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Building eGovernment services over Spatial Data Infrastructures *

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Abstract. The growing importance of eGoverment is putting pressure on authorities to provide services online and accessible to the citizen. In order to satisfy this necessity, Goverments have to develop high-cost infrastructures in a short period of time and with a diffuse specifications of the objectives and services. In the other hand, there are a large set of initiatives that have been launched for the development of spatial data infrastructures. This kind of infrastructures are the basic tool for optimizing the management of geographic information because its amount and complexity. Most of these initiatives are being promoted and sponsored by public administrations because geographic information is a basic resource for their operative work. This paper proposes the development of eGoverment infrastructures over the spatial data infrastructures launched, viewing them as the providers of the first version of the eGoverment services.

1 Introduction

According with [1], eGovernment is defined as the use of information and communication technology in public administrations combined with an organisational change and new skills in order to improve public services and democratic processes and strengthen support to public policies. eGovernment has been defined as a priority in the eEurope 2005 Action Plan. However, many barriers and obstacles need to be overcome and sizeable investments are needed. Change processes in organisation and culture take time: it can take several years before the combined investment in information and communication technology, organisation and skills deliver the full benefits. Strong political leadership and commitment is needed, guided by a long-term vision on the contribution of the public sector to Europe in the knowledge society. Forward thinking and innovation should be

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combined with concrete deliverables and results in the shorter term. The eGovernment initiative puts pressure on authorities to provide services online and accessible to the citizen. In turn, this necessitates improved information sharing between departments and joint working with other agencies and administration levels.

As it is indicated by [2], the most common eGovernment application is clearly in providing citizens with access to information. Governments produce huge volumes of information and an increasing amount of it is now available through the Web and other electronic venues. In the U.S. there are thousands of government Web sites, several portals to related Web sites, and several portals to government services. Tens of millions of citizens access information from the Library of Congress, download forms from the Internal Revenue Service, find out about benefits from the Social Security Adminstration, and plan vacations with information from the National Park Service. A recent Pew report (www.pewtrust.org/pdf/vf_pew_internet_e-citizens.pdf) states that 68 million Americans have used government agency Web sites. Given that 98% of the schools in the U.S. and well over half of the homes have Internet access, there are huge numbers of people accessing government information on a regular basis. This is clearly the government service that has most adopted information technology and some of the first digital government research and development raises issues such as confidentiality and equity.

On the other hand, the main creators and users of geographic information are public administrations. In addition, around 80% of the databases used by them contain some kind of geographic reference (postal codes, cartographic coordinates...). This information is used for the implementation of the public services related with their role in the different levels of government. Spatial Data Infrastructures provide the framework for the optimization of the creation, maintenance and distribution of geographic information inside each public administration and across different ones. As a consequence of this, Governments start considering spatial data infrastructures as basic infrastructures for the development of a country. Spatial Data Infrastructures are becoming so relevant as the classical ones like utilities (water, electricity, gas), transport or telecommunication infrastructures. In this sense, it is necessary to remark some high-level political decisions that have as their main objective the promotion of spatial data infrastructures development. Maybe, the most relevant ones have been made in the United States of America and in the European Union:

- In April 1994, Bill Clinton signed an Executive Order (nr. 12906, April 11, 1994) [3] for the establishment of the "National Spatial Data Infrastructure" (NSDI), forcing the cooperation among federal and local agencies in collecting, spreading and using geographic information. This Order provided the necessary resources for creating an administrative structure for making the cooperation among public and private institutions possible.
- In November 2001, the European Commission launched INSPIRE (INfrastructure for SPatial InfoRmation in Europe), an initiative to create European legislation to guide national and regional spatial data infrastructure devel-

opment. This initiative, sponsored at the highest levels within the European Commission, will mandate how and when each member state should create its national spatial data infrastructure.

