

University of Crete
Department of Computer Science

**Creation and development of an eGovernment
services framework through social networking
platforms**

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Master of Science Thesis

Heraklion, January 2011





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Abstract

The impact of social networking platforms, nowadays, is huge and has been monitored by several scientific sectors. On the other hand, eGovernment, a sector that is mainly focusing on bringing the government closer to the citizens, is being affected by neglect and Informatics illiteracy. As a result, an innovative idea would be to use a social networking platform and transform it into a wide citizen network, where the citizens would be able to communicate and interact with their social environment. However, the basic concept of the implemented social network would be to enable the citizens after proper authentication mechanisms provided by local legislature, to consume eGovernment services provided by this framework. For this purpose, we used an open source social network to implement an open citizen network which can perform every required functionality of a social network. For the implementation and adaptation of the citizen network, we used web based programming and we also implemented an interaction plugin that enables the communication of the citizen network with the government framework. This plugin is also using REST Web Services for authentication and communication. Provided the user has authenticated his account, using the plugin he is able to connect to the government framework and start interacting with it. An important feature of the proposed framework is also the ability to provide an eGovernment service by simply uploading the wsdl file of this service and by dynamically creating a client that enables the citizens to consume the service. This dynamic creation is based on an algorithm we implemented and does not require any further programming knowledge from the service provider. Each migrated service gets a unique package id which contains all required files and has a unique web client for the online requests and a backend which handles the provided data. In order to demonstrate the potential of the proposed framework three different web services were implemented. These include digital signing and verification based on a private-public key infrastructure and the creation of events and provision of digital tickets based on digital ticket specification. Another web service involves making a request / complaint supported by the longitude and latitude variables of geocoding, which are unique for every place worldwide. Upon a test period where randomly chosen users tested our system and evaluated the results in an online survey, the potential and interest of the citizens in eGovernment services was evident. This thesis demonstrates one of the first tries worldwide to correlate social networking platforms with eGovernment service consumption and provision. We strongly believe that this approach can trigger many citizens to start using eGovernment services and can also enable local or global government entities to provide proper eGovernment Services using the web service provision algorithm.



Δημιουργία και ανάπτυξη πλαισίου παροχής υπηρεσιών ηλεκτρονικής διακυβέρνησης μέσα από τη χρήση πλατφόρμων κοινωνικής δικτύωσης

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Abstract

Ο αντίκτυπος των πλατφόρμων κοινωνικής δικτύωσης στις μέρες μας είναι τεράστιος και παρακολοθείται διαρκώς από αρκετούς επιστημονικούς φορείς. Από την άλλη, η Ηλεκτρονική διακυβέρνηση, ένας τομέας που κυριώς στοχεύει στο να φέρει την κρατική μηχανή πιό κοντά στους πολίτες, πλείτεται από την άγνοια και τον ηλεκτρονικό αναλφαβητισμό. Επομένως, μια καινοτόμος ιδέα θα ήταν να χρησιμοποιήσουμε μια πλατφόρμα κοινωνικής δικτύωσης και να την μετεξελιξουμε σε ένα δίκτυο πολιτών, όπου οι πολίτες θα μπορούν να επικοινωνήσουν και να αλληλεπιδράσουν με τον κοινωνικό τους περίγυρο. Όμως, ο πρωταρχικός στόχος αυτού του δικτύου θα ήταν να επιτρέψουμε στους πολίτες μέσα από την χρήση ηλεκτρονικών μηχανισμών αυθεντικοποίησης, να καταναλώσουν υπηρεσίες ηλεκτρονικής διακυβέρνησης. Για το λόγο αυτό, χρησιμοποιήσαμε μια πλατφόρμα ελεύθερου λογισμικού που ονομάζεται elgg, για να υλοποιήσουμε ένα ηλεκτρονικό δίκτυο πολιτών. Για την υλοποίηση και την προσαρμογή του κοινωνικού δικτύου, χρησιμοποιήσαμε τεχνικές διαδικτυοκεντρικού προγραμματισμού και επιπλέον υλοποιήσαμε ένα πρόσθετο που επιτρέπει την επικοινωνία μεταξύ του κοινωνικού δικτύου και της πλατφόρμας ηλεκτρονικών υπηρεσιών μέσα από την χρήση του πρωτοκόλλου REST. Έχοντας λοιπόν ως δεδομένο ότι ο χρήστης έχει ταυτοποιηθεί, χρησιμοποιώντας το πρόσθετο, μπορεί να συνδεθεί στην πλατφόρμα ηλεκτρονικών υπηρεσιών και να την χρησιμοποιήσει. Ένα σημαντικό χαρακτηριστικό του υλοποιηθέντος πλαισίου είναι η δυνατότητα να παρέχει κάποιος χρήστης μια υπηρεσία, παρέχοντας μόνο το wsdl αρχείο που την περιγράφει. Η παροχή ενός αρχείου wsdl συνεπάγεται και την δυναμική δημιουργία μιας ηλεκτρονικής φόρμας που την καταναλώνει όποτε ζητηθεί. Η δημιουργία αυτής της φόρμας δυναμικά είναι βασισμένη σε έναν αλγόριθμο που δημιουργήσαμε και δεν απαιτεί καμία επιπλέον προγραμματιστική γνώση από τον πάροχο. Κάθε υπηρεσία καταχωρείται με έναν μοναδικό αριθμό και περιέχει όλα τα απαραίτητα αρχεία για την επιτυχή μετεγκατάσταση της στον server μας. Προκειμένου να εξετάσουμε περαιτέρω το δημιουργηθέν πλαίσιο, υλοποιήσαμε τρεις διαφορετικές υπηρεσίες: την ψηφιακή υπογραφή και εξακρίβωση με χρήση αρχιτεκτονικής δημοσίου-ιδιωτικού κλειδιού, τη δημιουργία κοινωνικών γεγονότων και την παροχή ηλεκτρονικών εισητηρίων για αυτά και την αίτηση για παροχή υπηρεσίας η αναφορά βλάβης με χρήση γεωκωδικοποίησης. Τέλος, μέσα από μια δοκιμαστική περίοδο όπου υποβάλαμε το σύστημα στην αξιολόγηση τυχαία επιλεγμένων χρηστών, διαπιστώσαμε τις μεγάλες δυνατότητες του εργαλείου. Η έρευνα και το εργαλείο που παρέχουμε είναι μία από τις πρώτες προσπάθειες παγκοσμίως για την συσχέτιση πλατφόρμων κοινωνικής δικτύωσης με την παροχή και κατανάλωση υπηρεσιών ηλεκτρονικής διακυβέρνησης. Πιστεύουμε ακράδαντα ότι μια τέτοια προσέγγιση μπορεί να προσελκύσει το ενδιαφέρον πολλών πολιτών να χρησιμοποιήσουν υπηρεσίες ηλεκτρονικής



διακυβέρνησης και να επιβάλουν σε κυβερνητικούς ή φορείς τοπικής αυτοδιοίκησης να παρέχουν περισσότερες υπηρεσίες ηλεκτρονικά.



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Acknowledgements

I would like first of all to thank my supervisor, Dr. Christos Nikolaou for the cooperation we had over all these years, for his help and for giving me the opportunity to implement my idea from scratch. I would also like to thank Dr. Dimitris Plexousakis and Dr. Kostas Magoutis for being in my board of enquiry and for reading my work.

I would also like to thank all my friends in Heraklion for the unforgettable moments we had the years of my stay and the members of Transformation Services Laboratory for the cooperation, the help and support during the last two years.

I would also like to deeply thank my family for the constant support during the years of my studies. My mother Eleni, for her belief in me and her support all the time and my father Giorgos, for learning me from early age to aim high. I would also like to deeply thank my sister Evi, for her help in my studies, her patience when she was helping me to write my report and for being the model professional I would like to be.

Last but not least, I would like to thank Mary Kampouraki, for her patience, her tolerance and her encouragement.





1. Introduction

In every part of our society, there are many types of relationships that exist among individuals. These relationships can be either personal or professional and each person can be displayed as an important part of a social network, where the center of the network is the individual and the summary of the relationships that each individual has forms the social network. At the beginning of the century, with the new capabilities the technology evolution generated, several social networking platforms arose through the Internet. In 2011, social networks like Facebook and Twitter contain much of the population of the modern and evolved countries and there are several studies and cases that try to benefit from the huge impact the use of social networks has got.

1.1 Social Network

A social network is a social structure made up of individuals (or organizations) called "nodes", which are tied (connected) by one or more specific types of interdependency, such as friendship, kinship, common interest, financial exchange, support or dislike, sexual relationships, or relationships of beliefs, knowledge or prestige.

Social network analysis views social relationships in terms of a network theory consisting of *nodes* and *ties* (also called *edges*, *links*, or *connections*). Nodes are the individual players within the networks, and ties are the relationships between the players. The resulting graph-based structures are often very complex. There can be many kinds of ties between the nodes. Research in a number of academic fields has shown that social networks operate on many levels, from families up to the level of nations. Thus, they play a critical role in the way organizations are run, and the degree to which individuals succeed in achieving their goals.

In its simplest form, a social network is a map of selected relevant ties between the nodes being studied, without distinguishing different kinds of relationship. The nodes to which an individual is thus connected are the social contacts of that individual. The network can also be used to measure social capital – the value that an individual gets from the social network. These concepts are often displayed in a social network diagram, where nodes are the points and ties are the lines.

A social network service is an online service, platform, or site that focuses on building and reflecting social networks or social relations among people, e.g., a sharing of interests and activities. A social network service essentially consists of a representation of each user (often a



profile). Most social network services are web based and provide means for users to interact over the internet, such as e-mail and instant messaging. However, online community services are sometimes considered as a social network service. Thus, a social network service usually means an individual-centered service whereas online community services are group-centered. Social networking sites allow users to share ideas, activities, events, and interests within their individual networks.

The main types of social networking services are those which contain category places (such as former classmates), means to connect with friends (usually with self-description pages) and a recommendation system. Popular methods now combine many of these, with Facebook and Twitter being the most widely used social networking services worldwide. MySpace and LinkedIn are the most widely used in North America, while Nexopia is mostly used in Canada. Bebo, Hi5 and Hyves are mostly used in The Netherlands, StudiVZ mostly in Germany, iWiW mostly in Hungary, Tuenti mostly in Spain and Nasza-Klasa mostly in Poland. Decayenne, Tagged, XING, Badoo and Skyrock are widely used in parts of Europe, while Orkut and Hi5 are used in South America, India and Central America. Friendster, Mixi, Multiply, Orkut, Wretch, Renren and Cyworld are widely used in Asia and the Pacific Islands.

There have been attempts to standardize these services to avoid the need to duplicate entries of friends and interests (see the FOAF standard [1] and the Open Source Initiative [2]).

Although some of the largest social networks were founded on the notion of digitizing real world connections, many networks focus on categories from books and music to non-profit business to motherhood as ways to provide both services and links to individuals with shared interests.

1.2 Social Networks Application domains

Government applications

Social networking is more recently being used by various government agencies. Social networking tools serve as a quick and easy way for the government to acquire public opinion and to keep everyone updated on their activity. The Centers for Disease Control demonstrated the importance of vaccinations on the popular children's site Whyville and the National Oceanic and Atmospheric Administration has a virtual island on Second Life where people can explore underground caves or explore the effects of global warming [3]. Similarly, NASA has taken



advantage of a few social networking tools, including Twitter and Flickr. They are using these tools to aid the Review of U.S. Human Space Flight Plans Committee, whose goal is to ensure that the nation is on a vigorous and sustainable path to achieving its boldest aspirations in space.

Business applications

The use of social network services in an enterprise context presents the potential of having a major impact on the world of business and work.

Social networks connect people at low cost; this can be beneficial for entrepreneurs and small businesses looking to expand their contact bases. Companies can also use social networks for advertising in the form of banners and text ads. Since businesses operate globally, social networks can make it easier to keep in touch with contacts around the world.

One example of social networking being used for business purposes is LinkedIn.com, which aims to interconnect professionals. LinkedIn has over 40 million users in over 200 countries.

Another example is the use of physical spaces available to members of a social network such as Hub Culture, an invitation only social network for entrepreneurs, and other business influential, with Pavilions in major cities such as London, UK. Having a physical presence allows members to network in the real world, as well as the virtual, adding extra business value.

Applications for social networking sites have extended toward businesses and brands are creating their own, high functioning sites, a sector known as brand networking. The idea is that a brand can build its consumer relationship by connecting their customers to the brand image on a platform that provides them relative content, elements of participation, and a ranking or score system. Brand networking is a new way to capitalize on social trends as a marketing tool.

Dating applications

Many social networks provide an online environment for people to communicate and exchange personal information for dating purposes. Intentions can vary from dating to short-term or long-term relationships.

Most of these social networks, like online dating services, require users to give out certain pieces of information. This usually includes the user's age, gender, location, interests, and perhaps a picture. Releasing very personal information is usually discouraged for safety reasons. This allows other users to search or be searched by some sort of criteria, but at the same time people can maintain a degree of anonymity similar to most online dating services. Online dating sites are



similar to social networks in the sense that users create profiles to meet and communicate with others, but their activities on such sites are for the sole purpose of finding a person of interest to date.

An important difference between social networks and online dating services is the fact that online dating sites usually require a fee, whereas social networks are free. This difference is one of the reasons the online dating industry is seeing a massive decrease in revenue due to many users opting to use social networking services instead. Many popular online dating services such as Match.com, Yahoo Personals, and eHarmony.com are seeing a decrease in users, where social networks like MySpace and Facebook are experiencing an increase in users [4].

The number of internet users in the U.S. that visit online dating sites has fallen from a peak of 21% in 2003 to 10% in 2006. Whether it's the cost of the services, the variety of users with different intentions, or any other reason, it is undeniable that social networking sites are quickly becoming the new way to find dates online.

Educational applications

The National School Boards Association reports that almost 60 percent of students who use social networking talk about education topics online and, surprisingly, more than 50 percent talk specifically about schoolwork. Yet the vast majority of school districts have stringent rules against nearly all forms of social networking during the school day — even though students and parents report few problematic behaviors online.

Social networks focused on supporting relationships between teachers and between teachers and their students are now used for learning, teacher's professional development, and content sharing. Ning for teachers, Learn Central, TeachStreet and other sites are being built to foster relationships that include educational blogs, eportfolios, formal and ad hoc communities, as well as communication such as chats, discussion threads, and synchronous forums. These sites also have content sharing and rating features.

It is also important to mention that nowadays, many universities have Facebook and Twitter accounts where they try to advertise themselves. That advertisement aims to attract the most gifted and talented students to their education programs.



Medical applications

Social networks are beginning to be adopted by healthcare professionals as a means to manage institutional knowledge, disseminate peer to peer knowledge and promote individuals and institutions. The advantage of using a dedicated medical social networking site is that all the members are screened against the state licensing board list of practitioners.

The role of social networks is especially of interest to pharmaceutical companies which spend approximately "32 percent of their marketing dollars" attempting to influence the opinion leaders of social networks [5].

Interestingly, a new trend is emerging with social networks created to help their members with various physical and mental ailments. For people suffering from life altering diseases, PatientsLikeMe offers its members the chance to connect with others dealing with similar issues and research patient data related to their condition. For alcoholics and addicts, SoberCircle gives people in recovery the ability to communicate with one another and strengthen their recovery through the encouragement of others who can relate to their situation. DailyStrength is also a website that offers support groups for a wide array of topics and conditions, including the support topics offered by PatientsLikeMe and SoberCircle. SparkPeople offers community and social networking tools for peer support during weight loss.

It is thus obvious from the above that social networking platforms are being adopted by a wide range of sectors. Their popularity comes from the feeling of personal contact that they can create and the many solutions to problems that they can offer. Government services are such a sector, where the direct contact between a citizen and the government entity is required in order to get an optimal service. Hence, in order to provide efficient eGovernment services, social networks could be used in a similar manner to the above mentioned applications.

1.3 EGovernment

At the beginning of the new century, governments realized that the Internet, which had already prevailed in the private sector, could be used in a similar manner by the state to serve citizens and businesses. As a result, they began to develop a new model of public administration named eGovernment. Originally, this term was associated with the use of Internet for processing transactions with the state. For example, a citizen could submit tax returns or make a virtual complain, directly from home using a personal computer. It was subsequently found that the



Internet could be used for strengthening citizen participation in democratic processes. Many started talking about the resurgence of Athenian democracy. As it is known, direct democracy developed and flourished in ancient Greece where citizens gathered in the Agora (Market) and discussed public affairs. Today, in similar way, the Internet could create a virtual “Agora”, where Citizens will have the opportunity to discuss and vote on matters that concern them.

According to the official definition of the EU, “EGovernment is the use of information technologies and telecommunications in public administrations combined with organizational reform and technologically experienced staff in order to improve service provision, strengthen democracy and support public policies”. This definition establishes two fundamental principles. The first principle is the definition of the objectives of eGovernment in serving citizens and businesses, improving the democratic processes and supporting public policies. The second principle is the linking of eGovernment broad organizational changes within the public administration.

Electronic Governance can be implemented by the local or global administration in order to improve the internal capacity and to provide public services and procedures of democratic governance. The basic models service is Government to Citizen (G2C), Government to Business (G2B) and Government to Government (G2G). The Basic model service can also be seen in Figure 1.

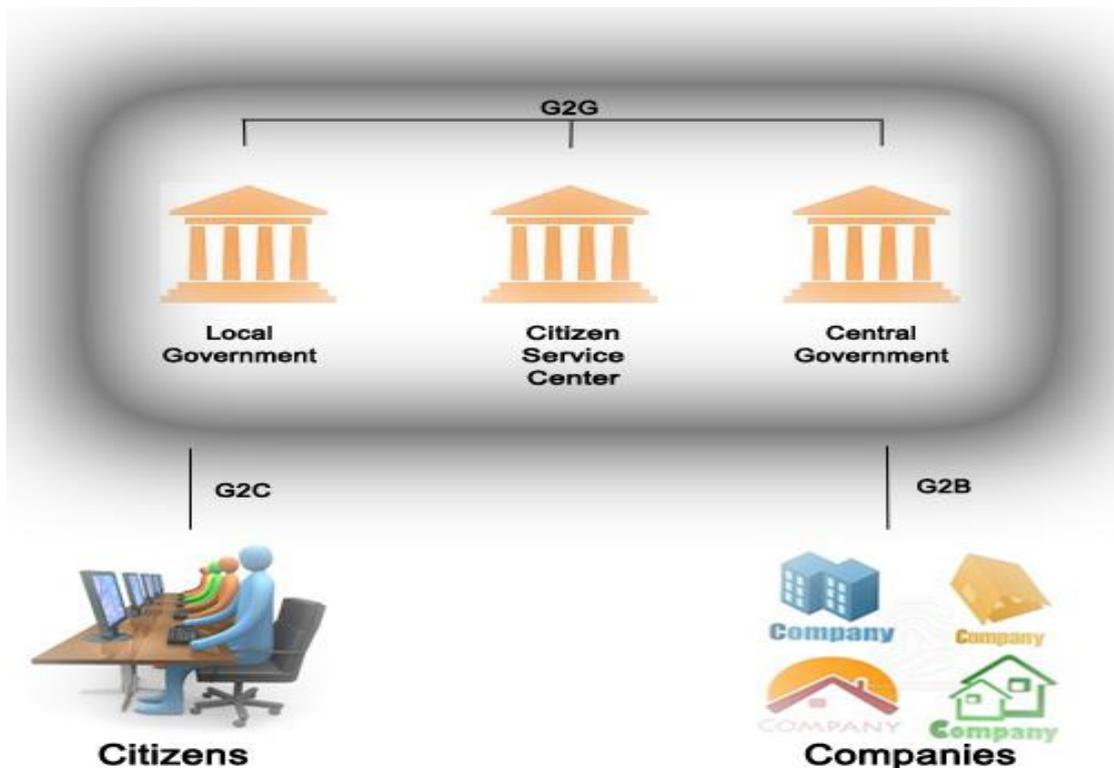


Figure 1: e-government service model

The main expected outcomes of eGovernment include greater efficiency, improved services and better access to existing services, greater transparency and accountability. Although eGovernment is often seen as an “online government” or “Internet-based governance”, many non-Internet technologies can also be used, such as the telephone, fax, the Personal Digital Assistants (PDAs), the Short Message Service (SMS), the Multimedia Message Service (MMS), wireless networks and services, Bluetooth, closed circuit television (CCTV), tracking systems, radio-frequency identification (RFID), traffic management, identity cards, smart cards, technology channels vote (for offline e-voting), television and radio provision of government services, electronic mail (email), online chats and instant messaging technologies. There are also subcategories of electronic governance based on technology such as mobile eGovernment (M-government) [6] and g-government (applications of GIS (Global Information System) / GPS (Global positioning System) for e-governance).

There are two approaches to eGovernment. For some eGovernment is “the application of tools and techniques of electronic commerce in the functioning of government”. This concept focuses in practical efficiency and reducing costs, such as the electronic filing of tax returns and electronic supply. For others, eGovernment is the potential to “improve the democratic participation” and “to overcome the political detachment”. This concept focuses on initiatives that will lead to an advanced interaction between different forms of governance and citizens.

1.3.1 Systematic versus Mechanistic approach

It is now commonly known that eGovernment is a more complex political, economic and social issue with a variety of technological components. Therefore, information systems and electronic telecommunications networks must be considered from the start as critical operational infrastructures, which are designed, operated and managed for operational utility and are interested in particular outcomes for system users and above all the citizens.

To make it more understandable, the systemic approach provided an example from the design and manufacture of highly complex technical projects. Constructing a bridge or designing a high traffic road involves many engineering and environmental studies. The people who will use the system are not interested in the technical features, but do have a greater sensitivity to environmental impacts and increased requirements for utility (a maximum expectation for the time transit, avoiding wastage of resources and satisfaction with the quality of service), as indicators attached to the under construction project.



An eGovernment project must follow the same methodology. It requires the involvement of many experts including computer engineers and economists to measure the return of investment, management science specialists to record the requirements and the law to safeguard personal data.

To achieve the objectives of eGovernment some critical success factors should be taken into account:

- Strong commitment of the political leadership and technical support staff to decisively implement conducive eGovernment services.
- Specific priorities, central to planning and decentralized to implementing projects. This means that the priorities must be defined and followed by the central government and be implemented in decentralized local government entities.
- Decisive strengthening of implementing agencies with operational and technical consultants to monitor projects. As to the technical infrastructure, information systems should be installed under the presence of supervision consultants.
- Rewarding best practice and dissemination of good results to society.

In order to achieve the previous objectives we must before answer decisively some critical questions. First of all, we must answer why we pursue eGovernment evolution. Are we sure about what we want to achieve and do we have clear objectives that we want to fulfill? Do we have a clear evaluation mechanism that monitors the evolution of each project and are we ready to face up with any internal reactions that may arise from the launch of the new eGovernment platforms? Are we ready to provide the proper initiatives to those who are interested in using those platforms?

As a result, the above mentioned principles make clear that the case of eGovernment is not limited to the development of electronic interfaces of public services to citizens. Although it is usually very easy to implement a system, its true success comes from the problems the service will solve. As far as the quality of service is concerned, if the citizen performs the same tasks from his personal computer, as he would have had if he was personally receiving the service and waits the same amount of time to receive the service we will surely fail. eGovernment services must be easier to invoke and quicker than the traditional ones.

The great potential of eGovernment, is that it can provide us with a simple and complete content service. The administration of processes such as building a house, establishing

an operation or signing for a pension must become more immediate and effective. The responsibilities and powers of the public sector, which have no other effect than self-justifying bureaucracy, must no longer be segmented. The entire administrative machinery must be recreated, with the main criterion being the organization and efficiency of the service.

1.3.2 eGovernment and Interoperability

The potential user, a citizen or business, of an online service of a Body Public Administration during its interaction with the service provider should not be required to possess advanced technological skills. They must also be in contact only with the starting point of service (Service center, a public information system) and receive the result of service from an exit point, without getting involved in the intermediate stages of service (one-stop shop). Lastly, they must be online on the flow of information and while decisions relating to the submitted cases are treated electronically.

To meet the requirements of users of electronic services, it is clear that services should be provided by an information system that goes beyond one institution. This system should be capable of combining content and functions from sub-services stakeholders in a transparent manner for each end-user service. Nowadays, this is the main principle for those developing web portals and information services covering a wide range of public administration bodies, eg Financial Services.

However, it is not easy to achieve a dynamic composition of heterogeneous data, functions and services from different public administration bodies and then enable the distribution to the interested parties. The interoperability of all relevant information systems that perform parts of these different functions may lead to and require automatic control data of other organizations. Interoperability is defined as the ability of information and communication technology (ICT) systems and of the business processes they support to exchange data and to enable the sharing of information and knowledge.

The provision of electronic services by public administration bodies to citizens, businesses and other entities or agencies of the Public Administration requires the interoperability of information systems of each administration body. The interacting administration parties can be central government entities such as Ministries and General Secretaries, local government entities such as regional division governments of A and B grade, supervised entities and agencies of the general public sector such as insurance institutions and audit institutions, intermediaries and

institutions such as banks and financial institutions and other international entities and organizations such as the Citizens Advice Bureau or the European Union.

As illustrated in Figure 2, Interoperability can be characterized as organizational, semantic and technical. The Organizational Interoperability refers to the definition of goals, the development of processes and the achievement of co-operation between entities that are willing to exchange information but may have different internal structures and processes. It aims to meet the requirements of the user community, offering services that are identifiable, accessible and focused on the needs of the user. The Organizational Interoperability is ensured through legislation and regulations and by general agreement among stakeholders. The Semantic interoperability refers to ensuring that the exact meaning and importance of the exchanged information is understandable from any application. Achieving interoperability at the semantic level enables the systems to combine information from these other sources and treat it effectively. The Semantic Interoperability is achieved by defining and adopting a common vocabulary and terminology in all systems and services. The definition and maintenance of such a “dictionary” is usually assigned to a central government office. The Technical interoperability is defined as the ability to transfer and use information in a seamless and efficient manner between systems and organizations. This level of interoperability consists of technical requirements for storage, construction, transport, presentation and data security services. The Technical interoperability represents the interoperability of the infrastructure and software.



