e-Government: Applications Levels

Penelope Markellou[1,2], Angeliki Panayiotaki[2], Athanasios Tsakalidis[1,2]

[1] Research Unit 5: Internet & Multimedia Technologies
Research Academic Computer Technology Institute
61 Riga Feraiou str., 26221 Patras, Greece
Email: {markel,tsak}@cti.gr
[2] Graphics, Multimedia and GIS Laboratory
Department of Computer Engineering & Informatics, University of Patras
26500 Rio Patras, Greece
Email: panayiot@ceid.upatras.gr

Abstract. Nowadays, more and more governments all over the world are trying to change their traditional profile to an electronic one. Citizens' requirements and needs increase continuously, so information searching and the completion of the various tasks have as a result the lost of valuable time in the tracking of responsible actor and waiting in queues. Moreover, the percentage of citizens who acquaint with the Internet has been recently increased. These two facts lead many governmental organizations to proceed with the provision of e-government applications via web sites. E-government aims at providing the best and quickest services not only to citizens but also to enterprises (private sector) from the public services. However, e-government's successful development and operation demands proper design, which will comprise the basis for its application. Information and Communication Technologies (ICT) may contribute essentially to this direction, as long as the state and the citizens adopt them under the framework of a broader reorganization of the public sector. This adaptation can be implemented gradually in levels, which will enable the unobstructed data flow from/to public sector and will give the opportunity to citizens and enterprises to obtain the highest access to the services that are provided by the state. This paper presents the application levels of e-government from the lowest one to the highest and more complicated one. Following gradually this sequence of levels, the transition from the traditional government to e-government may succeed.

1 Introduction

Citizen requirements and needs increase continuously, so information searching and the completion of the various tasks have as a result the loss of valuable time in the tracking of responsible actor and waiting in queues. Moreover, the percentage of citizens who acquaint with the Internet has been recently increased. These two facts lead many governmental organizations to proceed with the provision of e-government applications via web sites.

According to the survey [1], one of the most pioneer countries in e-government services is Canada. The portal http://www.canada.gc.ca offers information and services organized by the target-group in which are attended e.g. Canadians, non Canadians, businesses, etc. Departments and agencies, structure of the government of Canada, provinces and territories, municipalities, new initiatives for Canadians, government contacts, justice and law, public safety, etc. are only some of the supported services.

USA also has early demonstrated a steady advance in e-government, which is close, related to the fact that they are one of the main providers of software and hardware solutions [4, 10]. The high penetration factor of American citizens in Internet (from 23% February 1998 to 56% November 2000) has significantly contributed to reach this fact. The first portal created for this purpose is http://www.firstgov.gov in an effort to gather all governmental web sites in one place (one-stop shop).

The http://www.ukonline.gov.uk portal constitutes a trial of British government to provide services via Internet [2, 3, 8, 9]. Today, the portal offers: guidance to government, judicial system, submission of applications for VAT, taxes return, registration to vote, finding local childcare, application to universities, agricultural subsidies from Commission, etc.

Moreover, European Community with the program "IST-Information Society Technologies" supports the use of Internet for on-line governing. "e-Europe" master plan contains important activities for the support and promotion of e-government:

- e-Content program (http://www.cordis.lu/econtent) for the development of electronic content.
- IDA program (http://europa.eu.int/ISPO/ida) for data interchange between administrations.
- IST – Information Society Technologies program (http://www.cordis.lu/ist) for the development of research projects.

In Greece, e-Gov.gr (http://www.egov.gr) aims to operate as a reference portal for entering the web of e-government services, as well as for learning about e-government best practices abroad and accessing e-government-related resources in general [6]. e-Gov.gr addresses:

- Citizens and businesses that are interested in learning about e-government services in Greece.
- Governmental and local administration staff, as well as technical solution providers who wish to keep up-to-date with results and projects on e-government services.
- Researchers from a broad range of disciplines who are interested in practical results, case studies, ongoing research, as well as publications and events on e-government.

