Online Informatics Application for Managing Payments and Time for Individuals

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Abstract—Various solutions have been proposed for the utilities payments e.g. gas, electricity, water, mobile and fixed phones, internet, TV, insurance, local taxes, etc. These payments are generally classified in two categories: online payment methods and outside payments methods, at different pay points. This paper presents a solution for paying the utilities that involves an online method which has an original and novel concept. This method is transparent to the user and involves zero time spent for payments and smaller costs generated by commissions than in other existing payment methods. It provides the facility for the user to perform a single payment in a month that centralizes all the utility invoices together with local taxes, car and house insurance in a month which are redirected to each utility provider or billing entity.

I. INTRODUCTION

There are various ways for an individual to pay his taxes and monthly expanses. But all of these methods have downsides. Some of them need a lot of time invested by the individual to take into possession each supplier invoice, to go out and pay it or to go to the city halls to pay their taxes. Other methods involve Internet Banking, which costs due to the bank commissions and also the individual has to have each invoice so he knows how much he has to pay. More than that, he has to know when are the maturity dates for each invoice so he will not get any penalties for being late with the payment. No current method will show statistics to the individual of all his supplier invoices. All of these aspects went to the conclusion that there is a need for an application that manages the payments of each individual. And the optimum way to develop this kind of application is an online application so it can be used from anywhere the individual is.

To find out the stage in which we were right when we decided to develop the application, we made an online survey to check the opinions of our potential customers. We had four questions to which over 300 individuals answered. 65% answered that the application is needed, 30% answered It is possible, I must see it, 2% answered I don’t know and 3% answered No. [1]

II. RELATED WORK

In our knowledge, in Romania there is no other application similar to the one we thought of. There are alternatives for the payment methods like:
- Internet Banking;
- Direct Debit;
- Pay Point;
- At cash desk of some banks;
- At cash desks of some oil stations;
- At different pay points.

In [2], a transaction barcode is read to collect the supplier identification information and verify the client information of the corresponding supplier upon receipt of a transaction request made by the customer. It is used for paying educational fee, insurance bill, utility bill, rental fee. It ensures easy payment transaction.

Reference [3] presents a method that involves receiving identification (ID) for a payer payment from a card reader e.g. credit card inquiring apparatus and detecting applicant and history corresponding to the ID for the received payment. The use is for utility bill payment method.

Reference [4] talks about implementing 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 rigid system of utilities payment. The 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.

III. PROPOSED SOLUTION

The paper describes an informatics online application, named VELTIS, that manages the payments of the individuals. The managed payments are: mobile and fixed telephony, internet, TV, electricity, gas, water, local taxes, personal, car and house assurances and any other payment that an individual has to pay to a supplier during one year. The application works online. The first step is
for the user to create an account. After this step, a VELTIS consultant will take over the user and guide him through the usage of the application. The consultant will also add the suppliers that the user requests.

From this moment, all the suppliers invoices for the user will be managed by the application. Once per month, VELTIS will build a payment notification containing all the payments that the user has to make in that month. The notification is sent to the user and after it is paid, VELTIS redirects the incoming sums to each supplier. The user can log into the application and check the status of incoming supplier invoices and VELTIS payments notices. The user can check which invoices were paid, when are the next maturity dates, he can predict future cash flows based on the expenses from the past and he can manage his payments without being necessary to take possession of all supplier invoices.

The user may decide to pay partially the VELTIS notification. In this case, the payment is redirected to the suppliers by using a priority mechanism. The supplier invoice that has the most appropriate maturity date will be paid first, if the invoice sum is lower than the sum paid by the user. All the suppliers invoices that, summarized, are lower than the sum paid by the user will be paid considering that mechanism. The suppliers invoices that could not be paid are displayed in the next VELTIS notification payment and the user is notified.

The application allows an individual to add co-subscribed individuals. The number of co-subscribed individuals is unlimited. It allows an individual to become an administrator for other individuals. If there are persons who can not use the computer or the internet but they want to benefit from the advantages that VELTIS offers, they can ask users of VELTIS to manage their supplier invoices and to add them as co-subscriber. The data of the co-subscriber will be managed separately from the user’s data.

The benefits for the user are:
- The possibility to track his expenses, see statistics, predict the needed cash flow in the nearest future, generate estimated budget for an entire year;
- The reduction of the costs for paying all the monthly invoices, costs generated by the bank commissions for each payment order;
- The reduction of the time dedicated each month to pay each supplier invoice;
- The notifications for each event are automatically sent into the user’s mail account or via SMS on his mobile phone;
- The statistics offered by VELTIS with the of which the user can predict a month and year cash flow and he can keep track of all his invoices, without having to keep them in paper. VELTIS keeps a copy of each supplier invoice in an electronically format.

The benefits for the supplier are:
- The reduction of the invoice collection expenses;
- Notification of users and payments received until maturity dates;
- The optimization of the invoice collection by offering the users an organized manner for paying his monthly invoices;
- Free of charge and compatible with the supplier system software.

The schema of the logical flow of the application is presented in Figure 1. After an individual becomes a VELTIS user, he sets the process of paying the invoices: manual or automatic. The automatic process means that each month all the supplier invoices are paid, without any user authorization. The manual process means that each month, the user has to select which supplier invoices will be paid. VELTIS builds the payment notice and issues it to the user. The user pays it and then VELTIS redirects the payments to the supplier using the method defined by the user.

The scheme of the financial flow of the application is presented in Figure 2. Once an individual becomes a VELTIS client, VELTIS has to monthly transmit the individual identity data to each supplier asking for the payment data: data from the monthly invoice. This communication is described in the first block from Figure 2. VELTIS emits a payment notice containing all the monthly supplier invoices. This notice is paid by the individual, scene described in the third block of Figure 2. V4 shows that VELTIS created an automated mechanism to redirect the collected payment to all the suppliers that
formed the notice. Finally, in S5 the suppliers receive the money and one monthly cycle is finished.

