

# Towards Interoperable Infrastructures of Geospatial Data

**Sergio Farruggia**

GIS Consultant  
eSDI-Net+ Committed Expert  
Genoa, Italy  
sergio.farruggia@fastwebnet.it

**Emanuele Roccatagliata**

Geographic Information System  
International Group, GISIG  
Genoa, Italy  
e.roccatagliata@gisig.it

## Abstract

*The development of a Spatial Data Infrastructure (SDI) comes true thanks also to the ability and the will to carry out communication and co-operation solutions and processes suitable to this aim.*

*Two activities are described in this paper: a methodology for evaluating sub-national SDIs and a collection of the SDI user perspectives.*

*The information achieved regarding user needs offers the opportunity to point out different aspects that have to be taken into account to develop interoperable infrastructures of geospatial data.*

## Keywords

Geospatial Data, Geospatial Services, SDI, User Requirements.

## INTRODUCTION

The continued advances in remote sensing, mapping and geospatial technologies, including an increasing variety of data acquisition capabilities and low cost and more powerful computing capacity, coupled with the development of geographic information system technology, have enabled and increased the demand for geographic information. As the importance of geographic information in addressing complex social, environmental, and economic issues facing the diverse communities around the globe is growing, the establishment of a Spatial Data Infrastructure (SDI) to support the sharing and use of this data locally, nationally and transnationally makes increasing sense.

Despite the promising frame just described and the great efforts being made since the early 1990s, GI users -a part from rare exceptions- still have troubles in searching, discovering and exploiting geospatial data of the Public Sector.

On the other hand there has been recently an explosion of interest in using web to create, assemble and disseminate geo-information.

Thanks to the participation in two GI e-Content projects, precisely eSDI-Net+<sup>1</sup> and GIS4EU<sup>2</sup>, GISIG has the oppor-

tunity to follow its duties, related to dissemination activities and the user need collection, trying to take into account the rapid changes of user perspectives.

## The Google Earth phenomenon

In October 2004 Google bought a company called Keyhole Inc., which developed a product called Earth Viewer. Earth Viewer was renamed in 2005 and launched as Google Earth. Since this date, the Google commitment in making geographic information useful and accessible on the web has continued with a non-stop sequence of initiatives. In October 2006, it undertook huge updates to Google Maps API, displaying Keyhole Markup Language (KML), and it announced licensing and support for businesses wanting to embed a Google Maps experience in their websites or internal applications. In May 2007, at the Where 2.0 conference in San Jose (CA), the Mountain View company announced the most innovative maps available on line: Street View and Mapplets, a new feature of Google Maps that enables users to view and navigate within 360 degree street level imagery. In April 2008 Street View was integrated to Google Earth. In the same month the Open GIS Consortium (OGC) approves KML as an Open Standard, so the OGC KML will be maintained by the consortium.

These are only some of the news, for instance, to give an idea regarding the rapid growth of Google commitment in Geographic Information field: the release of Google Earth, more than any other of its competitors, caused a driving public interest in geospatial technologies and applications.

## The network of SDIs

The concept of the "Spatial Data Infrastructure" started taking shape during the early 1990s, when the Mapping Science Committee (MSC) of US-National Research Council coined the phrase "National Spatial Data Infrastructure" to identify a comprehensive and co-ordinated environment for the production, management, dissemination, and use of spatial data. The NSDI was conceived to be the totality of the policies, technology, institutions, data and individuals that were producing and using geospatial data within the US. The MSC report (1993) proposed a number of actions and responsibilities for various agencies and for the Federal Geographic Data Committee (FGDC) which related to their version of NSDI whilst another report a year later urged the use of partnerships in creating the NSDI. The FGDC team discussed the concept of NSDI with the Clinton Administration. The NSDI was recognised as an idea and means to

<sup>1</sup> eSDI-Net+, European Network on Geographic Information Enrichment and Reuse, n. ECP-2006-GEO-320005/2007, <http://www.esdinetplus.eu/>

<sup>2</sup> GIS4EU, Provision of Interoperable datasets to open GI to the EU communities, n. ECP-2006-GEO-310011/2007, <http://www.gisig.it/gis4eu/>

foster better intergovernmental relations, to empower State and local governments in the development of geospatial data sets and to improve the performance of the Federal Government. In 1994, the national Spatial Data Infrastructure was signed by President Clinton, directing the federal agencies to carry out certain tasks to implement the NSDI.