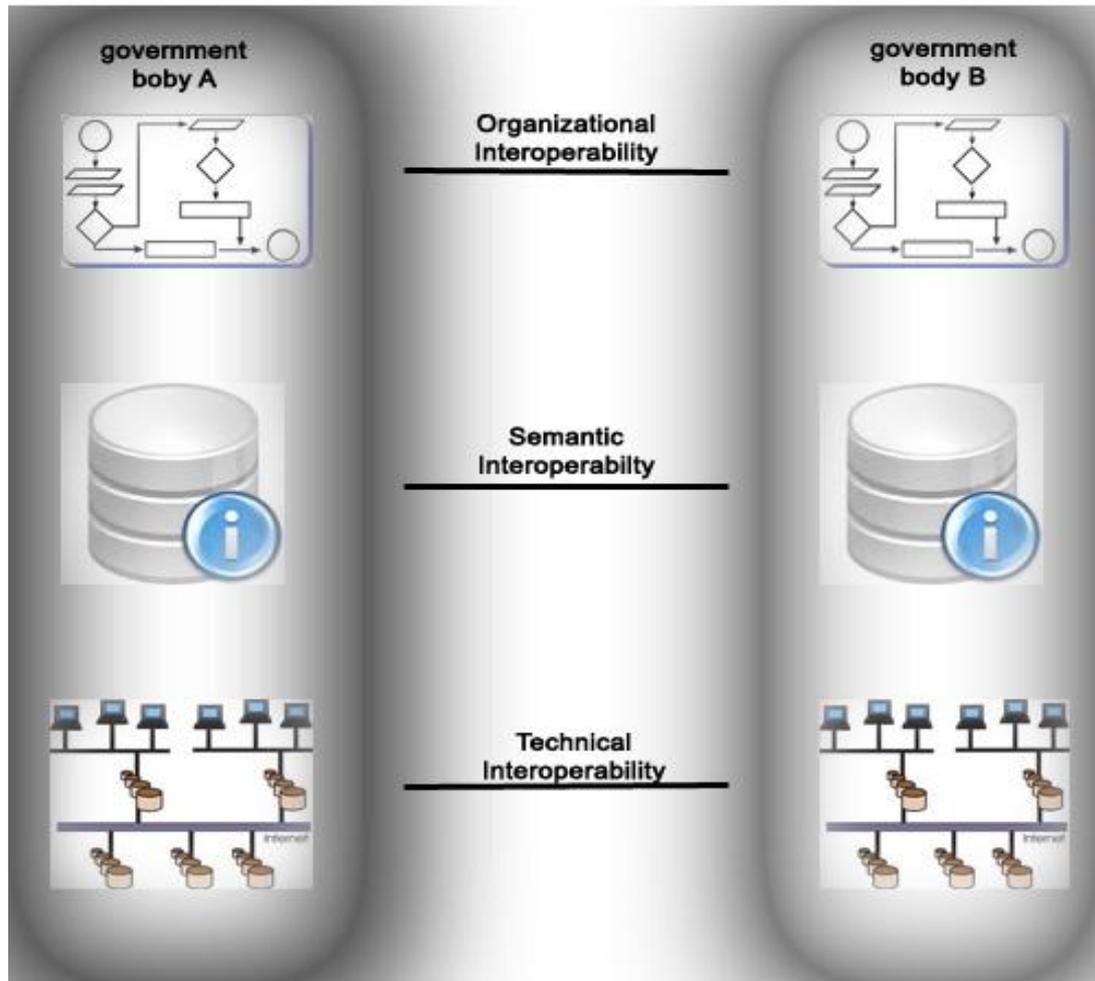


Figure 2: Interoperability Levels

It should be noted that interoperability at the information system level cannot be achieved, if we do not first ensure interoperability between procedures and data. Furthermore, operators that do not have a full machine support for all processes can be made interoperable only in terms of procedures, or in terms of procedures and data.

1.3.3 European and National Policy for eGovernment

The international environment of Information and Communication Technology (ICT) is highly competitive. Europe accounts for about one third of global ICT sales, which shows that investment in research and innovation in the ICT sector is crucial for continuous employment and short and long term development. The dynamic characteristics of this area are obvious, with increased competition, particularly from the U.S. and Japan. In Europe in particular, the expansion of broadband services is evident and access to such services has increased significantly. Furthermore, a corresponding increase has been observed in the on-line availability of public services with the

gradual growth of the use of ICT by businesses creating opportunities amongst European companies.

Similarly, the situation in Greece concerning the role of ICT improves hand but requires continued intensification of efforts to achieve digital convergence. The rate of Internet access of households and the use of electronic applications and broadband services, although improved compared to the past are very low at this time. The situation is comparatively better for business, particularly as regards the availability of the necessary infrastructure and less in terms of the dynamics using new technologies. Additionally, it has begun a major effort for the penetration of ICT in public services, particularly for digital services. Their use is expected to expand, combined with the increasing use of Internet by citizens. Alongside the public organizations have different aspects that differentiate the business. The reorganization of public services and the introduction of new procedures is related to very different factors such as politics, laws, national security, citizens' personal data and more. Strict and inflexible bureaucratic organization of public services gradually loses its meaning in a dynamic market like today.

1.3.4 Lisbon Strategy- Strategy i2010

In May 2000, the European Commission met in Lisbon and prepared The EU Action Plan to 2010, which became known as "Strategy of Lisbon". The Lisbon Strategy is a commitment and agreement between the European governments to focus their efforts on a single target. Their goal is to make the EU a more competitive and dynamic economy of knowledge in the world, an economy characterized by growth, social cohesion, respect for the environment, productivity and employment. The Lisbon Strategy reflects the priorities and proposed guidelines, which should be in line with the needs and particular problems of each Member State. The goals although sound very simple, are so difficult to be achieved. Technology was the key factor for all these targets, which is why in June 2000, in Feira, the EU announced the initiative eEurope that was mapping the technology strategy of the EU.

The European Union, after a five-year e-effort in the initiative eEurope, found that the progress towards the 2010 targets should be redefined. Additional measurements, surveys and studies suggested that Europe is not keeping up to date with new technologies, while under-performing in the investment in ICT research and new product development. The prefix "e" was then abandoned, and the EU presented the new i2010 strategy that revolves around three main themes: achievement, investment and quality of life. The prefix i needs to fulfill three goals:



- The first goal ("internal market for information services") refers to creating a common European space for the Information Society, where knowledge and the technology will spread faster and be used by all citizens.
- The second goal ("investment in ICT innovation for competitiveness") focuses on the issue of investment in exploiting new ICT technologies and on the rise of competitiveness across the EU.
- Third and final goal of the target ("inclusion and better quality of life") is to ensure a better quality of life for European citizens and use Information Society to address the phenomenon of social exclusion.

The i2010 strategy aims to strengthen the eGovernment European level and identifies key milestones. The main points are:

1. Citizens and businesses in the spotlight.

The eGovernment, after 2005, aimed solely at citizens and businesses to meet their needs. Both can be considered as potential users of eGovernment services which are focused to improve the quality of life, improve the job performance and offer more information about the global marketplace. Public services need to design processes from the user's perspective, taking into account the requirements, priorities and preferences of each individual user category.

2. Electronic identification of users and authentication of transactions.

The communications and transactions of citizens and businesses with public services must ensure the identification and privacy of the Contracting Parties and follow the institutional requirements for undertaking legal administrative transactions. In this context, the i2010 strategy states that by 2010, real-time transactions (online) were developed across Europe through a pan-European interoperable identification and authentication system.

3. eGovernment for all.

The electronic services and electronic products will have value if and only if all the citizens and businesses have access to them. Everyone must participate equally in society, without geographical, economic and cultural exclusion.

4. Efficient and effective public administration.

EGovernment offers the opportunity to create productive and efficient public administration. Therefore, by 2010 efficiency should increase by 1% of the Gross National

income and public authorities must have effective business products and services of high quality.

5. E-Procurement.

Each country of the European Union is placing orders that mount up to approximately the 15% of the Gross National Income. The objective in this area is: By 2010, state acquisition should be done electronically so that all companies can participate in the relevant competitions.

6. Cross-border services.

The eGovernment can facilitate the free movement of people, funds, goods and services between member states and contribute to creation of a united Europe. So, by 2010, pan-European cross-border applications should have been developed, permitting welfare, job searching, permit obtainment, new company establishment, VAT procurement etc.

1.3.5 The e-Europe initiative

The Information Society has a large potential for improving productivity and quality of life. This potential is increased due to technological developments of broadband and multiplatform access, ie the connectivity to the Internet by means other than the personal computer, such as digital television and third-generation cell phones. These developments are opening up significant economic and social opportunities. The new services, applications and content will create new markets and provide the means to increase productivity and hence growth and employment across economy. It will also provide citizens with easier access to information and communication tools.

The draft e-Europe 2005 implemented various measures that aimed simultaneously on both sides of the equation. On the demand side, there are activities in eGovernment, eHealth, elearning and ecommerce, which will lead to the development of new services. On the supply side, actions on broadband Technology and security are expected to promote the spread of infrastructure.

The Lisbon Strategy is not limited to the productivity and development, but also employment and social cohesion. The project e-Europe 2005 puts users-citizens at the center. It will strengthen the cohesion, provide opportunities for all and improve skills. It contains measures on eInclusion in all action lines. An important tool for achieving this goal is to provide services to multiple platforms. It is generally accepted that not everyone will want to have a PC. The ensuring that services, particularly online services of public entities, are available through various alternative



channels such as television sets or Mobile phones is critical to ensuring that no citizen will be excluded.

The Action Plan e-Europe is based on two groups of actions that reinforce each other. Firstly, it aims to stimulate services, applications and content, covering both online public services and e-business and secondly, it promotes the development of the underlying communication infrastructure while examining security issues. According to the Action Plan e-Europe, Europe should have, modern online public services, eGovernment, e-learning services, e-health, dynamic e-business environment, widespread availability of broadband access at competitive prices and secure information infrastructure.

The EU can measure the progress of member states in electronics government and consultation with the countries themselves, has created a list of 20 basic public e-services (12 to citizens and 8 to businesses) which appear in figure 3. The services are annotated as stage 3 or stage 4 web services, with more detailed description provided below.

Service Name	Target Group	Service Provider	Service Stage
Tax income / employer contribution: payment, record	Business	Central Government	4
Tax: declaration notice, pay	Business	Central Government	4
VAT: registration, declaration payment	Business	Central Government	4
Incorporation	Business	Central Government/ Local Government	4
Submission of information from statistical offices	Business	Central Government	3
Export Permits	Business	Central Government	4
Permits related to Environment	Business	Local Government	4



Public procurement	Business	Central Government	4
Tax Income: declaration, notification contributions, payment	Citizens	Central Government	4
Finding Work Services including application for work public bodies	Citizens	Central Government/ Local Government	4
Application for social allowances	Citizens	Central Government	4
Personal documents (Identity, driving diploma, etc.)	Citizens	Central Government	3
Car registration	Citizens	Central Government	4
Building permits	Citizens	Local Government	4
Statement to Police (Eg in case of theft)	Citizens	Central Government/ Local Government	3
Using public Library (Electronic catalogs, search engines)	Citizens	Central Government/ Local Government	4
Certificates (Birth, marriage): apply and send	Citizens	Local Government	3
Registration for schools universities and applications for discharge certificates and degrees	Citizens	Central Government	4



Change home address	Citizens	Local	3
Notices		Self-government	
Services related to health (eg waiting lists at hospitals)	Citizens	Central Government	4

Figure 3: List of European Union Essential Electronic Services

At the same time, wanting to examine the availability and extend of e – services, the EU has adopted a method that was developed by the Dutch government, under which each web service can be classified in the following 4 stages as shown in Figure 4:

- First Stage: Information - Publication. Inform the citizens about the provided services and provide instructions on how they can be used properly. At the first stage, the services are not provided electronically, its only goal is to inform the citizens about the existence of a service.
- Second stage: Interaction. In this stage, the web forms that are required to be submitted to a government office are provided and the citizens are allowed to download and print them.
- Third Stage: Two-way interaction. In this stage the citizen is provided with an online web form with the required fields. The citizen can fill in these fields and receive the required service. The web form may require an authentication procedure. However, the service is not completely electronic and requires human interaction with a public sector to be completed.
- Fourth stage: Transaction. In the last stage the service is completely electronic. It does not require any human interaction and consists of electronic routines like authentication, payment, decision making and delivery.



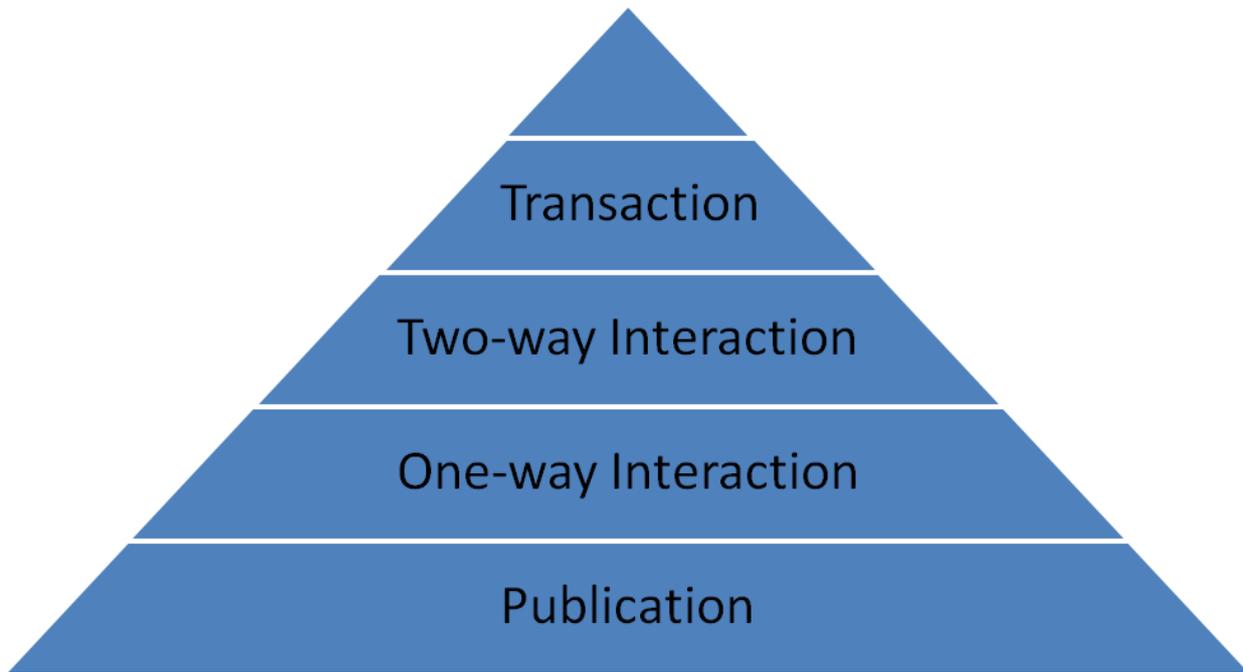


Figure 4: Stages of eGovernment Services Availability

It is worth mentioning here that not all services can reach the fourth stage. For example, driving license provision can reach up to the third stage since the citizen himself would have to receive the license from the central department.

In figure 5, several interactions between citizens and authorities can be observed. Public administration actively provides e-services to each relationship and as a result a citizen can possibly make an electronic claim in a G2C interaction, a government entity can make an electronic transaction with another government entity in a G2G interaction and the government can announce a public works contract in a G2B interaction. Similarly we can see a similar service provision with Citizens or Businesses as providers:

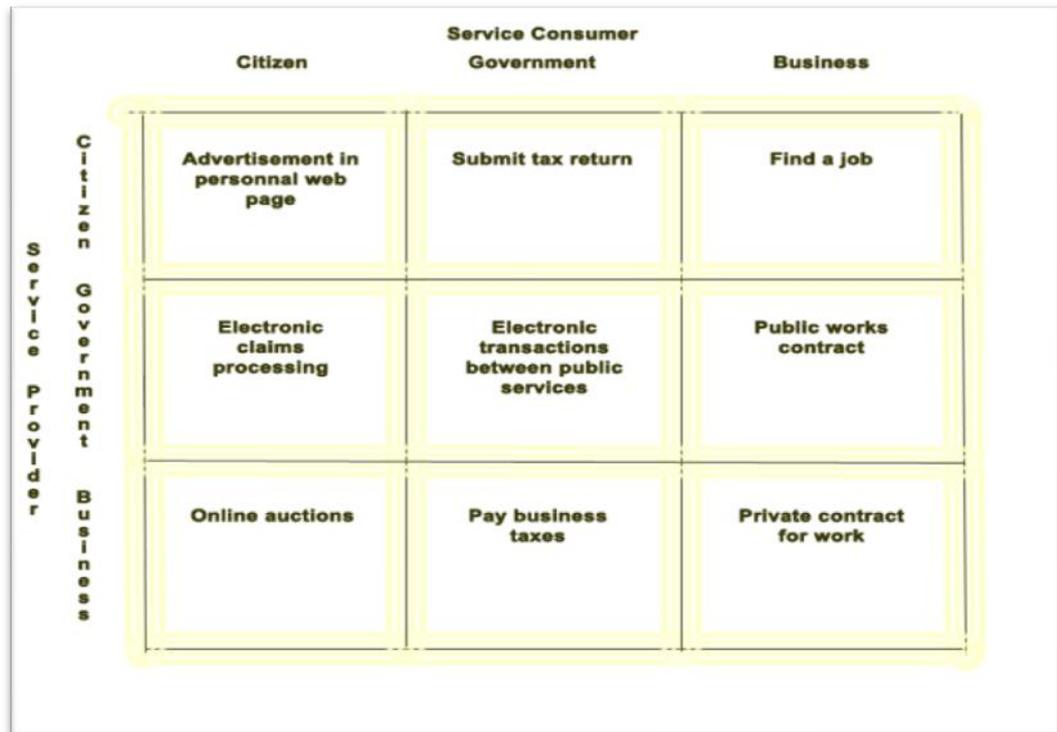


Figure 5: The principle interactions and examples

1.4 Famous eGovernment platforms

It is important to mention here and briefly describe some well-known eGovernment platforms which are provided across the world. For each application we mention the country of origin, the operating public entity, the web site and provide a small description.

Country	Greece
Operating Entity	Municipality of Heraklion
Web Site	http://www.heraklion-city.gr
Description	The website of the city of Heraklion is organized into three different levels. One for the city, one for the municipality and one for the online services. The first level presents general information on the city and is divided into categories. There are also specific topics that are addressing either the citizen or the visitor. The second level of organization is similar, but the topics there are related to matters of the Municipality of Heraklion The third level provides electronic services to both citizens and businesses offering two levels access. In Access Level A the citizen logs in by using "Username" and "Password". However, the citizen is obliged to personally



	<p>collect results of his claims. Access Level B is authenticated by personal presence in the Responsible Citizen Service of the City where he personally authenticates the "username" and "password". The difference is that after that authentication he has the right to submit demands and take documentary evidence or certificates by mail. He also has the right to access data such as economic debt, invoices, etc.</p> <p>Another service provided to visitors is the opportunity to express their opinion through forums, more in thematic areas related to the municipality or general interest. Finally, there is information available on local issues and matters relating to specific population groups, including elderly people, women, young people, foreigners and companies.</p>
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Country	United Kingdom
Operating Entity	UK government
Web Site	http://www.direct.gov.uk
Description	Directgov is the UK government's digital service for people in England and Wales. It delivers information and practical advice about public services, bringing them all together in one place. You can access Directgov on the web, on your mobile or on your television.

Country	Singapore
Operating Entity	Singapore government
Web Site	http://www.ecitizen.gov.sg/



Description	<p>The Singapore eCitizen portal is a particularly good example of a "one-stop shop" eGovernment website, providing citizens with access to a very wide range of fully online services. Access to the services is provided primarily via option lists labeled "I want to." or "How Do I.", a sign of the adoption of a strongly user-centered approach to the information architecture. The information is also listed by subject, and the site is linked to most other governmental websites. The Singapore eCitizen portal represents an example of best practice in eGovernment web services, its only weakness being perhaps the apparent lack of implementation of measures to make the site fully accessible to the disabled.</p>
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Country	South Africa
Operating Entity	South Africa government
Web Site	http://www.gov.za/
Description	<p>The government of the Republic of South Africa also adopts a courageous and direct user-oriented approach, by providing access to services directly from its main homepage. The provided functionality was greatly enhanced during the past years, because of the organization of the World Cup in 2010. The number of fully online services offered by the services site itself (http://www.services.gov.za) is still rather limited but there is a lot of information available for consultation (especially geographical), and in many cases users can download the forms needed to interact with the different government agencies. The information is well organized, according to the user profile (individuals, organization, and foreign nationals) and the transaction type, or subject. But unfortunately also in this case there appears to have been no implementation of specific accessibility measures for the disabled in the design of the site.</p>

2. EGovernment in Greece

A serious drawback of the Greek public administration, such as currently organized, is the poor quality of services provided to citizens and businesses. The main reasons for the poor quality



of service are bureaucracy, imperfect information, long times for processing requests, unfriendly treatment and corruption.

The rapid development of information technologies and communication, and the opportunities generated by the use of the Internet today, has created new challenges to pursue a proper and efficient functioning of public administration and establish a new contact between citizens and public services. In this way, functional modernization of the state should be centered and driven by the citizens' actions, rights, needs and problems.

Referring to the concept of eGovernment, which is in simple words the use of Information and Communication Technologies (ICT) to meet operational purposes, we are interested in the expected citizen satisfaction on the basis of several objectives. Those objectives should arise from the emergence of an open and transparent public sector. Administrative services should be more accessible and accountable to citizens. The ICT strengthens the communication links and can bring the government entities closer to citizens by promoting the participation on recent decision-making process. Lastly, administrative services that are available to all should be developed. A public sector focused on the citizen should not preclude any of its services and should treat each citizen individually, providing personalized service. Finally, the government must ensure a productive public sector, able to provide the best use of available financial resources. The basic premise is that investment in new technologies should be combined with investment in the reorganization of public administration and improvement of the skills of officials.

Digital technology offers the possibility of easier access and better use of the wealth of information in the public sector. eGovernment could transform the organization of the public sector and respond faster using these services. It can increase efficiency, reduce the costs, increase transparency and speed up the normal administrative procedures for citizens and businesses.

Electronic access would also be a major contribution to accelerating the transition to information society by strengthening the major web services. The purpose of eGovernment is to allow easier access to public information through the expansion and simplification of access of citizens on the Internet. Typically, the access of citizens to public information is made in three ways: either by phone or Internet, through personal presence in services or through Customer Service Centers. The ultimate goal is to reduce the movement of people looking for information and allow the Internet to prevail as the most appropriate way of accessing or managing information.

Moreover, the provision of public information is categorized as follows:

- **Information - leaflets on administrative matters.** Forms that are issued by public agencies on a regular or irregular base play an important role in informing the people on administrative activities. Significant effort should therefore be paid by each operator on the production of information bulletins for the citizens, especially when a new measure is being applied.
- **Citizens Call Centers.** The purpose of these centers is to provide various information (administration services, tourism issues, youth issues, cultural events, professional issues etc.) to interested citizens. For example, 14944, is the telephone center that provides information to citizens about hospitals and pharmacies 24 hours a day.
- **Websites.** The websites of public bodies should be continuously updated towards providing full information to citizens and emplacing the delivery of electronic services to them.
- **Access to administrative documents.** Under Article 5 of administration procedures code, public services are obliged to grant the right of each concerned, upon written request, to inspect administrative documents. If you have a specific interest, you can request to take insight of private documents kept in public services.

2.1 Information Society (IS) Program

The rapid development of information technologies and telecommunications brought about significant social and economic changes and established a modern form of society known as the "Information Society". For our country to meet up with these modern structures, the government prepared and implemented the Operational Program "Information Society" that is enrolled in the 3rd Community Support Framework.

The Ministry of Internal Affairs, Public Administration and Decentralization through the Operational Program "Information Society", started to develop the appropriate technological and organizational environment and the necessary institutional framework that will allow the government to evolve into a modern, efficient and effective electronic government. Promoting eGovernment aims at a better and friendlier citizen service through the implementation and use of Technology Information and Communication at all levels of government and particularly in terms of the Citizen's transaction with it.

Today, almost all ministries, regions, prefectures and municipalities have websites. These sites have been developed independently of the operators. They do not follow a common design or



organization and there is no cooperation between them. It is necessary therefore to set a model of "public place" and to establish common standards of design, architecture, operation and interconnection. Furthermore there is no mechanism for monitoring and certification of public places. The Information Society Program aims to implement the main points of the White Paper of the Greek government entitled "Greece in Information Society: Strategy and Actions" which was prepared in accordance with the program e-Europe. In summary the objectives were the creation and provision of improved services and information, the economic growth, the encouragement and actively support to the participation of the public.

More specific objectives are:

Digitization of Information

- Conversion of existing public information in digital form, organization of this information in supported databases and ensuring electronic access for citizens and businesses in these databases.
- Provision of complex, expanded and enhanced services to the private sector.
- Appropriate interoperable interfaces.
- Creation of the appropriate technical and functional integrated environment for public services.
- Development of "citizen-centric" applications.
- Creation of pilot sites which together with the Central Portal of the Ministry of Internal Affairs will support electronic transactions of citizens and businesses with public services.
- Standardization of digital communications between public services and development of knowledge management systems using innovative methods.

Online transactions

- Creation of integrated electronic transactions.
- Development of institutional and technical interoperability services for the Public Administration.
- Improvement of digital infrastructure for optimal operation of the service of Public Administration.
- Creation of the suitable framework for electronic transactions: single Service at one-stop-services web portal.
- Confidentiality and Security of transactions.

- Guarantee of a safe framework for business transactions and citizen protection of individuals from the unlawful use of personal information.
- Ability to identify the trader: smart cards, digital signature, encryption, decryption.

Provision of information to citizens and businesses

- Improved service to citizens by minimizing necessary contacts with public administration and make a functional reconstruction of procedures with the use of Information and communication technology.
- Achievement of efficiency, quality, transparency in Public Administration services.
- Use of new technologies in public administration in the creation of modern participatory democracy.
- Creation of a stable framework of principles for the creation, distribution and management of public information. Free availability and accessibility for all specific data categories.
- Creation of the respective databases for specific administrative, technical, financial, and legal information necessary for the operation companies in the private sector.
- Economic factors need safe and inexpensive access to high quality of public sector information.
- Limitations and exceptions to the right of access to public information.
- Rules for placing information on the market (pricing, intellectual rights practices of fair competition).

The adoption of eGovernment involved the implementation of a general framework of interventions that contribute to society and allow electronic and secure business transactions. That framework was program "State". The main focus of "State" was the integration, development and use of Information and Communication Technology (ICT) to improve the quality of services for citizens and businesses. There are three Information Technology projects currently running, which will contribute to the implementation of electronic transactions in public and they are:

- Creating and Modifying National Portal "Hermes", which is the "national reference point" and will act as one stop service for digital communication between citizens and businesses with public administration.
- Creating Unified Authentication Systems and security transactions. Digital transactions for citizens and businesses with the government must ensure the authenticity and protection of personal data. Each new system should rely on the electronic signature. Citizens will submit

their electronic signatures, their request in the National Portal, will establish the identity and the request will be routed to the appropriate department.

- Creating and institutionalizing a Unified Interoperability System, which will establish uniform rules for standardized communication between services, processes and IT systems. Based on these interoperability rules, government agencies will collaborate digitally to provide full service to stakeholders.

2.2 Development Strategy for the Period 2007 – 2013

Greece's development strategy is defined in the document for the development strategy for the Period 2007-2013. This strategy among other various sectors includes several key parts for ICT. These key parts can be presented as the following key national priorities:

Priority 1: Improving productivity using ICT:

This priority axis comprises measures for all parties involved in the production process: firms, employees and the wider public sector. Taking interested parts into account the Priority Axis 1 can be specialized in 4 specific objectives:

- Specific Objective 1: Promoting ICT use in enterprises.
- Specific Objective 2: Provision of digital services to enterprises and reconstruction of public sector services.
- Specific Objective 3: Strengthening the contribution of the ICT sector in the Greek Economy.
- Specific Objective 4: Promoting entrepreneurship in areas that utilize ICT.

Particularly for the Specific Objective 2: Provision of digital services to enterprises and re-engineering of public sector services, the following comment can be made. The efficient operation of the public sector through the introduction of effective procedures for handling business contributes significantly to enhancing the competitiveness and attractiveness of a country for investment. According to the most recent survey of the World Bank, "Doing Business 2010", Greece ranks in the 122nd place among 133 in the world, in terms of the number of procedures related to start-ups, establishment costs, time, etc. Measures aimed at a drastic reduction of costs in the business sector and public service sector will boost competitiveness. Furthermore, it is an equally necessary action to improve the institutional setting issues hindering the diffusion of new electronic services (Digital signature, copyright protection, regulations for financial transactions via mobile technologies etc.).

At the same time, it is necessary to develop integrated applications for digital services which are proposed to offer support in the form of “trading hubs” (e.g. electronic or thematic nodes for tax transactions, transactions insurers, trade with Prefectures, electronic processing of public supplies at regional level). With the above measures, the problem of fragmentation of ICT that occurs widely in the public sector at national level is expected to be tackled by setting Priority Axis 2.