Nevertheless, as [4] indicates in its Issue 1, the role(s) of geographic information and the associated technologies within eGovernment programmes are not currently registered and as such there is a need for the geographic information community to clearly demonstrate and present how geographic information and the associated technologies can contribute to the success of eGovernment programmes. Delivering government services to the public via Internet and other digital means is helping to rebuild the link between people and government and enabling government agencies to meet the challenges of having to reduce costs, deliver services faster, provide better customer service, and increase productivity. When organizations connect geography to the eGovernment process, things should work better. Online services, such as interactive mapping, help agencies to serve citizens and businesses better, and internal government operations-data management and warehousing, information exchange, and field force automation-are more efficient and flexible with data layers that provide a spatial perspective which to view the enterprise. Additionally, the Issue 3 of [4] says that many of the infrastructure needs for a spatial data infrastructure (both hard and soft) are already included within many of the eGovernment programmes. This means that a spatial data infrastructure can provide interesting services for eGoverment. So, if there are many initiatives to built spatial data infrastructures, and they offer services that can be used by developing eGoverment services, why cannot spatial data infrastructures be considered as the first step for developing eGoverment?

The rest of the paper is structured as follows. Next section revises the problems related with geographic information creation and use, and presents the concept and components of a spatial data infrastructure. Section three studies how eGoverment services can be developed over a spatial data infrastructure. This work ends with a conclusions section.

2 Geographic Information and Spatial Data Infrastructures

2.1 Geographic Information Creation and Use

The geographic information (also known as geospatial data) is the information that describes phenomena associated directly or indirectly with a location with respect to the Earth surface. Nowadays, there are available large amounts of geographic data that have been gathered (for decades) with different purposes by different institutions and companies. For instance, geographic information is vital for decision-making and resource management in diverse areas (natural resources, facilities, cadastres, economy...), and at different levels (local, regional, national or even global) [5]. Furthermore, the volume of this information grows day by day thanks to important technology advances in high-resolution satellite

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remote sensors, Global Positioning Systems (GPS), databases and geoprocessing software notwithstanding an increasing interest by individuals and institutions. Even more, it is possible to georeference complex collections of a broad range of resouce types, including textual and graphic documents, digital geospatial map and imagery data, real-time acquired observations, legacy databases of tabular historical records, multimedia components such as audio and video, and scientific algorithms.

One feature that makes geographic information different from other information resources is the complexity of the processes involved in data creation and maintenance. Some of the main reasons for this complexity are the following:

- **High costs of data creation.** The creation of geographic information requires in most cases important financial resources. For instance, the creation of topographic maps must include the financial support for aerial flights, topographers field sessions, apparatus and human resources for digitalization, and so on.
- **Geographic information is updated quite frequently.** This originates problems of maintenance and control of the different version of this geographic information.
- **High volumes of geographic information.** Geographic information, overall raster data obtained by remote sensors, require high-density storage devices as well as well-organized backup and recovery policies.
- **Multidisciplinary use of geographic information.** Geographic information provides must have into account that the same geographic information can be used many application domains. Geographic data must be enough general to be useful in different domains.
- **The proliferation of exchange formats and their characterization.** During last decades almost each geographic information system vendor has created its own specific formats to maximize the possibilities of its software. However, this implies interoperability problems when data is exchanged between two different geographic information system products. Geographic information system vendors have tried to overcome this problem by providing import/export utilities to enable compatibility. But this is not a seamless solution because these data conversions usually involve an information loss.[**?**].

In recent years nations have made unprecedented investments in both information and the means to assemble, store, process, analyse, and disseminate it. Thousands of organisations and agencies (all levels of government, the private and non-profit sectors, and academia) throughout the world spend billions of euros each year producing and using geographic data ([6, 7]). This has been particularly enhanced by the rapid advancement in spatial data capture technologies, which has made the capture of digital spatial data a relatively quick and easy process. However, they still do not have the information they need to solve critical problems. Some causes of this problem are that:

- Most organisations need more data than they can afford.

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- Organisations often need data outside their jurisdictions or operational areas. In addition, information needed to solve cross-jurisdictional problems is often unavailable.
- Data collected by different organisations are often incompatible.
- Some organisations, despite being public institutions, are reticent to distribute high-quality information.
- In most cases, there is a lack of knowledge about what data is currently available. It is not unusual to find that different divisions of the same company pay data suppliers for a product that had been already ordered by another division. This lack of synchronism leads into a consecutive recreation of data with similar characteristics.