After the US-NSDI other Countries started with analogous projects as Australia, Canada, Japan and so on. In 2002 the European Commission also launched a project, named INSPIRE<sup>3</sup>, that aims to create the European Spatial Data Infrastructure.

At the heart of the US-NSDI there were at the beginning very pragmatic concepts as a reduction of the deficit and to guarantee a more efficient use of the billion-per-year dollars spent to acquire and manage geospatial data. Over the time the objectives of an SDI have been enlarged, including the promotion of the geospatial data use and the re-use for various aims by public administrations and citizens as well as the organization of the necessary services to allow the collectivity to discover and exploit them.

### **The web underpins co-operative approaches**

From the user point of view there are various elements of confusion between the Google offer (as well other its competitors) and that can be achieved by an SDI. What it seems is that even if Google spatial data are often less accurate than SDI ones, its services are immediately ready, user friendly and universally known. So, various public GI services are offered on Google-based ones.

Comparing the two initiatives in terms of developing time-frame, it is even too easy to point out the fast result of Google, that in less than four years reached a leadership in the www. With this overture, can we image which other big jump it will be able to do into 2013, the foreseen date to have a complete implementation of the INSPIRE directive at EU member State level.

At a first examination, such great difference between the results of the two initiatives could be traced back to investment differences or revenue opportunities, thinking that the Google business model is based on the advertising market, a very profitable one. But anyhow, also Public Sector has dedicated in the same period a considerable number of investments, for GI in general and for SDI developing programmes too: some estimations regarding this matter should be useful. Are we so sure that the result differences are owing only to financial aspects?

So, it is possible to analyse this subject from another point of view. Both Google and SDI GI products and services arose and are growing inside the Internet new era. Google is designed taking advantage of the www network characteristics, concerning the scale-free degree distribution<sup>4</sup>, it con-

<sup>3</sup> <http://inspire.jrc.it/>

<sup>4</sup> Barabási, Albert-László, Linked. The New Science of Networks, Perseus Publishing (2002)

tributes to diffuse the Web 2.0 model, so that Google solutions strongly underpin the spontaneous development of a new way to manage and use GI on the web, e.g. Mashup and Volunteered Geography<sup>5</sup>. On the other side, the web diffusion of SDIs -and of the network of SDIs as a consequence- doesn't ride the wave of this innovation as well.

Obviously, Public Sector approach to the www is still not very suitable, it is still not consistent with respect to the main paradigms of the Society of Knowledge. International and national SDI associations, as well as single experts are connected in a network: perhaps its size and its characteristics are not still proportionate to exploit the web power. But too many public organizations who should be committed in the development of owner SDI and to contribute to the improvement of the SDI network are dismissing opportunities that SDI development means for GI users and for themselves.

Just as the theory of Public Administration is evolving to take into account changes of our society<sup>6</sup>, so also operative approaches have to try opportunities of co-operation between public organizations, as well as between public, private and research sectors and -in general- with the web communities.

With respect to this context, eSDI-Net+ project aims to bring together existing SDI key players and target users in a Thematic Network to be established as a platform for communication and exchange between different stakeholders involved in the creation and use of SDIs.

### **AN EUROPEAN NETWORK ON GEOGRAPHIC INFORMATION**

eSDI-Net+ network intends to promote high-level decisions, low-level technical discussion and information exchange, in order to increase awareness concerning the importance of GI enrichment and of SDI's for GI reuse, to allow an integrated view of the experts and to permit the creation of integrated guidelines, standards, and implementation of best practices. Within the network, communication mechanisms between the European and local levels are implemented to maximize the benefits of INSPIRE, GMES and GALILEO, regarding digital GI content.