Priority 2: Improving the Quality of Life

Priority 2 specializes in 2 specific objectives:

- Objective 1: To improve daily life through ICT - Equal participation in digital society in Greece.
- Objective 2: Development of digital services to serve citizens.

Particularly for the Special Objective 2: “Development of digital services to serve citizens” we can say the following: Improving the quality of service of the Public Administration is possible through the use of ICT. In particular, it is proposed to focus on redesigning and digitally providing the most frequently used services, as well as targeted e-mail information service to citizens of each region based on local needs. The development of these applications is designed for all population groups (geographic, age, disability, etc.) and should strengthen the information provided from all types of the media (center - periphery, written - electronic, greek - international).

The entry of technology in the public sector may have begun years ago, but almost all over the world, governments are still wondering if the thread that has begun to unfold is the right one. Initially, eGovernment was implemented using all technologies, networks and software. In the process, however, it became apparent that in eGovernment, technology is not the protagonist, it is an instrument and therefore if no one can use the provided system, it loses its value. In the case of eGovernment, our country is in the final positions of European studies specialist. Apart from some small projects from local government entities, the penetration of eGovernment in public organizations is unfortunately characterized, as insignificant. At the same time the e-knowledge of the vast majority of people does not improve. There are many steps that must be taken to enable our country to reach the e-readiness of other developed countries. Perhaps eGovernment is the most crucial challenge of our country for the years to come.

The creation of Citizen Service Bureau (KEP) through the Ariadne program had improved the government services provision in Greece significantly and will play an important role in the transition to eGovernment [24]. Another important progress in eGovernment sector was the



announcement of two major projects Syzefxis[25] and TAXISnet [26], which are greatly used nowadays. It is however characteristic that the term eGovernment is not known to a great proportion of the Greek population. In a general context, we could say that the main barrier to implementing an eGovernment program is not technical. It is social and cultural. eGovernment must be followed by changes in the organization, philosophy and structure of public services. It requires the training of civil officials and citizens on how they could use the provided government services properly. It also requires defining a set of common standards and specifications that will cover every possibility of eGovernment and are prerequisites for any implemented application or service at the present day. That complex mixture of redesigning, defining new standards and specifications and announcing specific instructions is being set by the Greek Electronic Government Service Framework for Standards and Interoperability.

2.3 Greek Electronic Government Service Framework

The Greek Electronic Government Service Framework included the drastic redesign of the Greek Public Administration to provide eGovernment services to agencies, businesses and citizens. It is the cornerstone of the Digital Strategy 2006-2013 for tackling bureaucracy and adapting services to meet the requirements of modern times. It is inextricably linked with the goals and direction of European policy in European Information Society 2010. The Greek Electronic Government Service Framework aims to effectively support the eGovernment Central, regional and local government entities and to assist in achieving interoperability at the level of information systems, procedures and data.

The purpose of Greek Electronic Government Service Framework is to establish the operational and technological standards, which must be followed by administration operators to provide or plan online services. The adoption of standards, directives and guidelines will improve the level of service from operators of Public Administration in both quality and speed, allowing improving the overall functioning of the Greek Public Administration. It is the strategic cornerstone of the Greek Public Administration on the transition and adaptation services to the demands of the modern era and their harmonization with the European policy and guidelines.

The Greek Electronic Government Service Framework separates in three different panels, each by regulating specific aspects of e-Government. First panel is the eGovernment Service Provision Framework, which defines the issues that are addressing the service provision and consuming. In line with the covered services the Greek Electronic Government Service Framework



also provides a reservoir (Interoperability Registry), which contains standards and specifications that will enable the interoperability of government services between different government entities. Finally, the Greek Electronic Government Service framework is complemented by educational standards, educational material and dissemination material. A more detailed representation of the Greek Electronic Government Service into panels and subpanels is shown in figure 6.

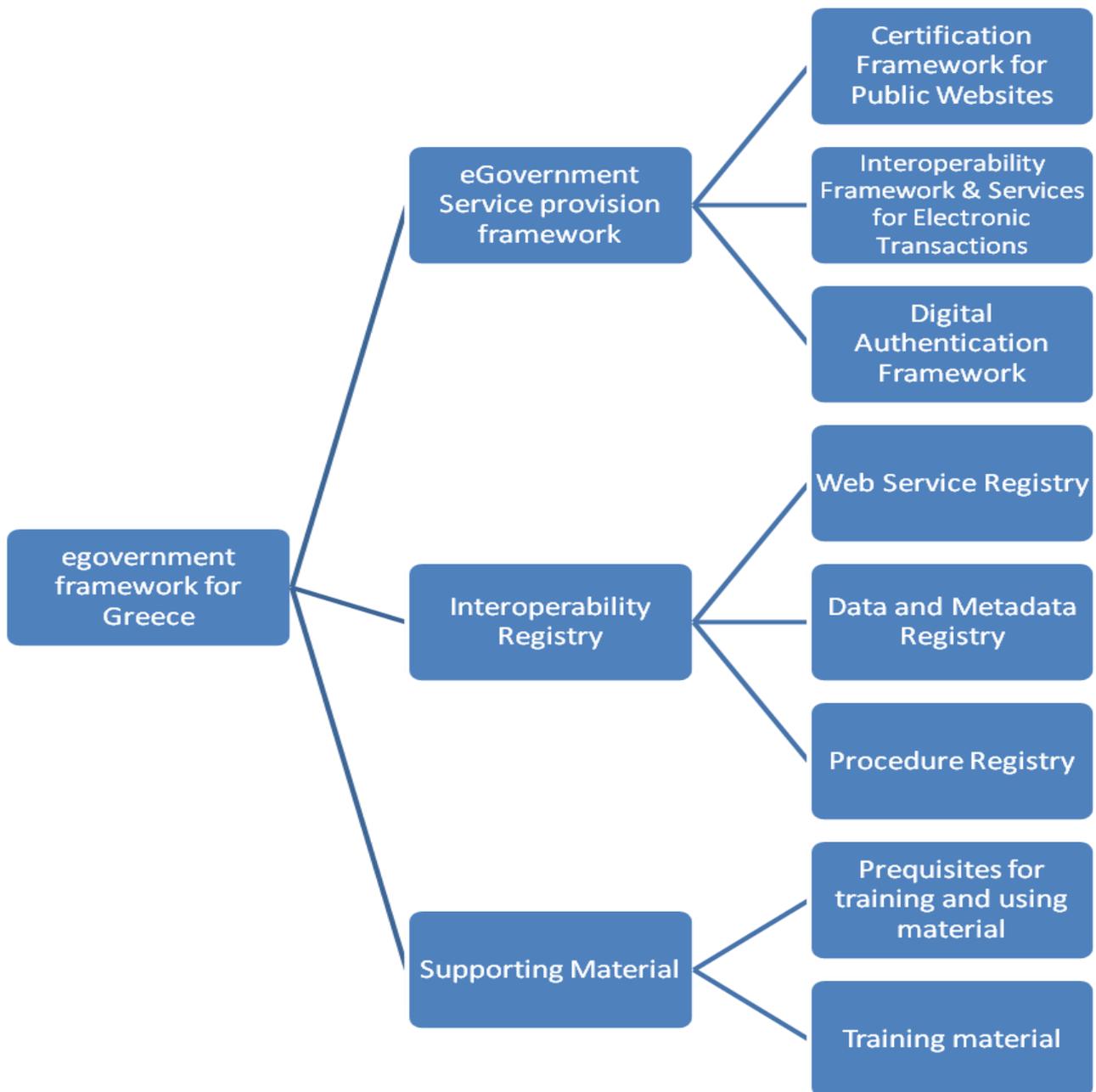


Figure 6: Architecture of eGovernment Framework

The Greek Electronic Government Service Framework is open to all players of Public Administration, who are developing or plan to develop information systems or government services. The Framework aims to support operators to design, develop, maintain and support the information systems. To achieve this objective, the Framework contains policies, technological standards and guidelines covering the information systems of public administration bodies that support and provide electronic services to citizens, businesses and institutions. It also contains documents and deliverables feasibility studies for the analysis and design of Information Systems of Public Administration and data formats and models of public organizations and description of the workflow Services to citizens and businesses. Lastly, it can support business information systems, to the extent where there is necessary interoperability with systems of public administration.

2.3.1 Components of the Framework

2.3.1.1 Framework for Certification of Public Websites

The purpose of the Certification Framework for Public Websites is to present rules, standards and specifications that should be followed by public administration bodies on the development, storing or viewing of content. The Certification Framework for Public Websites is also for everyone involved in the design, development, evaluation and support of a public web site.

The presence of the Greek government on the Internet is characterized by a high degree of heterogeneity, mainly because it is the result of efforts implemented without any central planning and allowed to obey to different specifications. The disparity was observed in each parameter design and operation of public web sites. The Framework for Certification of Public Websites aims to improve the above situation and to homogenize the presence of the Greek Public Administration on the Internet.

Adopting the framework from the bodies of public administration is expected to significantly improve their image, to facilitate interaction with the public, improve the quality and speed of service traders and to strengthen the provision of services through the Internet. It will give new impetus to the institutions to make content available online and use services by central government portals such as the Customer Service Center website (KEP) and the central government portal HERMES. For contractors developing public websites and software manufacturers, the implementation of the Framework will provide the ability to create products and applications that meet a set of common standards, which will be known in advance and will not differ significantly in



the development of public websites. Thus, it will be able to respond quickly to calls from public bodies to develop web sites by reusing software components with almost standard functionality.

The Framework for Certification of Public Websites provides rules and standards in the following categories and subcategories, which are parameters to be taken into account in the design, development and operation of public web sites:

- Website Management: The administrator responsibilities and user rights must be clearly defined. This would involve organizing website management, roles and responsibilities
- Structure and organization of public websites
This involves the naming of public websites which includes the domain name, language, writing style and size of the domain name. It also defines the desired structure of the website along with the content categories. The required content for each website includes a contact form, search engine, sitemap and navigation menu.
- Online Services and Interoperability. It involves Electronic Services including the Support for electronic services, Electronic payments, monitoring the progress of processing affairs, local printing and saving content
- Systems Security & Privacy. This involves Security Policies, Access – Authentication, Transmission, Storage, Integrity Trade Availability and system performance.
- Legal Issues: Privacy, Copyright, Disclaimers.

The guidelines and standards may be mandatory or optional, depending on the significance and degree of integration in each version of the Framework.

2.3.1.2 Interoperability Framework and Services for Electronic Transactions

The purpose of the Interoperability Framework and Services for Electronic Transactions is to define the general principles and strategy that should govern the development of information systems from entities of the Greek Public Administration. It must also define which technology standards should be used in order to implement data exchange among government entities or between government entities and users.

The services currently provided by public administration bodies to citizens, businesses and others are designed in such a way as to serve primarily the needs of their own bodies. In the same way they are designed and developed into information systems that support only these services. Especially in the case of information systems strategy, key principles and standards of design and development do not obey to a set of specifications that have arisen as a result of central planning,

coordination and optimization of procedures related to import and use of ICT in the public sector. Thus, each institution designs its own interventions at the level of ICT, which in most cases do not take into account the needs of the recipients of services or the need for communication, cooperation and data exchange with other public government bodies in order to provide integrated services to the final beneficiaries.

Additionally, despite the fact that there are significant initial applications and systems that have been implemented or are being implemented in the operations funded by the Second and Third Community Support Framework, the use of modern practices enabling an overall improvement in the data exchange of public institutions, is minor.

The Interoperability Framework and Services for Electronic Transactions is trying to provide solutions by setting common standards and specifications for the design, storage and provision of information from systems of public administration bodies. Also, the framework does not omit to define the general principles that should be followed by operators in organizational and operational levels, in order to be able to collaborate and share documents and files with other players that provide services to citizens / businesses.

The Interoperability Framework & Services Electronic Transactions analyze the levels of interoperability (organizational, semantic and technical) and identify the principles that should be followed by public administration bodies to achieve interoperability. At the level of organization and procedures, it identifies the architectural model, based on which the information systems of public administration must be designed and developed. Then, it specifies the semantic and technical dimensions of interoperability by defining policies, technology standards and guidelines to be adopted by the public bodies' administration in the following categories and subcategories:

- Documentation for Application Development for eGovernment: Modeling Methods, Model Specifications for data Exchange, Languages and Architectural Applications Implementation.
- Service Modeling: Modeling Methods, Languages Execution
- Data Modeling: Modeling Methods, Exchange Data Model Specification, Exchange Data Specification, Data Structure, Metadata, Metadata Mapping, Semantic Information Representation Languages
- Presentation and Information Processing: Accessibility, Hypertext exchange specification, Style sheets, character set encoding, Identification for Configuration File (File Formats),

Configuration for Text documents relating information exchange, Configurations about Audio, Video and Streaming.

- Link - Contact - Interoperability: Interoperability with third Systems and Network layer protocol, application layer protocols, Content Distribution
- Security and Authentication: Security Web Services for Data Transfer, Authentication and Encryption

2.3.1.3 Digital Authentication Framework

The purpose of Digital Authentication Framework is to support Administration bodies offering government services, with appropriate mechanisms for the authentication, the registration and the identification of users.

All online services currently offered by the Greek Public Administration, use as a method of authentication usernames and passwords to electronically confirm the users. It is a sad fact that the choice of each authentication method does not take into account the relevance of services, regarding the effects that may be caused to the operator and the user in the event of a security incident. This incident raises more questions regarding the appropriateness of each authentication mechanism, as well as the adequacy and reliability of the corresponding registration procedures.

The Digital Authentication Framework establishes rules and guidelines for the prioritization of each online service, and therefore the choice of authentication mechanisms is clear, simple, methodical and well documented. Rules are based primarily on the current legal and regulatory framework for the protection of personal data of the citizen.

The introduction of this Digital Authentication Framework by the operators of Public Administration should improve the security of electronic transactions significantly by applying the "principle of proportionality" in the selection of authentication mechanisms. This means that the more serious the consequences that may result from unauthorized access might be, the more powerful the authentication mechanisms should be. For contractors developing electronic services and for public entities manufacturers, the Digital Authentication Framework will give the ability to create products and applications that meet a common set of authentication standards, which will be known in advance and will not vary considerably from project to project.

The main contribution is to provide specific guidelines, rules and guidance based on the current legal - regulatory framework related to:

- The classification of data processed by electronic services. Such data can be plain data, financial or sensitive. The Law 2472/97 protects the individual from the processing of personal data as amended, defines that personal data (Article 2a) and the sensitive data (Article 2b).
- The definition of "confidence levels" for electronic services, taking into account the possible consequences that may be caused by incorrect operation or management.
- The relationship of trust with any appropriate authentication, where each authentication level sets specific authentication mechanisms.
- The correlation of each level of trust with the appropriate processes for recording of the service users.

As a result the bodies of public administration that design and develop electronic services must firstly understand the minimum confidence of each implemented service. This understanding will lead to the choice of the proper electronic authentication mechanisms and the related registration procedure that will provide the required credentials for that mechanism. The Digital Authentication Framework will answer which authentication mechanism is proper for each confidence level.

2.3.1.4 Model Documentation

The aim of the Model Documentation is to describe the notation, rules and standards that need to be applied so as to develop models, procedures and data - metadata. At the same time, it makes contracts about the naming, designing and administration of different versions of models so as to ensure the addressing of issues related to these areas for the Greek Public Administration in a uniform way. Model Documentation is based on specifications and standards modeling, set by international organizations such as the World Wide Web Consortium (W3C), the United Nations Centre for Trade Facilitation and the Electronic Business (UN / CEFAC) and Object Management Group (OMG).

The adoption of standards, guidelines and directions should provide an understanding of the processes and information exchange in a single view and maximize the reuse of information. Reuse can be achieved by defining standard procedures and data components using specifications from the mentioned international organizations. Last but not least, the specifications should be used to provide a homogenous process model for each administration body.

The areas of Model Documentation are taking into account the contents of the Registry of the Interoperability Office and the documentation that is required before the the development of a new information system. The basic guidelines that arise from Model Documentation are:



- Each service should be recorded and modeled in a standard way. The metadata and models generated will be published to the Registry and will help to identify points of Interoperability between operators.
- Each document exchanged in a service should be analyzed and modeled in XML Schema and published into the Registry of Core Components and metadata described in the Model Documentation.
- Each web resource must be published under the instructions for metadata as described in the Model Documentation.
- Each Web Service that will enable electronic communication between points of Interoperability must be based on the standards set in the Model Documentation. The WSDL file documenting the Web Service must be published at the Registry together with metadata, model and XML Schemas documents exchanged in order to facilitate the discovery and use of the service.

Model Documentation is the basis of the Interoperability Framework of Electronic Transaction Services and assists the structure of Processes, Data and Metadata of the Interoperability Registry. Regarding the Interoperability Registry, Model Documentation contributes to the representation of the real world which involves Entities, Services, Data Tracking and Information Systems without any omissions or assumptions.

2.4 The Networked Readiness Index (NRI)

The Networked Readiness Index (NRI), established by the World Economic Forum (WEF), measures the propensity of countries to exploit opportunities of Information and Communication Technology (ICT) for development and increased competitiveness. It takes into account data from official sources such as the ITU (International Telecommunication Union) and the World Bank, as well as data from the annual Executive Opinion Survey. The framework assesses the extent to which different economies benefit from latest ICT advances, based on three main principles, as follows:

1. Environment is a crucial enabler of networked readiness. The successful leveraging of ICT is strongly influenced by the overall environment provided for innovation and ICT use. In this concept, efforts made by the government and other relevant actors to put in place policies for a supportive market and regulatory environment are considered beneficial.

2. A multi-stakeholder effort is the key. Although the government has a natural leadership role to play, when it comes to establishing an ICT and innovation friendly environment, a joint effort from all the actors is needed to achieve optimal networked readiness. The recent development history of some of the most networked economies in the world (Estonia, Israel, Korea, or Singapore) shows that the alliance between a far-sighted government and an actively engaged private sector on the definition and implementation of a common ICT vision has been extremely powerful.
3. ICT readiness facilitates ICT usage. Preparation and willingness to use ICT is a critical determinant of effective ICT readiness in all parts of a society. An economy whose stakeholders are more ready and show a greater interest toward ICT advances will be likely to use it more effectively and extensively.

Figure 7 depicts the Networked Readiness Index, together with its three dimensions: environment, readiness, and usage. The environment component is broken down along market, political, regulatory and infrastructure lines, while the readiness and usage components are along the lines of the three main stakeholders (individuals, businesses and government).

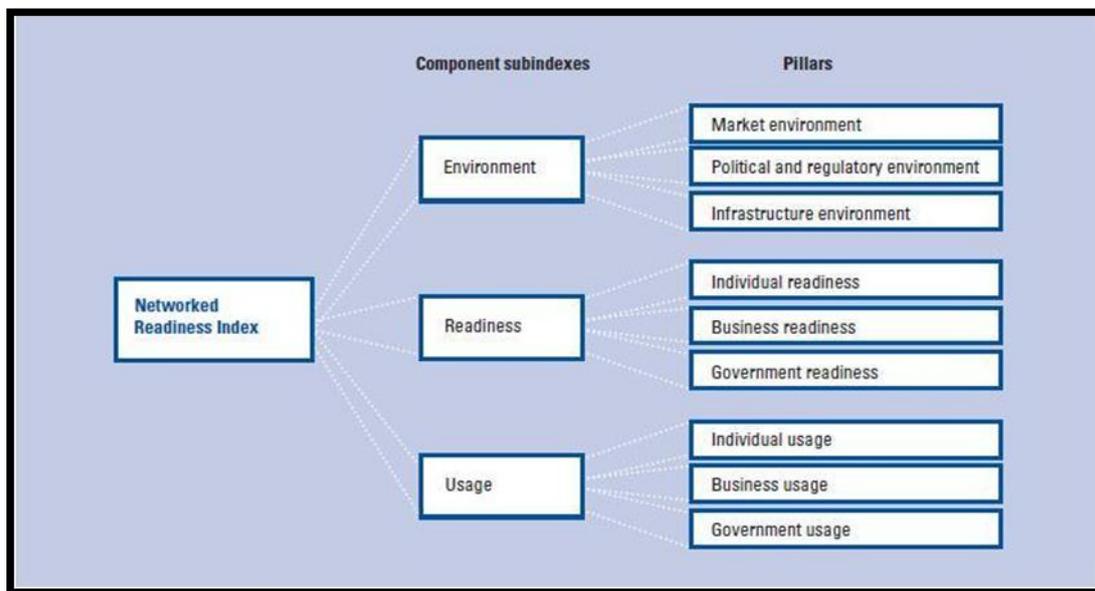


Figure 7: NRI index and sub indexes

The final NRI score is a simple average of the three composing subindex scores, while each subindex's score is a simple average of the composing pillars. A brief description of the different composing elements (at the subindex and pillar level) of the NRI follows.

Environment subindex

The environment subindex measures the extent to which the market, regulatory and infrastructure environment of a given country is conducive to innovation and ICT development. It includes a total of 30 variables grouped into three different pillars, relating to the market, regulatory, hard and soft infrastructure dimensions.

The *market environment pillar* (11 variables) gauges the quality of the business environment for ICT development and diffusion in any given economy, taking into account dimensions such as the availability of appropriate financing sources (notably venture capital) and the extent of business sophistication (as captured by cluster development), together with the ease of doing business (including the presence of red tape and fiscal charges) and the freedom of exchanging information over the Internet (proxied by the freedom of the press).

The *political and regulatory environment pillar* (10 variables) captures the degree to which the national legal framework facilitates innovation and ICT development. In this sense, general aspects having to do with the protection afforded to property rights, the independence of the judiciary and the efficiency of the law-making process. ICT-specific features, such as the development of ICT laws and the extent to which intellectual property is protected, are also considered, along with the level of competition in the Internet and mobile telephone services.

The *infrastructure environment pillar* (9 variables) assesses the quality of the national ICT-related infrastructure, both in its hard (namely the number of telephone lines and secure Internet servers, electricity production, Internet bandwidth and accessibility of digital content) and softer elements, which are related to human resources. In particular, to capture the human infrastructure in a given economy, quantitative measures such as tertiary enrollment rates and education expenditure are combined with a qualitative assessment of the scientific research institutions and the availability of scientists and engineers.

Readiness subindex

The readiness subindex assesses the preparation and interest of the three stakeholders to use technology, particularly ICT, in their day-to-day activities and transactions. With a total of 21 variables, this subindex gauges the main aspects of individual and business readiness (including the existence of appropriate human skills for using ICT) as well as of government readiness (among these indicators is the prioritization of ICT in the national agenda).

The *individual readiness pillar* (8 variables) measures citizens' preparedness to use ICT through a comprehensive selection of indicators, including the quality of the educational system

(notably maths and science education), Internet access in schools, residential telephone connection charges and monthly subscription costs, together with fixed broadband, mobile and fixed telephone lines tariffs.

The *business readiness pillar* (10 variables) provides insight on the degree to which firms are inclined and ready to incorporate ICT into their operations and processes. Elements taken into consideration are the quality of on-the-job training, spending on research and development (R&D), collaboration between academia and the industry (key to fostering applied innovation and intrinsic to solid clusters), the quality of suppliers in the economy and the affordability of ICT for business.

The *government readiness pillar* (3 variables) represents an attempt to capture government's vision and prioritization of ICT in the national agenda and competitiveness strategies, including the extent to which public procurement of high-tech products are used as a tool to promote efficiency and innovation.

Usage subindex

The last component of the NRI measures the actual ICT usage by an economy's main stakeholders, focusing in particular on the impact of ICT in terms of efficiency and productivity gains, with a total of 17 variables.

The *individual usage pillar* (5 variables) measures ICT penetration and diffusion at the individual level, using indicators that present the number of mobile and broadband Internet subscribers, Internet users, personal computers (PCs), and Internet access in schools.

The *business usage pillar* (7 variables) captures the capacity of the business sector to absorb and generate innovation and technology by factoring in variables such as the prevalence of foreign licensing, the capacity for innovation as well as the extent to which businesses use the Internet in their daily transactions and operations.

The *government usage pillar* (5 variables), in turn, analyzes the implementation of the vision captured by the government readiness pillar described above as well as the actual usage of ICT by the government. Government's success in promoting ICT penetration, e-participation, and the development and quality of e-government services are assessed, as well as the government's own ICT usage and the extent to which this has led to productivity and efficiency gains.

2.5 Overall Ranking of Greece

In 2010 according to the Networked Readiness Index - NRI of the World Economic Forum (WEF), Greece ranked in the 56th place among 133 countries. Compared to the previous six years

there have seen a loss of 14 seats in total. Specifically in 2006 there was a loss of a single seat, in 2007 5 seats and in 2008 8 seats. In 2009 Greece gains 1 seat which it loses the next year (Figure 8). This is due to the addition of new countries in the overall standings every year. Nevertheless, comparing the performance of Greece to the other EU-27 countries (Figure 9), the decline and weakness of our country to catch up in readiness for new technologies is also evident.

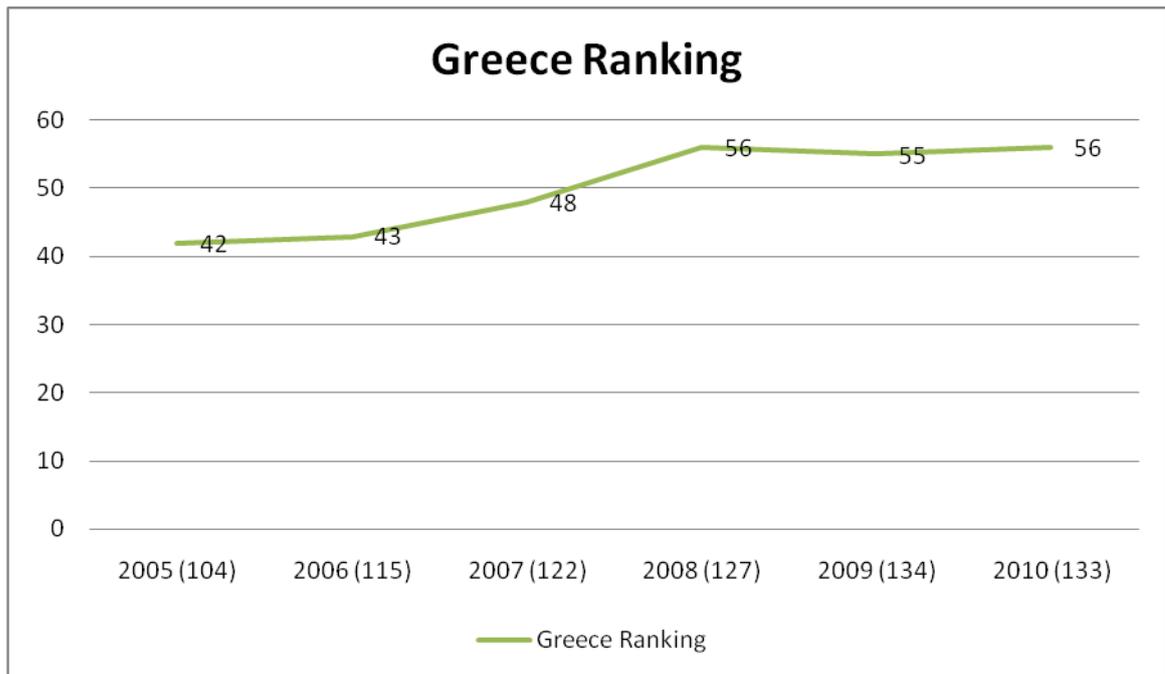


Figure 8: NRI Ranking of Greece from 2005 till nowadays

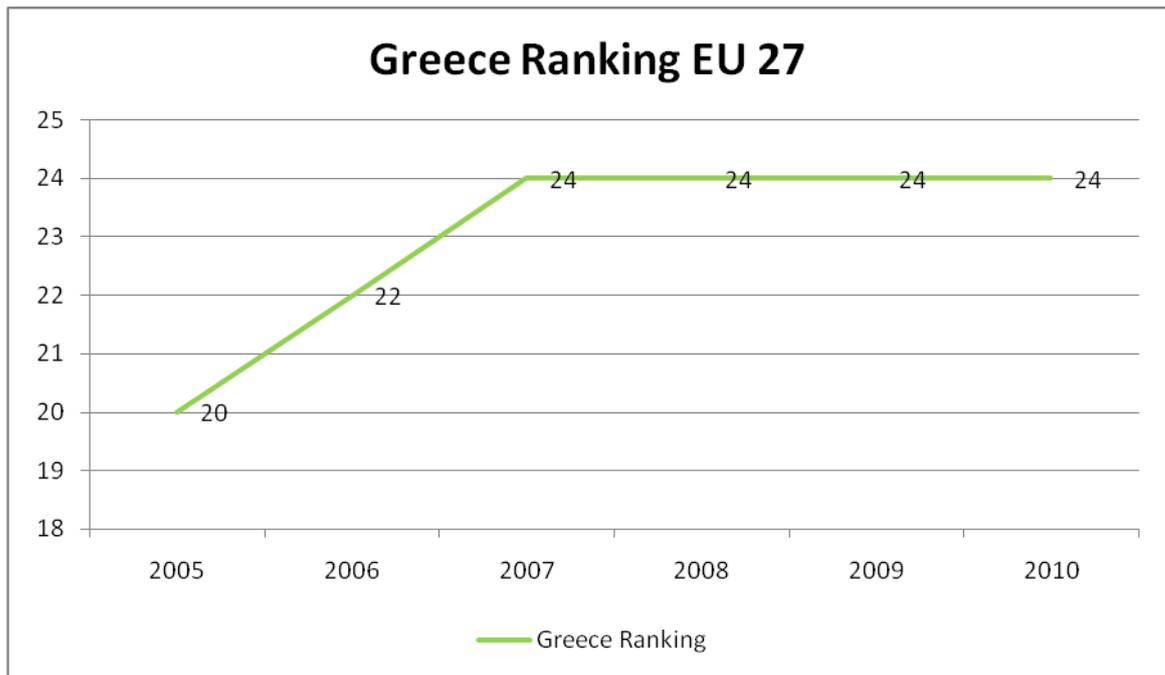


Figure 9: NRI Ranking of Greece among EU of 27

From the components of the NRI, the best performance was observed in the Greek infrastructure environment (38th), while the use of ICT readiness by the government is the factor with worst performance (93th). Specifically, the position of Greece is positively affected by the participation of citizens in Higher Education (3rd), rates of telephone connections to enterprises (18th) and citizens (17th), the number of telephone lines (14th place) and the availability of scientists and engineers (20th position). On the other hand worst place are greatly affect from the number of procedures required to start a business (122th place), time to enforce the terms of a contract (109th position), the poor promotion of ICT by Government (83th place) and accessibility of digital content (95st). The country profile of Greece with all indexes and variables is shown in Figure 10.