![Diagram of financial flow]

Figure 2. Scheme of the financial flow

IV. IMPLEMENTATION DETAILS

VELTIS is composed of three major parts:
1. Website
2. Clients
3. Administration

1. Website
   The website is made with HTML, CSS, PHP, Flash and AJAX. It represents the first meeting point between the individual and the application.

2. Clients
   Clients is the module where all the features of the application can be seen. It has a menu which contains: Supplier invoices in, VELTIS payment notices, Suppliers, Personal data and Account settings. After the first steps are done and the user is registered and all the suppliers are added by the consultant, the supplier electronically invoices are sent into the VELTIS mailbox. This is done by changing the income email address of each user to a VELTIS email address. Each supplier can have a different approach. For example the city hall has itself an online application that displays the taxes for each individual. VELTIS has to automatically read from this existing application the taxes and add them to the payment notification. Once the supplier invoices are coming into the VELTIS mailbox, an import parsing Java Module interprets each invoice and extracts the needed data after a secure identification of the individual as a user. The Java module has an analyzer for each supplier which interprets the supplier’s invoice.

   If the invoice is recognized as being of a supplier registered in the user’s account, it is added to the VELTIS payment notification. Else, it is moved in an Unknown files deposit where all the files are treated separately and individually. Figure 3 describes how the parser module is implemented. The technologies used in developing the parser module are:

   - Apache PDFBox
     The library is used for extracting text from the pdf files and can be found at http://pdfbox.apache.org. Comparing with other libraries like ITextPDF which is licensed with GNU AFFERO GENERAL PUBLIC LICENSE, Apache PDFBox is licensed with Apache License Version 2.0 which means that it can be used in commercial applications. This is vital for the legal part of VELTIS;

   - Google Guice
     Google Guice is an open source software framework for the Java platform released by Google under an Apache license. is a Dependency Injection Framework that can be used by Applications where Relation-ship/Dependency between Business Objects have to be maintained manually in the Application code.

   Since Guice support Java 5.0, it takes the benefit of Generics and Annotations thereby making the code type-safe. To compliment dependency injection injection, Guice supports method interception. This feature enables you to write code that is executed each time a matching method is invoked. It is suited for cross cutting concerns ("aspects"), such as transactions, security and logging. Because interceptors divide a problem into aspects rather than objects, their use is called Aspect Oriented Programming (AOP). AOP provides a safe way to add security at the methods and classes level;

   - Implementation of Hibernate of JPA
     Hibernate is an object-relational mapping (ORM) library for the Java language, providing a framework for mapping an object-oriented domain model to a traditional database. Hibernate solves object-relational impedance mismatch problems by replacing direct persistence-related database accesses with high-level object handling functions. It can be found at http://www.hibernate.org/;

   - JavaMail
     The JavaMail API provides a platform-independent and protocol-independent framework to build mail and messaging applications. It is used for reading the mails form the VELTIS mailbox;

   - Log4J
     Log4j is an open source tool developed for putting log statements into your application. It’s
speed and flexibility allows log statements to remain in shipped code while giving the user the ability to enable logging at runtime without modifying any of the application binary. All of this while not incurring a high performance cost. It can be found at http://logging.apache.org/log4j/1.2/

Figure 3. Implementation of the parser module

The VELTIS payment notification is sent to the user, who can pay it by using a range of possibilities:
- P.O. via Internet Banking;
- Direct P.O. with zero bank commission.
- By lowering his balance. For this type of payment, the user has to load in advance his balance;
- By calling a courier who comes to the user’s location.

After it is paid, VELTIS splits the received sum and redirects each payment to the supplier bank account. This entire process is automated. The flow of the application is shown in Figure 4.

3. Administration

The Administration module allows to manage the clients module and all the user’s subscribed in the system. It manages the income payments and outcome payments, the relation with the bank which is the intermediate between VELTIS and the suppliers and all the statistics offered to the individuals. Only VELTIS will have access to this module.

Figure 4. Flow of VELTIS

MD5 (Message Digest Algorithm 5) is the encryption on which the security is based. The result of the encryption is a 128 bits value. An example of an MD5 encryption is the encryption of the string „123456” which is „e10adc3949ba59abbe56e057f20f883e”. The encryption is irreversible, a string can only be coded.

In the nearest future, an SSL (short from Secure Sockets Layer) certificate will be obtained.

V. CONCLUSIONS

The paper presented a method for an individual to pay his utilities with the minimum possible effort in time and money.

The writers of this paper were involved in all aspects in the development of the described application. We defined the requirements and functional specifications, defined the activities, allocated the human resources, defined the software platforms to be used together with our development engineers and participated in the testing stage of the project.

The application is at first release. There is a wide range of new features that can be developed to fully cover all the needs of the individuals for managing themselves.

Future developing directions are:
- Manage the expenses for individuals living in an apartment in a block; also helping the administrator of a block to keep track of the expenses;
- Manage the annual financial sheet of an individual;
- Get the values of the energy meters and communicate them via the supplier software. This action will cut the time used by the individual to read and communicate to the supplier this meter;
- Get from distance the values for the gas meters and electric meters;
- Cover the rent payment and basically all the possible types of payments that could be made by an individual in one year;
- Offer a vast range of statistics to the individual.

REFERENCES

[2] J. Wee, J.S. Wee, “Payment service for paying e.g. educational fee, insurance bill, utility bill, rental fee, involves requesting approval of transaction made by purchaser for merchant to finance company corresponding to financial institution card”, Jun 2009, Patent Number JP2009521764-W