With *eSDI-Net+*, multicultural and multilingual aspects in accessing, exploiting, using, and reusing digital GI content in Europe are addressed. As a result, the project wants to contribute to achieving interoperability between national digital collections and services (e.g. through common standards) and facilitating access and use of the material in a multilingual context.

<sup>5</sup> Goodchild, Michael F., Citizens as sensors: the world of volunteered geography, *GeoJournal* (2007), available at [http://www.ncgia.ucsb.edu/projects/vgi/docs/position/Goodchild\\_VGI2007.pdf](http://www.ncgia.ucsb.edu/projects/vgi/docs/position/Goodchild_VGI2007.pdf)

<sup>6</sup> Only referring to the last two decades, three models have been introduced to take into account citizen perspectives; see, e.g. [http://en.wikipedia.org/wiki/Public\\_administration](http://en.wikipedia.org/wiki/Public_administration)

A first goal of the project is the evaluation of sub-national SDIs in Europe, in order to select SDI best practices. In the next subsection the methodology carried out to that end is described. The results of this activity will be discussed in national workshops, scheduled in last quarter of 2008.

### **A methodology for describing sub-national SDI**

The first issue of the methodology concerns the standardization of the area-of-interest sizes at the sub-national level. In the context of eSDI-Net+, sub-national means NUTS 1, NUTS 2, NUTS 3 levels or any of their aggregations according to the administrative structure of the countries, referring to the nomenclature defined by of the European statistical office EUROSTAT.

Once this aspect was detailed, several key SDI questions that each sub-national SDI, identified by the national level, have to elaborate on, were identified.

A questionnaire was elaborated, as a guideline for interviews of sub-national SDI officials, for recording the results of the national workshops and for the relationship with the eSDI-Net+ project. Seven topic categories were proposed and synthetically shown hereinafter.

#### ***Sub-national SDI identity card***

This part regarding the “SDI register data” such as objective, legal status, funding mechanisms and so on.

#### ***SDI usage assessment***

This section intends to assess the sub-national SDI usage. In particular, questions concerning this aspect are:

- The sub-national SDI objective regarding the usage
- The assessment of SDI usage from the sub-national SDI stakeholders, its effective use and the user expectation for SDI services
- Social impacts of the sub-national SDI.

#### ***Networking people assessment***

This section intends to understand the networking issue the sub-national SDI has to face. It relates to the “humanware” and tries to identify what exists beyond the digital façade (the emerged part of the iceberg visible on the net). Two main aspects have to be investigated:

- The sub-national SDI may have set up networking people mechanisms in order to create a climate of opinion, to identify common interest, shared interest, and to build consensus
- The sub-national SDI may have addressed issues related to raising awareness.

#### ***Socio-economic impact analysis***

The fourth topic category concerns the evaluation of the sub-national SDI undertaking with respect to socio-economic impact analysis. To assess this aspect, one can

use different methods such as cost benefit analysis, cost avoidance. The objective here is to collect results if any, and identify innovative methods.

#### ***Organisational assessment***

This section intends to assess the place of the sub-national SDI in the overall organisation of the territory.

Main aspects to investigate in this section are:

- Links between Sub-national SDI and the administrative area governance
- Funding required by sub-national SDI and the team to operate it
- Suggestions would like to channel to the EC with respect to the European statements that the Regions should undertake regarding sub-national SDI (e.g. in the modernisation and IT area, not only produce data but also enable data sharing)
- Any remarkable aspect regarding joining with sub-sub-national SDI in the area covered by the sub-national SDI.

#### ***Coping with legal aspects***

Legal aspects of sub-national SDI are two fold. On the one hand it copes with the laws and regulations that the SDI has to comply with and on the other hand what is the legal status that the SDI should have to reach sustainability.

#### ***Technical functionalities-facilities-components***

Technical facilities are related to the type of data involved within the sub-national SDI and the services offered to the users. As other initiatives are focusing on technical aspects of SDI, for example the INSPIRE state of play, the methodology is not looking for details on the technical aspects.

### **THE USER ROLE IN SDI DEVELOPMENT**

An activity that can contribute to the sub-national evaluation is the analysis of the SDI user perspectives, conducted by GISIG inside GIS4EU project.