Sweden won the first place according to the NRI for 2010, followed by Signapore (2nd), Denmark (3rd), Switzerland (4th) and USA (5th). Burundi appears 129th, the Timor-Leste (130th), Bolivia (131th), Zimbabwe (132th) and Chad (133th) are at the bottom of the rankings. Among the countries of the EU-27, counties of similar ranking to Greece include Romania (59st) and Poland (65nd). Counties of very similar ranking among the world are also Vietnam (54th), Slovakia (55th), Uruguay (57th), and Panama (58th).

2.5.1 Findings – Opinion

Despite the significant improvements that occurred in related digital convergence of Greece and Europe, our country fails to win positions and to catch up in readiness for new technologies. In particular, it is true that in recent years Greece has made significant steps in using information and communication technologies and lowering the number of broadband and internet access costs. According to recent evidence of the Observatory for the Information Society, approximately 4 in 10 households are connected to the internet on 2008 [28]. However the EU27 average is 6 out of 10. At the same time, broadband penetration in July 2010 was 18,6% and the retail cost of broadband approaches the European average [29]. However, there are no corresponding improvements in other areas that determine the readiness of new technologies and affect the overall competitiveness of the Greek economy.

However, most indicators are worsening, which brings Greece to one of the lowest positions among the EU countries – 27 (the 24th). The weaknesses of our country focus mainly on the business environment and the quality of education, the small degree of cooperation between enterprises and universities, the low cost business investment in research and development, the lack of supply of high-tech equipment from the government and the low priority set by the Greek government on information and communication technologies. Once again it highlights the need to promote drastic reforms in all sectors and especially in the business environment, institutions and organizational structures to enhance the overall competitiveness of Greece.

In particular, policy directions should include the improvement of the business and regulatory environment and in particular to reduce the cost of administrative regulations on business activity, the internal organization of business and the administrative definition of price and wage rates of production. The significant reduction of bureaucracy, which, according to calculations of Commission costs 7% of GDP each year [29] and the continued growth and improvement of services provided electronically. The provision of incentives for investment in research and the development of measures that encourage the adoption of new technologies by businesses of all sizes should be applied immediately. The beginning of a systematic dialogue between market and academic institutions to promote research and innovation and the promotion of new technologies in education and culture change is also required for the introduction of new technologies.

Greece

Key indicators

Population (millions), 2008.....	11.2
GDP per capita (PPP \$), 2008.....	30,681
Mobile phone subscriptions per 100 population, 2008.....	123.9
Internet users per 100 population, 2008.....	43.5
Internet bandwidth (Mb/s) per 10,000 population, 2007.....	45.6
Utility patents per million population, 2008.....	2.1

Networked Readiness Index

Edition (number of economies)	Rank
2009–2010 (133)	56
2008–2009 (134)	55
2007–2008 (127)	56
Global Competitiveness Index 2009–2010 (133)	71

Environment component 49

Market environment 78

1.01 Venture capital availability.....	75
1.02 Financial market sophistication	58
1.03 Availability of latest technologies	64
1.04 State of cluster development	87
1.05 Burden of government regulation	125
1.06 Extent and effect of taxation.....	78
1.07 Total tax rate, 2008*.....	88
1.08 Time required to start a business, 2009*.....	64
1.09 No. of procedures required to start a business, 2009* ..	122
1.10 Intensity of local competition	68
1.11 Freedom of the press.....	25

Political and regulatory environment 62

2.01 Effectiveness of law-making bodies.....	57
2.02 Laws relating to ICT	78
2.03 Judicial independence	75
2.04 Intellectual property protection	42
2.05 Efficiency of legal framework in settling disputes	90
2.06 Efficiency of legal framework in challenging regs.....	84
2.07 Property rights.....	47
2.08 No. of procedures to enforce a contract, 2009*	80
2.09 Time to enforce a contract, 2009*.....	109
2.10 Level of competition index, 2007*	59

Infrastructure environment 38

3.01 Number of telephone lines, 2008*.....	14
3.02 Secure Internet servers, 2008*.....	45
3.03 Electricity production, 2006*.....	42
3.04 Availability of scientists and engineers.....	20
3.05 Quality of scientific research institutions	77
3.06 Tertiary education enrollment, 2007*.....	3
3.07 Education expenditure, 2007*.....	107
3.08 Accessibility of digital content.....	95
3.09 Internet bandwidth, 2007*.....	38

Readiness component 72

Individual readiness 65

4.01 Quality of math and science education.....	47
4.02 Quality of the educational system.....	90
4.03 Buyer sophistication	50
4.04 Residential telephone connection charge, 2008*	31
4.05 Residential monthly telephone subscription, 2008*	101
4.06 Fixed broadband tariffs, 2008*.....	17
4.07 Mobile cellular tariffs, 2008*.....	82
4.08 Fixed telephone lines tariffs, 2008*.....	55

Business readiness 74

5.01 Extent of staff training.....	101
5.02 Local availability of research and training.....	84
5.03 Quality of management schools.....	80
5.04 Company spending on R&D	101
5.05 University-industry collaboration in R&D	90
5.06 Business telephone connection charge, 2007*	18
5.07 Business monthly telephone subscription, 2007*	60
5.08 Local supplier quality	61
5.09 Computer, comm., and other services imports, 2008*	78
5.10 Availability of new telephone lines	50

Government readiness 93

6.01 Government prioritization of ICT	77
6.02 Gov't procurement of advanced tech. products.....	91
6.03 Importance of ICT to gov't vision of the future.....	97

Usage component 60

Individual usage 48

7.01 Mobile telephone subscriptions, 2008*	24
7.02 Personal computers, 2006*	65
7.03 Broadband Internet subscribers, 2008*	37
7.04 Internet users, 2008*	43
7.05 Internet access in schools.....	73

Business usage 73

8.01 Prevalence of foreign technology licensing.....	47
8.02 Firm-level technology absorption	98
8.03 Capacity for innovation	101
8.04 Extent of business Internet use	99
8.05 Creative industries exports, 2006*.....	34
8.06 Utility patents, 2008*	37
8.07 High-tech exports, 2007*.....	47

Government usage 70

9.01 Government success in ICT promotion.....	83
9.02 Government Online Service Index, 2009*	58
9.03 ICT use and government efficiency	76
9.04 Presence of ICT in government agencies	89
9.05 E-Participation Index, 2009*	46

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Figure 10: Greece NRI profile

3. Implementing a social network that provides and consumes government services.

It is obvious from the previous sections that eGovernment services are a sector of rapid development for Computer Science. However, although in the last decade several countries of the European Union were among the first in ranking in Network Readiness Index (NRI) and have been investing constantly in this field, Greece remains in the 24th place among the 27 for the last years. This place is not only a result of poor investment but also proof of the ignorance and the computer illiteracy that our country faces.

In order to create an Information System that has a realistic chance of being accepted by the people, we have to make it very user friendly and add to it some useful functionalities that would improve its overall image and performance. In the past years, there have been an increasing number of people that were interested in and wanted to contribute to the fields of eParticipation and eDemocracy. Most local governments in the European Union are willing to interact with their citizens in a web dialogue about any public affair. Such public affairs can be noted as the dialogue over a proposed law by a ministry, over the changes that are required to a specific field of public services like health or education or even by announcing an auction about the needs of a public organization. In Greece after the national elections of 2009, all proposed laws are subject to dialogue over the web and all auctions that involve public funding must be published or they are illegal. Also, in early 2011 a new law will be applied from the Ministry of Internal Affairs, which is focused mainly on putting into action the directives provided by the European and are mainly described in the previous section.

At the same time, Greece has greatly adopted most social networks and many people have more than one account in a social network. The most widely known social networks in Greece are Facebook, Twitter and LinkedIn. In order to realize the amount of penetration a social network has over a country, is important to mention here that Facebook has over 3 million accounts from Greece and a penetration over 28% of the population [7]. As a result and having realized the impact of social networks both in the European Union and Greece, we made the crucial decision of implementing a social network that will also be able to provide a mechanism for providing and consuming services over the social network environment.

3.1 Why using social networks?

During the last decade a phenomenon arose over the web that enabled an alternative way of communication and interaction between people. Several platforms that enabled people to have

a virtual life appeared over the web and their acceptance was a result of the ability to communicate easier and with more people at the same time. The e-presence of everyone is something that generated new possibilities for research. As a result we used a social network as a core part of our system, as it will obviously make more people use it.

Using a social network meant we had to tackle the problem of illegal use or fraud identity. Fraud identity is a common problem nowadays as many people are willing to pretend to be someone richer, well-known or more successful. On the other hand, illegal use arises from the potential ability of everyone to do whatever he wants in his virtual life, due to the lack of appropriate legislation. However, the nature of the social networks requires the creation of an account for yourself. Pretending to be someone else results in not being able to communicate and interact with your friends while using a social network. As a result there will be no way to interact with the people you know from your real life. In order to address both problems we decided to allow each user to register to our social network for free but in order to use the designed framework we designed a verification of the account.

A major problem that arose was whether to use a well-known commercial social network, acting as a 3rd part agent or an open source social network that would enable us to be the administrator of it. In order to realize the actual difference of each type we had to distinguish the parts where their real differences were. One important difference between them was the amount of users each one could have. As mentioned above the users of commercial social networks represented a big percentage of the population, while an open-source social network starts with a zero registry of users. Another important advantage of a commercial social network is that most of them are being supported by well-known companies that provided them with an interaction API and plugins about any kind of developed web technology while open source ones usually have a limited amount of web technology capabilities, require advanced programming skills for establishing the main functions, providing a friendly user interface and are heavily dependent on to the community each one created for any update or enhancement.

However, open source social networks have some key advantages that could be neglected by a commercial company but could not be by a government agency. First of all, we would be the administrators of the generated network and we could tackle any kind of problem that would arise. Such kinds of problems could be illegal use of fraud identity as mentioned above. By being administrators we could also enforce a registration face and constrain for an amount of time or delete any account that did not obey the rules. Another important aspect was that if we were to



develop an interaction plug-in over a commercial network, we would be all the time under the inspection of their developers. As mentioned from a Facebook developer that we have contacted, all information that would be exchanged would be visible to them and they could at any time withdraw the implemented plug-in. Last but not least, using an open source social network means that we were able to intervene to the provided Content Management System and import the characteristics and the aspects that each government entity would require.

As a result and taking into serious consideration the advantages and disadvantages of each type of social network we decided to implement the plug-in for the open source network and provide the code and possibilities for any interaction with any social network in the future.

When the implementation of this thesis started in 2009, there were only a few available and reliable open source social networking platforms. After several days of research we concluded in Elgg. The main criteria of that choice were the provided functionality, the online stability, the amount of the online supporting community and the existence of visual characteristics. Elgg is an award-winning open source social networking engine that provides a robust framework on which to build all kinds of social environments, from a campus wide social network for a university, school or college or an internal collaborative platform for an organization through to a brand-building communications tool for a company and its clients. Elgg was voted as the best open source social networking platform in 2008. Elgg is becoming more and more popular and it is important to mention that it is being used by the Australian Government, the British Government and the Federal Canadian Government [8].

3.2 Social Network - Presentation

Our **Visual Application for Government Services (eVagos)** can be separated in three parts each one of which plays a specific role. These parts are the social network, the eVagos service provision/consuming framework and the interaction plugin. Each part required a different approach for its implementation, although at the end all parts were interacting. This interaction will be explained later.

Although there are several key features of the social network that are already implemented we defined new ones to enable the communication and the distribution of government services. Elgg is created using mostly php, css/html for the visual representation of the network and JavaScript for implementing the key functions that require interaction with the database for adding



of removing users. Each functions, like “add friend”, “create group” etc is implemented on the server side using php and are fully free to customization.

In order to improve the web environment we implemented a specific theme that can be customized and changed for any different administration body that wishes to install our system and enable this citizen network. In backend side we implemented better function prototypes and designed an alternative implementation that enabled a REST system. REST services are currently the only way to interact with web services in elgg and we had to use them in order to interact with our service framework which was mainly developed outside of the social network.

In elgg we also implemented a key action which is instant chatting between registered users in chat rooms. In order to enable this kind of chat we used phpFreeChat which is a open source chat framework under the term that we will allow a link to the site of the creators. As a result we allowed a link to the creators’ homepage. So we altered the code in order to fit to our social network and interact in a proper way. The names of chat rooms are also able to change and can be defined by the administration of the network, and as a result from any government entity.

Last but not least, the key addition to elgg was the plug-in that enabled us to connect to the eVagos framework. This plug-in was implemented in php and communicated with the created framework with REST web services. This plug-in was implemented under the guidelines of elgg developers in order not to have any problems with elgg key features and is approved for any further use.

3.2.1 Social Network – Registration

Registration to our social network is free. This choice was made upon the idea that a social network that has restricted access will end up in a complete failure. What we wanted to do was to attract as many people as we could, with our social network that would be advertised as a citizens’ network, and by meeting its environment, citizens would start using it and would find the new opportunities that it created on the eGovernment services provision.

The startup screen, as shown in Figure 11, is similar to any commercial social networks and contains the login bracket, the latest news, the newest members, the latest bookmarks, the latest blog posts and files.

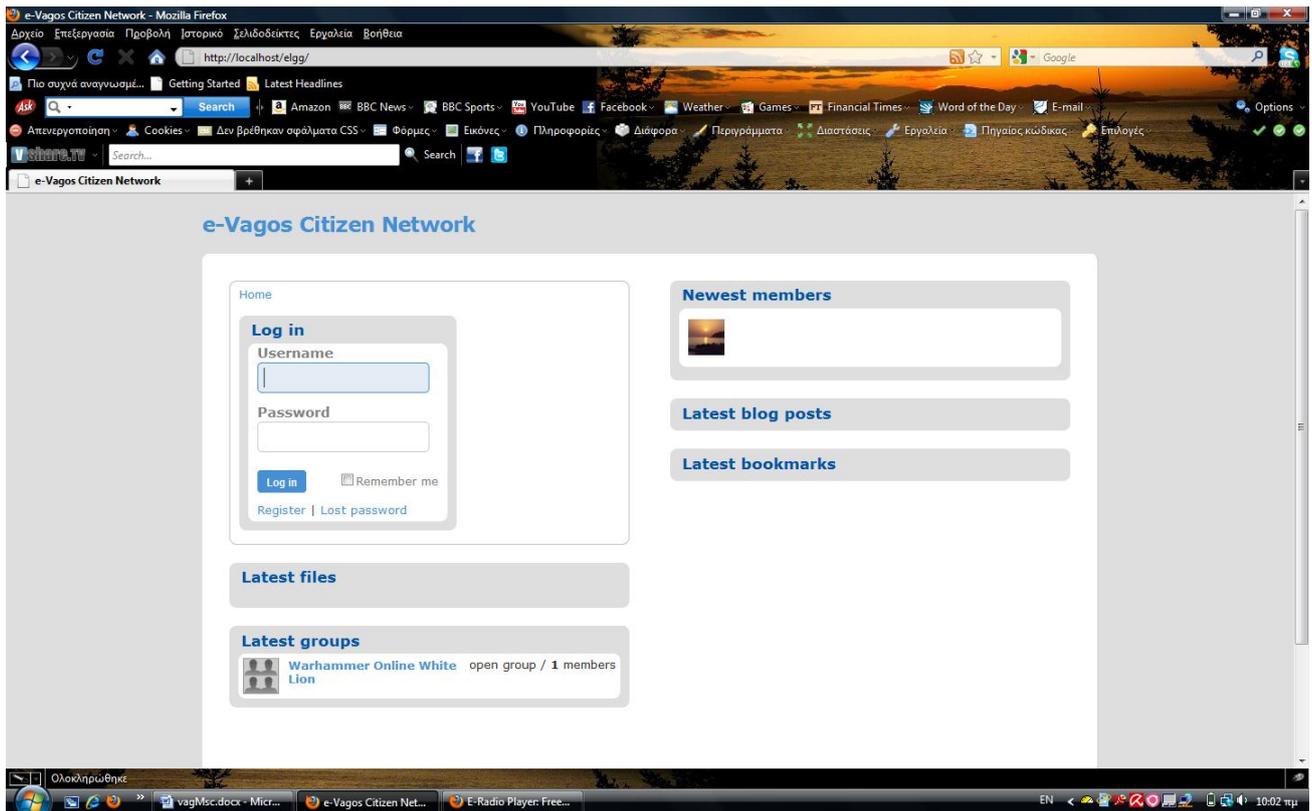


Figure 11: Social Network login screen

The first time a user visits our page, they must login in order to gain access to our network. The registering procedure is activating by clicking on the Register tab. This register page as shown in Figure 12 requires inserting the Display name, email, username and password (twice for verification). The Display name is the name that our account will display which can be either our real name or a nickname. The Username and password are the credentials that are required for logging into the network.

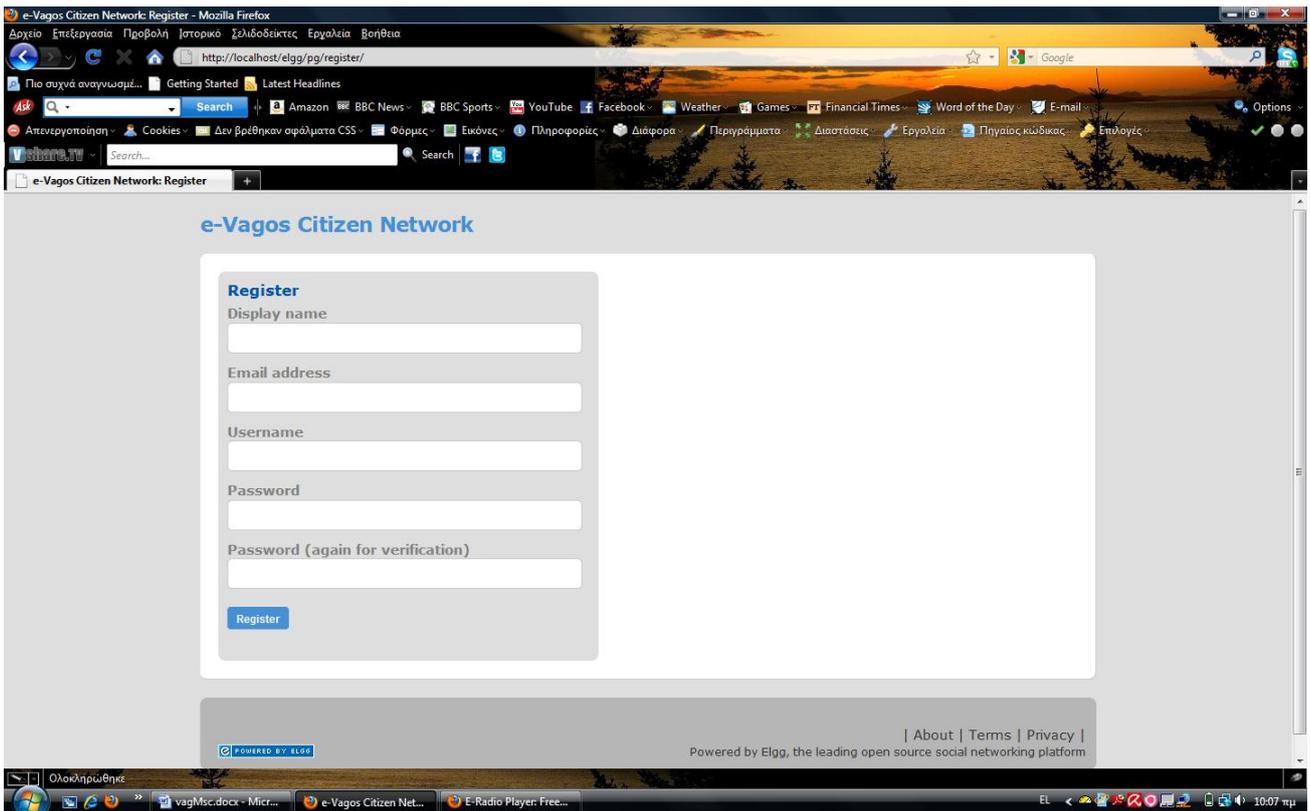


Figure 12: Social Network Register Screen

There are also some requirements that must be fulfilled at registration, which is that the password must be longer than 6 characters and that the given mail must not already exist in our database. After successful registration, a confirmation email is sent to the email address with a confirmation link. Clicking on that link results in activating the account and being able to log in.

3.2.2 Social Network – User Profile

This social network has 2 available user roles, the administrator and the users. After a user logs in he will see an environment very similar to a commercial social networks. Several enchantments have been made to the base Content Management System (CMS) of elgg in order to make it friendlier and more formal. Successful login results in viewing the dashboard of our social network for the logged in user as shown in figure 13. The dashboard is the place where you can see any recent update, including status changes, uploaded files etc. Furthermore you can see any new member that has logged in and by clicking in his icon you can add him as friend.

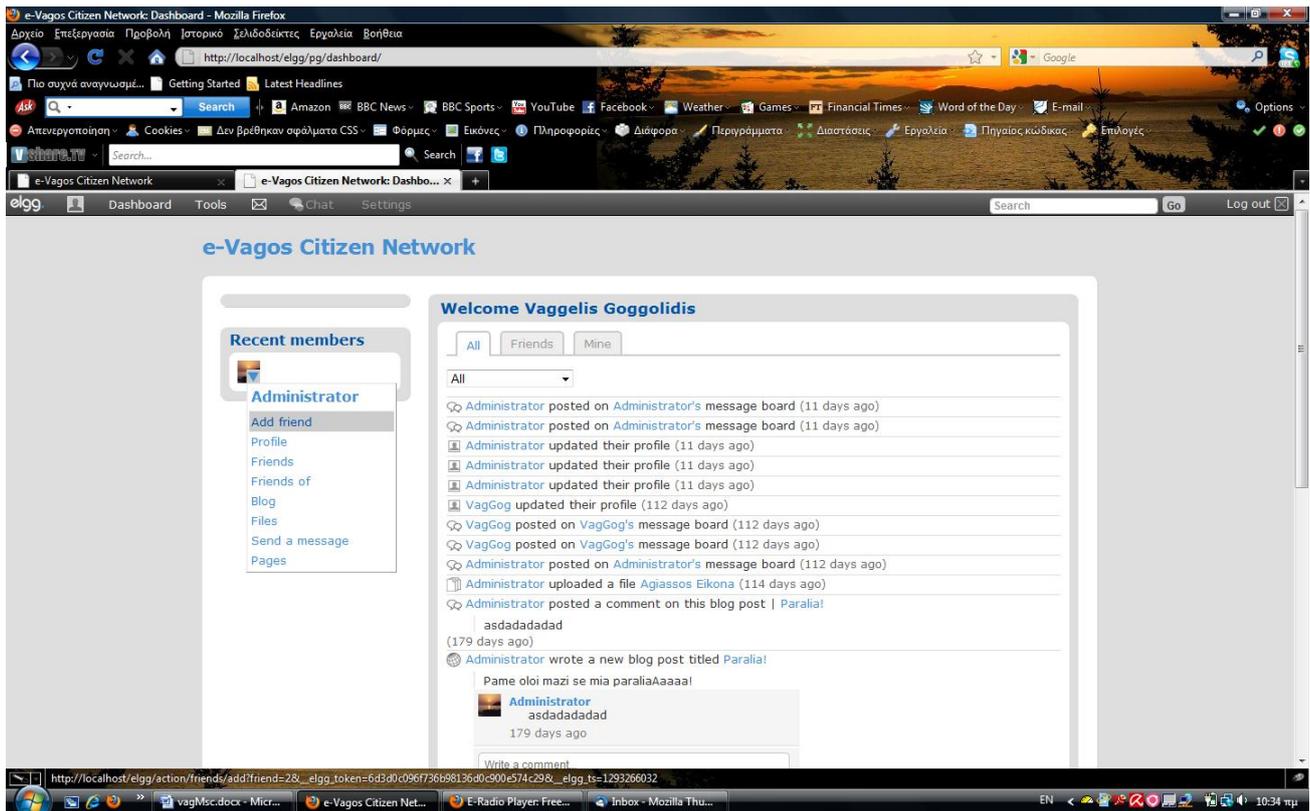


Figure 13: Social network user dashboard

On the top of the screen there are the different sections of the social network where we can select and explore. In order to become easier the understand and correlate with well known Facebook we can suggest that the Dashboard is the Facebook Profile page, the small image is the Home page of the user, the Tools tab contain all the media (images, videos) and social network stuff(groups, bookmarks, friends). On Tools there is also the tab eVagos Framework that enables the interaction of our social network with the government provision system. The mail folder image enables sending and receiving messages from friends, chat enables us to communicate with other online users and finally settings is the place where we can set the preferences for the user account. It is important to mention here that the presented profile selection, as shown in figure 14, is customizable. That customization can be done by selecting the “edit page” and putting the items in the page fields. Each tab can be put either left, center of right.

