(Draft) Proceedings of the 11th EC-GI&GIS Workshop: ESDI: Setting the Framework. 2005, p. 56-58.

IDEZAR: AN EXAMPLE OF USER NEEDS, TECHNOLOGICAL ASPECTS AND THE INSTITUTIONAL FRAMEWORK OF A LOCAL SDI

D. Portolés-Rodríguez, P. Álvarez, R. Béjar, P.R. Muro-Medrano
Computer Science and Systems Engineering Department,
University of Zaragoza, Zaragoza (Spain)
{dporto, alvaper, rbejar, prmuro}@unizar.es

ABSTRACT

This paper illustrates the IDEZar project, a project that mainly consists in the development of a local Spatial Data Infrastructure (SDI) in Zaragoza (Spain) in order to get an improved management of spatial data available in the City Council of Zaragoza and to provide several online services to its citizens. The authors detail in this paper the initial analysis performed (strictly necessary, due to an initial chaotic situation) so as to plan the next steps towards a successful SDI implantation, the actual progress of this implantation and the benefits and applications obtained as a result. Apart from that, they also describe the components of IDEZar SDI (available data, technical aspects, inter-institutional relationship, user dimension, institutional framework), their experiences (problems encountered), some concluding remarks on modeling a SDI framework, and finally, the future work directions.

KEYWORDS: local SDI, SDI components, general purpose and thematic SDI applications

INTRODUCTION

In recent years, different international communities have promoted investments in spatial information and infrastructures for producing and using it at different administrative/political levels. This work has been strengthened by supplementary European directives, such as INSPIRE, Local Agenda21 (European Cities & Towns Towards Sustainability) and the directive relating to the assessment and management of environmental noise (2002/49/EC), but most of the administrative/political organizations, particularly among the local administrations, are not aware enough about the importance of these infrastructures, better known as Spatial Data Infrastructures (SDI), and its benefits both economically and environmentally from a better management of their spatial data assets. In expert's opinion, this situation is a seriously problem because the SDI perspective starts at local levels and proceeds through regional, state, national to global level [Chan et al. 1999].

According to the previously opinion, the IDEZar Project (http://idezar.unizar.es) is an exception. It is the result of a collaboration agreement signed in March 2004 between the City Council and the University of Zaragoza (Spain). Its main targets are an in-depth analysis of the spatial data assets of the City Council and their uses, a technological proposal for the development of a local SDI, the creation of two committees (governmental and technical) in order to promote the implantation of the new SDI and advise on technical aspects of this implantation (data, models, standards, processes, uses, etc.) respectively, and finally, the implementation of policies of spatial data access and acquisition. The ultimate aim is to facilitate and coordinate the exchange and

sharing of spatial assets between stakeholders from the City Council for improving their internal workflows and for building a Web-accessible information city able to offer a range of online services to its citizens.

In this framework, this paper presents and discusses the key issues of the IDEZar-SDI that have been highlighted according to user needs, spatial data (availability, accessibility and applicability), SDI development technical aspects, inter-institutional relationship, constrains and policies. Moreover, the authors intend to show how this experience has been useful to consolidate their SDI software technology and to create know-how and procedures that allow them a future and successful implantation of a new local SDI in another council.

The paper is organized as follow. The results of the analysis of the spatial data assets of the Zaragoza City Council and their uses are presented in the first section. This analysis has been used to make the planning for the development of a local SDI environment. This plan and the components developed for its implantation are detailed in the next two sections. Examples of applications built on the SDI environments for improving the daily work of the council technicians and providing new online services to the citizens are shown in the fourth section. Finally, the last section contains some concluding remarks and future work directions.

STARTING POINT ON THE DEVELOPMENT OF A LOCAL SDI: A ZARAGOZA STUDY CASE

In the City Council of Zaragoza the SDI concept was unknown one year ago. Although some previously mentioned directives and initiatives promoted by the European Commission require the creation of an environment in which all stakeholders (government, private and non-profit sectors, academic sectors, users, etc.) can share spatial assets and cooperate with each other, the reality was that the City Council was not ready in a position to build an SDI in its internal technological environment. Their spatial data were scattered and held in independent silos with often little contact between them and, besides, it was common to find several internal departments responsible for different aspects of their management.