GIS4EU aims to develop a common data model, harmonisation, aggregation and data exposition rules and guidelines in order to enable access to consistent and homogenous reference data, regarding four themes (administration units, hydrography, transportation networks and elevation) provided by cartographic authorities from different countries and levels (national, regional and local) without building one central database and service.

This work was subdivided in two phases. In the first an analysis of the available literature on this matter, made considering the results obtained by previous user requirement surveys, was carried out. The achieved information gave the opportunity to point out the role of users in SDI development and a method to improve user role in SDI development was suggested. In particular, a checklist was formu-

lated to be used as a structured and uniform tool for assessing and evaluating the feasibility of developing an SDI and as a hint for deliberation for those public organizations that have already, partially or totally, developed GI services.

In the second phase, the same tool was then submitted to various SDI managers and people in charge of SDI organizations to obtain, through the checklist use and the resulting answers, confirmation about user requirements collected from previous surveys, as well as other information about this matter and, in general, comments and suggestions derived from the knowledge of perspectives of their users.

### User Identification and User Classification

Geographical Information users are many and various and include users in the environmental field who need spatial data for planning, management, assessment, monitoring and reporting. But the range of users includes as well those ones from many other application sectors: Agriculture, Forestry, Mining and geological industry, Fishery, Transport, Utilities, Construction, Property agents, Logistics, Health and Government, and many others.

Nowadays, as a consequence of the increasing number of available technological communication platforms (connected to the Internet and mobile, and without forgetting the forthcoming ones in a near future, e.g. from the merge of Internet and digital TV) many new applications of geospatial technology are present and will arise year by year<sup>7</sup>.

Besides this, to identify GI users, the context of new paradigms also has to be taken into account, e.g. the WEB2.0 (namely in our matter WHERE 2.0) as well as new disciplines such as Neogeography<sup>8</sup>, whose scope and application is currently object of debate (but anyway connected with the increase of user-generated geospatial content).

Hence the user community is very broad and diverse and includes: Governments & Administrations, Utility and Public Services, Research and development, Commercial & Professional End Users, Non Governmental Organisations (NGOs) as well as not-for-profit organizations and Citizens.

With respect to the goals of GIS4EU project, generally speaking users are people who are using already existing SDIs and Thematic SDIs, able to highlight the main obstacles/problems they are facing.

Regardless of the SDI different scales, local, regional, national and international, a first classification of them is with respect to their role, as suggested in "State of Art in User Groups and Needs", Humboldt project<sup>9</sup>:

- GIS developer, i.e. people who are doing programming jobs in the environment of GI Systems;
- GI data custodian, i.e. people/ institutions who have to provide data adapted to assigned standards (harmonised) – because of legal or market requirements;
- GI data integrator, i.e. people who have to use heterogeneous geodata to meet the requirements of their daily job;
- End users of geo data, i.e. people who are working with already harmonised geodata or geodata that doesn't need harmonisation or integration at all;
- End users of spatial information, i.e. users at a laypersons level, e.g. people who are using online services (not dealing with the real geodata).

Always having in mind the GIS4EU aims, a user of each previous class can be attribute to one of the following class:

- Public Administration Users, i.e., people who are working in a institutional context, regardless of the organization level (EU, national, regional and local);
- Public Organization End Users, i.e., users involved in specific organizational missions of agencies, authorities, public bodies (like port authorities, public IT consortia, environmental agencies, and so on);
- Private company Users, i.e., employs, managers and consultants who are working in software GI system developing and/or GI service deployment.

This classification was introduced in the "Study of the Socio-Economic Impact of the Spatial Data Infrastructure in the Region of Catalunya"<sup>10</sup>: In this first analysis research sector was not taken into account.

Overlapping these two categorization a match between requirements arising from user tasks or duties and from different organization missions can be achieved.

### Review of user requirement survey activities done by previous projects

The analysis carried out on the previous user requirements/needs surveys<sup>11</sup> has allowed to collect a certain number of information regarding this topic, that is possible to synthetically resume here.