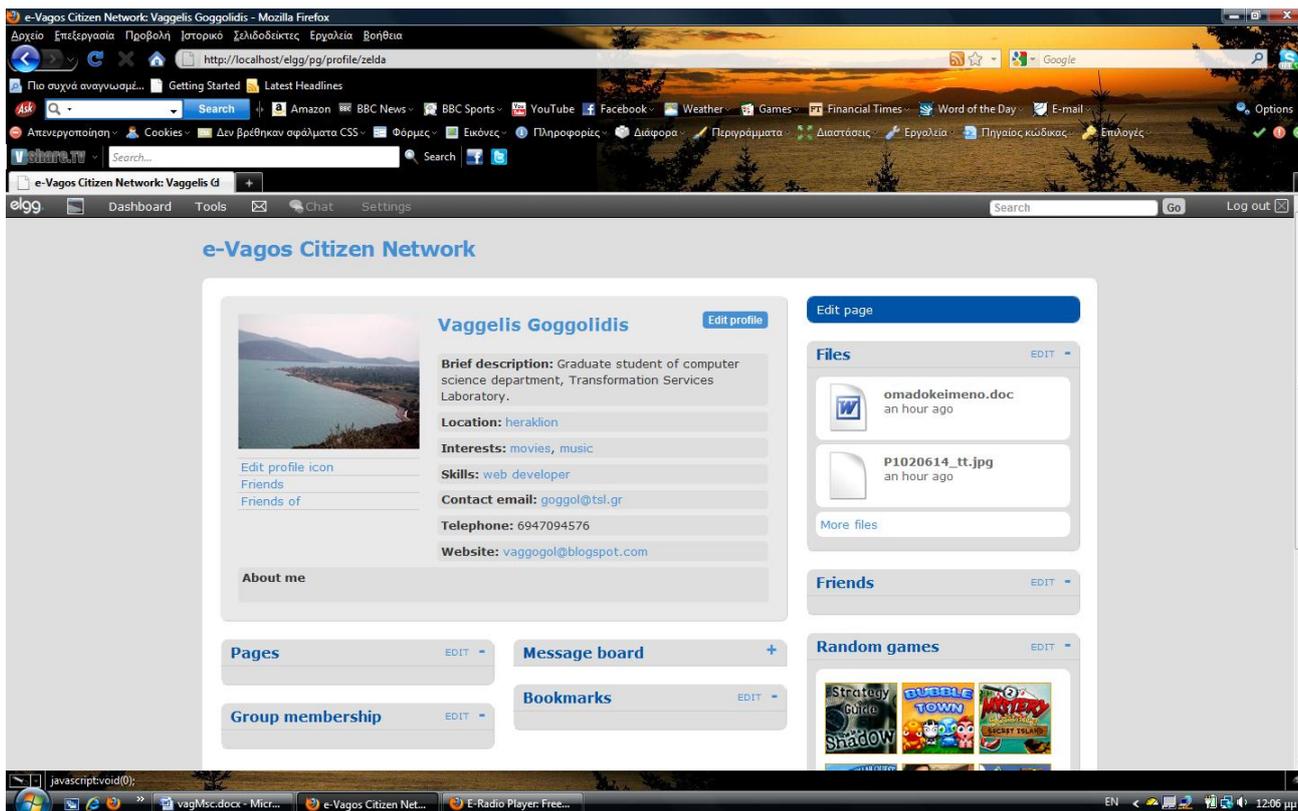


Figure 14: User profile eVaGoS

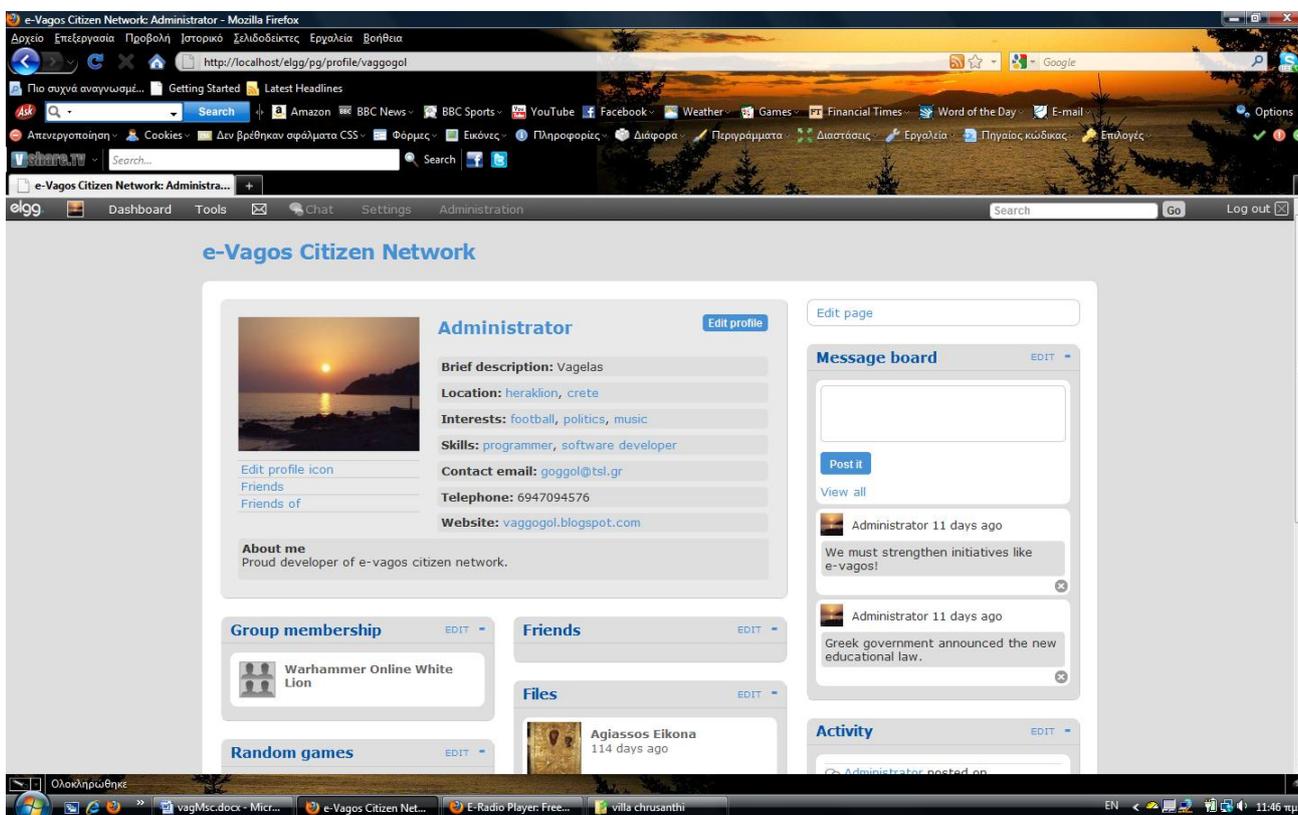


Figure 15: Administrator Profile eVaGoS



3.2.3 Social Network – Administration Profile

The administrator role is the most important role of our social network. He is responsible for monitoring what is happening at the social network and can modify or alter any information. As an administrator the user has another field tab in his login that enables the customization of the platform, the adding or banning of users, the creation of new plug-in and more stuff that enables us to build and reform the visual image of the network from top to bottom. That tab is called “Administration” and is located at the right of the settings tab shown in figure 15. There can be as many administrators as desired and the first administrator is always the person that performs the installation of the open source software. By selecting the administration tab many different options show up, as shown in figure 16.

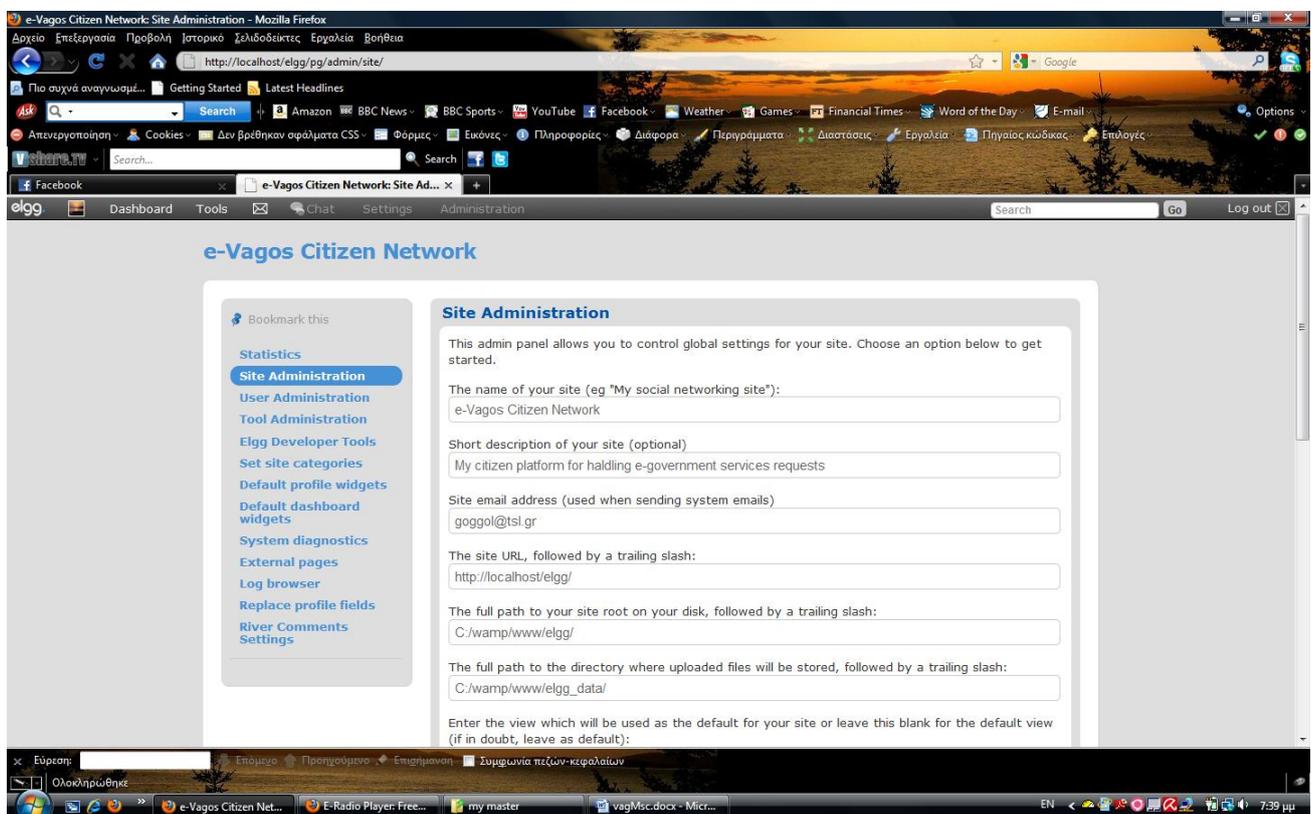


Figure 16: Administrator Options of eVaGoS

The administration tab is the place where you can add or alter the information about the social network. Among this information is the name of the social network, a short description of it, the email from where the confirmation emails will be sent and the url of the site over the web. There is also some information about the interaction of elgg with the physical storage, it is explaining where the main folder that contains the source code is and where the users’ data is

stored. User administration shows all the users of the social network where you can also add a new user just like the register procedure and sent him the confirmation mail for activating his account. The administration tool is about the activation and deactivation of the elgg plugins. The Elgg Developer Tools is a plug-in that enables the modification of the elgg source code for experienced users. The Set Site categories, the Default Profile widgets and Default Dashboard widgets are related to the visual representation of specific categories of the social network. The Replace profile fields tab enables the modification of the tabs that are shown on the user's profile. The System diagnostics and Log browser tabs are helping administrator to get useful statistics about the social network. Lastly, the External pages and River Comments Settings are tabs of activated plugins that require further customization.

It was mentioned before that one of the main reasons for choosing a social network in which we could be the administrators was the ability to handle instantly illegal use or fraud identity. As a result, we can immediately “discipline” the user with the extra abilities that an administrator has on its user's profile.

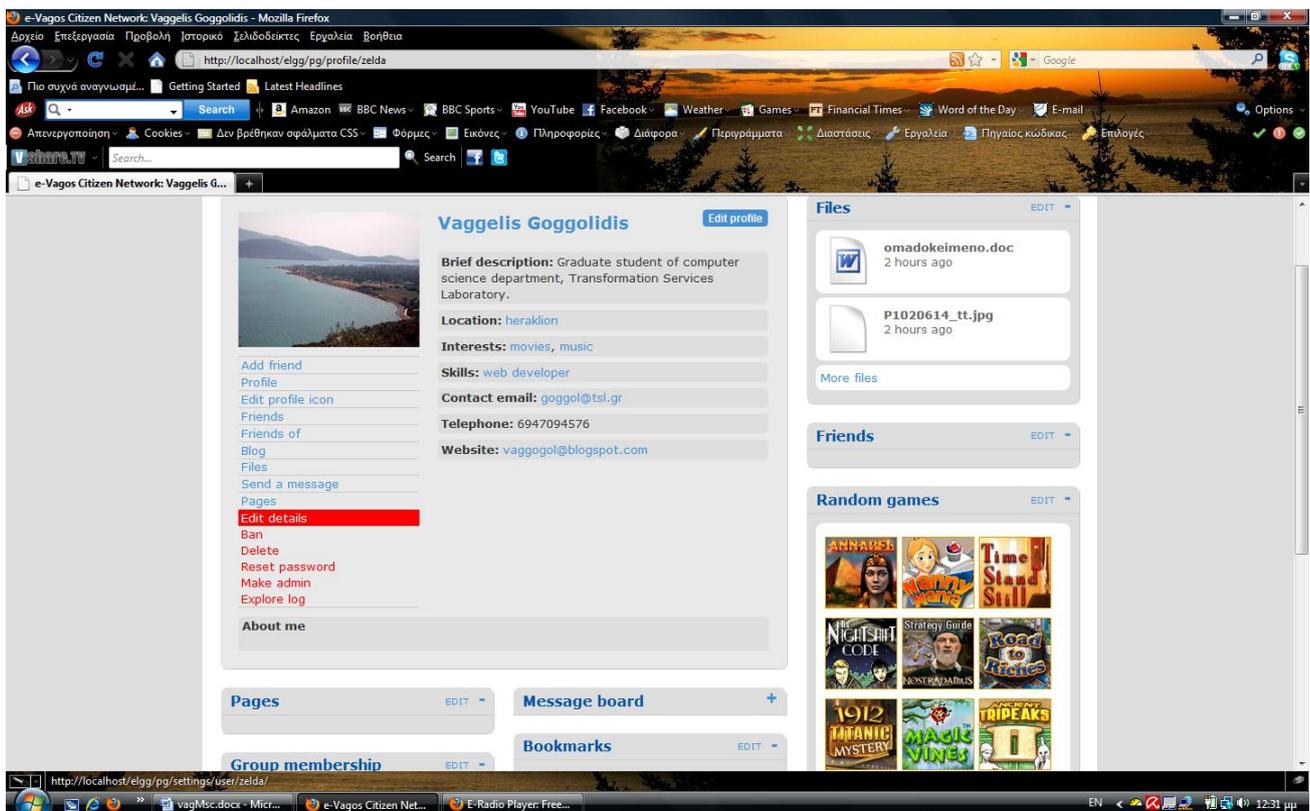


Figure 17: Viewing a user's profile as administrator

In figure 17 we can see colored in red, the administrator options that are available in each user's profile. Edit details enables the administrator to alter any illegal, false or offensive information that a user has on his profile. Ban and Delete are the "discipline" methods of our social network. The difference of Ban and Delete is that Ban forbids the user login for a selected period of time, while Delete deletes instantly the account from the database of our social network. Furthermore, the function Reset password resets the password of the selected account in case we had a lost password event. Make admin, instantly makes that user an administrator and explore logs shows a detailed list of the logins and the actions that account had from his activation.

As mentioned above, in the Tools tab of each profile page another tab named "eVaGoS_Framework" is located. By selecting the eVaGoS_Framework we were instantly redirected to the implemented plug-in page that is responsible for interacting with eVaGoS as shown in figure 18. There are 2 tabs the main tab that present us all the required information about and using of the plug-in and the GO tab that connects the eVaGoS login page.

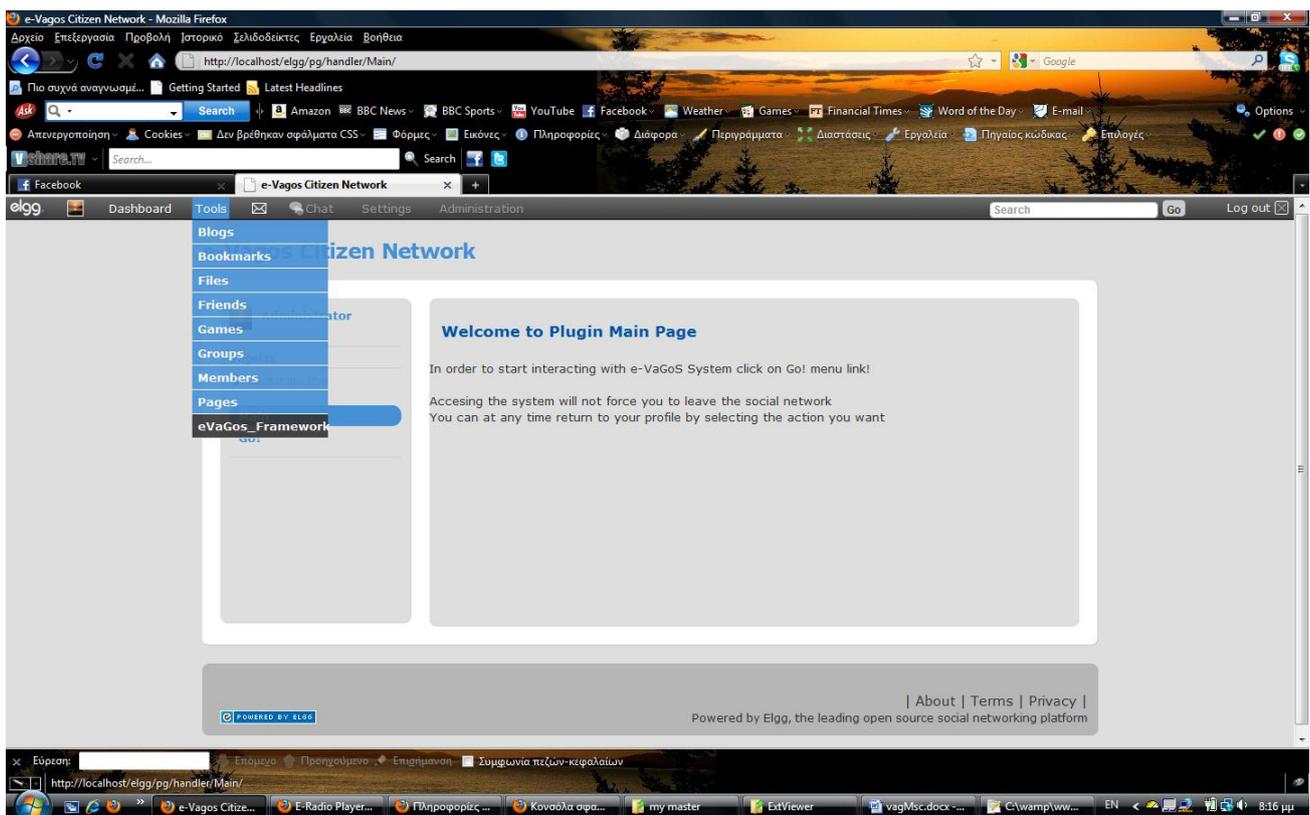


Figure 18: Invoking Plugin Homepage

3.3 Plugin Page and Registration to eVaGos.

The plug-in we implemented was developed and created according to all requirements specified from the framework for government services. Our plug-in helped the framework to interact with the social network and performed 2 different tasks importing a service and consuming a service. The plug-in page is divided into two different tabs Main and Go. The Main tab is the place where each government entity that selects to install our system is able to add all desired information about the system, the plug-in, the terms of use and any other information. The Go Tab is responsible for interacting with each installed system and performed all desired operations. In order to use the system, the user must first of all register his account. Registering the account meant that the user was willing to use his account not only for logging into the social network but also as an authentication procedure for using eGovernment services. The authentication procedure can be different than the one we proposed for local government entities but it is strongly recommended that the users must visit a Citizen Service Center (KEP) to activate their account. However, in order to reduce bureaucracy and enable the best quality of service we decided to use only the citizen card number as registration for user account which will be introduced in early 2011 in Greece.

Registered users should select if they wanted to be registered as consumers only or if they wanted to also be providers. If they wanted to be providers, they should also submit to the KEP the legislation papers that are required by the law or local government entity. In our proposed methodology there was a signed paper from the head of the organization they represent and a signed paper by themselves that suggest they will not use their account for any illegal actions. In addition to that, the service provider should ensure that any service provided in the future would be according to the national standards and that would be approved by a 3rd party who would be responsible for those authentications. The 3rd party could be defined by the government entity that used our system and can be either in the private or public sector.

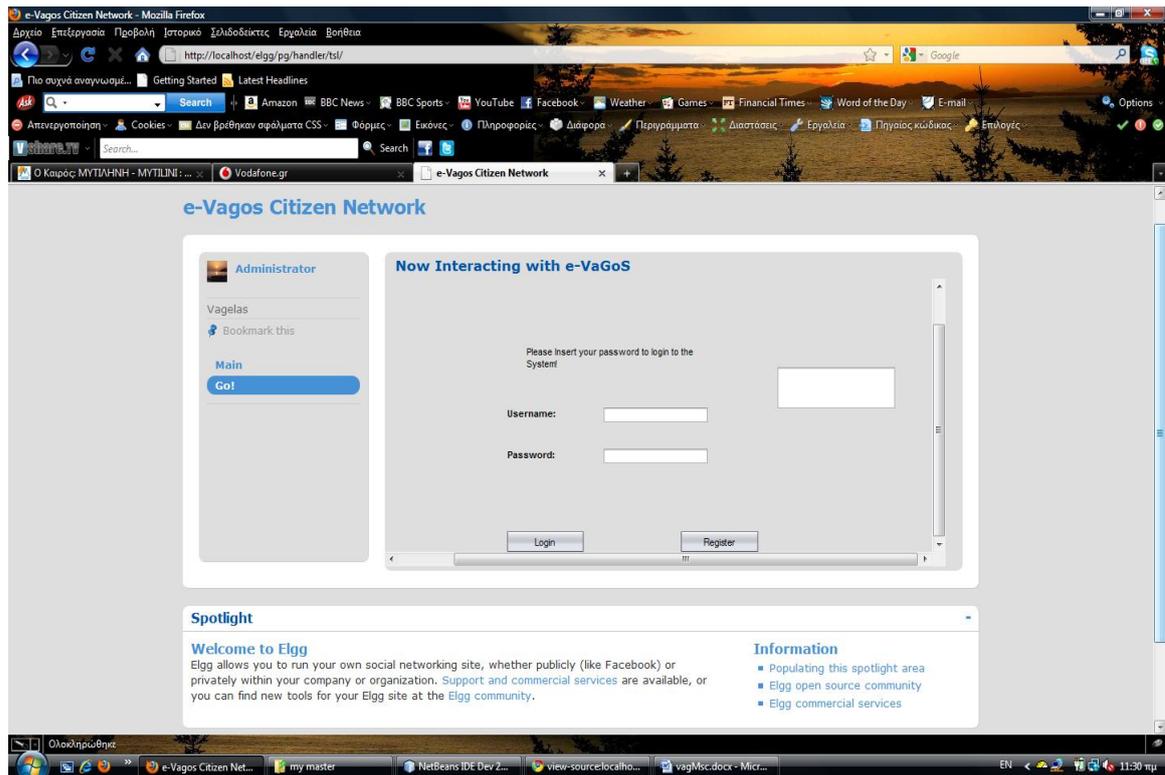


Figure 20: eVagos user login page

When the user activates his account and was successfully logging in, using the login page as shown in figure 19, he was logging into the main page where he could select if he wanted to consume a service or to provide the WSDL of the service that would be migrated to our system, as shown in figure 20. In case he logged in with a consumer privileged account the provide service button is deactivated and a message that informs the citizen appeared. In case the user is privileged and selects to provide a service he is instantly redirected to the service submission page.

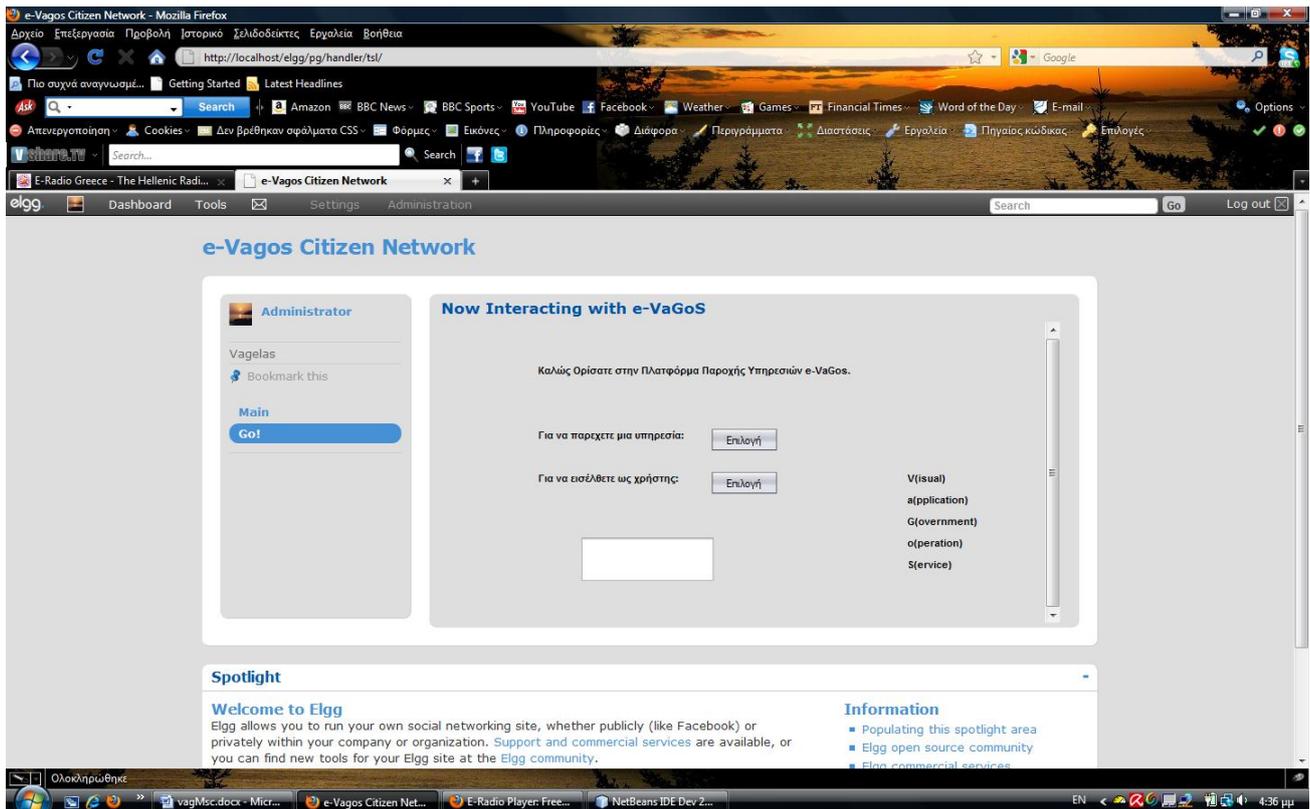


Figure 20: eVagos successful login selection page

3.4 Framework backend description / Algorithm / Standards

The service backend framework is the most important part of this thesis and required a lot of bibliographic research and programming. The framework key features were implemented using Netbeans 6.9 and the visual and coding implementation was an interaction between JSP for the frontend and Java for the backend. Each page that was visible in the framework had a key java class that handled its requests at the backend. In our framework there were two different kinds of visual representation for the static and the dynamic web pages. The static web pages were implemented by us and are responsible for displaying the static content (welcome page, select page etc) and were interacting with eVaGoS database to get or insert data and the dynamic web pages that were the key feature of this framework which was the dynamic creation of the web service consumer in JSP and Java.