The situation described above was detected by the Information Technologies department which decided to make an in-depth analysis of the spatial data assets of the City Council and their uses. A complex situation around on the data, processes, and institutional relationships was discovered as a result of the preliminary work, for example:

- Outdated spatial data and without a proper organization (It took months to “discover” some of the existing data).
- Lack of spatial data and other GIS resources, including skilled GIS staff.
- Many public information (urban planning, infrastructures, pollution, tourism, public services, etc.) was available in non-standard GIS formats, such as PDF files, static maps, etc..
- Outdated spatial enabled applications, such as a street gazetteer.
- Undefined processes for the creation, maintenance and access of spatial data.
- Frictions in the relationships among the internal departments, for example, between the Information Technologies and Urban Planning department (the first one boosted and financed the development of the local SDI, but the second one is responsible for creating and maintaining the urban cartography).
- And many others...

These conclusions showed the necessity of a very significant institutional change for the developing of a SDI environment. This development is a long-term process that must tackle a wide variety of critical issues, such as people, technological proposals, institutional framework and inter-institutional relationships. In these authors opinion, this change is very complex within the local administration. Local levels are the main responsible for the creation of the most of the spatial data and, therefore, they play a key role for the successful of the SDI hierarchy [Williamson et al. 2003] that involves at different political and administrative levels.

EFFECTIVE STEPS FOR THE IMPLANTATION OF A SDI ENVIRONMENT

With this scenario in mind, in order to achieve the described change, the first efforts have been focused on the identification of the core components for developing the IDEZar local SDI and the establishment of their specific objectives. In our opinion, four components are required: data, a technological architecture, an institutional framework and people. Although in the next section we deep in the description of each mentioned component, their high-level objectives are detailed below:

- Data component:
  - The resolution of the compatibility and homogeneity problems between data produced by different internal departments or external providers for avoiding promoting their duplication and uncertainty. Implicitly, the desirable objective is to achieve good quality data
  - The guarantee of the quality of the data models.
  - The definition of the responsibilities about the creation and maintenance of the spatial data produced by the City Council.
- Technology component
  - The design of a technological proposal based on existing SDI access models, policies and standards for the development of an infrastructure that supports Web-based and ubiquitous applications
- People
  - The training of the City Council staff that daily works with spatial data and enabled applications.
  - The building of a range of online services based on spatial resources to its citizens, for example, a new street gazetteer.
- Institutional framework
  - The improvement of the required inter-institutional and organisational relationship and the coordination and communication between involved agents (data producers, internal users, citizens, etc.).
  - The establishment of necessary legislation for formalising policies involved in data creation, organization, maintenance, sharing, open access or privacy, etc.
  - A stable investment beyond the period of elected mayors (under institutional instability it is difficult to carry out the project successfully).

COMPONENTS OF THE IDEZAR

Let us briefly introduce the core components that compose the SDI environment we are proposing.

Technological architecture

From a technical perspective, the IDEZar SDI is based on the service-oriented computing model [Graham et al. 2002] and the Open Geospatial Consortium (OGC) Web Services Architecture [OGC-WSA 2003]. Conceptually speaking, the underlying SDI architecture has been organized according to two orthogonal criteria: firstly, by means of a functional point of view (data, services, and internal and external applications; see the right part of the Figure 1); and secondly, according to the institutional organization of the City Council (left part of the Figure 1). Its core is composed by a series of OGC and ISO compliant services that provide the required functionality to discover, access, analyze, and visualize spatial data (Data and Service Catalogs, Web Map Servers (WMS), Web Feature Servers (WFS), Web Coverage Servers (WCS), etc.). These services have been implemented according to the Web service paradigm as reusable software components that can be accessed via ubiquitous Web protocols and data formats, such as HTTP, XML, or SOAP, with no need to worry about how each service is implemented. This choice based on standard, open and interoperable services has allowed us to tackle the inherent complexity of this SDI and the implementation of a wide range of applications and new SDI-based tools for creating and maintaining the existing spatial data.