Some information gives a picture of the state of the art regarding particular components of SDIs, like metadata availability. In this regard, the INSPIRE metadata survey provides a first level of data that will allow to monitor change in practice and uptake of the INSPIRE implementing rules

<sup>7</sup> An example of the wide range of the possible application domains, is given in "The SDI Cookbook", 2004, <http://www.gsdi.org/docs2004/Cookbook/cookbookV2.0.pdf>

<sup>8</sup> See, e.g. [http://en.wikipedia.org/wiki/Neogeography#Discussion\\_about\\_the\\_definition](http://en.wikipedia.org/wiki/Neogeography#Discussion_about_the_definition)

<sup>9</sup> HUMBOLDT, 3.3-D2 State of the art in user groups and needs, 2008, <http://www.esdi-humboldt.eu/home>

<sup>10</sup> INSPIRE, Study of the Socio-Economic Impact of the SDI in the Region of Catalunya: Executive Summary, 2008

<sup>11</sup> In particular, INSPIRE and HUMBOLDT have already collected similar surveys.

on metadata over time. For example, a matching between this first survey result and the foreseen eSDI-Net+ interview activity will can give more useful information about this subject, like scenarios will change after two years.

With respect to the GIS4EU aims, the results of the HUMBOLDT user requirement survey has provided very useful indications regarding the main problems and obstacles encountered by a significant sample of users. In brief, as it could be expected, among the technical requirements, standardization and harmonization requirements play the dominant role, following by service requirements. On the side of non-technical requirements the biggest concern is connected to public data policy. Note that some users declared that to avoid losing time and energy before starting to work with public data, they are using data from pan-European private companies, like Teleatlas or Navteq. Another topic highlighted by users is training and know-how transfer. Users would highly appreciate a pragmatic, non-bureaucratic platform for the exchange of encountered problems and best practice experiences.

These aspects are well confirmed when an SDI project is approached using business model: then it is possible to collect a great number of information about user needs, problems and behaviours in respect to opportunities offered by SDI services. In this regard, the results of the socio-economic impact study of the SDI in the Region of Catalunya is a remarkable collection of useful information. For example, while availability of metadata catalogue services is crucial, the activity of inventorying and updating could be a problem for users, above all in using the complex and extensive ISO format to do so.

In the end, while user technical requirements are identified and, in such a way, under control, contributes to improve the cultural changes in SDI planning and management are highly needed, so that the user perspectives are satisfied.

## **USER ROLE IN SDI DEVELOPMENT IMPROVEMENT**

E-gov aims to transform traditional services into on-line ones. In the same manner of most e-gov projects, SDIs are often seen as “sum zero game”: the system development costs are covered by funds (National or EU, Regional, etc.) and the system management costs are balanced by cost cutting to supply traditional products and services.

But whilst the SDIs management costs are very expensive, the reduction of traditional geographical service costs doesn't take place, as a consequence of the small number of on-line users till now (few per cent). Moreover, very frequently (almost always) the GI services are supplied free of charge, while sometimes prices are defined for GI products (e.g. maps).

An alternative future to e-gov definitely doesn't exist any more, but, while waiting for an on-line increase of users, the

cost problems are real and they risk delaying the SDIs' (and INSPIRE's) process development.

Following this vision, even for public SDI projects it would be better to take into account business model approaches and to use the same way every private entrepreneur would use before creating on-line services for his customers.

According to that, planning an SDI project means first of all the analysis of context and of SDI products and services demand: what are the products and services customers are waiting for and they consider the most useful; what is the user fragmentation (by field of interest, by professional activity, etc.); what is the added value (in terms of time and/or outlay costs saved) with respect to access to traditional ones.

Only after having collected this information it will be possible to draw up strict business plans regarding various SDI products and services, going on to define the addressed goals (how many traditional users we want to become digital customers and with respect to which services) and the indicators to be used to monitor the plan performances.

### **A method to improve awareness on User SDI role**

A method to improve user role in SDI development is described. The aim is to supply a complementary methodological tool to add to those that have been developed and they are using for SDI projects. Moreover it seems that the proposed method is useful also in general to pick up users' requirements, supporting a better understanding of their world.

