IMPACT OF CLOUD COMPUTING ON ELECTRONIC GOVERNMENT

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Abstract: *The cloud computing market is one of the fastest growing segments in the global technology industry, yet less than a quarter of the PC (**P**ersonal **C**omputer) users in Europe declare that they access cloud services. Cloud-based solutions [1] can and shall bring huge benefits to the European Union economies, allowing governments, businesses and consumers to access high-quality software and IT (**I**nformation **T**echnology) resources in a more efficient way and with lower costs than in the past. Unfortunately, most PC users in the European Union are not fully familiar with what cloud computing is and still fail to take advantage of the opportunities it offers. This paper aims to present some aspects on the use of cloud computing services for the computerization of society and for its transformation into an information society as an intermediate step towards the knowledge society.*

Keywords: cloud computing, information technology, e-government, information society

1. INTRODUCTION

In a study involving nearly 4,000 PC users of 9 European Union countries, including Romania [2], only 24% of respondents said they used cloud services such as e-mail or online text processing, compared with 34% of respondents globally. Also, most European PC users are not familiar with cloud computing technology, 65% of them saying that they "*had never heard of cloud computing*" or "*had heard only the name of cloud computing*". Data from the European study were drawn from a larger survey focused on PC users worldwide and conducted in 2012 by Ipsos Public Affairs for BSA (***B**usiness **S**oftware **A**lliance*).

The study revealed significant discrepancies between the levels of knowledge of cloud computing technology within the European single market. Thus, one of four PC users in the UK (28%) and Greece (24%) said they were highly familiar with it, compared with one in 10 users in Poland (9%) and France (10%). Romania ranks fourth among the countries with the highest level of familiarity with cloud computing solutions: one in five Romanian users (20%) consider themselves to be expert in cloud-based solutions.

The highest rate of cloud computing technology use is found in Greece and Romania, with a percentage of 39%, significantly higher than the European and global average. The percentage is considerably higher than the familiarity rate of the most developed European markets, where a much smaller percentage of PC users say that they access cloud applications; e.g. Germany (17%), Belgium (18%) and France (19%).

The difference reflects the global trend identified in the research, according to which the emerging markets have surpassed the mature markets in terms of cloud-based solutions usage. In Romania, the use of cloud technology has advanced rapidly because, generally speaking, Romanians are open to new ideas and ready to use the latest technologies - first of

all for personal and "*entertainment*" reasons and subsequently for business [2, 3].

In the EU, 86% of the cloud service users said they resort to them for personal use, especially those offered for free. Only 29% of them say they use cloud solutions for business, a percentage close to the global average of 33%. In Europe, the most popular cloud applications and services are: e-mail (79%), online text processing (36%), photograph storage (35%) and online games (35%).

1.1. Electronic government (e-Government)

Electronic government or e-government is the digital interaction among government, parliament, central and local governments and citizens. By implementing e-government, the (central and/or local) government has to redefine the way in which the state interacts with the community, bringing it closer to the citizen and it involving him in the government process. The process of e-government is a complex one, developed on several levels:

- *The interaction between Government and Citizens (G2C).* The Government must implement information technologies in order to simplify the citizens' obligations towards the state (taxes, fees, etc.). The e-government segment dedicated to the interaction between the government and the citizens should consider developing a one-stop digital office, an electronic platform that allows access to both electronic and traditional and online services. The results of the electronic services implementation aim to improve the quality and availability of public services and the degree of participation of citizens in the decision-making process and, last but not least, to improve communication between government and citizens, which can become more interactive.
- *Interaction between Government and Government agencies (G2G).* The second level of e-government addresses communication between state institutions. By implementing intelligent solutions, the interaction will become more efficient using Intranet, which will allow better collaboration and more efficient resource assignment. This will allow an optimization of the document flow within public authorities and will reduce the number of procedures entailed by the administrative process.
- *Interaction between Government and the Business environment (G2B).* The electronic services that should be available through the digital one-stop office should also include services dedicated to the business environment, such as: the procedure to register a business, to obtain documents, certificates, licenses. These services, which traditionally require bureaucratic procedures and long waiting, shall be more accessible.

By creating a single service delivery office, e-government allows significant savings to the budget. Money thus saved can be redirected to support other areas of the public sector. e-Government can be applied in order to make the public sector and the business environment more efficient and to achieve sustainable economic growth.