To all those communities, e-Gov.gr aims at providing services for:

- Obtaining information and news about e-government services and projects in Greece, as well as on e-government best practices abroad.
- Submitting their own requests, views or ideas and participating in discussions on e-government issues.
- Learning about technical issues and gaining access to technical resources on e-government.

- Staying informed on e-government publications and events.

In this respect, it will provide e-government resources including links to e-government sites and e-government services, e-government technical papers, discussion lists, as well as information on e-government publications and events, presented from multiple end-user (citizens, business sectors, regions), service-provider (governmental sectors, local administration) and technical perspectives.

At the information level, KEP (center for citizen support) provides information about citizens' rights, everyday life, licentiates, certificates, youth, work and insurance, emigrants, etc. through its web-site http://www.polites.gr.

Finally, TAXISnet (https://www.taxisnet.gr/web) offers the services of Treasury – General Secretariat of Information Systems (http://www.gsis.gov.gr/home.html) electronically. The citizen has the opportunity to submit his tax return and VAT claim, to pay his debts, etc.

This paper is intended to explore the application levels of e-government from the lowest one to the highest and more complicated one. Following gradually this sequence of levels, a governmental organization can provide online information and services in their citizens (individual and corporate) and improve their efficiency and effectiveness.

2 e-Government Levels

The idea of e-government has matured considerably over the last years [5, 7]. More and more governments worldwide are trying to change their traditional profile to an electronic one. E-government can be distinguished into three basic models:

- *Government-to-Government:* relates to these activities, which will improve and upgrade governments' services.
- *Government-to-Citizen:* relates to the relationships between governments and citizens. It mostly deals with law and democracy issues.
- *Government-to-Business:* relates to the relationships between governments and businesses. It mostly deals with co-operations, common activities in national and international level.

This transition can lead to a series of strategic, administrative and operational benefits that relate to:

- Best coverage of citizens' needs and requirements.
- Greater satisfaction of the citizens.
- Cost savings.
- Improved response times.
- Support on new and improvement of current co-operations.
- Processes automation.
- Upgrade government profile and image.
- Access to more and reliable information.

For the implementation and successful operation of e-government, the proper design, which will be the basis in order to receive the above benefits, is necessary. The application of e-government in the public domain can be gradually in levels. This

allows the unobstructed flow of information from/to the public sector and gives the possibility not only to the citizens but also to the enterprises (private sector) to acquire better access in the services that state provides. These levels, beginning from lowest and advancing in most complicated, are separated as presented in figure 1.
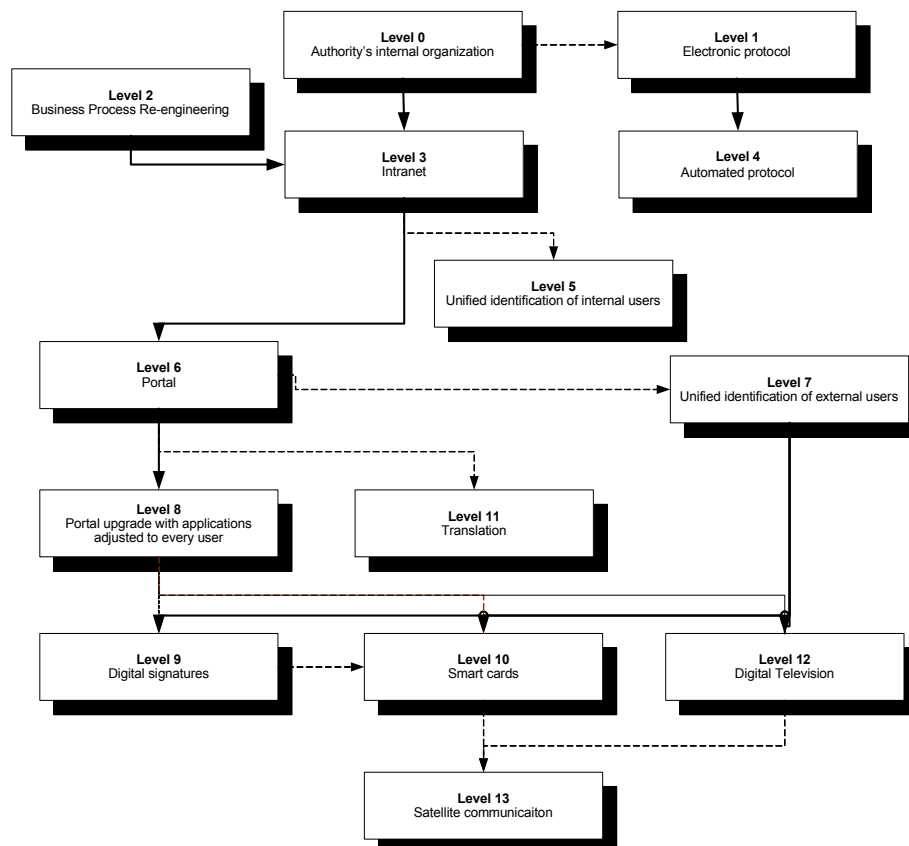