#### *General strategy and implementation criteria*

Taking into account the user points of view, when starting the planning of an SDI project the following criteria must be carefully considered and pursued:

- to incorporate the needs both of the internal and external users of the SDI Organizations involved in the project and to define solution suitable with respect to the needs expressed by those users
- to verify the possibility of continuing to use products, tools, and skills already present within those Organizations and to exploit their contribution for the best project result
- to verify the possible links with similar projects carried out or under development in other actors (private, public, research, ... ) of the SDI area of interest, proposing them collaboration agreements.

With respect to these points, the results of the user requirement survey conducted inside the HUMBOLDT project can be useful. In fact, the answers given by such user expert target in terms of:

- Main obstacles in using geodata from different sources

- Main common problems in using geodata from different sources and ...
- ... the solutions already implemented or expected to overcome these obstacles

can be taken into account as guideline, both as a help for evaluating the feasibility of developing an SDI and as a hint for new deliberation, for those public organizations which have already, partially or totally, developed an SDI.

According to previous developments of automation processes of geo-based information systems able to meet the needs, for example, of a region, even the time needed for an SDI planning and development could be considered to be a number of years to complete the main database and services and to be a longer period to consider its use as steady. Obviously, this time lapse is not suitable to have effects on practical and every day GI uses and it is too slow to benefit private sector.

Anyhow, within such a period both internal (the most common: a change of the political administrators) and external (e.g. a technological evolution) changes may happen that can influence (positively or not) the final result.

Starting from such background and considering that the reference context is not always favourable, it is always a wise policy to design a project development able along the time of using solutions not only reacting to the change but as well anticipating it. This development model is frequently adopted in the entrepreneurial context to help enterprises in changing according with the change of the markets and of the society.

In other words it can be useful to try two parallel and simultaneous strategies: the first one targeting the short-term management, then limited to recognise and to address the past and present problems; the second one targeting future scenarios and hypotheses. That twofold approach can be applied to three different levels: the organisational structure, the external context interacting with it, the widest societal context.

### *Strategy in the short term*

In a pragmatic approach the short term project management strategy can be summarised as the identification of specific actions needed to fulfil the programmes coping with the present situation, that is the assignment of tasks to people involved and a joint definition of the plans for the realisation of those tasks. Within a project that is complex as SDI development is, and when this project is managed by a structure internal to the body and interacting continuously with the organisation, the actual implementation of the programmes becomes then the key element of the short term strategy (focus on project management).

As the Catalan SDI study highlights very well, while the measurement of an SDI costs is easy to achieve, the evalua-

tion of benefits is more difficult. Benefits are subdivided in three categories:

- efficiency benefits (e.g. time or money saved ...)
- effectiveness benefits (e.g. better integration data and IT platforms, ...)
- social-political benefits.

The first and the second category concern mainly the evaluation of so-called tangible benefits: they are essential for the private sector, to evaluate if such an innovation submitted could be approved. They are quantifiable in the private sector because it is used to apply operative control methods. Instead, the evaluation of such benefits is usually a problem for public sector because data of the "status quo" doesn't exist and consequently it is not possible to estimate the changes driven by innovation. Of course, this is due to a reason: usually, the adoption of a innovation is underpinned by the promulgation of new laws or norms, so "it must go independently from the costs". Further, the culture of controlling management is still "young": this justifies the difficult to acquire data that allows this evaluation to be done.

On the contrary, according to his main aim (voter satisfaction) public sector is a bit more able to estimate intangible benefits. They have in fact experience in defining indicators and in recording them and their changes along the time. However, because the concept of an SDI is still rather new inside of public administrations, actions should be identified in order to:

- allow that the process for the creation of a SDI is incorporated into the Authorities
- foster awareness in these organisations, top-down starting from the management, so that the system control formulation takes into account the requirements about SDI in a non-sectoral form.

To overcome the above mentioned obstacles the identification of indicators to measure the impacts of the SDI and their *status quo* evaluation is essential. In this regard, the methodology applied to the study of SDI of Catalonia is an excellent example.