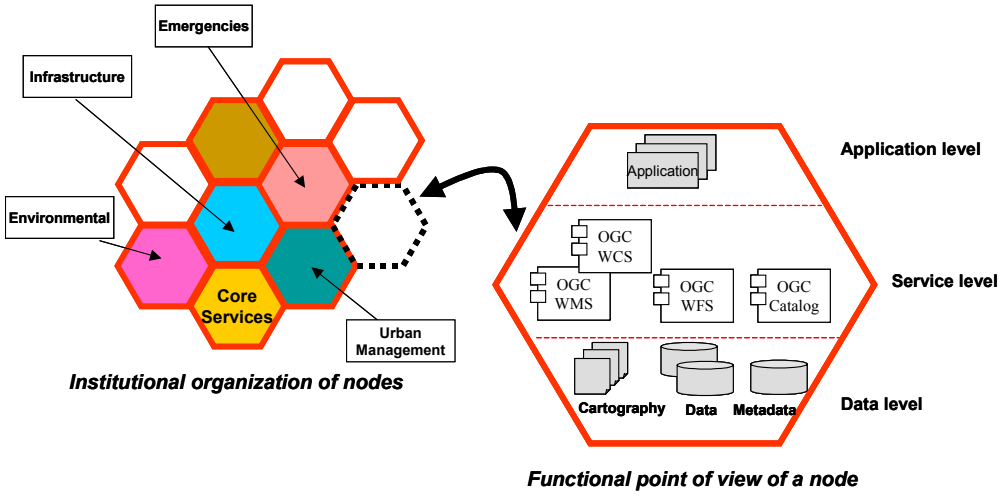

Figure 1: *SDI architecture*

The mentioned OGC standards and Web service paradigm resolve some integration problems that appears in the development of a local SDI, for example, problems related to the integration into a SDI hierarchy (in this project, the relationship has been at regional and national levels), into the legacy system used in the council workflows, or into heterogeneous tools used by data providers for submitting new spatial information (recently, it has approved the joint of the IDEZar initiative to the GMES Urban Services project from the European Space Agency, http://www.gmes-urbanservices.com/). Moreover, it is planned the development and starting of a

tourism application that lets wireless mobile users access to Web-based information –tourism, cultural, and urban resources contents– provided by the local SDI. This type of proposals requires the integration of the SDI core services into heterogeneous software and hardware platforms (communications, positioning and mobile platforms) for supporting new applications with device-independent, time-aware, and location-aware.

Institutional framework

Two committees have been established as a part of the IDEZar project: the technical and governmental committees. The technical committee advices in terms of data (formats, precision, and quality), procedures (data creation, acquisition, maintenance, sharing, accessing, and security), technical standards, and technologies (hardware, software and ubiquitous platforms). Currently, it is composed by technical staff of the University and City Council of Zaragoza (staff of the Information Technologies department to be precise).

On the other hand, the governmental committee has established an institutional framework for the internal promotion of the new SDI and the definition of responsibilities, policies and administrative arrangements according to the technical committee's advices. In an overview, it tries to facilitate the interaction between the people component (citizens, council technicians, decision makers, data and services providers, etc.) and the SDI technological framework [Rajabifard 2001]. According to our first experiences, we must remark that the work of this committee is very laborious due to the frictions among the internal City Council departments.

People

The people dimension is without doubt a fundamental issue in a SDI: people usually establish their needs (which will reflect most of functional requirements of systems), may be classified into several categories or profiles and, besides, play the role of end-application tester. In connection with user needs, we have found a wide range of spatial use cases and applications as a result of a first analysis, for example, for managing the urban environment (surveillance of the urban environment for detection of new construction activity, for monitoring current land use according to the Master Urban Plans –MUP–, the decision support for the management of urban infrastructures, etc.), for controlling the environmental impact and for promoting sustainable development (the elaboration of the urban noise maps, the periodic update and continuous evaluation of the local environmental indicators, etc.), or for providing on line services to the citizens (for consulting cadastral survey information and the MUP, a street map with advanced functionality for planning tourist and natural routes, a street nomenclator, a bird's-eye view application, a ubiquitous access to cultural tourism portals using mobile devices, etc.).

On the other hand, people is classified according to different profiles or skills. Each one of these profiles will be characterized for having a different set of applications, functionalities and data available for their use, depending on several criteria (such as, permission level, responsibility, departments, etc.). Related to that, it is specially remarkable current proposals based on LDAP [Yeong et al. 1995] solutions, in order to unify and integrate user control and other authentication tasks, by a single sign-on. Nowadays, IDEZar users are divided into just two profiles ("council people" and citizens) that access to different home pages of the IDEZar portal site (for example, the URL of the citizens home-page is http://idezar.unizar.es). However, in future, there would be a more complex classification, which is likely contains categories such as: citizens of Zaragoza,

Spanish tourists, European tourists, Spanish-spoken tourists, rest of tourist (from the previous profile citizens), and a new specialization from profile "council people" that contains, for instance, council technicians, decision makers, data and services providers, managers of each departments of the council, department administrator, council administrator, etc.