Fig. 1. Application levels of e-government.

2.1 Level 0: Authority's Internal Organization

An authority, in order to advance in the process of e-government, should create the suitable infrastructure. This level includes tasks, such as:

- Supply of hardware and software for office applications.
- Network interconnection existing and new equipment.

The supply of essential equipment and its network interconnection constitute a basic condition in order for the remainder levels to be implemented and for the organization to finally support e-government.

2.2   Level 1: Electronic Protocol

This level refers to the passage from the conventional protocol (hand-written) to the electronic one. For the full computerization of authority's documents (incoming and outgoing) the transition from the conventional entry (manuscript) to the electronic (files) is required. In this level, the authority's book of incoming/outgoing documents is suppressed and document distribution henceforth is kept electronically for timesaving and facilitation in document searching and recovering. Moreover, each service of the authority has its own protocol number, given manually by the user.

2.3   Level 2: Business Process Re-engineering

This level is related to the following:
- Feasibility study of documents' flow re-planning, internal processes interrelation, and authority's flow chart processes preparation for the next level.
- Specifications, planning and implementation of the applications that need modifications and improvements (legacy systems).

Specifically in this level, the differentiation of each public authority, depending on the type and the breadth of their applications, is presented. For each authority, new levels of applications should be created after a feasibility study.

For the passage to the following levels, all processes from the organizational side should be registered in order to achieve their unification and communication in the whole public authority. At the same time, it should be defined how the applications that are already used by authority's services are suitable to remain operational with small interventions and modifications.

2.4   Level 3: Intranet

Intranet is supported at level 0 and in the existing infrastructures. The employees of the organization, via an Internet-based environment are able to use applications of their department or other departments without having installed these applications in their personal workstation. In each application where a login is required, the user (employee of organization) maintains the login/password that used before the implementation of level 3 (authorization capability, authentication). In particular it may concern:
- Electronic distribution of documents (suppression of hard-copy documents).
- File management and common space for storage of documents.
- Follow-up of employees' availability (calendar) and to-do list.
- Organization of internal meetings (taking into consideration not only the employees' availability but also resources e.g. when and which meeting room is available).
- Transaction of document charging.
- On-line library.
- Telephone list of employees.

- News, statements, proclamations.
- Other applications essential for the completion of daily work, adapted in the needs of each department and each address (e.g. in urban planning, management of building authorizations and control of illegal constructions).

2.5   Level 4: Automated Protocol

To all applications that it is required, Level 1 automatically provides a protocol number, without the personal use of electronic protocol from the user. This application constitutes the input and output gate of documents and files that the organization totally manages. Its layout will provide the system ability of recording, monitoring, checking and informing the total of internal and external activities that are realized by the persons in charge of receipt and service of citizens, consequently the improvement of working conditions and the upgrade of provided services.

The documents' registration is performed in the units of central class, while through network, the follow-up with the charging of each document in specific unit, sector and individual of the central or other class will be done. The documents' import in the system requires the automatic choice of protocol number and date, while the subjects of documents can be selected from a specific list, which can be common for the total of units of each authority's class. The list might be modified and complemented from the system administrators whenever is necessary. The sender's import in the system is performed once and its selection at a subsequent registration can be completed from a list of senders.