1.2. EuroCloud Europe

In autumn 2012 the European Commission launched *the Cloud Computing Strategy* for the European Union as a first step to stimulate the adoption and increase of the use of cloud technologies within the European single market. The European Commission encourages legislators to develop a generous global approach to cloud computing so as to ensure that both cloud computing European users and providers will enjoy the full benefits of this market growth.

EuroCloud Europe is a federation of independent European non-profit organizations, present in 30 European countries which adhere to the general mission and objectives of EuroCloud: to promote and raise awareness of the benefits of the cloud computing market in Europe. Through the annual events they organize, EuroCloud facilitates knowledge sharing, creation of a contact network and the establishment of strategic alliances with the European industry.

Through its office in Brussels, EuroCloud Europe participates in the working groups on the standardization of cloud industry in the European Commission (trust, certification, interoperability). In less than two years, EuroCloud has been present in 27 European countries with legally established organizations in 18 countries, including Romania. The directors of the boards of the organizations from these countries are members of the EuroCloud Europe and have one vote in the decisions to be taken at European level.

Cloud computing is, above all, a widespread phenomenon. To exploit the full benefits of this phenomenon, Europe needs a well-organized digital single market which is also connected globally; thus, European users will have the freedom to choose the best cloud services, while European cloud service providers will have opportunity to grow in emerging markets with the greatest potential for growth outside Europe.

2. TRANSIT TO E-GOVERNMENT

The Internet undoubtedly plays a very important role in our everyday lives and an increasing number of services for individual consumers (citizens) move on cloud-type structures. And it is also an undisputed fact that the Internet remains the fastest and most effective way to reach the common person, often even before the traditional media such as television and radio.

First of all, we must analyze the reasons why a state (government) must promote an e-government system [4]. The reasons are many, and some of them are not so obvious:

- *Transparency of governance* – means free access to information of general interest to citizens, legislature and executive decisions that can be made available within a few minutes after they were taken, as well as fast and convenient search of regulations and documents in the legal records. This is what we see when we look for the text of any law or emergency ordinance, especially those which contain amendments to another law, which in turn is a modification of a law, and navigating from one document to another is done with a simple click.
- *financial motivations of e-government* – these are substantial savings to the public budget arising primarily as a result of optimizing resource expenditures (a centralized approach to procurement which provides not only a much better price

because of the quantity involved, but also better control of the way in which public money is spent). In addition, a centralized approach of the service offering type allows subcontracting of certain parts to experienced companies, which can result in significant savings (for example, a private national government network, built and operated by the state would be extremely expensive - except in certain very specific cases - given that there are offers for Internet connectivity even in remote communities and at very affordable prices and which can provide secure VPN (***V**irtual **P**rivate **N**etwork*) - type communication.

- *Access to information and sharing* – citizens can access any piece of information concerning their own person, from online filing of tax returns, pay tax liabilities over the Internet to the public administration and up to the resolution status of document issuing (although we are still far from a complete automated issue of identity documents, in some countries citizens can pre-authenticate and register their request for replacement of a document directly through the Internet, having to pay only one visit to the administration office for retrieving the physical document).
- *Enhanced analysis of social information* – allows investigation of the population evolution trends in a country by correlating information from different sources, and by devising long-term plans on demographics. The best example is the analysis of data related to the working population, social contributions and long-term sustainability of pension and public health systems.
- *Process flexibility and speed up* – bringing into contact the various government entities facilitates a better correlation of the institutional activities, the collaboration between these and access to / sharing of information among state bodies, including between the central government and the local governments. For example, a road construction involves the Ministry of Transport, the Office for Cadastre and the local governments on the route (to name but a few, as there may be many more entities involved), and the exchange of electronic documents [4-5] among these bodies is more efficient than in the case of the classical letterhead and stamp.
- *Consolidating information on the citizen* – this is an issue associated to the childhood of every government computer system, which we have not been able to avoid either, namely: the lack of complete centralized public records on the citizens which are correlated with other information of interest to the government. Thus, in the first years after 1990, massive databases of public records were developed (the introduction of the PIN (personal identification number) was just one of the requirements of these programmes), but we later reached a conglomeration of databases with specific destinations, which were not correlated with each other (for example: the registrar, passports and driving licenses offices) and which subsequently require substantial effort for unification. Another example of enhanced development of databases is that of the health system [6]. Once the foundations of centralized management of health services were laid through the

SIUI (**S***istemul* ***I****nformatic* ***U****nic* ***I****ntegrat* – *The Unic Integrated Computer System*) several very useful services for citizens were developed, such as:

- *The Health Card (e-cards)* – a simple and effective way of identifying an insured person, which is aimed at reducing errors when processing compensated prescriptions and, not least, at deterring fraud;
- *The electronic prescription (e-prescription)* –replaces the paper-based prescription with database record (filled in by the physician, but readable by the pharmacist), which allows the person to buy the medicines from various pharmacies (the paper-based prescription required that the pharmacy have all the medicines on the prescription);
- *The electronic health record (e-health record)* – a project that enhances the patient's medical information throughout their entire life, and which provides a doctor with all the information about the patient in an emergency case: previous treatments, medical tests, allergies and incompatibilities and so on, which dramatically reduces medical errors.

The SIUI system allows one to easily verify information about a citizen (with only some of this information being public - for example, the insured status can be checked from the link in the useful resource box. However, implementing electronic government also poses special problems, which must be dealt with great care because they can have catastrophic effects. We will mention only a few of these issues whose importance is obvious:

- *Database integration and updating* – the more disparate the information, the more difficult their management and transfer among different public institutions. If we take the example of the relationship between population registry, tax and healthcare system, we can have a picture of the data traffic required for the update, correlation and use of the aggregate information about a citizen. Moreover, as errors may occur, as well as lack of synchronization (the present day population migration poses special problems to updating this information), there are protocols and regulations to solve these problems - for example, the population registry is the "*master*" database which feeds information for the update of the others.
- *Data Security* – this requires national database operators to be extra careful, as the government is responsible for the security of the data and any loss or theft can have adverse consequences (there have been cases in other countries, widely mediatised, in which information on citizens or military personnel has been lost).
- *The concept of privacy* – citizens are rightfully concerned about the potential use of their personal information for purposes other than those stated, and one of the small inconveniencies that can happen is to be assaulted with commercial information by third parties, but there have been situations in which the loss or theft of personal data resulted in their use in order to get money or fraudulent loans from banks.

In order to remove individual data security concerns, while allowing the use of the existing information, access is allowed only to consolidated data from which any identifying information has been removed, so that one can use the information for statistical, demographic, purposes etc..

2.1. Technologies for e-government implementation

C*loud technology* appears to be very promising, as it enables flexible, highly scalable (from a site in a village to server farms for an entire country), economic (resource allocation and control allows better cost management) and, not least, uniform and standardized implementation (with major benefits for the management of such a system).

Another area which has been extensively explored is that of the *open-source programmes* that allow government agencies to use mature and reliable software platforms [4] without having to worry about purchasing a complicated and complex license system. Since most commercial companies producing software provide a clear license to a company with a fixed number of users, but cumbersome and complicated especially when it comes to a large number of users who connect from the Internet (such as an entire country), the choice of an open-source system becomes more natural and simple.

In recent years we have focused on the concept of *Open Government Data*, a set of technologies enabling quick and easy access to public data in an aggregate form, whose pioneers include the U.S. and British governments. This way, a wide range of information becomes available, from weather forecasts to maps of areas of forest fires exported in Google Earth format.

3. CONCLUSION

The mere computerization of the current government projects does not mean current transition to e-Government. This involves strategic thinking, support and coordination at government level. The e-Government strategy is a requirement of the European Union for all Member States, and one of the objectives of the e-Government at European level are: inclusion of all social groups as beneficiaries of e-government services, the use of information technology for more efficient and effective government, creation of an electronic identity recognized by the Member States.

The benefits of e-Government (reduction of bureaucracy, transparency, inclusion of all social groups as beneficiaries of services, etc.) are all aims analyzed for developing the e-government strategy. The Ministry of Communications and Information Technology has initiated studies and research which can be the base of European funded projects, has launched projects to serve as a model for implementing the e-government strategy and has initiated cooperation agreements with other central government institutions.

In e-Government information is more important than technology, because the information is valuable; it gives rise to partnerships with the private sector and with other government entities. Moreover, it should also be understood that e-government is not an end in itself, but a means to be closer to citizens, to create a transparent and trusting relationship with these. The Government aims to have an efficient administration and to be closer to the Romanian citizens whom they wish to provide efficient and non-bureaucratic services. As the e-government strategy aims inclusion (*e-Inclusion*), the Romanian Government started an initiative to contribute to the development of the use of computers by students and by the personnel of rural municipalities.

This initiative demonstrates the government's interest in educating the people to use e-

Government services.

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