Finally, users don't only play the role of end user of applications. In addition to that, they also acts as a qualified quality tester (due to their privileged position near to the problems, and their expertise, experience and knowledge), detecting improvements and new use cases. In this context, it is very important to take into account three main design principles to improve the usability: efficiency, efficacy and satisfaction.

Inter-institutional relationship

The inter-institutional relationships are the cornerstone for the development of a SDI hierarchy [Rajabifard 2001]. This hierarchy creates an environmental, in which data are created and maintained by the responsible levels and decision makers working at any level can draw and work on data from other levels, depending on the themes, scales, currency and coverage of the data needed [Williamson et al. 2003].

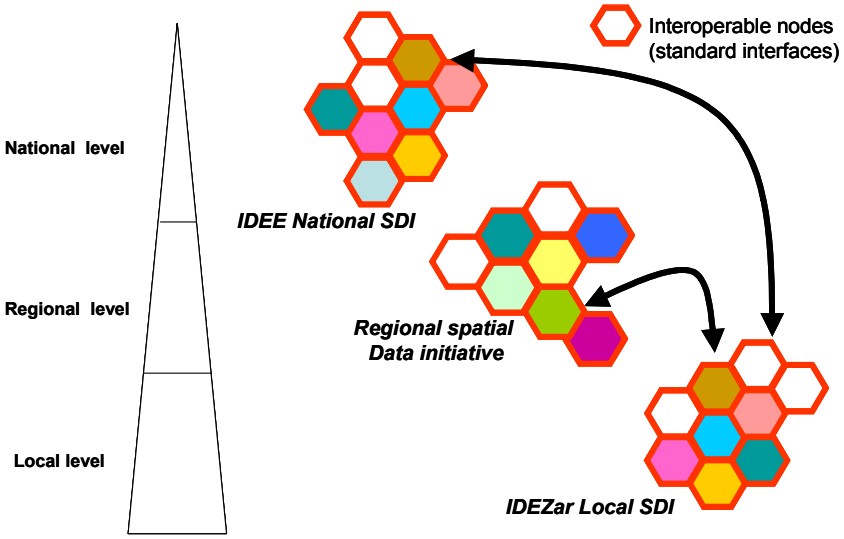

Figure 2: *IDEZar into a SDI hierarchy.*

As it was previously mentioned, the preliminary analysis showed the lack of certain data in the Zaragoza City Council, for example, medium scale urban data (1:20,000) or aerial photographs covering the city. For this reason, a main challenge was to improve the relationships between the City Council and another related administrations (such as, regional and national administration) for the integration of their respective SDIs or spatial data initiatives. As it is shown in the Figure 2, currently, IDEZar local SDI collaborates with the Regional spatial data initiative for integrating aerial photographs from Zaragoza city and environmental data related to the municipal area (flora and fauna, information about the wind parks, protected natural spaces, etc.) and, besides, with the

National SDI (http://idee.unizar.es) for integrating large and medium scale urban data (1:20,000-1:200,000; for example, these scales may be used for presenting location maps). Of course, a technological proposal based on interoperability standards (Web services and data and service OGC specifications) is required for the development of this SDI hierarchical integration, as it was previously described at the beginning of this section.

EXAMPLES OF SDI-BASED APPLICATIONS

Once the four components of IDEZar have been presented, in this section it is briefly described how they have been combined to develop SDI-based applications. According to the user profiles, these applications have been organized into different Web portals accessible by citizens, internal technicians of the City Council or users interested in environmental information (thematic portals). Details of these portals are introduced below.

City Council Web Portal

Building a web portal it is probably the most appropriate way of developing SDI-based applications accessible to citizens. Thus, as a part of the IDEZar project, a Web portal has developed including links to information and explanations (about the concept and the evolution of SDI, European initiatives –INSPIRE-, another SDI implantations, etc.) and links to applications that highlight the benefits of a SDI strategy (see Figure 3.).

Figure 3: *IDEZar portal*

Apart from the habitual applications available in any geoportal (such as interactive visualizers that shows the urban maps, aerial photograph or digital orthoimages of Zaragoza, a nomenclator, a search application to find out and locate any council-dependent buildings and offices, etc.), there are two applications specially outstanding: a route planner application and a new street gazetteer. On the left side of Figure 4 appears the route planner, capable of calculating the shortest or fastest path between any Spanish town to Zaragoza's center (Pilar Square) and draw it on a road map. On the right side can be observed the new version of the street gazetteer that has been developed, which main target is to allow to the final user the task of locating addresses by querying (usually providing a street name as filter criterion) and finally, after a candidate selection, achieving a map of the zone.