Moreover, to guarantee a careful realisation of the programmes, communication is of fundamental importance. An efficient communication starts with a broad participation of the overall working group, even open to users, in the planning process.

### *Organisational improvement factors*

We are shortly giving below some hints concerning various factors that can favour the start-up of anticipatory strategies which could be taken into consideration and applied to a structure responsible for an SDI project carried out with a pragmatic approach.

### ***Becoming more entrepreneurial***

To have an entrepreneurial vision of a project means to pursue the opportunities of its development even outside the resources available at the moment.

### ***Becoming more participatory***

The experience shows which fundamental role could have to work in team: solutions to specific problems can come from a single individual but the realisation normally requires a wider involvement.

### ***Becoming more users' needs oriented***

As a company that does not understand in time the new requests by the market can face losses of market share, reduction in the competition margin and increasing difference between the prices applied and those competitors, in the same way an SDI project could face a rapid deterioration of the co-operative relationships in case changes in users' trends are not timely assessed, with a consequent lose of interest in the service itself.

### ***Becoming flatter and slimmer***

The staff engaged in SDI development is, for some functions and/or specific periods, a duplication of structures already pre-existing within user organizations. For this reason it should have a hierarchical structure which allows a faster and more adequate decision-making to follow users' needs.

### ***Becoming faster***

The peculiarities of an SDI project (complexity, strong innovation value, but also risks to meet resistance) suggest to proceed as fast as possible, particularly in the initial phases. That means to acquire trust, to demonstrate reliability, to convert hostile behaviours.

### ***Becoming more integrated***

One of the winning cards to ensure the success of an SDI project is to find advanced ways to manage the growing participation requests from the users and to integrate the different bodies. These integration aims have to be pursued for the different levels of interaction:

- The first level is internal to the structure of body
- The second level includes the bodies and the companies with which the SDI organization interacts
- The third level concerns the relationships which is appropriate and useful to establish with other SDI bodies of the same level of one own Country
- Finally, the last level concerns the integration of the own project with the initiatives promoted at a national level and, more in general, with the on-going processes at an international level.

### **Structured interviews and result description**

As pointed out in the previous section, GI users are very spread on a wide range of technical domains: the rich information got by analysis of previous user requirement surveys has made us aware that an effective way to reach user requirements is through the consolidated knowledge that SDI organizations have already got from of their users and consequently of the needs that they bring. Unfortunately, studies like the one conducted in Catalunya are not still at the disposal of more SDIs; one of the reasons is a lack of market or business approach in SDI planning and management, as underlined in the previous section.

Our contribution was therefore oriented to formulate a checklist following the method described in the previous subsection. This tool was submitted to various SDI managers and people in charge of SDI organizations to obtain, through its use and the resulting answers, confirmation about user requirements collected from previous surveys, as well as other information about this matter and, in general, comments and suggestions derived from the knowledge of perspectives of their users.

Referring to the aim to bring into focus the change in the GI user perspectives owing to the change from traditional mapping to mass-market GI, the people interviewed confirmed that, among user technical requirements, standardization and harmonization play a very dominant role, followed by service requirements.

In particular, the questions concerning GIS4EU spatial data themes gave the opportunity to highlight two relevant subjects for the development of SDIs. The first concerns the "Administrative Units" theme: it is a common suggestion that the value of this information is closely linked to the possibility to access easily to the statistical information. Various SDI operators affirmed that users would like to access population distributions and other geo-statistics data for many applications (urban planning, environmental planning, transportation, geomarketing and so on). The second subject regarding "Transportation Network": operators in this field are committed to the improvement of vehicles and goods traceability. To do that, they need up-to-date information regarding transportation networks.

With respect to the answers collected by the checklist sections referred to the "Strategy in the short term" and "Organisational improvement factor" the following comments can be reported. SDIs are still too planned and managed putting user needs not at the beginning of the process. The knowledge of user awareness with respect to the evolution from traditional GIS and SDI approach as well as only its involvement –at different levels- can guarantee good results, both in terms of efficiency and effectiveness. To reach this goal, improvements in the area of project management as well as the start-up of anticipatory strategies to target future scenarios and hypotheses are very useful. What we feel we must suggest is to use the checklist proposed also as

a tool inside GIS4EU project, in order to have a hint with respect to the monitoring of GIS4EU feeling on user perspectives, considering that GIS4EU can be seen as a “brick” of an SDI.