Another circumstance that must be taken into account is that, as well as other information resources, lots of geographic information resources are also available on the Internet. And in most cases it is assumed that the own Internet is the storehouse of this information. However, as it is mentioned in [8] there are also potential disadvantages to use of the WWW as a mechanism for storing and disseminating geoinformation that will have to be addressed. Little of the information now available via the WWW has been subjected to the mechanisms that ensure quality in traditional publication and library acquisition: peer review, editing, and proofreading. There are no WWW equivalents of the library's collection specialists who monitor library content. As the volume of information grows, issues of quality and reliability are becoming more complex. And with the increasing use of the Internet as a marketplace, the cases of abuse and misinformation will appear more frequently. The quality of the information will be questioned more and more as this trend continues. The increase in the diversity of sources of information is an additional complicating factor. Problems of context, provenance and timeliness become much more complex with the added dimension of distribution. But it is easy to be misled into believing that quality control problems of the WWW are somehow different from conventional ones. Users of on-line digital geographic information will tend to trust data that come from reputable institutions, with documented assurances of quality, and to mistrust data of uncertain origins, just as they do today by acquiring them off-line. The active participation of public administration at all levels will be needed to guarantee a minimum level of quality.

Another issue related with the use of Internet is the increasing complexity of discovery and information retrieval services, augmented by the distribution over the Internet. There is an increasing volume, diversity, decentralization and autonomy in the development, meaning and types of information. The number of protocols for accessing this information increases and the reasons for making it available are more complex than simply sharing useful data. At the same time, there is a massive growth in the number and diversity of users' sophistication background, and expectations. There is also an increasing criticality of the search problem to people's personal and professional lives. Furthermore, not only human users are searching on the Web. At present, there are computing systems

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whose functionality is based on the discovered information, e.g. decision-support systems.

In conclusion, despite the potential uses of geographic information and the important investments in their creation, nowadays geographic information is not exploited enough. A number of studies have established that although the value of geospatial data is recognised by both government and society, the effective use of geospatial data is inhibited by poor knowledge of the existence of data, poorly documented information about the data sets, and data inconsistencies. We often hear the phrase "information is power" but with increasing amounts of data being created and stored (but often not well organised) there is a real need to document the data for future use - to be as accessible as possible to as wide a "public" as possible. Data plus the context for its use (documentation) become information. Data without context are not as valuable as documented data. This necessity has an extremely importance in the case of geographic information. Once created, geospatial data can be used by multiple software systems for different purposes. And given the dynamic nature of geospatial data in a networked environment, metadata is therefore an essential requirement for locating and evaluating available data.

Most commonly defined as "structured data about data" or "data which describes attributes of a resource" or, more simply, "information about data", the concept of metadata is not new: map legends, library catalogue cards and business cards are everyday examples. Basically, metadata offers description of the content, quality, condition, authorship, and any other characteristics of the resources. It also provides for standardized representation of information. That is, similar to a bibliographical record or map legend, it provides a common set of terminology to define the resource or data. Metadata constitute the mechanism to characterize data and services in order to enable other users or applications to make use of such data and services. Metadata can help the concerned citizen, the city planner, the graduate student in geography, or the forest manager to find and to use geospatial data, but they also benefit the primary creator of the data by maintaining the value of the data and assuring their continued use over a span of years. Over thirty five years ago, humans landed on the Moon. Data from that era are still being used today, and it is reasonable to assume that today's geospatial data could still be used in the year 2020 and beyond to study climate change, ecosystems, and other natural processes. Metadata standards will increase the value of such data by facilitating data sharing through time and space. So when a manager launches a new project, investing a small amount of time and resources at the beginning may pay dividends in the future.

Finally, it must be remarked that the solution to distributed information access will not be created by imposing a single monolithic solution on everybody. All solutions must be framed within organizational and economic contexts. The solutions must be targeted to support a world of different overlapping communities and permit layered solutions from no cooperation, to loose agreements, to tightly coupled organizations.