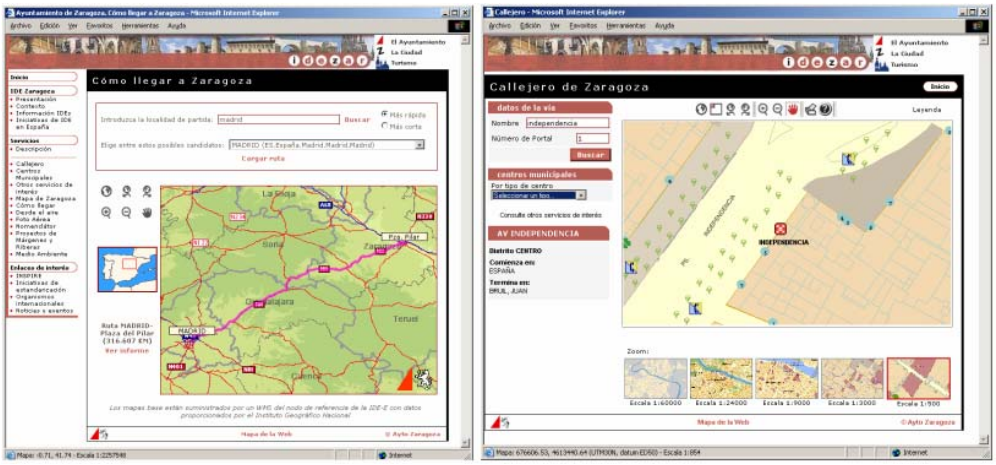

Figure 4: *IDEZar route planner and street gazetteer*

Finally, Zaragoza has been chosen recently as the organizational city of International Exposition 2008 (EXPO'08, http://www.zaragozaexpo2008.es/). IDEZar cannot be beyond this choice, and its web portal has included an interactive visualizer that shows future plans and works related to EXPO'08 ("*Proyecto de Márgenes y Riberas Urbanas del Río Ebro*"), located over an aerial photograph, apart from much more information about land planning, future buildings or urban elements to be constructed, statistics, reports and so on.

City Council intranet

As it has been mentioned above, one of the challenges of IDEZar is to facilitate and coordinate the exchange and sharing of spatial assets between stakeholders from the City Council for improving their internal workflows. In this context, it has been developed a series of applications oriented to daily work done by council technicians.

The existing applications for the intranet in IDEZar are an heterogeneous set that vary from search-based applications (that allow any user perform queries so as to find a list of metadata ordered from best to worst accomplishment of the spatial and non-spatial restrictions) to visualizers. Currently, in the first group, there are two applications: a multi-purpose search

application and a specific one for the Environment Department (the difference between them is just the data that can be founded). However, in the second group there are included: a multi-purpose visualizer that can include/remove dynamically data coming from any OGC-compliant Web Map Server by providing just only its URL, a multi-purpose georeferencing tool (explained below), and two visualizers specially oriented to urban-planning technicians. These last thematic visualizers are specialized in showing urban cartography and presenting a district map of the City that allows, by clicking over any district zone, access to statistics and future planes about the district selected.

But let us briefly describe the one of the most important internal applications we have developed: the georeferencing application. This Web-accessible application simplifies the task of locate and georeference multiple elements (points, lines and polygons), such as schools, libraries, the path of a new bus line, and so on. The process of converting the output of georeferencing application to data included in IDEZar SDI is clearly established and partially automated; it consists of three phases: an initial phase (generation of recordset) that obtains a table with features (columns of business information plus a geometry column, such as the one on the right side of Figure 5), followed by a conversion phase from XY table to any "GIS-format" file (using any of commercial solutions available at this moment), and finally, an integration of this GIS files into the services included in IDEZar SDI (such as, a WMS, a metadata Catalog Service, etc.).

Figure 5: *Georeferencing application and results on an Excel sheet*

The publication of this application has sensitized Council Departments regarding the geographical feature of data they usually managed. Its easy and free use (specially versus equivalent expensive and closed commercial applications, such as either ESRI or Intergraph solutions), it has resulted in an improvement of their productivity, and it has solved the problem of dealing with geographical data and having a visualization of it in a quick and easy way. The

structure of this application (see left side of Figure 5.) consists of a visualizer, whose map shows a typical urban cartography 1:1000 and 1:5000 and urban elements, common tools for interacting to the map and, in this case, several tools for creating simple geometries (points, lines and polygons) by clicking the map, a table of contents in order to choose what information should be represented in the map, and a street gazetteer in order to simplify the task of locating addresses (a common situation considering the following use case: "georeference many features from a printed table that contains a column for the address"). Finally, it must be emphasized the fact that the underlying services are obviously the same IDEZar SDI services presented before (WMS, gazetteer, etc.).