The interviews allowed us to emphasize even some needs regarding non-technical aspects: as they were pointed out by the people interviewed. These issues risk delaying SDIs’ process development (and INSPIRE’s too).

Among them all, it is useful here to recall the following:

- A better knowledge and information transfer between data providers and data users
- Less strict access rules to spatial data
- Need for training and GI cultural improvement (“process of diffusion and awareness raising within Local Authority still has some way to go”, Catalan SDI Study)
- Metadata management improvement and updating of data more frequently
- Too many (and not clear) data access policies.

This study has pointed out some limits that will have to be taken into account for future GIS4EU activities and that will have to be gone into more thoroughly.

They concern non-technical requirements and can be synthesized by these statements:

- An awareness gap still exists between user SDI and the people involved in the SDI development
- Absolutely, GI Public Sector is lagging with respect to Private one.

Even if considering the GIS4EU objectives it would seem sufficient to fix one’s attention on technical user requirements, partners of the consortium would take into account these aspects to avoid having difficulty with respect to the expected outcomes following the dissemination and awareness activities as well as those related to “Impact and follow-up” activities..

Data-provider partner, for example, during the progress of the “Specification of data models and harmonization processes”, faced by research and technological partners, have the opportunity to analyse their metadata supply chain and, while contributing to the success of this task, they can even improve the quality of their meta datasets for the GIS4EU selected themes and –in general- the quality of the tools and services connected to the description of their data (i.e. glossaries, dictionaries, catalogues, and so on). Obviously, such a behaviour can be followed with respect to other components of their owner SDI (e.g. services) as well as over the development of the other project tasks.

The check list proposed would have to help them to “keep in touch” with their users and control their requirement evolution.

## CONCLUSIONS

Let us consider the time lapse 2004-2007: while analysis of Public Sector Information (PSI) value was being conducted and the results emphasized the GI role; while the debate around the SD dissemination policies was (and still is) running GI, the private sector... enters into orbit. Not only was the Google Maps phenomenon arising and SDI users have learnt to apply these tools for their needs. But in the World Wide Web there is continually a lot of news regarding new GI companies, GI company acquisitions or amalgamations as well as information about new GI applications and services offered by the private sector.

Therefore, it is important to underline that a risk exists: perhaps, while Public Sector (and GIS4EU is a component of it) is looking for the best standards, interoperability, harmonization etc., the GI’s world goes far without waiting: so problems have to be solved right now.

With respect to this vision, non-technical user requirements become at least as important as the technical ones and, as the market rules are teaching, both of them together are the engine of the GI development. Users would highly appreciate a pragmatic, non-bureaucratic platform for the exchange of encountered problems and best practice experiences.

Into this context what we suggest inside GIS4EU partnership is to keep relationships with other projects which are running at the same time, specifically with the working groups inside them, who are involved in user requirement monitoring activities.

As it is about establishing "a European Network on Geographic Information Enrichment and Reuse" the results of GIS4EU, as an example reported in terms of GI user satisfaction improvement, will be for sure an enrichment for that network. Just as the outcomes of eSDI-Net+ activities to assess SDI initiatives will be able to give many suggestions to GIS4EU partners.

The interoperability is a basic distinctiveness to allow communication and co-operation between systems, exchanging and using data through standard protocols and format. The attention for this subject, in all its different aspects (at the communication level, of data, of services, of semantics) cannot leave a cultural guidance that supports –paraphrasing the definition- the “interoperability of the organizations” in other words their capability in communication and co-operation, thanks to shared processes and methods, to satisfy the citizen and the enterprises requirements. Single organizations and individuals are urged to share such ideas, to totally become organizations and individuals of the 21st Century. Geographical Information, thanks to the extent of “space” (technological, disciplinary and application-oriented, organizational) in which we operate, represents an ideal arena in which to play and value our attitudes and ability to accept the challenge of our age.