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2.2 Spatial Data Infrastructures

Geographic Information Systems (GISs) is the term that is commonly used to refer to the software packages that are capable of integrating spatial and non-spatial data to yield the spatial information that is used for decision making. This includes computer-based equipment, procedures and techniques for manipulating spatial or map data. In this context, GISs are mostly used on a project basis, for example, to perform a particular analysis. When used in such a way, digital spatial data would be acquired by assembling the relevant maps and then digitizing or scanning them. And prior to the analysis, other data may be collected by using field techniques that collect the data in digital form. At this level, geographic information system is used as a tool.

But data that are collected for a particular project are, in most cases, useful for other projects. This fact is even more pertinent with the recent "commoditisation" of data and information. The costs involved with data collection are taken into account in project planning, along with attempting to maximize the use of the data from a project. Furthermore, it should be also realized that some data required for particular decisions are transient and may no longer be able to be collected when required. An example of this occurs when decisions concerning agricultural practices must be made. These decisions will often require environmental data spanning over several years. This data must be collected when they are available, even if the need for them is not present at the time of collection, otherwise it is not possible to collect the data for past years when they are later needed. Thus there is a need to store this type of data in databases and make them accessible to others. These databases (spatial databases) become a shared resource, which must be maintained continuously. Moreover, the database, which has been maintained and exploited by a GIS tool, is itself often referred to as a Geographic Information System. Thus, at this level the own Geographic Information System may be viewed as a resource whose maintenance usually requires the cooperation and collaboration of several disciplines and a proper strategic plan. Furthermore, one might be interested in the interoperation of those resources (GISs), which are maintained at the state or national level, and sometimes by private corporations. In such cases, coordinating authorities are needed to assign custodianship and usage privileges for subsets of the data to different users (which may be agencies). Users in the general community are then able to expect the data to be available, and with network technology, to be accessible transparently. At this point, the Geographic Information Systems have acquired the status of an infrastructure: a Spatial Data Infrastructure.

The first formal definition of the term "National Spatial Data Infrastructure" was formulated in the US and published in the Federal Register on April 13, 1994 [3]. It states: "National Spatial Data Infrastructure (NSDI) means the technology, policies, standards, and human resources necessary to acquire, process, store, distribute, and improve utilisation of geospatial data". The definition of "Global Spatial Data Infrastructure" follows this closely [9]. It states: "A coordinated approach to technology, policies, standards, and human resources necessary for the effective acquisition, management, storage, distribution, and improved utilization of geospatial data in the development of the global community". Yet another view is that the spatial data infrastructure is that of a system where the general community can expect the geospatial data to be available and accessible transparently with networking technology. In this view co-operation and collaboration between several disciplines and the emergence of a strategic plan for the maintenance of databases, which include spatial databases, is a key component of the spatial data infrastructure. According to [10], the main components of a spatial data infrastructure should included data providers (sources of spatial data), databases and metadata, data networks, technologies (dealing with data collection, management, search and representation), institutional arrangements, policies and standards, and end-users (see figure 1).

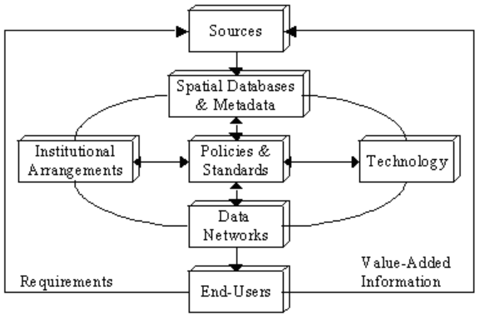

Fig. 1. A system view of the spatial data infrastructure components (taken from [10])

Viewing some details of them:

– **Technology.** Spatial data infrastructures should be developed over technological components created from the experience acquired working with generic information technology. One of the most important challenges should be the integration of all this experience, specially the one provided by the geographic information systems.
– **Policies and Standards.** Standards constitute the link among the different components of a spatial data infrastructures providing common languages and concepts that make possible their communication and coordination. Additionally, it is necessary the establishment of general guidelines to be followed by all the actors of a spatial data infrastructure. This guidelines should include several aspects such as architectures, processes, methods or standards.
– **Human Resources.** The development of spatial data infrastructures have to be done over the necessity of the users, both end-users and data providers (sources). On the other hand, the work to implement and maintain a spatial data infrastructure should be done by qualified teams of researches and developers. All these people integrates the human resources that are necessary for the development of spatial data infrastructures.