Segregation of the incoming and outgoing documents should be provided. Moreover, a separation of internal and external registrations from the authority's point of view is required for the distribution of documents. Still, the software, will propose the protocol number in increasing order and it will be ensured that it is unique for the whole authority. Since the authority's units have multiple communication with a range of public services and organizations during the implementation of electronic protocol, the compatibility and the collaboration with corresponding software (e.g. Municipalities, Prefectures, Ministries, Regions), must be taken into consideration, having a special field for protocol number registration originated by the external authority.

The communication among the software functional units should be safely realized with the use of encryption. The possibility of security gradation at the processing performed by the protocol is required and where it is needed, the document in question must be coded respectively.

2.6   Level 5: Unified Identification of Internal Users

This level deals with the study, the design and the implementation of a common login/password for all applications that require one, which will correspond to one single internal user. Nowadays, at the several applications installed and used at governmental services, each employee/user has a different login/password to be identified as unique by the applications and to be able to access and use them. Within this

level, a unique pair of login/password will be assigned to each user, enabling him to access all applications used internally in his service.

2.7 Level 6: Portal

Level 6 deals with the implementation of a portal addressed to citizens presenting information on the public sector without the need of user authentication. Indicatively, it can contain information, such as:

- Announcements, news, press releases.
- Call for proposals, contests.
- Laws, presidential enactments.
- On-line libraries containing documents not provided for free.
- Guidelines for the citizen to perform certain governmental transactions.
- Auctions.
- Presentation of an organization and its supervised organizations to the citizens.
- Links to other e-governmental portals/sites and sources of interesting information, relevant to the issues dealt by the public sector and public organization presented.
- Information searching.
- Personnel telephone catalogue for public.
- Help desk for citizens.
- Portal's map.

Through this level, the government's image to the public seems integrated and not as a collection of different partial pieces. The citizen can be served by visiting a one-stop shop. Moreover, several vortals can be included (e.g. resources for tourists, immigrants, foreign students, business, etc.)

2.8 Level 7: Unified Identification of External Users

This level deals with the study, the design and the implementation of a common login/password for all applications that require one, which will correspond to one single external user. It refers to applications that are electronically available and were accessed only by the citizen's personal attendance at the specific public department. It does not refer to the applications that will be developed under the framework of level 8, described in the next section.

2.9 Level 8 – Portal Upgrade with Applications Adjusted to Every User

The main scope of this level is the portal update and enrichment with applications that demand external users' authentication, which varies from weak to very strong. The aim is the portal to permit several users' categories to access information and services according to the privileges granted to them. The portal's users can belong to any of

the following broad categories: citizens, businesses, ministries' and other public authorities' employees, organizations' employees, and administrators.

The portal should provide a central point of data accumulation and interconnection with several different applications and systems used by various participants, located in different sites. Therefore, the issue of security and the issue of personal data manipulation are of high priority and importance. For the portal's reliable and efficient operation, the definition of security policy is required. According to this policy, the citizen will use the same pair of login/password entering the specific location and will be recognized by the system until he logs out. The services provided by the portal relate to all the above-mentioned users' categories and indicatively are:

- Information publication and interconnection of different Internet sites.
- Information search, retrieval, and data submission for further processing.
- Send e-mail to public authority, containing personal information in its content.
- Receive e-mail from the public authority's person-in-charge containing personal information.
- On-line filling-in of applications' forms, where no signature is required.
- Life episodes (having a baby, change of address, emigration, driving license acquisition).
- E-learning.
- Involvement to governmental processes by posting personal vote through the portal.
- Discussion forums with other citizens.
- Complaints' submission.
- On-line filling-in of tax returns and VAT.
- Financial transactions.
- E-commerce.
- On-line digital libraries non-gratis.
- Electronic circulation of medical records.
- Services for emergencies' confrontation.

Additional functional characteristics that will be provided relate to the following:

- Multilingual support. Portal's content must support other languages than the native one.
- Search engine with sorting capabilities for searching and index creation of structured and unstructured data. The search engine's operation must be irrelevant to the content's language.
- On-line and off-line discussion forums part of which are addressed to people with special needs.
- Unified and automated users' support through multiple communication channels (web, e-mail). Possibility of communication channels' extension (e.g. to SMS and fax).
- Portal's content management tools for content maintenance. Content management includes the creation, the administration and the delivery of the content.
- Personalization for every user resulting to pages with information according to their preferences.
- Security policy.