Our framework was interacting with a database and there were 2 static tables that we used to perform our operations. Those tables were:

Users table :

- Id: Unique id of the user
- Guid: Id of user in elgg database
- Username: Username to enter to our system.
- Password: Password used along with username to enter to our system
- Adt: Unique number of citizen card.
- Alias and keypass: These fields were used for the electronic identification.
- Property: this was the field that describes if a user is only a consumer of can also provide a service.
- Email: this property sets the mail where the user wishes to receive the responses from the government service invocation. This email can be different from elgg email.

Service table:

- Serv_id: Unique id of the uploaded service
- Service_Name: Name that was displayed for the service
- Service_Desc: Description that was displayed for the service.
- Service_wsdl: The url where the wsdl file was located.
- SocNet_id: The id of the service provider.
- Params_No: Number of required parameters by the service.

Each time a new citizen wants to verify his account and to use the eGovernment framework, an insertion is made in the users table. This creation can only be done in a Citizen Service Centre (KEP), as described above, and the user must have the required papers to become a service provider. It is important to mention again here that this activation is required only to gain access to the framework. The creation of a new account and authentication to the social network is made via the web and does not require something special. This authentication is the direct correlation between the social network account and the eVaGoS account.

On the other hand each time a service provider uploads a service to our system an insertion to service_table is made and is the representation of the fundamental attributes of the new service. The validation and parsing of wsdl file is a complex procedure and will be described later. However it is important to mention here that along with the insertion to this table, another new table is created which is named (Service_Name value)_ operations. That table is dynamic and will be the registry of the service for the executions that are done and the parameters the user provides. That registry is required by the frameworks and standards provided by the EU in order to provide a service.



Migrating a web service to our server requires to perform some key operations and to identify the key items that were provided from the wsdl file. It was important to mention here that we used WSDL 1.1 specification and as a result we cannot parse WSDL 2.0 files. Furthermore, the provider at the implementation of the service must bear in mind that the return type of the service must be a string containing the url of the file that the provider wishes to be emailed to the user. The key items that the wsdl file contains and we required to parse were:

- **Service:** The service could be thought of as a container for a set of system functions that had been exposed to the web based protocols.
- **Port:** The port/endpoint did nothing more than define the address or connection point to a web service. It was typically represented by a simple HTTP URL string.
- **Binding:** The binding specified the interface as well as defining the SOAP binding style (RPC/Document) and transport (SOAP Protocol). The binding section also defined the operations.
- **PortType:** The portType element defined a web service, the operations that can be performed, and the messages that were used to perform the operation.
- **Operation:** Each operation could be compared to a method or function call in a traditional programming language. Here the SOAP actions were defined and the way the message was encoded, for example, "literal."
- **Message:** Typically, a message corresponded to an operation. The message contained the information needed to perform the operation. Each message consisted of one or more logical parts. Each part was associated with a message-typing attribute. The message name attribute provided a unique name among all messages. The part name attribute provided a unique name among all the parts of the enclosing message. Parts were a description of the logical content of a message. In RPC binding, a binding might reference the name of a part in order to specify binding-specific information about the part. A part might represent a parameter in the message; the bindings defined the actual meaning of the part. Messages were removed in WSDL 2.0, in which XML schema types for defining bodies of inputs, outputs and faults are referred to simply and directly.
- **Types:** The purpose of the types in WSDL was to describe the data. XML Schema is used (inline or referenced) for this purpose.

The algorithm that was followed to create the web service consumer dynamically was:

1. Decompose the wsdl file to the seven semantic parts that were described above.



2. Import all required execution files from wsdl file and create a new package into the library which is named serv(number of current services +1).
3. Find operation name.
4. Find parameters for the requested operation.
5. If the parameter (input or output) is complex and not simple (string, int) look into types for the description of the complex (input or output) parameters and transform complex into sum of simple parameters.
6. If the service has a sql file associated that is provided by our web service uploader wizard validate the sql file and execute it properly.
7. If the service has an associated .gov file parse it and save to temporary memory that parameters that are requested to have predefined set of values.
8. Create new base files (java and JSP) for the new service.
9. Create the graphic JSP environment by adding an input field for each simple parameter.
10. Add listeners for each input field that handle value change events for those fields and the button that invokes the service.
11. Edit the java file and add the functions that are required for invoking the web service with the input parameters defined from the parsing.
12. Add the navigation rules that are required for invoking correctly or not and will trigger on client use events.
13. Add a function call to the email daemon that will send the confirmation mail along with the attached file as defined after the web service consuming.
14. Add the new service url and values to the registry of our framework.
15. Inform the user if the upload and validation was successful or not.

Every time this algorithm was executed successfully, a new web service consumer was created and was visible through the consumer page of our system. It is important to mention here that the sql file is a simple sql file generated from the export of any table in any database while the .gov file had a specific format for the variable order and semantic meaning. That file contained a type of primitive language that was understandable by eVaGoS and allowed many expansion capabilities in the future. The current format of the file was:

command	Param1	Param2	Param3	Param4
---------	--------	--------	--------	--------



A example that can be used and will explain better the meaning of each field is: collaboratevar email mail_list users_list dropbox. This means that the command is collaboratevar which means to use the values of a field of a table for an input parameter of a web service. The input parameter that requires that operation is defined in Param1 and in our case is email. The table that will be used is defined in Param3 and is users_list and the table column that we will use its' values is mail_list. The visual representation of the parameters is defined in Param4 and in our case is dropbox. As a result, the provider bearing in mind the previous defined rules can provide any service with predefined input from a column of a table.

3.5 eVagos Description and provision/consuming example.

Having presented our theoretical approach on how a provider can generate a dynamic client we must now view the service provision from the point of the provided web interface. At the redirected page of eGovernment service provision the user will see that there six different fields present. These fields are:

- Name of Service: The name of the service. This name will be present in a selection action and is visible to the service consuming user. This is a required field.
- Wsdl Location: This is the url location of the wsdl file that describes our web service. It is used to import the service to our system. This is a required field.
- Description of Service: That is the description that is shown when a user requests more details about the service. This field must also contain a detailed description of the required parameters to invoke the service. This is a required field.
- Parameters Number: That is the number of the input parameters. This is a required field.
- Sql file Location: This is the url of the sql file that contains a snapshot of the database that uses the provided service. This field is optional and is required only if the web service is accessing a database.
- Gov file Location: This is the url of the file that contains gov language. This language is used to describe either the input or output interoperability with a service or a database and is a key feature for future extensions of the system. That is an optional field.

When the provider finishes the insertion of the described fields they submit the service and if everything has been done correctly the service is now visible to all service consumers under the name provided in the Name of Service field.

In case a user selects to act as a consumer, he logs in to an interactive page that he selects the name of the service and gets information about it from the database. Such information is the provided description of the service and the parameters information. The user can select and draw information at any time. When the users decides which service he wants to invoke he can click at the invoke button to start the dynamic client. The created consumer contains as much input parameter fields as the selected service provided in the information description and the name shown is identical to the name provided in the wsdl file. In case the required input data is set into a database a dropdown box will appear and the selected value is used for the invoking. When the users decided, he invoked the service and he was informed if the service was successful or not. In case the service was successfully executed, a mail that has attached a file defined by the web service creator is sent. The users then can either disconnect from the system and return to the social network environment or continue with another service invocation.

A more detailed visual representation of the functionality provided is shown in the following figures. What is shown here is how we can migrate, provide and consume a web service into our system. The provided service is an addition service and the reason we selected it, is that the expected behavior and results are known to everyone without any further technology knowledge. The provided wsdl file is presented in figure 21.

```

1 <?xml version='1.0' encoding='UTF-8'?><!-- Published by JAX-WS RI at http://jax-ws.dev.java.net. RI's version is JAX-WS RI 2.2-hudson-752-. --><!-- Generated by JAX-WS RI at
http://jax-ws.dev.java.net. RI's version is JAX-WS RI 2.2-hudson-752-. --><definitions xmlns:wsu="http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-utility-
1.0.xsd" xmlns:wsp="http://www.w3.org/ns/ws-policy" xmlns:wsp1_2="http://schemas.xmlsoap.org/ws/2004/09/policy" xmlns:wsam="http://www.w3.org/2007/05/addressing/metadata"
xmlns:soap="http://schemas.xmlsoap.org/wsdl/soap/" xmlns:tns="http://mypack/" xmlns:xsd="http://www.w3.org/2001/XMLSchema" xmlns="http://schemas.xmlsoap.org/wsdl/"
targetNamespace="http://mypack/" name="AddService">
2 <wsp:Policy xmlns:wsat="http://schemas.xmlsoap.org/ws/2004/10/wsat" wsu:Id="AddPortBinding_add2_WSAT_Policy">
3 <wsat:ATAlwaysCapability />
4 <wsat:ATAssertion xmlns:ns1="http://schemas.xmlsoap.org/ws/2002/12/policy" wsp:Optional="true" ns1:Optional="true" />
5 </wsp:Policy>
6 </types>
7 <xsd:schema>
8 <xsd:import namespace="http://mypack/" schemaLocation="http://localhost:8080/AddService/Add?xsd=1" />
9 </xsd:schema>
10 </types>
11 <message name="add2">
12 <part name="parameters" element="tns:add2" />
13 </message>
14 <message name="add2Response">
15 <part name="parameters" element="tns:add2Response" />
16 </message>
17 <portType name="Add">
18 <operation name="add2">
19 <input wsam:Action="http://mypack/Add/add2Request" message="tns:add2" />
20 <output wsam:Action="http://mypack/Add/add2Response" message="tns:add2Response" />
21 </operation>
22 </portType>
23 <binding name="AddPortBinding" type="tns:Add">
24 <soap:binding transport="http://schemas.xmlsoap.org/soap/http" style="document" />
25 <operation name="add2">
26 <wsp:PolicyReference URI="#AddPortBinding_add2_WSAT_Policy" />
27 <soap:operation soapAction="" />
28 <input>
29 <wsp:PolicyReference URI="#AddPortBinding_add2_WSAT_Policy" />
30 <soap:body use="literal" />
31 </input>
32 <output>
33 <wsp:PolicyReference URI="#AddPortBinding_add2_WSAT_Policy" />
34 <soap:body use="literal" />
35 </output>
36 </operation>
37 </binding>
38 <service name="AddService">
39 <port name="AddPort" binding="tns:AddPortBinding">
40 <soap:address location="http://localhost:8080/AddService/Add" />
41 </port>
42 </service>
43 </definitions>

```

Figure 21: Sample web service wsdl

The wsdl service follows the wsdl 1.1 specification and all required fields are shown here. However, because we create dynamically the client of the service it is important to show the xml schema that describes the elements of the input and output messages the web service generates. Those elements are the requested and provided parameters of the web service and are used for the creation of the dynamic web service client/ consumer. The provided xml schema is shown in figure 22 and it should be mentioned that the required input parameters of the service are p1 and p2.

```

1 <?xml version="1.0" encoding="UTF-8"?><!-- Published by JAX-WS RI at http://jax-ws.dev.java.net. RI's version is JAX-WS RI 2.2-hudson-752-. --><xs:schema
2 xmlns:tns="http://mypack/" xmlns:xs="http://www.w3.org/2001/XMLSchema" version="1.0" targetNamespace="http://mypack/">
3 <xs:element name="add2" type="tns:add2" />
4
5 <xs:element name="add2Response" type="tns:add2Response" />
6
7 <xs:complexType name="add2">
8 <xs:sequence>
9 <xs:element name="p1" type="xs:int" />
10 <xs:element name="p2" type="xs:int" />
11 </xs:sequence>
12 </xs:complexType>
13
14 <xs:complexType name="add2Response">
15 <xs:sequence>
16 <xs:element name="return" type="xs:string" minOccurs="0" />
17 </xs:sequence>
18 </xs:complexType>
19 </xs:schema>

```

Figure 22: Sample web service xml schema

The described web service must now be uploaded to eVagos system. The upload page of the eVagos system is in figure 23.

Figure 23: Sample web service migrate page

It should be mentioned that the fields we inserted to the upload page is the desired information that will be shown when the service consumer invokes the page. The service name is



“Add 2 numbers”, the service description is “A sample service where you can add 2 numbers” and the parameter number is 2. By clicking send the eGovernment service migration procedure begins and if everything is correct we will get a successful message.

In case we are now willing to check that the migration is done correctly and the provided service is running properly we will select the service consuming tab as shown in figure 21 and we will be redirected to the service consuming service environment. Selecting from the dropdown list the service named “Add 2 numbers” (the same name we used at the migration time) we can click the button “Get Information” and we will get all the requested information that the provider provided at the migration time. As shown in figure 24 the Service Information and Parameters Info tabs contain the uploaded information. In case we want to invoke the selected service, we click on the invoke service button and the dynamically service consumer created page is loaded.

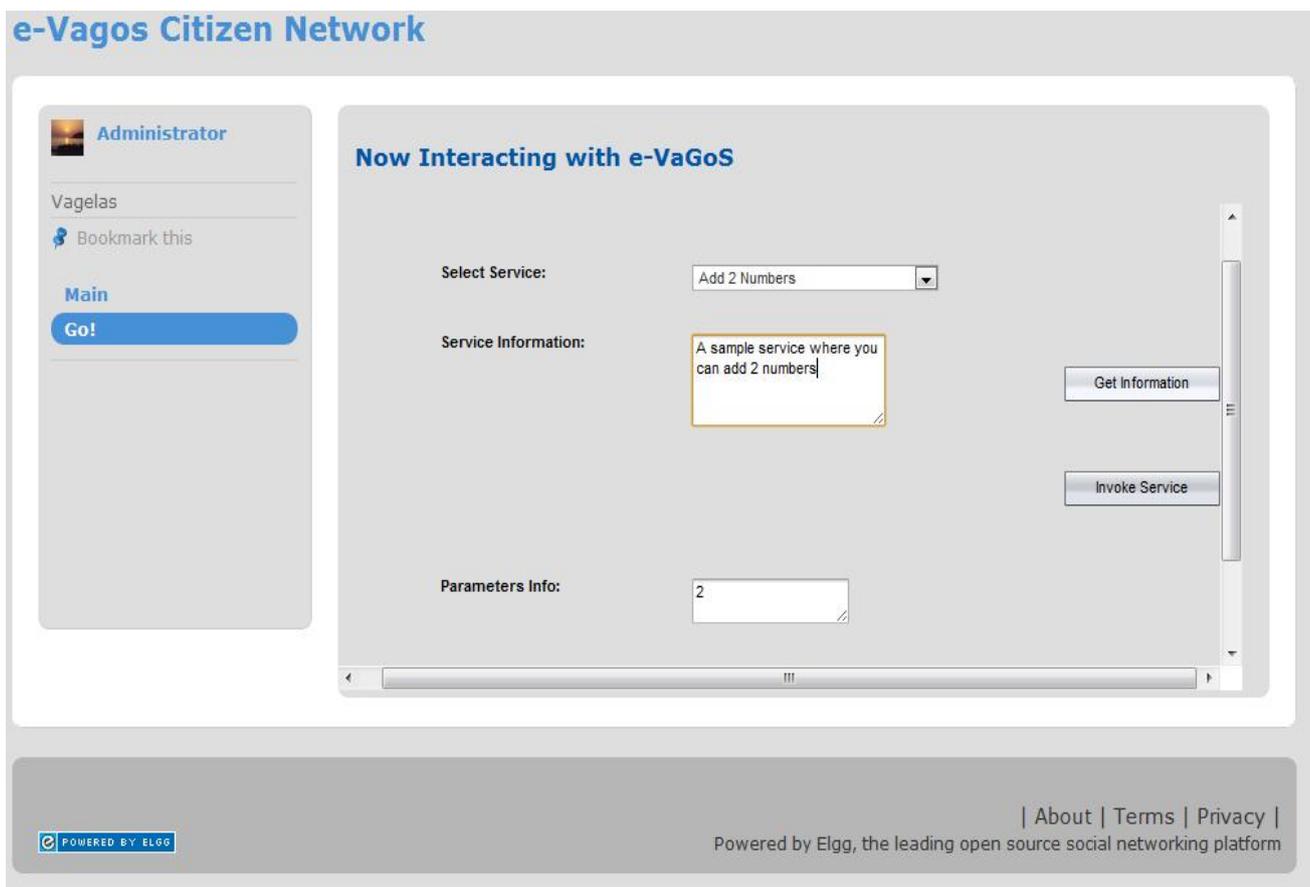


Figure 24: Sample web service invoke page

The dynamically created client contains as much parameters as the wsdl file provided. In the addition client we could see that there are 2 parameters named p1 and p2 which is the name of the

parameters in the provided xml schema as shown in figure 25. Inserting the values and clicking the invoke service button results in the execution of the web service and a screen that will inform us about the results of the invocation.

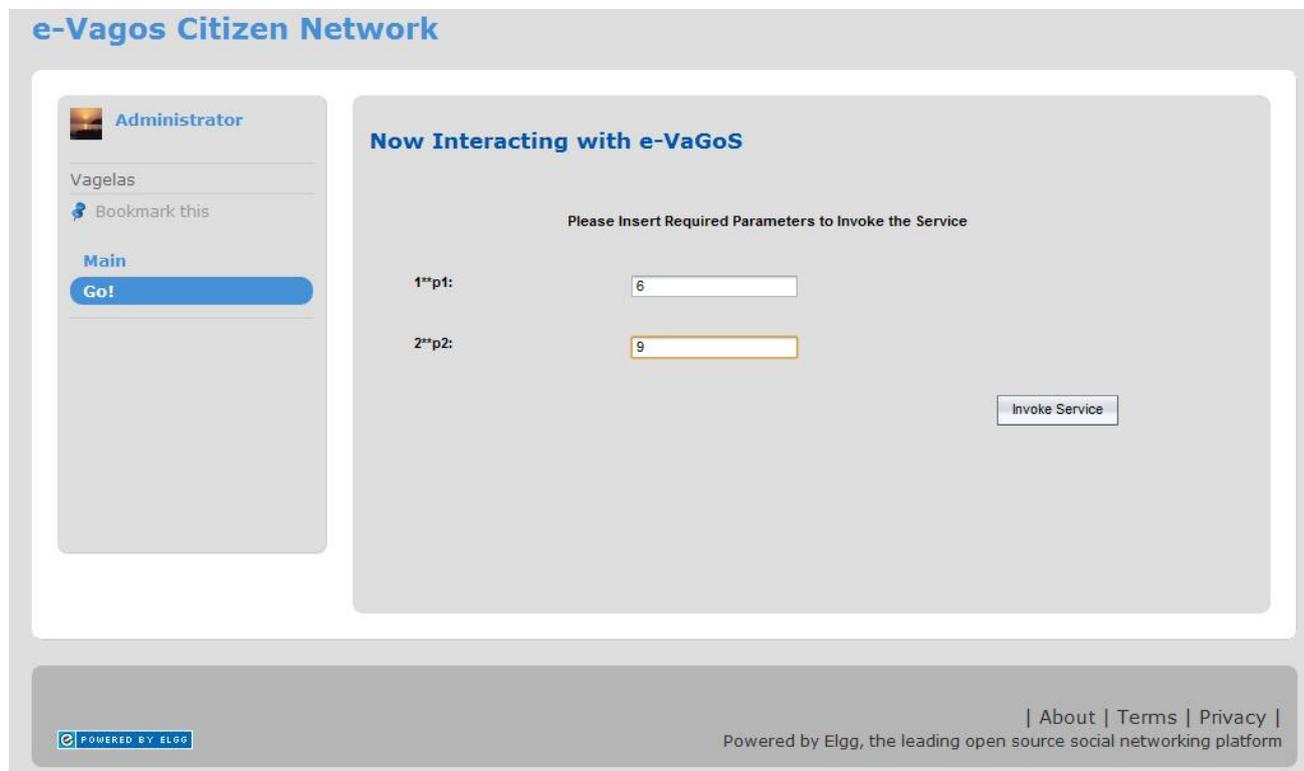


Figure 25: Sample web service dynamically generated client/consumer

The successful invocation of the service invokes an email daemon that sends the created file to the user's email as shown in figure 26.

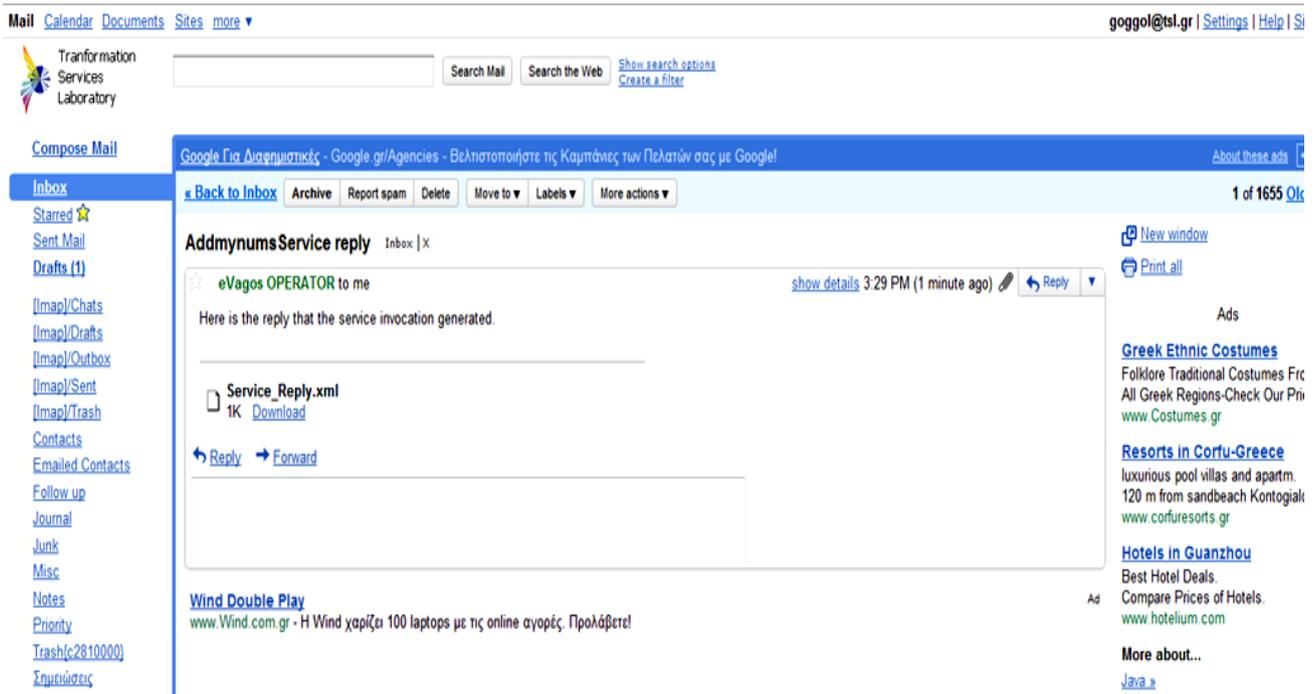


Figure 26: email sent after successful invocation

3.6 Description of Implemented government services

In order to test the framework, 3 different types of eGovernment services according to the standards and requirements provided in the web interoperability framework are implemented. These services are upload a complain/request about a specific location which is enhanced with a geocoding description, signing and verifying a document with a digital signature and creating social events and issuing digital tickets for them.

3.6.1 Government service for yahoo maps

The first implemented service uses yahoo maps in order to make a web announcement to a public service about a request or a complain that is accompanied by a web map with the location of the problem. Accompanying a web announcement with a map is a common policy in 2010 and is proposed by many public organizations worldwide, in order to save much time from looking for an address that you do not know. The web service uses the maps data collection that was provided from yahoo maps. The required parameters are the address, postcode, region and the type of request/complain the user requested for. Not all parameters are required to find the address in yahoo maps and in some cases even the address and region is enough to find the address. When

the user confirms that the present address is correct the data of his query is added to the database and a confirmation mail is sent to the user's email.

The implementation of the service that is used for a citizen to upload his request / complaint through our government provision system is made according to the guidelines and requirements that were given in Digital authentication and interoperability framework (Chapter 11.8). In the implementation we have also attached a yahoo map processor in which we interacted to find the location the user requested. As described in 11.8 the user of the service provides his Citizen Card number, the reason/type of his complain/request and the address/location this concerned. The system then used REST services and requested from the yahoo maps server the location of his address, which it then attached to the request/complain that was stored to the database of our service.

