3.1. Our framework provides and ensures the following functions:

3.1.1 Authentication

Send the user name and the password to the user by short message via cell phone in addition to sending a link to the website.

3.1.2 Viewing all bills

On the website, users can view the bills they want to pay and the history of older ones too.

3.1.3 Paying the selected bill

In real life, paying the bill requires a person that collects the money of the bills; this person goes to every
building and even in every flat of that building or the citizens have to go themselves to the prescribed branches by the electricity dept. for the payment of their utilities and then have to wait in the rows. This system provides a secure transfer of the user's data to the bank's server. The bank server retrieves the credit card's numbers and the security card number. The acquiring bank begins to contact VISA NET, MASTER CARD, etc (depending on the card type).

3.2 Services Proposed

3.2.1. To provide services efficiently to citizens, companies, and investors through ensuring the following

- Outreach to all beneficiaries: The aim is to extend congregated services to citizens regardless of their location or proximity to governmental service provider bodies. This concept will eliminate the need for physical location in governmental offices whenever essential services are required.
- Timely and efficient delivery: Services will be provided to citizens, companies, and investors in a way that satisfies their expectations and within a convenient time framework. This will be achieved through upgrading governmental procedures, omitting unnecessary tasks, eliminating obstacles, and providing services for longer hours, and during weekends.
- More productivity/quality performance: The target of efficient service provision can be achieved through restructuring services dynamically to meet citizens' expectations and personalizing delivery to each recipient's demands.

3.2.2. To deploy a new philosophy and work methodology in government offices in a move that would help

- Smooth transition of the Egyptian Ministry of Electricity operations to accommodate changes in the new globalization era: Egypt's participation in international agreements (e.g. the European Union partnership agreement) requires that government performance be maintained at a level equivocal to governmental systems worldwide. The E-Government project will contribute to the transition by providing and integrating the latest technology required for best performance.
- Government expenditure reduction: The approach is expected to minimize government expenditure through proposing a new mechanism of governance procurement, enterprise resource planning (ERP), and efficient allocation of government resources.
- Accurate updated information to decision makers: Providing decision makers with accurate and updated information that supports the decision making process and enable constant follow up on the progress of the development projects.

4. SCENARIO

The website sends news messages with username and password to the subscribed clients on the available means of communication about the payment of invoice, due date and website of service at the end half of each month. When the client/citizen enters into the website as new subscriber for the subscription to this service, the website shows subscription form to the client/citizen. The client/citizen fills the subscription form (sign up form) with the validation of some data and the available means of communication. The website activates the service for the client/citizen and saves client's data in the website's database. When the normal client enters into the website to pay his/her bills he/she must define the counter number and the board number. When the subscribed client enters into the website to pay his/her utility bill he/she must define the user name and password.

After the normal or subscribed client authentication the client chooses the invoice he/she wants to pay. The client determines the method of payment, either credit card or via prepaid cards. The website shows the payment form that was chosen. The client fills the payment form and determines the account number. The website sends the user's account information to the corresponding bank, and the bank verifies the user’s
account information. After the successful authentication of the user’s account information and the availability of the required amount, the bank deducts the invoice value from the client’s account. After the successful transaction the concerning bank sends the invoice value to the website and the website informs the client that the payment process is completed successfully.

**Subscription of service & service activate**

**Inform client with the bill date**

4.1 Subscription of service & service activation dialogue:
The Client: enters into the website as a new subscriber.
Website: shows the subscription form.
The Client: fills the subscription form.
Website: sends the client’s data to its database.
Database: verifies to the website that data has saved successfully.
Website: sends to client an activation message.

4.2 Login- process as old subscriber or normal client
Client: scenario 1: when the client enters as a normal client, he must define the counter number and the board number.
Scenario 2: when the client enters into the website as a subscriber client, he must define the username and password.
Website:
Scenario 1: the client’s bills appear.
Scenario 2: Verify the username and password.
“If username & password is validated”. - send valid input message to the client.
else if “username & password is incorrect” – send message to client: invalid input, insert correct username & password

4.3. Account authentication & payment process
a) Client: after the valid authentication as a normal or subscribed client, chooses the bill.
b) Website: shows payment form.
c) Client: determine payment method and the account information.
d) Website: sends account information and the bill value to the bank for authentication.
e) Bank: IF the account number “doesn’t exist”. -send to the website invalid account number, message.
else if “account exist” -check the bill value
IF “account value>= bill value” – deduct the value of bill from the account balance.
- send message to the website account covers this bill.
6-Website: sends message to the client the payment process completed successfully.
7-Bank: Else IF “account value< bill value”. -send to website there isn’t enough balance.
8-Website: sends to the client payment process stopped, massage.