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- **Institutional Arrangements.** It is necessary the establishment of political decisions such as the creation of institutional framework. Agreements must be ratified to establish a national spatial data infrastructure, for coordinating the formation of regional spatial data infrastructures and for linking them to form the global spatial data infrastructure.
- **Spatial Databases and Metadata.** Spatial data infrastructures should be created over the geographic data, stored in the spatial databases, and their description (metadata).
- **Data Networks.** Spatial data infrastructures should be open systems deployed over data networks that provide the channel for accessing the services from remote systems.

There are significant benefits handling the data management problem from the spatial data infrastructure point of view. Firstly, it avoids duplication of effort by ensuring all the stakeholders in the spatial data infrastructure are aware of the existence of data sets. Data providers are able to advertise and promote the availability of their data and potentially link to online services (e.g. text reports, images, web mapping and e-commerce) that relate to their specific data sets. This way, all types of users (GI professionals or casual users) can locate all available geospatial and associated data relevant to an area of interest. On the other hand, the description of geospatial data with appropriate metadata builds upon and enhances the data management procedures of the geospatial community. Metadata helps organise and maintain the investment in data done by the entities participating in the spatial data infrastructure. Furthermore, reporting of descriptive metadata promotes the availability of geospatial data beyond the traditional geospatial community.

Finally, it must be remarked that spatial data infrastructures are just like other forms of better known infrastructures, such as roads, power lines or railways. The whole concept of spatial data infrastructures, and other forms of infrastructure, is that they allow authorised and/or participating members of the community to use them. They are simply available and taken for granted, although we may pay for the right to use them, for example through vehicle registration, railway tickets etc. Users essentially do not care how they work or who makes them work. In fact, it is said that the new spatial data infrastructures are being developed along similar lines as previous major transportation systems. Instead of transporting products and people by trains, planes or automobiles, digital networks transport ideas and information. The development of concrete infrastructures for the transport of things took decades, and continues today. The planning process was long and arduous. We must take a similar long view of the digital infrastructures of today, or we may see a breakdown similar to crumbling highways and broken water mains. A spatial data infrastructure is the integration of multiple components which do not initially fit together in a seamless fashion for a number of reasons. Firstly, the necessary components come from a background of different communities and secondly, they should - in combination with other components - enable new functions which were not under consideration when the individual single components were designed and

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implemented. This means that the realisation of large-scale globally spatial data infrastructures depends as much on collaborative effort as it does on the development of new technologies in order to develop systems which truly integrate their components. The level of collaboration required, across disciplines as well as across geographical boundaries, will be much higher than we have previously encountered.

3 Developing eGoverment services

3.1 Spatial Data Infrastructures and Public Administration Levels

According with the model proposed by [11], the development of spatial data infrastructures should be organized into a hierarchy that includes infrastructures developed at different political-administrative levels. This model includes interconnected spatial data infrastructures at corporate, local, state or provincial, national, regional and global levels. This structure is directly related with the structure of the public administrations. In this sense, each spatial data infrastructure provides a first set of core services (Web Mapping, Web Featuring, Web Coverage, Catalog, Gazetter, ...) associated with the public administration level that has the responsibility of creating and maintaining the corresponding infrastructure level. Regarding this subject, each public administration is offering implicity a minimum set of eGoverment services.

Additionally, these services provide a good base for developing new value-added services oriented to the satisfaction of specific functionality. Maybe the most immediate and prototypical example could be the direct access to the majority of the information of the public administrations. As it has been mentioned before, most of the contents of the databases of the public administrations can be related with a specific geographic position. This geographic reference could be used as a primary index for discovering the information by the citizens. In the same way, a citizen could have access to services that allow him to make a big set of administrative formalities related with elements with a geographic position associated such as business premises, home, plot of land, etc.