The Geocode Service is also available to be attached to any web service for future use. The type of the implementation that we also use in this service is REST services, which is to provide the requested input parameters from the url that we invoke. The parameters that we can provide are shown in the figure 27:

Parameter	Value	Description
Appid	string (required)	The application ID.
Street	string	Street name. The number is optional.
City	string	City name.
State	string	The United States state. You can spell out the full state name or you can use the two-letter abbreviation. In other counties this field is oprionail.
Zip	integer or <integer>-<integer>	The five-digit zip code, or the five-digit code plus four-digit extension. If this location contradicts the city and state specified, the zip code will be used for determining the location and the city and state will be ignored.
Location	free text	This free field lets users enter any of the following:



		<ul style="list-style-type: none"> • city, state • city, state, zip • zip • street, city, state • street, city, state, zip • street, zip <p>If location is specified, it will take priority over the individual fields in determining the location for the query. City, state and zip will be ignored.</p>
Latitude	float: <i>-90 to 90</i>	The latitude of the starting location.
Longitude	float: <i>-180 to 180</i>	The longitude of the starting location. If both latitude and longitude are specified, they will take priority over all other location data. If only one of latitude or longitude is specified, both will be ignored.
image_type	<i>png</i> (default) or <i>gif</i>	The image format for the map.
image_height	integer: <i>10 to 1024</i> (default: <i>500</i>)	The height of the image being generated, in pixels.
image_width	integer: <i>10 to 1024</i> (default: <i>500</i>)	The height of the image being generated, in pixels.
Zoom	integer: <i>1 to 12</i> (default: <i>6</i>)	The zoom level for the map, from <i>1</i> (street level) to <i>12</i> (country level). If a radius is specified, this is ignored.
Radius	float	How far (in miles) from the specified location to display on the map. The default radius varies according to the location given and the zoom level.
Output	string: <i>xml</i> (default), <i>php</i>	The format for the output. If <i>php</i> is requested, the results will be returned in



	Serialized PHP format.
--	------------------------

Figure 27: Yahoo Maps Input Parameters

A sample of the generated file from the yahoo maps response is shown in figure 28. It should be mentioned here that the output of yahoo maps usually has an image-map. However, at the response time our system can also query the system for the longitude and the latitude parameters which can be used to find any location. These parameters are then stored into our database for any future use. Longitude and Latitude can be used from any GPS device to locate the address and give us the pathway from our current position to there. The provided file is also signed using the digital signature of the administrator so the file cannot be changed and can be used only as it is.

```
<?xml version="1.0" encoding="UTF-8"?><!-- Instance of Geocoding Provided by eVagos with the help of yahoo maps--><Request ID="34">
  <Latitude>35.328057</Latitude>
  <Longitude>25.124579</Longitude>
  <Address>22 Iktinou</Address>
  <City>713 05 Heraklion</City>
  <State>Greece</State>
  <Zip>null</Zip>
  <Country>GR</Country>
  <Description>Blash se Lamba</Description>
  <Signature xmlns="http://www.w3.org/2000/09/xmldsig#"><SignedInfo>
    <CanonicalizationMethod Algorithm="http://www.w3.org/TR/2001/REC-xml-c14n-20010315"/>
    <SignatureMethod Algorithm="http://www.w3.org/2000/09/xmldsig#rsa-sha1"/><Reference URI="">
      <Transforms><Transform Algorithm="http://www.w3.org/2000/09/xmldsig#enveloped-signature"/></Transforms>
      <DigestMethod Algorithm="http://www.w3.org/2000/09/xmldsig#sha1"/><DigestValue>ZGYzjGCqST1Lg2NM9DnBQstDFig=</DigestValue>
    </Reference></SignedInfo><SignatureValue>e+4uGxdK8d5Ln1RWNMzd57a+D50GLqbGpZhBS7huJTMsBBm3WfKdAN/CV8/t12I0N1rg/oKc4mkt
    DiJYMakTcwZ1AR/Zk/ATtvydAUXEc3J0JsNuI0swzWvihPw1sUvbJ8NP0wrYMjvDRx3zwVX1FuSH
    +m3GfgIND1Mp1GF016k=</SignatureValue><KeyInfo><X509Data><X509SubjectName>CN=admin,OU=Citizen,O=eVaGoS,C=GR</X509SubjectName>
  </X509Certificate>MIIB9zCCAWCgAwIBAgIETS3EMzANBgkqhkiG9w0BAQUFADBAMQswCQYDVQQGEwJHUjEPMA0GA1UE
  ChMVGZVZhr29TMRARwDgYDVQQLEwcdAxpemVudM04wDAYDVQQDEwVhZG1pbjAeFw0xMTAxMTIxNTA5
  MzIzFw0xMTAxMTEExNTA5MzIzlaMEAxChAJBgNVBAYTAkdSMQ8wDQYDVQQKEwZ1VmFhb1MxEDA0BgnV
  BAsTB0NpdG16ZW4xZjAMBGNVBAWBTWpWbW1nMIGfMA0GCSqGSIb3DQEBQUAA4GNADCBiQKBggQCC
  ATOpDr7j1wsxKARUDvf0gVV3EVc1bMrfLELbn5RPFovJ9T7U1xrAUFz3AbsS13XGFghH7AuePZ
  8L9BFYbXEG854N+Lyx+miqxUCZJTWYVtnGmlri6dOYTwHyV4amx9XTq9r0ybH8oVC9XsH8qjjauL
  Q1g+yjUIgJeho7maxQIDAQAEMA0GCSqGSIb3DQEBBQUAA4GBAA5pV1z+Sq819UnRv63PYVCOKRTf9
  qDBwdeJlV2081rnrW8R90t5Vnsh7KKR8+27PpR7Ha/Tx5FSxMuhnTdbBljO/muQ2E/S65mWCh04
  B+0Sn8ijN+RbQW+2ZSIAIZG8svPgyi+Rb4BG/ldrG1btNLUrAUMMnFM/02q4ldftSBPQ</X509Certificate></X509Data></KeyInfo></Signature></Request>
```

Figure 28: Geocode File response

3.6.2 XML Signature eGovernment Service

The second implemented service is eSignature. Electronic signature was a field of great interest and impact in the field of web services. It was the only way to verify that a document has one and only one creator and ensure that it was signed by only him. Electronic signature was the

scientific “personal presence” that accompanies each submission of a formal request to the public or private sector. In order to implement Digital Signature in our system we used DSig Specification[19]. Each user that is registered to our system has got a unique private/public key. These keys are stored into an encoded keystore in our system that is not visible over the web. This web service is implemented in two phases. First phase involved signing a document for any proper use eg signing an id card. The signed document is signed using the private key of the signer and is sent to the user’s mail. A clone of the signed document is stored to our system for security reasons. The requested parameters are the url location of the document and the username of the signer. The second phase involves verifying that the signature of a document is authentic. The requested parameters are the url location of the signed document and the username that we wanted to verify. An email with the attached file as provided by the web service creator is sent.

XML signatures are digital signatures designed for use in XML transactions. The standard defined a schema for capturing the result of a digital signature operation applied to arbitrary (but often XML) data. Like non-XML-aware digital signatures (e.g., PKCS), XML signatures adds authentication, data integrity, and support for non-repudiation to the data that they sign. However, unlike non-XML digital signature standards, XML signature had been designed to both account for and took advantage of the Internet and XML. Detailed elements of a digital signature are shown in figure 29.

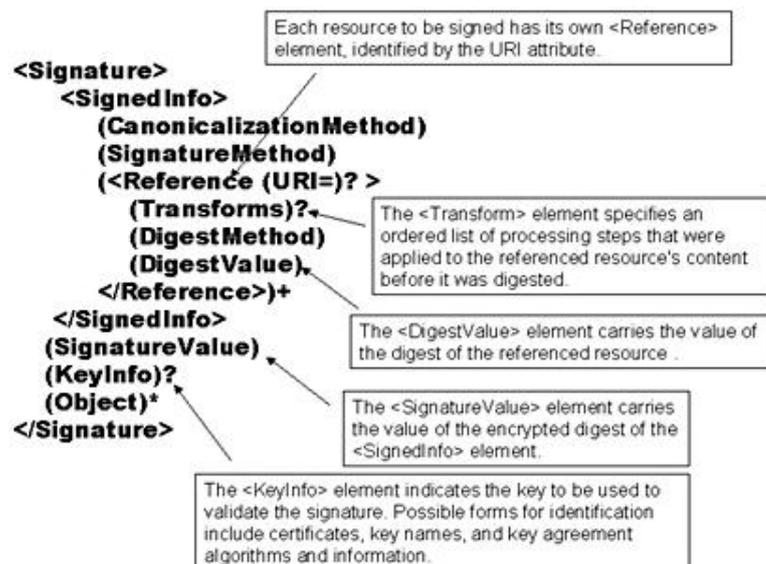


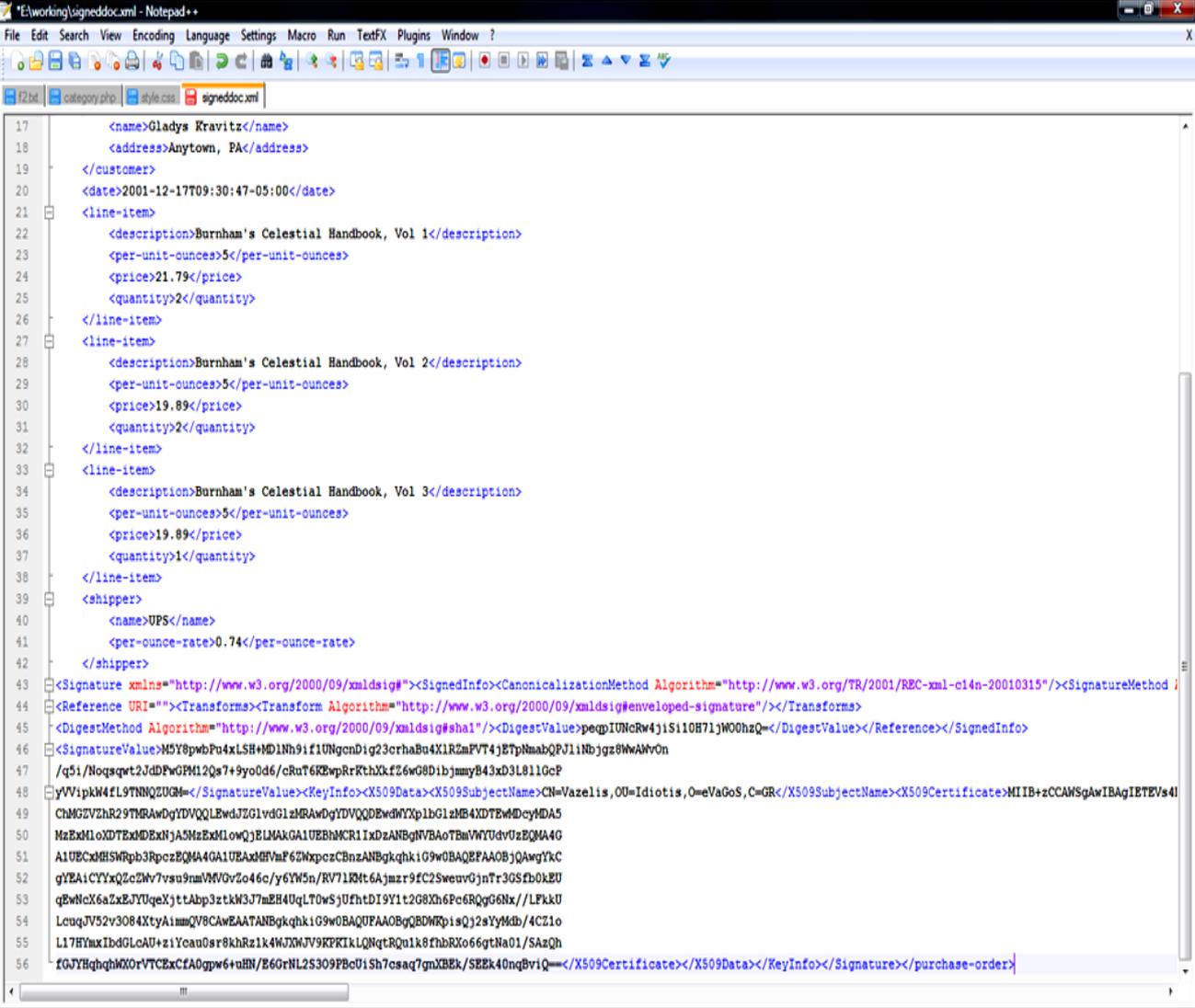
Figure 29: Digital Signature elements



As a result the implemented web service follows the following algorithm to generate the signature.

1. Determine which user wants to sign the document are collect the required fields from keystore.
2. Calculate the digest of each resource. In XML signatures, each referenced resource is specified through a <Reference> element and its digest (calculated on the identified resource and not the <Reference> element itself) is placed in a <DigestValue>child element like the <DigestMethod> element identifies the algorithm used to calculate the digest.
3. Collect the <Reference> elements (with their associated digests) within a <SignedInfo> element like The <CanonicalizationMethod> element indicates the algorithm is used to canonize the <SignedInfo>element. Different data streams with the same XML information set might have different textual representations, e.g. differing as to whitespace. To help prevent inaccurate verification results, XML information sets must first be canonized before extracting their bit representation for signature processing. The <SignatureMethod> element identifies the algorithm used to produce the signature value.
4. Calculate the digest of the <SignedInfo> element, which signed that digest and put the signature value in a <SignatureValue> element.
5. Add key information If keying information is to be included, place it in a <KeyInfo> element. Here the keying information contains the X.509 certificate for the sender, which would include the public key needed for signature verification. As a result the fields <X509Data>, <X509SubjectName> and <X509Certificate> are also considered as required fields of the Digital Signature.
6. Enclose in a Signature element place the <SignedInfo>, <SignatureValue>, <KeyInfo>, <X509Data>, <X509SubjectName> and <X509Certificate>. The <Signature> element comprises the XML signature. The signed document is sent to the user. An signature example is shown in figure 30.





```

17      <name>Gladys Kravitz</name>
18      <address>Anytown, PA</address>
19    </customer>
20    <date>2001-12-17T09:30:47-05:00</date>
21    <line-item>
22      <description>Burnham's Celestial Handbook, Vol 1</description>
23      <per-unit-ounces>5</per-unit-ounces>
24      <price>21.79</price>
25      <quantity>2</quantity>
26    </line-item>
27    <line-item>
28      <description>Burnham's Celestial Handbook, Vol 2</description>
29      <per-unit-ounces>5</per-unit-ounces>
30      <price>19.89</price>
31      <quantity>2</quantity>
32    </line-item>
33    <line-item>
34      <description>Burnham's Celestial Handbook, Vol 3</description>
35      <per-unit-ounces>5</per-unit-ounces>
36      <price>19.89</price>
37      <quantity>1</quantity>
38    </line-item>
39    <shipper>
40      <name>UPS</name>
41      <per-ounce-rate>0.74</per-ounce-rate>
42    </shipper>
43    <Signature xmlns="http://www.w3.org/2000/09/xmldsig#"><SignedInfo><CanonicalizationMethod Algorithm="http://www.w3.org/TR/2001/REC-xml-c14n-20010315"/><SignatureMethod I
44    <Reference URI=""><Transforms><Transform Algorithm="http://www.w3.org/2000/09/xmldsig#enveloped-signature"/></Transforms>
45    <DigestMethod Algorithm="http://www.w3.org/2000/09/xmldsig#sha1"/><DigestValue>peqpiUNcRw4j1Si10H71jW00hzQ=</DigestValue></Reference></SignedInfo>
46    <SignatureValue>M5Y8pwbPu4xLSH+MD1Nh9if1UNgcnDig23crhaBu4X1R2mPVT4jETpNnabQPJ1iNbJgz8WwAMvOn
47    /q5i/Noqsqwt2JdPwGPM12q8+79yo0d6/cRuT6KBPwRrKthXkfZ6wQ8DibjmyyB43xd3L811GcP
48    yVW1pkW4EL9TNNQZUGM=</SignatureValue><KeyInfo><X509Data><X509SubjectName>CN=Vazelis,OU=Idiotis,O=VaGoS,C=GR</X509SubjectName><X509Certificate>MIIB+zCCAMsgAwIBAgIETBVs4I
49    CHMGZVZhr29TRAwDgYDVQQLLEwdJZG1vdG1zHRAwDgYDVQQDEwdWYXp1bG1zMB4XDTEwMDcyMDA5
50    NzExM1oXDTEwMDExNjA5MzEzExM1oWQjE1MAKGA1UEBhMCRIExDzANBgNVBAoTBmVudVUzBQMA4G
51    A1UECmQhSWRpb3Rpe3BQMA4GA1UEAxbHVm6ZWhxpczCBnzANBgkqhkiG9w0BAQEFAAOBjQAwgYkC
52    qYEAiCTYxQ2o2Mv7vsa9nmVMVgv5o46c/y6YM5n/RV71RMt6Ajmzr9fC2SweuvGjnTr3OSFb0kEU
53    qBwNcX6aZxZyUqeXjttAbp3ztkW3J7mEH4UqL70wSjUfhtDI9Y1t2G8Xh6Pe6RqG6Nx//LPkKU
54    LcaqJV52v3084XtyAimmQV8CAWAAATANBgkqhkiG9w0BAQUFAAOBgQBDNRp1sQj2sYyMdb/4CZ1o
55    L17HYmxIbdGLoAU+zIYeau0sr8khRz1k4WJXWJ9KPKTKLQNgtrQn1k8fhhRXo66gtNa01/SazQh
56    tGJYHqhqhX0RvTCEXCfA0gpw6+uHN/B60rNL25309PBoU1Sh7csaq7gnXBK/SEBK40nqBviQ=</X509Certificate></X509Data></KeyInfo></Signature></purchase-order>

```

Figure 30: Digital Signature signed document

In case someone else is willing to verify the validity of the signed document they can login into our system and invoke the digital signature validation eGovernment service. The algorithm that our web service uses to validate the signature is very simple. It has to recalculate the digest of the <SignedInfo>element (using the digest algorithm specified in the <SignatureMethod> element) and uses the public verification key to verify that the value of the <SignatureValue> element is correct for the digest of the <SignedInfo> element. A verification is then sent to the users' email with the result of the verification for any use.

In order to fulfill the requirements defined in digital tickets standard [20] we adopted an approach which uses our already existing account management system. We developed a system which consists of XML language for ticket definition and SOAP for web service implementation. As a result, in our system a digital ticket is defined as an assertion that an issuer promises the ticket owner specified in <Owner>, a promise specified in <Event> for Number of Seats specified in <seats>, place specified in <place> and date specified in <date>. The digital signature was specified in <Signature> as illustrated hereafter. The information details that are printed on the ticket came from the input parameter of the service as described above. Those properties were necessary for the ticket processing systems. An example of a signed digital ticket is shown in figure 31. It is important to mention here that once the ticket is signed and provided there is no way that someone can alter the details of it, because at the same time the signature that the file contains will be invalid.

3.7 Description of Implemented methods and classes

In our projects we implemented several different codes as described above. However, it is important to mention and explain the classes that exist in two specific packages of our project. Those packages are responsible for the eVaGoS framework and are web.util and java_dbase.

3.7.1 Package java_dbase

This package is responsible for performing all the required operations that included connection and update of eVaGoS database. This package contains only one class with several methods. The containing methods are shown below with a short explanation.

```
public String getServiceParameters(String nm);
```

This method returned the value of the field that describes the requested parameters of the eGovernment service with the name provided in nm;

```
public String getServiceDescription(String nm);
```

This method returns the value of the field that describes the eGovernment service with the name provided in nm.

```
public String getAlias(String nm);
```

This method returned the alias of the user with the username provided in nm.

```
public String getKeypass(String nm);
```

This method returned the keypass of the user with the username provided in nm.

```
public String loginUser(String nm, String pw);
```

This method checks if the user with username nm and password pw is allowed to login to our framework.

```
public String HasProviderPriviledge(String nm, String pw);
```

This method checks if the user with username nm and password pw is allowed to provide a eGovernment service in our framework.

```
public String activateUser(String nm, String pw, String id, String pr);
```

This method correlated the user with elgg username nm and elgg password pw with eVaGoS framework username id and password pr and enables him to use our framework.

```
public String Add(String ServID, String name, String wsdl,String description, String params);
```

This method added the eGovernment service with ServID, Service name, location of wsdl file, description of the service and description of parameters to our service_table in database and invokes all the required operation for the creation of the dynamic client.

```
public String Create_Service_Operations_Table(String servName, Map Params);
```

This method creates an invocation registry for a specific service in our database for service with name servName and input parameters Params.

```
public String TableCount(String nm, String table);
```

This method is a utility one and counts the appearances of string nm in database table.

```
private void accessKeyStore(String command);
```

This method accesses the Keystore where the identification keys for eSignature are located and performs the command described in command.

```
private String createVals(String cn, String org, String al, String ps);
```

This method associates the nickname provided in cn and the characteristic provided in org with the username (alias) provided in al and password provided in ps.

3.7.2 web.util

In this package there is the heart of our framework and the most advanced operation are performed here.



3.7.2.1 Class ClientGenerator

This class performs all desired operations for generating the dynamic client that will be available for the eGovernment service consuming. The containing methods are:

```
public ClientGenerator(String n, String p, String sName, String w, Map m, String sql, String guides );
```

This method creates a new client instance with service id as defined in n. package name as defined in p, service name as defined in sName, wsdl file location as defined in w, Parameters List as defined in m. SQL file location as defined in sql and gov file location as defined in guides.

```
public void createFiles();
```

This method created the JSP and Java files that will be the base files of our client and will be altered later to fit to each service.

```
private String WriteConfigxml();
```

This method declares into the master xml file our system which is required for the client to be visible through the web.

```
public void createJavaBase();
```

This method alters the java base file of the client in order to perform all predefined operations. Java base is responsible for the backend operations of each web service.

```
public void createJSPBase();
```

This method alters the jsp base file of the client in order to perform all predefined operations. Jsp base is responsible for the visual representation of each web service.

```
public void parseParametersMap(Map m);
```

This method parsed the Map m and extracted all defined parameters into the local service.

```
public void makeJavaActions(int num, HelperGovHandler GovHandler, String DropParams);
```

This method invokes the algorithm that will perform all related operation to the java base. Num is number of parameters, GovHandler is a variable that is related to the operations for gov language and will be further explained later and DropParams is a helper parameter for our algorithm.

```
public void addNavigationRuleSubmit(String from);
```

This method performs all desired operation for the redirection of our JSP client file to the successful or failed pages after the execution/submits of the web service. Parameter from defines the name of our service.

```
public void addNavigationRuleInvoke(String to);
```



This method performs all desired operation for the redirection of our framework to the new dynamic JSP client before the invocation of the web service. Parameter to defines the name of our service.

String properCase (String inputVal);

This method checks if the string provided in inputVal is valid.

String properCaseGovTable (String inputVal);

This method checks if the string provided in inputVal is valid. The difference from the above is that the valid event is different because here we check if a line defined in a gov file is of corrent spelling.

3.7.2.2 class ComplexParamTypesList

This class is responsible for handling any complex parameters and decodes it into a list of items. A complex parameter can be a message named Msg which contains two string parameters and one Integer.

public ComplexParamTypesList(String n, String t, ComplexParamTypesList p);

This method defines a new ComplexParamTypesList with parameter name as provided in n, parameter type as provided in t and next node as provided in p.

public String getName();

This method gets the name of the current processed node.

public void setName(String s);

This method sets the name provided in s to the current processed node.

public String getType();

This method gets the type of the current processed node.

public void setType(String s);

This method sets the type provided in s to the current processed node.

public ComplexParamTypesList getNext();

This method returns the next ComplexParamTypesList node that points our current node.

public void setNext(ComplexParamTypesList s).

This method sets as next ComplexParamTypesList node, the node provided in s, to our current node.



3.7.2.3 class HelperGovHandler

This class is responsible for the handling of the gov file. Handling includes decoding, creating or altering the dynamic client in order to be according to the provided commands.

```
public HelperGovHandler(String fileloc, String servName);
```

This method invokes a new HelperGovHandler instance for the service name as provided in servName for the gov file located in fileloc.

```
public String getFile();
```

This method returns the location of the gov file of the current HelperGovHandler instance.

```
public String getName();
```

This method returns the name of the associated government service of the current HelperGovHandler instance.

```
public helpGovParams getParams();
```

This method returns a list of the associated parameters as defined in the gov file.

```
public void GetParamsFromFile();
```

This method starts the decoding of the commands defined in gov file and separated them into different parameters.

```
public boolean needHandling(String pName, int val);
```

This method checks if the parameter named as defined in pName which is the i-th parameters as defined in val need any handling as arised from gov file.

```
public String findTable(String name, HelperGovHandler curr, int val);
```

This method checks if the parameter named as defined in name which is the i-th parameters as defined in val is included into the command and returns the database table associated with that command.

```
public String findColumn(String name, HelperGovHandler curr, int val);
```

This method checks if the parameter named as defined in name which is the i-th parameters as defined in val is included into the command and returns the database column associated with that command.

```
public void fixSessionBean(String tableName);
```

JavaBeans is an associated technology that enables us to draw the values from a table using java. This method here performs all required operation in order our dynamically created client be able to draw values from the table defined in tableName.



3.7.2.4 class **Importer**

This class is invoked first by the time the user selected to migrate the eGovernment service to our framework. It performed all operations for a first decoding of the wsdl file into separate semantic parts that would be used later.

```
public Importer(String a, String b);
```

This method invokes a new Importer instance for a new eGovernment service. The package where the execution files of the service are defined in and the url location of the wsdl file is defined in b.

```
public boolean SimpleParams();
```

This method checks if the wsdl file contained only simple parameters or also had complex parameters. If has only simple returns true otherwise false.

```
public String getPortName(String loc);
```

This method finds and returns the port defined url location of wsdl file in loc.

```
public void getComplexTypes();
```

This method is invoked if SimpleParams returned false and finds the Complex Parameters into the wsdl file and stored them in a static list of the instance for future use.

```
public String getServiceName();
```

This method returns the service name of the current instance of Importer.

```
public String getWsdLoc()
```

This method returns the wsdl location of the current instance of Importer.

```
public Map getMap();
```

This method returns the list of parameters as defined in wsdl file of the current instance of Importer.

```
public String getpackName();
```

This method returns the package name where the execution files of the eGovernment services where extracted of the current instance of the Importer.

3.7.2.5 class **ParametersList**

This class is responsible for keeping all the simple parameters names that are defined as simple from the beginning into the wsdl file and do not need any further handling.

```
public ParametersList(String n, ParametersList p);
```



This method generates a new ParametersList node with name as defined in n and next node as defined in p.

```
public String getName();
```

This method get the name of the current processed node.

```
public void setName(String s);
```

This method sets the name provided in s to the current processed node.

```
public ParametersList getNext();
```

This method returns the next ParametersList node that points our current node.

```
public void setNext(ParametersList s);
```

This method sets as next ParametersList node, the node provided in s, to our current node.

3.7.2.6 class PortInfos

This class is responsible for storing the infos that are required for the invocation of a port. It specifically stores the information provided in the executable code that is related to the web service port.

```
public PortInfos(String c, String f);
```

This method invokes a new instance of the PortInfo and stores the class name that describes them as defined in c and the function name that invokes a new port instance of that type as defined in f.

```
public String getFunctionName();
```

This method returns the name of the function that invokes a new current port instance.

```
public String getClassName();
```

This method returns the name of the class that describes the current port.

3.7.2.7 class SQLScript

This class is responsible for performing all required operations for the migration of a database into our system. It also executes the sql file that could be provided from service provision selection.

```
public SQLScript(String scriptFileName);
```

This method invokes a new SQLScript instance and extraxts from location defined in scriptFileName the required information and connects to our database using JDBC.

```
protected void loadScript();
```



This method loads the script that was defined in the previous method in scriptFileName.

```
private boolean isComment(String line);
```

This method checks if the line provided in line is connected and should be omitted.

```
public void execute();
```

This method is invoked in case a full command was read and stored to our buffer and executes it.

```
private boolean checkStatementEnds(String s);
```

This method checks if the string provided in s contains an statement end character and execute method should be invoked.

3.7.2.8 class ServiceParsing

This class is the 2nd hand of parsing that goes after and extracts all desired information from the generated parts that provided the 1st parsing. From the results of this parsing we will have all desired information for the creation of the dynamic client.

```
public ComplexParamTypesList getComplexParamList (String nm, ParametersList p);
```

This method gets the parameters list and their definition file as defined in nm and decodes them into simple types.

```
public ParametersList getInputParams(String loc, String nm, String nm2);
```

This method returns the input parameters as defined in file loc with name either nm or nm2. The two parameters are required to handle a different version of import.

```
public String getOperName(String nm, String outNameMsg);
```

This method returns the operation name of the operation that is contained in nm and returns a web service message with name outNameMsg.

```
public ParametersList getOperationParamsTypes(String nm, String opName);
```

This method return a list of the Parameters defined in nm for the operation with name opName;

```
public PortInfos getPortName(String nm);
```

This method finds the port name that is defined in nm and returns them into PortInfos.

3.7.2.9 class helpGovParams

This class is responsible for storing the commands that are provided from a gov file and decompose them into separate parameters.



```
public helpGovParams(String com, String pN, String col, String tb, String v);
```

This method invokes a new helpGovParams instance with command parameter as defined in com, parameter name as defined in pN, table column name as defined in col, table name as defined in tb and special info parameter as defined in v.

```
public String getCommand();
```

This method returns the command parameter of the current node.

```
public String getColumn();
```

This method returns the column parameter of the current node.

```
public String getTable();
```

This method returns the table parameter of the current node.

```
public String getViewSpec();
```

This method returns the special parameter of the current node.

```
public String getParName();
```

This method returns the parameter name of the current node.

```
public helpGovParams getNext();
```

This method returns the next node of the current node.

```
public void setNext(helpGovParams s);
```

This method sets s as the next node of the current node.