5. SECURITY ISSUES
The ever-increasing popularity of the world-wide web comes along with a growing number of web-based applications. Besides the functionality of these applications itself, security and privacy concerns experience an increased awareness. When anyone tries to build a web-based application, the security issue is always a concern. When the application is designed to allow the sharing of data across the internet, security becomes one of the major topics. Before sitting down and developing the functional pieces of any internet-based application, we need to think about how secure we want our application to be. Understanding exactly what the security concerns are up front must be a basic part of our design. The internet is a different medium for application development. When we want to develop any web based application the decision we have to make is; what do we want to secure. The basic questions which we must keep into consideration before we build our basic object model about our application are listed below:

1. Can anyone access the system or do the users need to be defined?
2. How will we store user ids and passwords in the system?
3. Will the system allow the users to share information?
4. Are there parts of the application which we want to restrict to only certain users?
5. Should users have access to any of the files or tools on their desktops?
6. Will the application reside only an intranet, or will it be available on the Internet?
7. Should data be sent across the internet?
8. Will user information be sent across the internet?
9. Are there other security requirements due to the nature of the application?

It is not as important how much time we are spending as long as we are thinking about the issues, we are at least off to a good start in our design. There are at least three basic areas where we can address security within our design to help us solve each of our concerns.

Fig (4) Checking Account Number & Bill Value
The hardware is the most critical piece of our design and will affect what we can do to help with security in each of the other two pieces. By choosing the right technology, we can buy ourselves some security advantages with almost no additional work. And finally the application itself, by understanding what parts of the application are critical, we can design our strongest security features around them.

It is very commonly said, “We’ll put it behind a firewall so everything will be safe”? A firewall is a one small part of the overall hardware design for security and a firewall alone is a pretty thin protection.

One of the primary fears, for anyone running an Internet based application in their web browser is: what can this thing do to my data on my hard drive? Can the application see what is on my hard drive, and can it modify it, or even delete it? By choosing an appropriate application environment which is designed for the deployment over the internet, we can save ourselves from having to implement much of the required security functionality. And by using technology our customers are familiar with and trust, we can more easily convince them of the security of our application.

First and foremost, Java was designed to be a development environment for web based applications. The web application of the electricity ministry will run across the internet, so the security and performance are key issues. The proposed development language for the Computerized System of the Ministry of Electricity is also Java. Because it is the most secure and the trusted language for the web based applications. There are number of ways to use technology to develop a secure web-based application. Java is one of them, and it does much of the work for us with little effort. By using it effectively, a secure application can be developed quickly and easily.

The proposed system of the electricity ministry is well equipped with the latest technology and fulfills all the security measures that are compulsory for any secured system. The three most important areas where the security can be addressed, “the hardware, language and tool and the application itself”, are supposed to keep into consideration in the design of the system. Furthermore it is well equipped with the latest firewalls and antivirus programs. The system is supposed to prevent any vulnerable attacks and any sort of unauthenticated access to the system. To build a web application that enforces all of our security concerns is possible - although more difficult - than for a conventional client/server application. The web introduces a host of security concerns, but the real issues are how we design our application. We must take the time up front to consider all of the security constraints we require and then some research should be done on how best to solve them.

6. CONCLUSION & PERSPECTIVE WORK

The proposed framework for the utilities payment can play a vital role in the development process of developing countries. The implementation of this framework can be very fruitful not only for the electricity ministry but it will also bring ease for the masses as it will be very supportive to eliminate the rigged system of utilities payment in developing countries.

The system is intended to provide a novel approach for the utilities payment in the developing countries. It will prove, defiantly, a ray of hope for the citizens of these countries to get rid of the rigged method of payment for their domestic utilities. It will provide them a comfortable approach for utilities payment and they will be able to save their time and resources. The aim is to extend congregated services to citizens regardless of their location or proximity to governmental service provider bodies. This concept will eliminate the need for physical appearance in governmental offices whenever essential services are required. The target of efficient service provision can be achieved through restructuring services dynamically to meet citizens' expectations, and personalizing delivery to each recipient's demands.

The intended system will allow citizens to interact with computers to achieve objectives at any time and from any location. It eliminates the need for physical travel to government agents sitting behind desks and windows, who are more often paying full attention in drinking tea rather than the citizens. It is convenient and cost-effective for businesses, and beneficial to the public...
by getting easy access to the most current information available without having to spend time, energy and money to get it. E-government helps in simplifying processes and makes access to governmental information easier for public sector agencies and citizens.

The proposed framework for the utilities payment system will also provide the facility for the citizens to pay their utilities using their cell phones. The Payment for the domestic utilities through mobile technology removes the frustration of forgetting to recharge or to pay these service fees, because it’s now possible to do it anytime, anywhere, through mobile phones. The e-Government data centre will receive requests from customers through SMS. The customer simply sends an SMS to charge or pay for a specific service, and the framework integrates with the service provider’s back-end system to complete the payment transaction.

The utilities payment system will be able to satisfy all security issues that are necessary for any secured and trusted system. Furthermore, it is intended to implement the latest firewalls and antivirus programs so that the system can prevent any vulnerable attacks and any sort of unauthenticated access to it. By implementing such security measures, we will be able to end up with an application that is as secure as we want it to be.

7. REFERENCES