- Constant (24/7), secure and layered functionality, with 99,99% at least availability.
- Open-structure, able to expand easily regarding the users' increase and the portal's traffic.
- Surveillance of Internet behavior and users' visitation and statistical tools to analyze all information distributed and exchanged through the portal.
- Portal administration through an easy-to-use central control tool with layered access and security.
- Survey requests processing progress and relatively informing the applicant through e.g. e-mail.

2.10 Level 9: Digital Signatures

In contrast to documents in paper, digital documents are more vulnerable to alterations or forgeries. To avoid therefore the danger of unwanted modifications, digital signature processes have been developed, supported by cryptographic methods. However, digital signature legalization is required, in order for applications, documents and transactions demanding citizen's signature to be equivalent to their electronic versions digitally signed and sent from the citizen's workstation.

Digital signature fulfils simultaneously mainly two functionalities. One is affirmation, as the receiver may be certain that the delivered message belongs to the sender, without any intermediate modifications. The other one is confidentiality, as the receiver is assured that he is the only one who will read the message and not any unauthorized people as well.

Digital signature is not the electronic printing of the handwritten signature, as the term misleadingly implies. It is a "locked" abbreviation of an electronic document. This abbreviation could be characterized as the electronic document's fingerprint. The root of the process to create a digital signature are the cryptographic algorithms, which use different keys for "locking" and "unlocking" an electronic message.

2.11 Level 10: Smart Cards

Level 10 constitutes an advanced and secured authentication pattern in order for the citizen to use the portal and includes personal data encryption. Smart cards compose the most well-known authentication method of the people participating in transactions. These cards are capable of re-specifying the data stored at their memory and can be used in advanced applications.

At these cards, unique data on their owner are stored, used for their authentication, such as personal ID, as well as data relevant to the advanced applications, facilitating the smart cards' holders transactions with the government, automating procedures, which in the conventional way are time-consuming and demand bureaucracy and long queues at citizens' help desks, etc. Depending on each authority's peculiarities, a large number of applications using smart cards came up and can be classified to several layers according to their operational dimension.

2.12 Level 11: Translation

Level 11 copes with the translation of the applications that are available to the citizens into several languages, due to the number of the emigrants in Greece and the joint market in the European Union. All the above-mentioned functionalities must be understood and be accessible to non-native citizens, as Greece is appealing to many economic emigrants, which while trying to find a job, they are obliged to transact with governmental services and these transactions have been characterized so far as extremely time-consuming and difficult.

2.13 Level 12: Digital Television

The target of level 12 is the citizen to access the portal via digital television. The ultimate stage of e-government where the citizen (native and non-native) will be able to access these services through his television in a way similar to zapping through television channels according to his preferences, as television is a communication mean more accessible and familiar to the average citizen.

2.14 Level 13: Satellite Communication

Governmental executives' information and opinion exchange through satellite signals (GPS). This advanced stage composes the way of informing the governmental executives on the evolution of national affairs, during their traveling abroad due to their obligations, through satellite signal. Moreover, it provides the capability of sending information to the portal, in order to promptly inform the citizens, as well as of discussing with other executives and the citizens on vital governmental issues.

3   Conclusions

Governments, facilitated by information technologies and the Internet, promote and support e-government, aiming to more rapid and more efficient citizens' servicing from public authorities. This attempt is not an easy one, since it demands correct and prompt design, infrastructures' availability at wide-scale and modification of citizens' mentality. Nevertheless, following gradually a series of levels, the transition from the traditional government to e-government may succeed.

Information Communication Technologies may contribute essentially to this direction, as long as the state and the citizens adopt them under the framework of a broader reorganization of the public sector. The outcome will be the allowance of the unobstructed information flow from and to the public sector and the offering of the possibility to the citizens, as well as the enterprises, to acquire better access to the governmental services.

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