3.7.2.10 class ServiceDescription

This class is the final class that will contain the detailed description of the web service in every semantic and physical part. An instance of this class is invoked at the beginning of the service parsing and its fields are filling throughout the parsing.

```
public void setServiceName(String a);
```

This method sets the service name as defined in the wsdl file and stores it to the specific field.

```
public void setPortClassName(String a);
```

This method sets the used port name as defined in the wsdl file and stores it in the specific field.

```
public void setgetPortFuncName(String a);
```

This method finds the function that will return the port name in the executable code of the web service and stores it for future use.

```
public void setServiceOperationInvokeName(String a);
```



This method finds the function that generates an instance of the desired operation in the execution code and stores it for future use.

```
public void setInputMessageNameASQNAME(String a);
```

This method sets the QName of the input message as defined in wsdl file.

```
public void setoutputMessageNameASQNAME(String a);
```

This method sets the QName of the out message as defined in wsdl file.

```
public void setInputMessageNameASCLASS(String a);
```

This method finds the function that generates an instance of the input message from the execution code and stores it for future use.

```
public void setoutputMessageNameASCLASS(String a);
```

This method finds the function that generates an instance of the out message from the execution code and stores it for future use.

```
public void setfunctionOutputParamsTypes(ParametersList a);
```

This function finds the parameters types of the function that generates the output message from the execution code and stores them for future use.

```
public void setfunctionInputParamsTypes(ParametersList a);
```

This function finds the parameters types of the function that generates the input message from the execution code and stores them for future use.

```
public void setInputMessageParams(ParametersList a);
```

This function finds the parameters types of the input message as described in the wsdl file and stores them for future use.

```
public void setoutputMessageParams(ParametersList a);
```

This function finds the parameters types of the output message as described in the wsdl file and stores them for future use.

```
public void setComplexParamTypesList(ComplexParamTypesList a);
```

This function finds and sets the exchanged ComplexParameters Type, if they exist, and stores them for any future use.

For each function there is a mirror function that returns the stored results when is need at the construction of the dynamic client and are described in the following lines:

```
public ComplexParamTypesList getComplexParamTypesList();
```

```
public String getServiceName();
```

```
public String getPortClassName();
```



```
public String getgetPortFuncName();
public String getServiceOperationInvokeName();
public String getinputMessageNameASQNAME();
public String getoutputMessageNameASQNAME();
public String getinputMessageNameASCLASS();
public String getoutputMessageNameASCLASS();
public ParametersList getfunctionInputParamsTypes();
public ParametersList getfunctionOutputParamsTypes();
public ParametersList getinputMessageParams();
public ParametersList getoutputMessageParams();
```

4. Related Work

One critical goal for eGovernment systems nowadays, is to provide to their users (citizens, businesses or public administration) the ability to interact efficiently with any government administration office and provide the best possible solutions for their needs. This kind of interaction, between the public administration and its users, is composed of several different stages and aspects. Such kind can be the ability of the user to submit a request in a formal and verified form which is suitable for the public administration to handle it, the ability to inform users about any change of policy, rules or operation, the ability to provide to the citizen any useful information or update that is related to their personal of public life, the ability to act as a pro-active measure so can approach the citizen in any stage of his current life and face a problem that could occur, the ability to provide citizens with central point of contact and one-stop government services etc. Most eGovernment systems adopted by public administration today provide their services through eGovernment portals under the username/password policy and verification, so users can interact directly with public administration office. However, the key factor that distinguishes a normal portal from a truly useful one that would be easily adopted by the public, is the insertion of semantic technologies in it. Semantic technologies provide a better experience and easier use to their users, by personalizing and focusing the portal and the services to each user's profile and requests. As a result a key research sector nowadays in eGovernment is semantic enabled eGovernment portals.

Semantic-Based Knowledge Management in E-Government: Modeling Attention for Proactive Information Delivery is a great idea about how we can transform a Public Administration portal into a really productive and informative environment. Using this portal, authors enable



public administration to take grounded and proactive decisions that are in accordance with the related legislation and all other sources of related knowledge, such as Public Administration regulations, previous cases, local policies and relevant web resources. The provided system goes beyond just informing the user about a change that was made recently. It also requires from the user to inform system about his reaction on this changes, by supporting him with key features that are based on user's working context and preferences. This approach is based on an expressive attention model, which is realized by combining ontologies with Event-Condition-Action rules. Although, this approach is really interesting it is not yet adopted by any system and there is no formal evaluation about it until today. However, such an approach would be useful to be taken into consideration because our system, has a built-in feature of like or dislike method (as a proper social network), and any formal evaluation about that system should not be under-estimated.

Personalization in E-Government: An approach that combines Semantic and Web 2.0, is a great approach for empowering eGovernment portals with adaptability and web 2.0 technologies, Ajax and semantic web technologies. The main problem that the authors are trying to tackle is that technology is the centre of each government portal. This approach usually ends up limiting radically the number of users that can user these portals, because of the lack of knowledge of the technologies. However, to confront different citizens with a one-size-fits-all Web service is not an optimal way to deliver public sector services, because each person is an individual with different knowledge, skills and preferences. As a result, most citizens tend to use conventional public administration services rather their e-version. The authors of the described here paper claim, that in order to attract some of these people to eGovernment portals, it is required to build adaptive portals for public services. Such portals, are believed to increase usability and as a result the acceptance of eGovernment, enabling administration to achieve the, as yet, elusive gains and user satisfaction that are the primary goals of eGovernment projects. The solution proposed provides a semantic framework for capturing the meaning of a user's behavior in a portal, applying certain rules and allowing the portal to adapt to this situation. This approach has been tested and there are some interesting results that come from that evaluation. The most interesting is that the adaptive version of the portal was used more than the static one. This approach is important compared to our approach, because it also tries to tackle the problem of not widely accepted government portals and provides an adaptive portal for that. On the contrary, we are assuming that enabling eGovernment provision/consuming over a social network, which is widely accepted, will tackle that problem.



A Semantically Enabled Portal for Facilitating the Public Service Provision describes a possible solution for complex public services on actual users' needs/profiles. In order to address problems like complex legislation and vague pre-conditions based on multiple details for citizens profiles, a solution is described that will allow users to express their needs or interests and discover which available public services address these specific needs/interests. This solution is comprised of a user-friendly, self-explanatory platform which is responsible for supporting users in searching for the appropriate services, while at the same time it provides guidance through the service provision process. That platform also can provide information about the eligibility of services, together with specific and well-structured service descriptions. In this approach, it is very interesting the search for a government service with the help from a users' digital profile. Comparing to our system, this profile can possibly be the social network profile and any future search based on users' needs, can be implemented by using and enriching the users' profile with information that could help the algorithm that searches / invokes the public service.

Given the above, we conclude that eGovernment is not merely a technology field, or just a sum of applications. It must be considered deeply into a substantive transformation of the field of government relations with citizens, businesses and employees. This is precisely the deeply transformational nature of eGovernment which is to establish the primary objectives by the improvement of administrative and state operations. This goal must be nowadays the primary objective of both Greece and the European Union.

5. Conclusion – Future Work

It is obvious that together with the environmental studies of engineering, information technology projects should be accompanied by indicators of social utility. A citizen - system user should always be able to provide the degree of his satisfaction of needs from the implemented system and he must not be trapped in a tricky technocratic approach and other technical features. The very blatant lack of such studies makes eGovernment information systems inaccessible to the public and too awkward.

As an example, some innovative ideas for projects of eGovernment with outward-oriented and high value added could be:

- Establishing a business in a few days. Practically this means that each person interacts with a single point service (one stop service), which is required to communicate electronically to any other public authority.
- Electronic change of address after filing accountable statement to a single point of reference. The declaration of change of residence propelled by this unique point to any other authority, which needs to communicate with citizens.
- Mandatory electronic communication between all public services to serve the citizens.
- All ministries and public bodies are required to disclose a specific site and publish their law propositions and bills before they take effect. This public consultation is mandatory to reduce the real democratic deficit in decision making.

In order to get some feedback about our application, its functionality and the provided services we have decided to launch a test period where we exposed our system to randomly chosen citizens and were asking them to use it. After a 15 minute test time where they were registered over the social network, they altered the details of their account and they consumed a selected service, they were asked to fill in an online survey with five questions. It is important to mention here that before each user started to use our framework there was a small briefing with little details about the system. For the online survey we used the online site <http://www.kwiksurveys.com> and the test period was from 27th December to 15th January.

We have selected four questions with four predefined answers and one open type question where we asked from the user to submit any enquiry, complain or suggestion to the developers. The four questions were if the user was using any social networks, if the user is positive towards the use of social networks for the provision of eGovernment services, if the user finds the framework easy to use and if they would suggest the framework to a friend. There was also one final question about the age distribution of the individual. The survey can be accessed at http://www.kwiksurveys.com/online-survey.php?surveyID=HBMKMN_b1f89d95.

The results of each question are presented below.

Q1 The question was: “**Do you use social networking platforms?**”.

The provided answers were “Frequently, Rarely, Not at all, No”.

The results are shown in figure 32.

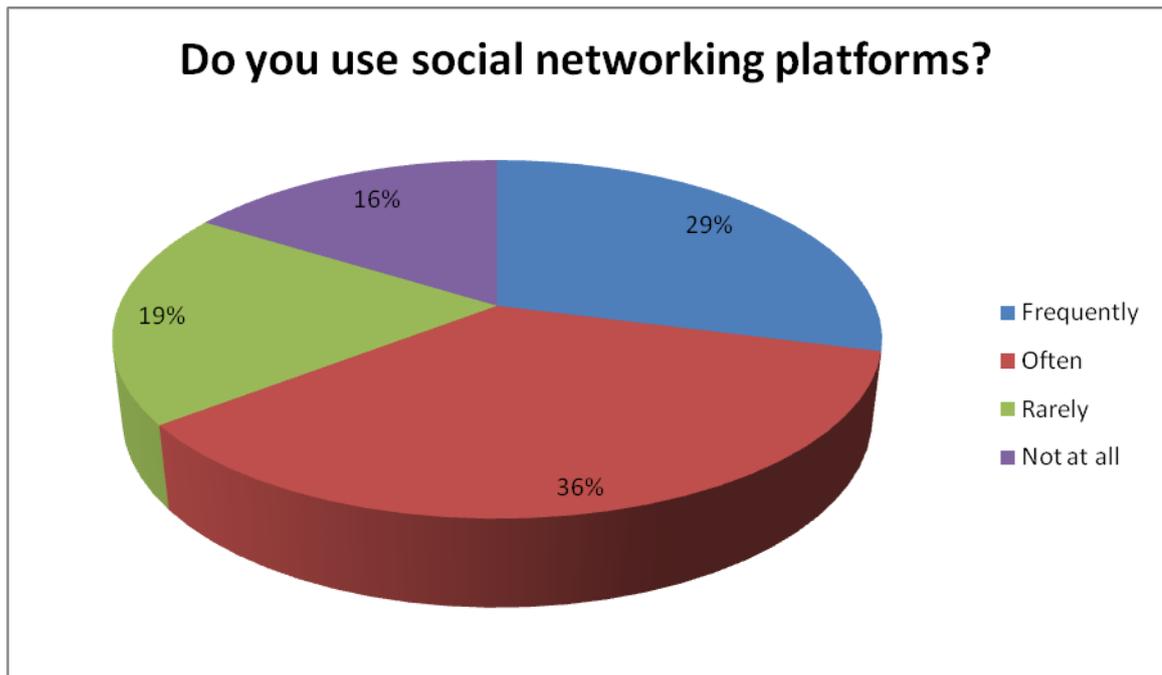


Figure 32: Question 1 Results

Q2 The question was: “Do you think positively towards the use of social networking platforms for providing eGovernment Services?”.

The provided answers were “Yes, Rather So, Rather Not, No”.

The results are shown in figure 33.

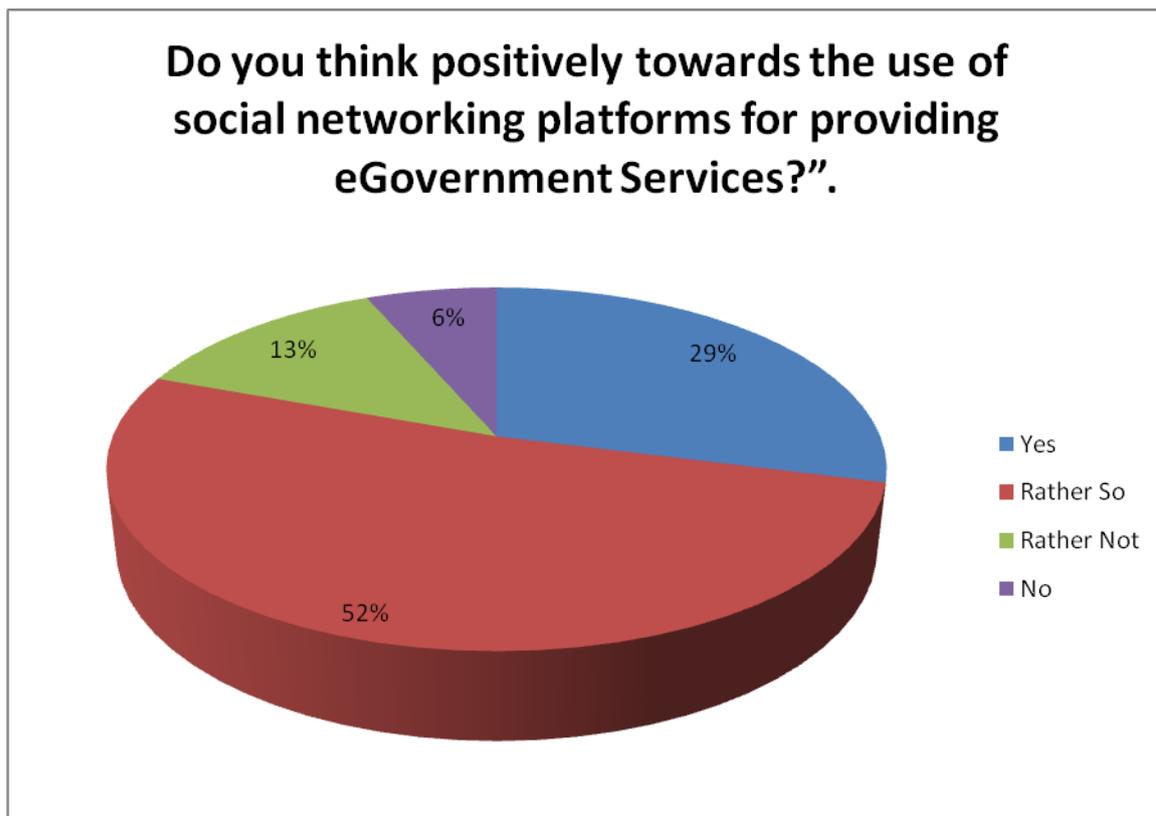


Figure 33: Question 2 Results

Q3 The question was: “**Did you find the platform easy to use?”.**

The provided answers were “Yes, Rather So, Rather Not, No”.

The results are shown in figure 34.

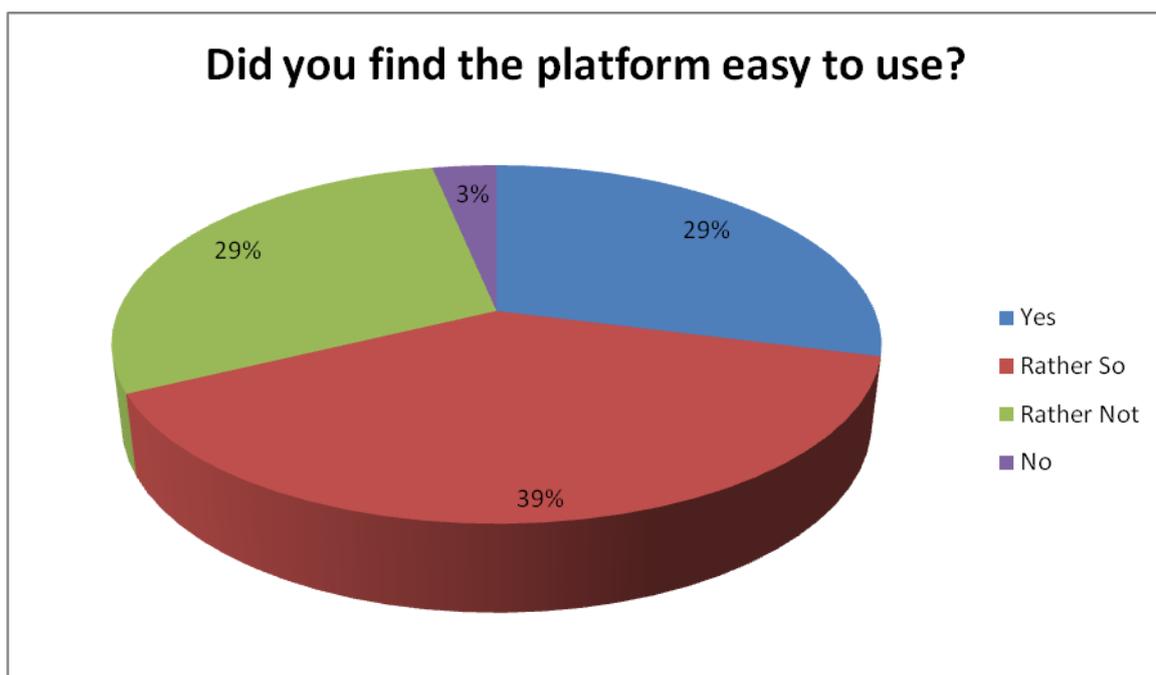


Figure 34: Question 3 Results

Q4 The question was: “**Would you suggest this framework to a friend?**”.

The provided answers were “Yes, Rather So, Rather Not, No”.

The results are shown in figure 35.

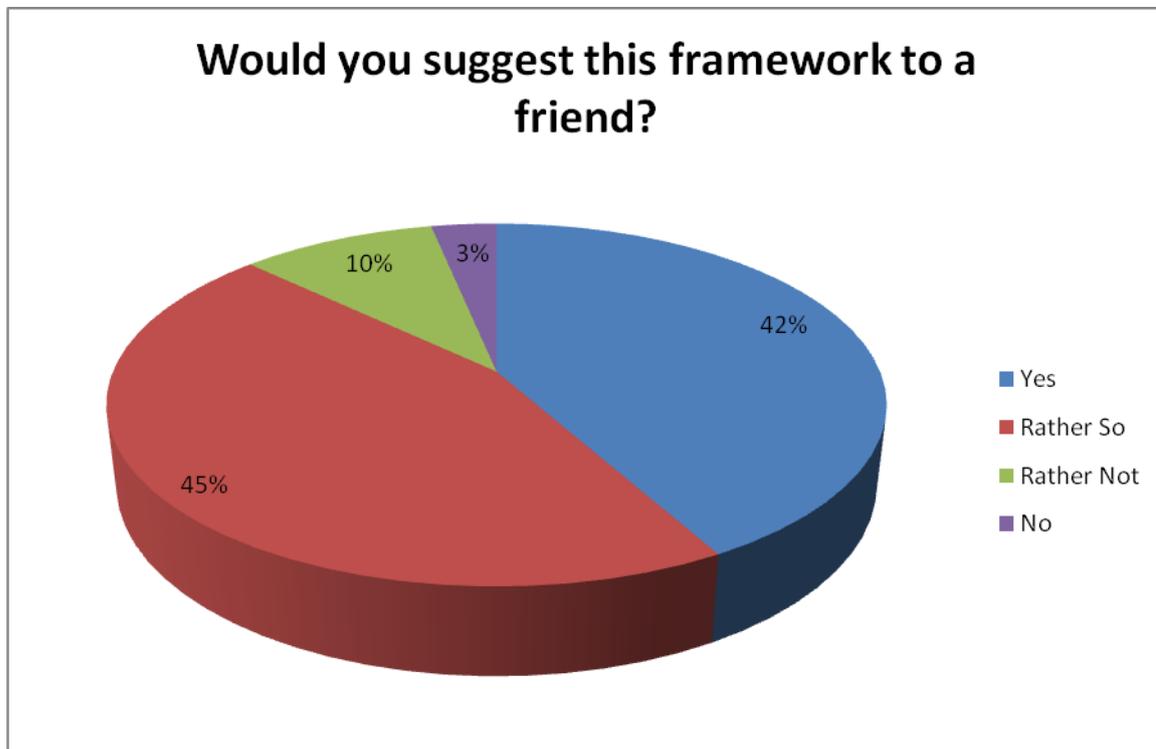


Figure 35: Question 4 Results

Q6 The age demographics are presented in Figure 36.

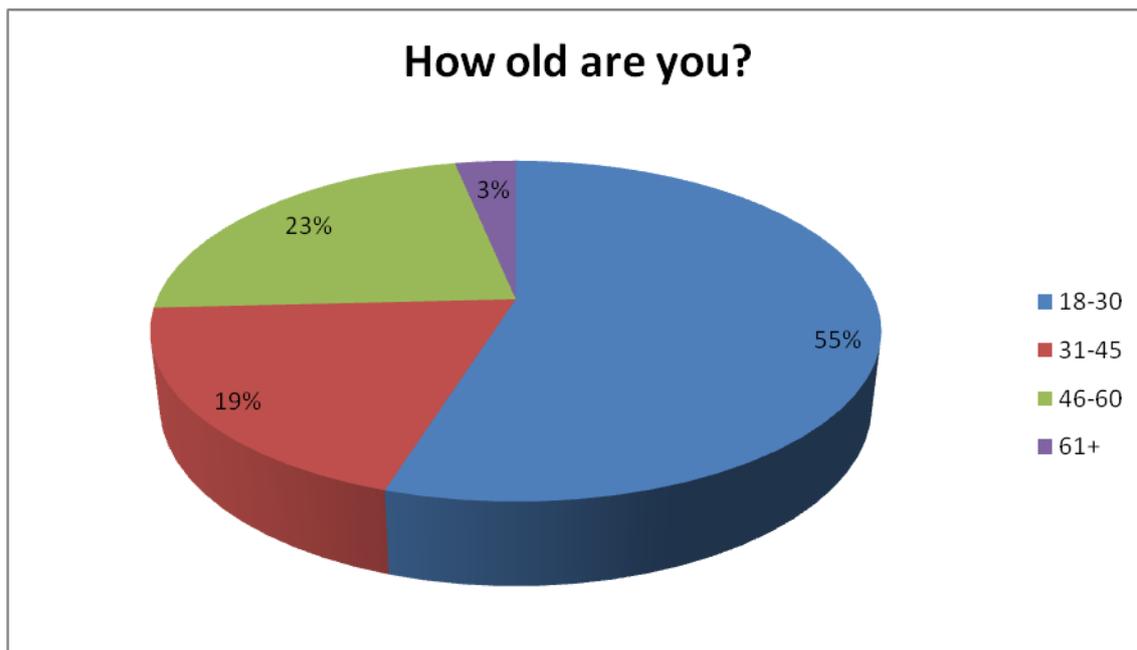


Figure 36: Age Demographics



The results of the questionnaire showed that our system was treated with interest from the people that tested our framework. The first question showed that the large majority of people were already using a social network, which also confirmed their large penetration in the Greek society. The positive answers about the use of social networking platforms were 65%, while the negatives ones were 35%. It is also of great importance that the great majority of people asked about their attitude towards the use of these platforms for eGovernment services were positive on 81%, while negative at 19%. The age question showed that the people were adults of early or mature age which are the active population of every country. The question about the ease of use showed that the result was not as high as expected. However, it is important that the majority of people answered positively by 68% while 32% were negative. We expected a result of at least 75% of individuals finding our platform easy. However, we were really close to our goal. Last but not least, the question about the possibility of suggesting the framework to a friend gets a huge majority of positive answers, which ensures that a system like this in the future will be widely accepted and advertised personally by every user. The positive answers of the recommendation were 87%, while the negative ones only 13%. It is important to mention here that the 87% that are willing to recommend our framework are much more than the 65% that are already using frequently social networks. As a result we can clearly conclude from that question that our implementation seems to be very interesting to people who nowadays neglect the existence of social networking platforms. The open type question had several key comments but the most interesting ones were enquiries about a type of tutorial or online documentation that will explain each step to the users. From these answering that part, as it was not obligatory as the previous multiple choice questions, a 62% is requesting documentation about how to use.

5.1 Final remarks

In this thesis, we have developed and tested a complete system that enabled the provision and consuming of government services through a social network. We have also tested this implementation into an open source social network and provided three government services, digital signature (signing and validation), digital ticket (create an event and provide a ticket) and making a request/complain accompanied by yahoo maps. We have launched a test period for the system, where we exposed the system to citizens and got feedback. This system is one of the first attempts worldwide to correlate social networks and eGovernment services, trying to take advantage of the huge impact that social networks have to our lives.



Each user can obtain a unique username and password that can be used to login to the social network and interact with other citizens. At any time they can go to a citizen service center and authenticate their account with their citizen card if they want to be only a consumer. In case they want to be a provider, they must also provide the desired certificates that are required from the law and wait for their approval. At any time the users can consume a service and receive a copy of the reply from the web service to their email for any legal use. The reply of each web service is an attached file that must be provided by the web service creator. This reply is digitally signed and cannot be altered in any way. For the eVagos system, there is a separate database that contains all the desired attributes for both users and services. Each service has also a separate database table where each invocation is stored in order to keep a backup and track any problem that could arise. Using our system it is also possible to provide new services using the existing ones from our framework.

5.2 Where our system helps

We believe that the provided system is an innovative idea about the possible integration of social networks into some real life services. The main advantage of this system is that we enable each user that has internet access and logs into a social network to be able to consume any government service. This service also requires only authenticating the account once and then the citizen is able to have every provided government service with a simple click of his mouse.

Another important advantage is the ability to provide and migrate every provided service to our server by simply authenticating the user as a provider, under the recent laws and legislate. The migration simply requires the wsdl 1.1 file and also enables to provide to the migrated service the state of the old one by simply providing an sql file with the old entries, which will be executed to our database. Furthermore, the system provided a dynamically created client which consumed the web service and did not require any further technology knowledge about how you could create a web client that will consume a web service.

A very important positive is that it is an interesting idea about how we can tackle the citizens' negligence about the local and global government. Providing a framework that can be attached to any social network will result in a more friendly and coherent way for citizens to adopt and use better government services. This will result in the better quality of service, in tackling bureaucracy and digital illiteracy. EGovernment provision is important and can result in the reactivation of the marginalized parties of our society.



Last but not least, using such kind of the developed services, as digital ticket, digital signature and web complaints/requests, results in creating better ecological incentives for everyone because we reduce the amount of paper that is needed for each service. An important application that fits in here is that we can reuse the digitally signed copy of our degree many times, while we have to authenticate each photocopy of our degree if we want to apply for a job. Environment and nature can benefit greatly from properly designed and developed eGovernment services.

5.3 Future Work

An important part of the future work is implementing and connecting the eVagos system with a more known social network such as facebook or twitter. However, it is important to mention here that the theory that we provided must be evolved, as in elgg we were also the administrators of the network and could handle any request or problem. Developing such a system in a network where we are not administrators could result in situations, whose handling must have been foreseen and agreed with the provider.

Another key characteristic of future work is how we could enable the dynamic synthesis of services at runtime environment. For example let's suppose that we want to get our tax return, but we have to submit a digitally signed form of our identification card. As is the way the system works now and provided that the tax return service is created, migrated and uploaded, we must first digitally sign our id card, then get it from our email and resubmit it to the tax return service. Such an aspect will surely result in an enhanced dynamic service provider that would be mentioned worldwide. We believe that guides.gov functionality can play an important role for that feature.

A really interesting approach that arose from studying the related work was how we could enrich our system with semantic information that would help both the user and the public service to interact easily, with getting as much information as possible, without having the user to insert each single bit of it. To be more specific, most information crawlers / adaptive portals algorithms, use a dynamically generated user profile to assess their search. That profile is enriched all the time by handling each user interaction / request and contains several information like nationality, age, political views, profession, which most of the time is requested from a public service but is not usually dynamically accessible. As a result a very interesting future implementation would be to evolve the social network profile into a dynamically updatable citizen profile with information and preferences generated by the users' recent actions and requests.



Last but not least, it is also important to upload several key government services to our system. More specifically as future work is noted the development of the twenty desired government services (12 for businesses and 8 for citizens) which are described above in the eEurope initiative section. This way, many of the goals of the Lisbon i2010 will be achieved and eGovernment will be more actively integrated in the lives of citizens, contributing to the amelioration of their everyday wellbeing.

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