Following, a representative example of the job that the authors are developing for the Ebro river Hydrographical Confederation (CHE: http://www.chebro.es) in order to facilitate citizens with the electronic access to the services provided by this organization.

3.2 The Ebro River Basin Use Case

The Ebro river Hydrographical Confederation (CHE) is the Spanish state organization in charge of physically and administratively managing the hydrographical basin of the Ebro river (figure 2), through planning (by elaborating and revising a global catchment hydrological plan), managing (by administering and controlling the different water resources in the catchment area) and investing (by projecting and carrying out the public works that may be entrusted to them).

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Fig. 2. Ebro river basin

The CHE Hydrological Planning Department (OPH) administrative work is mostly devoted to analyse and approve water point exploitation by particulars or companies, according to the river basin management plan objectives while collecting and maintaining large sets of geodata needed for this process (mainly thematic hydrological datasets and a water point inventory that stores over 50,000 water resources points). The GIS infrastructure at the OPH has evolved from a set of systems oriented to provide tuned functionality and applications for a perfectly established and experienced workflow process to an open SDI, in order to fulfil new requirements originated both from the OPH work process and the need of interoperate with other organizations. Two different use cases can be distinguished and developed in order to provide eGoverment services to citizens, taking advantage of the SDI previously developed. As it is stood by the Water Framework Directive in its 14th article and by the Guidance on Public Participation in Relation to the Water Framework Directive [European Commission], information supply is the base to allow consultation and active involvement in the management of the river basin to the general public, stakeholders and other authorities. Information supply is firstly achieved by giving public access to the datasets created by and property of the CHE and by giving access to up-to-date information stored in the inventory. General public access to the data is achieved through a website, where a search tool is available, so the user can query a catalogue service to get a page with all the datasets fulfilling the query restrictions imposed. Users can browse the dataset metadata, to access the web map server client to visualize its contents, and, eventually, download the datasets (figure 3). Access to up-to-date inventory information is provided with specific html clients that query the web feature server and basic information results are shown. If the user is interested in further information, he or she can request the same kind of informative reports or charts that are available inside the organization.

Much more specific services can provided to individuals or companies that apply for water resources exploitation. Before submitting the application, he or she can browse through a web map service client what the parameters of the catchment hydrological plan are in the area, which areas are suspicious of overexploitation, and what are the maximum caudal that it is possible to extract by law at each location depending on other surface or groundwater resources in use in the surrounding area. This allows the user to predict the likelihood of success of the petition and to choose the best location to catch water form

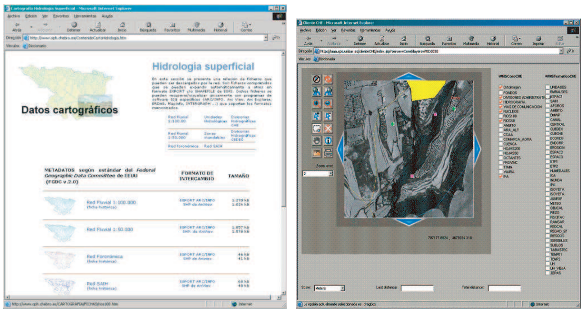

Fig. 3. Dataset browsing and downloading page (left) and dataset visualization (right)

an environmental point of view and, thus, where the chances of getting it are higher.

Histórico de informes

Expediente: 1994-

Versión	Estado	Fecha inicio	Agente	Observaciones
1	ENTRADO	26-mar-2003	Rebeca	
1	EN ESTANTE DE AGENTE	02-jul-2003	ALICIA	
1	EN TRAMITE	02-jul-2003	ALICIA	No pongo párrafo E.A. pq en ese tramo el Jil...
1	EN TRAMITE	03-jul-2003	ALICIA	Realizado informe.
1	EN TRAMITE	08-jul-2003	TERESA	En pag 4: dos tontadas referentes a poner e...
1	EN TRAMITE	05-ago-2003	ANTONIO	OK
1	EN TRAMITE	07-ago-2003	ALICIA	
1	EN TRAMITE	11-ago-2003	VÍCTOR	
1	INFORMADO	20-ago-2003	ALICIA	
1		19-feb-2004		

Cerrar

Fig. 4. Historical processing states

Once the user has make a petition, specific and restricted services can be generated to keep him or her informed about the process is following the CHE: in which state it is and when it reached that state (figure 4), additional documents and information that may be needed, etc. Anytime a problem is found or once the petition is resolved, the user can get a copy of all the administrative and informative reports even before it is sent to him via postal mail, speeding up the process.