Thematic SDI nodes: Agenda 21 in Zaragoza

The City Council of Zaragoza is aware of the importance of promoting sustainable development and the rest of issues of Agenda 21 and its role as a local administration. In connection with this awareness, the Council signed in 2000 "*The Aalborg Charter*" (Charter of European Cities and Towns Towards Sustainability) and, subsequently, it has carried out many initiatives in order to spread the main principles and the local action plans towards sustainability described in Local Agenda 21. These initiatives are available at the main Council web portal (http://www.zaragoza.es/agenda21).

In spite of this awareness, at the beginning the situation was not easy at all. Taking this into account, we have followed the next process so as to tackle this problem: first of all, it was an in-depth analysis to find out all environmental data available in the City Council (it is important to highlight the fact that the amount of environmental data managed by a Council is simply huge). After that, there was a phase of cataloguing those data (according to Dublin Core standard) and, subsequently, an integration of these cartographic and environmental contents and metadata into a OGC Web Map Service and into a Catalog service, respectively. Finally, it just remains how to exploit them by integrating in applications, taking account of the fact that, due to the enormous amount of data, possible applications and services are simply unimaginable. Under these circumstances, we decided to develop several new applications for IDEZar and to improve another pre-existing applications as a sign of these advantages (they will be described on next paragraphs).

In conclusion, due to the geographical nature of the most of environmental data, the establishment of IDEZar SDI has resulted in an effective mechanism of achieving the global actions included in Agenda 21, by improving the resources and applications available previously. It is important to point out that one of these global actions is the diffusion of environmental information to citizens; for instance, thanks to IDEZar SDI, there was an improvement on the previous daily online reports about atmosphere indicators and the quality of air in the city, based on control pollution measurements, that now include a map using an OGC WMS (the same used in the street gazetteer) obtaining a more descriptive environmental information.

However, apart from that, the set of maps that now may be integrated into IDEZar in the future could be extended to, for example, elevation maps, thermal maps, noise maps, relative humidity maps, Normalized Difference Vegetation Index (NDVI) maps, urban density... built using legacy closed systems up to date, and consequently, far away to the benefits of a SDI-based solution.

Figure 6: *Environmental applications*

On the other hand, as an example of new applications, there was developed an application that let search over metadata related to environmental issues (on the left part of the Figure 6 it is showed the main page with available criteria). Besides, it has also been developed thematic environmental applications to present the protected natural spaces related to the Zaragoza area, such as "El Galacho de Juslibol" (see the right part of the Figure 6.). This application contains: a location map of the natural resource, a complete interactive visualizer properly customized depending on the theme selected by final user and finally, several cartographic documents.

CONCLUSIONS AND FUTURE WORK

In general, local governments must improve the workflows of City Council technicians as cartography producers, maintainers or users, and provide citizens with a lot of public information and applications for their daily activities based on spatial data and services. A SDI environment is the best way to achieve these challenges, but it requires an important investments and a very significant institutional change. In this paper, the authors' experiences in the framework of the IDEZar project are presented. These experiences concludes that the development of a local SDI is a long-term process that must tackle a wide variety of critical issues, such as people, technological proposals, institutional framework and inter-institutional relationships.

In authors' opinion, it is important to remark two facts. Firstly, although, in recent years we have participated in the development of local, regional and national SDIs, we have noticed that the biggest and fastest impact has been at the local level. The citizens want good services and dated public information. These requirements demand a sustainable development of a SDI environment, for example, a few days after the presentation of the IDEZar Web portal, a letter to the editor of

the most important newspaper in Zaragoza (*Heraldo de Aragón*) complains about the fact that some of the newest streets were not appearing in the street gazetteer. And secondly, local government needs in spatial data are high, but their budget is typically not so high. It is necessary to convince local administrations of the benefits of a SDI: it is the best way to develop good applications for internal technicians and citizens, to keep lower costs and increase the possibilities when it is compared with other solutions and to make profit of the services at other levels of the SDI hierarchy.

Recently, the agreement between the City Council and the University of Zaragoza has been renewed. The challenges are to discover new spatial use cases for the development of new interesting applications, to continue the internal and external promotion of the SDI and to integrate mobile platforms and technologies into the SDI architecture (for example, for the development of a tourism application based on PDA devices).

BIBLIOGRAPHY

Chan, T.O., Williamson, I.P., 1999, Spatial Data Infrastructure Management: Lessons from corporate GIS development, Proceedings of AURISA'99, Blue Mountains, NSW, AURISA'99 CD-ROM.

Graham, S., Simenov, S., Boubez, T., Davis, D., Daniels, G., Nakamura, Y., Neyama, R., 2002, Building Web Services with Java: Making Sense of XML, SOAP, WSDL, and UDDI, SAMS Publishing, 2002.

OGC-WSA, 2003, OpenGIS Web Services Architecture, Reference number OGC 03-025, 2003.

Rajabifard, A. 2001, SDI Hierarchy from Local to Global SDI Initiatives, Presented at Open Seminar on SDI in Asia and the Pacific Region, 7th PCGIAP meeting, Tsukuba, Japan.

Williamson, I., Rajabifard, A., Feeney, M.E., 2003. Developing Spatial Data Infrastructures. From concept to reality, Taylor and Francis Publisher, 2003.

Yeong, W., Howes, T., Kille, S., March 28, 1995, "Lightweight Directory Access Protocol", Internet Engineering Task Force (IETF) Request For Comment (RFC) 1777.

(Draft) Proceedings of the 11th EC-GI&GIS Workshop: ESDI: Setting the Framework. 2005, p. 56-58.

IDEZar: an example of user needs, technological aspects and the institutional framework of a local SDI

D. Portolés-Rodríguez, P. Álvarez, R.Béjar, P.R. Muro-Medrano
Computer Science and Systems Engineering Department, University of Zaragoza
Zaragoza, Spain

The IDEZar Project (http://idezar.unizar.es) is the result of a collaboration agreement signed in March 2004 between the City Council and the University of Zaragoza (Spain). Its main targets are an in-depth analysis of the spatial data assets of the City Council and their uses, a technological proposal for the development of a local Spatial Data Infrastructure (SDI), the creation of two committees (governmental and technical) in order to promote the implantation of the new SDI and advise on technical aspects of this implantation (data, models, standards, processes, uses, etc.) respectively, and finally, the implementation of policies of spatial data access and acquisition. The ultimate aim is to facilitate and coordinate the exchange and sharing of spatial assets between stakeholders from the City Council for improving their internal workflows and for building a Web-accessible information city able to offer a range of online services to its citizens.

In this framework, this paper presents and discusses the key issues of the IDEZar-SDI that have been highlighted according to user needs, spatial data (availability, accessibility and applicability), SDI development technical aspects, inter-institutional relationship, constrains and policies. Moreover, the authors intend to show how this experience has been useful to consolidate their SDI software technology and to create knowhow and procedures that allow them a future and successful implantation of a new local SDI in another council.

The first steps are always difficult within the local administration. There is an increasing awareness of the important role played by the spatial data today, but the situation is still very complex. The development of a local SDI is a long-term process that must tackle a wide variety of critical issues: 1) it is desirable to have good quality data, but their quality is relative (compatibility and homogeneity problems between data produced by different internal o external providers that promote its duplication and uncertainty, the responsibilities about their creation and maintenance are not defined, the quality of the data models, a low inversion on spatial assets, a severe lack on trained staff, etc.); 2) the design of a technological proposal based on existing SDI access models, policies and standards for the development of an infrastructure that supports Web-based and ubiquitous applications; 3) the required inter-institutional and organisational relationship and the coordination and communication between involved agents (data producers, internal users, citizens, etc.); 4) the necessary legislation for formalising policies involved in data creation, maintenance, sharing, open access or privacy; and finally, 5) a stable investment beyond the period of elected mayors (under institutional instability it is difficult to carry out the project successfully).