4 Conclusions

The growing importance of eGoverment is putting pressure on authorities to provide services online and accessible to the citizen. In order to satisfy this necessity, Goverments have to develop high-cost infrastructures in a short period of time and with a diffuse specifications of the objectives and services. In the other hand, there are a large set of initiatives that have been launched for the development of spatial data infrastructures. This kind of infrastructures are the basic tool for optimizing the management of geographic information because its amount and complexity. Most of these initiatives are being promoted and sponsored by public administrations because geographic information is a basic resource for their operative work. This paper has proposed the development of eGoverment infrastructures over the spatial data infrastructures launched, viewing them as the providers of the first version of the eGoverment services. The consideration of spatial data infrastructures as the first stage for the development of eGoverment services is based on the high importance of geographic information for the implementation of the public administration procedures.

As a use cases of how the development of these eGoverment services can be done, the work that the authors are being developing for the Ebro river Hydrographical Confederation have been presented. The experience derived from this work, specially the one related with the implementation of the Water Framework Directive [European Commission], suggests that many eGoverment services can been developed easier and faster if they are built over the capabilities provided by a spatial data infrastructure. In other way, because currently experiences suggest that spatial data infrastructures have to been developed by public administrations in order to be able to manage the geographic information necessary for their own operativeness, it is reasonable to plan the development of eGoverment infrastructures and services over spatial data infrastructures initiatives.

References

1. European-Commission, eGovernment Unit (Unit C6): About egovernment. http://europa.eu.int/information_society/programmes/egov_rd/about_us/text_en.htm (2003)
2. Marchionini, G., Samet, H., Brandt, L.: Introduction to the SPECIAL ISSUE: Digital government. Communications of the ACM **46 (1)** (2003) 24–67
3. U.S. Federal Register: Executive Order 12906. Coordinating Geographic Data Acquisition and Access: the National Spatial Data Infrastructure (U.S.). The April 13,1994, Edition of the Federal Register **59** (1994) 17671–17674
4.
5. Buehler, K., McKee(eds.), L.: The Opengis Guide. Introduction to Interoperable Geoprocessing. Part I of the Open Geodata Interoperability Specification (OGIS). OGIS TC Document 96-001, OGIS Project 6 Technical Commitee of the OpenGIS Consorcium Inc. (1996)
6. FGDC: Framework, introduction and guide. Federal Geographic Data Committee(FGDC), Available at http://www.fgdc.gov/framework/frameworkintroguide (1997)
7. Groot, R., McLaughlin, J.: Geospatial Data Infrastructure: concepts, cases and good practice. Oxford University Press, New York, USA (2000)
8. Committee, M.S.: Distributed Geolibraries: Spatial Information Resources. Summary of a Workshop: Panel on Distributed Geolibraries. Mapping Science Committee (National Research Council [US]). Washington, D.C.: National Academy Press. (available: http://www.nap.edu/html/geolibraries) (1999)
9. GSDI: Homepage of the Global Spatial Data Infrastructure (GSDI): http://www.gsdi.org (2004)

(Draft) Lecture Notes in Computer Science (LNCS). 2004, vol. 3183, p. 387-391. ISSN 0302-9743.

10. D.J.Coleman, D.D.Nebert: Building a North American Spatial Data Infrastructure. Cartography and Geographic Information Systems **25** (1998) 151–160
11. Rajabifard, A., Williamson, I.P., Holland, P., Johnstone, G.: From Local to Global SDI initiatives: a pyramid building blocks. In: Proceedings of the 4th GSDI Conference, Cape Town, South Africa (2000)