Despite this complexity, in these authors opinion, the return on the investment is guaranteed by the growing importance of the role of spatial data in local decision support and citizen services. This importance is increased for directives and initiatives promoted by the European Commission, such as INSPIRE, Local Agenda21 (European Cities & Towns Towards Sustainability) and the directive relating to the assessment and management of environmental noise (2002/49/EC), that require the human and technological capabilities to access and use available spatial data to support decision making. As a whole, a wide range of spatial use cases and applications have been found, for example, for managing the urban environment (surveillance of the urban environment for detection of new construction activity, monitoring current land use according to the Master Urban Plans –MUP–, the decision support for the

management of urban infrastructures, etc.), for controlling the environmental impact and for promoting sustainable development (the elaboration of the urban noise maps, the periodic updating and continuous evaluation of the local environmental indicators, etc.), or for providing on line services to the citizens (for consulting cadastral survey information and the MUP, a street map with advanced functionality for planning tourist and natural routes, a street nomenclator, a bird's-eye view application, a ubiquitous access to cultural tourism portals using mobile devices, etc.). As a result of the previous analysis, these SDI use cases have been identified and functionally described, and are explained in detail in this paper for offering an interesting knowledge to the spatial data interest communities.

On the other hand, in the first steps of this project we have also focused our effort in the development of the key components of the IDEZar SDI. From a technical perspective, this SDI is based on the service-oriented computing model [Graham et al. 2002] and the Open Geospatial Consortium (OGC) Web Services Architecture [OGC-WSA 2003]. Conceptually speaking, the underlying SDI architecture has been organized according to two orthogonal criteria: firstly, by means of a functional point of view (data, services, and internal and external applications); and secondly, according to the institutional organization of the City Council. Its core is composed by a series of OGC and ISO compliant services that provide the required functionality to discover, access, analyze, and visualize spatial data (Data and Service Catalogs, Web Map Servers, Web Feature Servers, Web Coverage Servers, etc.). These services have been implemented according to the Web service paradigm as reusable software components that can be accessed via ubiquitous Web protocols and data formats, such as HTTP, XML, or SOAP, with no need to worry about how each service is implemented. This choice based on standard, open and interoperable services has allowed us to tackle the inherent complexity of this SDI and the implementation of the previously mentioned applications and new SDI-based tools for creating and maintaining the existing spatial data.

However, this paper intends to stress the importance of the OGC standards and Web service paradigm to resolve some integration problems that appears in the development of a local SDI, for example, problems related to the integration into a SDI hierarchy (in this project, the relationship has been at regional and national levels), into the legacy system used in the council workflows, or into heterogeneous tools used by data providers for submitting new spatial information (recently, the technical committee has approved the joint of the IDEZar initiative to the GMES Urban Services project from the European Space Agency, http://www.gmes-urbanservices.com/). Moreover, it is planned the development and starting of a tourism application that lets wireless mobile users access to Web-based information –tourism, cultural, and urban resources contents– provided by the local SDI. This type of proposals requires the integration of the SDI core services into heterogeneous software and hardware platforms (communications, positioning and mobile platforms) for supporting new applications with device-independent, time-aware, and location-aware.

Finally, the governmental committee has established an institutional framework for the definition of responsibilities, policies and administrative arrangements according to the technical committee's advices in terms of data (formats, precision, and quality), procedures (data creation, acquisition, maintenance, sharing, accessing, and security), technical standards, and technologies (hardware, software and ubiquitous platforms). In an overview, this work tries to facilitate the interaction between the people component (citizens, council technicians, decision makers, data and services providers, etc.) and the SDI technological framework [Rajabifard 2001].

References

Graham, S., Simenov, S., Boubez, T., Davis, D., Daniels, G., Nakamura, Y., Neyama, R., 2002, Building Web Services with Java: Making Sense of XML, SOAP, WSDL, and UDDI, SAMS Publishing, 2002.

OGC-WSA, 2003, OpenGIS Web Services Architecture, Reference number OGC 03-025, 2003.

Rajabifard, A. 2001, SDI Hierarchy from Local to Global SDI Initiatives, Presented at Open Seminar on SDI in Asia and the Pacific Region, 7th PCGIAP meeting, Tsukuba, Japan.

Institute for Environment and Sustainability

EUROPEAN COMMISSION
DIRECTORATE-GENERAL
Joint Research Centre

Abstracts

ESDI: Setting the Framework

11th EC-GI&GIS Workshop

Alghero, Sardinia
29 June-1 July 2005

www.ec-gis.org/Workshops/11ecgis

INSPIRE - Infrastructure for Spatial Information in Europe

REGIONE AUTONOMA DELLA SARDEGNA

(Draft) Proceedings of the 11th EC-GI&GIS Workshop: ESDI: Setting the Framework. 2005, p. 56-58.

Table of Contents

(Draft) Proceedings of the 11th EC-GI&GIS Workshop: ESDI: Setting the Framework. 2005, p. 56-58.