

**Strategies for SDI implementation:
A survey of national experiences**

Uta Wehn de Montalvo

SPRU - Science & Technology Policy Research
University of Sussex
Brighton, Falmer
BN1 9RF East Sussex, UK
u.w.c.wehn@sussex.ac.uk

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Uta Wehn de Montalvo BSc (Hons) Computer Science, University of Portsmouth, UK; MSc Science Policy, University of Sussex, UK; PhD Science & Technology Policy Studies, University of Sussex. Programmer in IBM UK Ltd. 1991-1995, Research Officer in SPRU (1996/97); co-editor of *Knowledge Societies - Information Technology for Sustainable Development* (OUP) for the UN Commission for Science and Technology for Development; chapter editor of Chapter 8 'Outreach and Capacity Building' in the *SDI Cookbook* by the GSDI Technical Working Group.

Abstract

Initiatives to implement Spatial Data Infrastructures (SDI) are emerging at the national and regional level in industrialised as well as developing countries. The 'lessons learned' from the experiences with SDI development in several countries have been compiled in the SDI Cookbook of the GSDI Technical Working Group. This paper presents an update and an extension of that compilation. It is based on a survey of national SDI directorates around the world and reports the strategies and approaches they have found useful as well as the obstacles and barriers they have encountered in the implementation of their national SDI. The paper concludes on the way in which the guidelines recommended in the SDI Cookbook may need to be adapted.

1. Introduction

Initiatives that aim to implement Spatial Data Infrastructures (SDI) are emerging at the national and regional level in industrialised as well as developing countries. Adopting a top-down approach, this paper focuses on the obstacles and barriers encountered by SDI directorates in several national contexts. It also presents the strategies and approaches that they found useful in dealing with these problems. This comparison of experiences with implementing a SDI is intended to benefit all those engaged in fostering a SDI.

This paper is organised as follows. First, the context for this research is given, followed by a description of the method employed. Next, the findings of a recent survey of national SDIs are presented. Finally, the extent to which the recommendations of the SDI Cookbook need to be updated in the light of these findings is considered and conclusions are drawn.

2. Context

"Only through common conventions and technical agreements will it be easily possible for local communities, nations and regional decision-makers to discover, acquire, exploit and share geographic information vital to the decision process." (Nebert 2000, p.6)

As part of the activities of the Technical Working Group of the Global Spatial Data Infrastructure (GSDI), the SDI Implementation Guide, also called Cookbook, has been prepared. The Cookbook provides the necessary background information to implement the components of SDI. Chapter 8 of the Cookbook considers the outreach and capacity building activities that accompany the more technical elements of building a SDI (Wehn de Montalvo 2000). The following aspects have been identified:

- clarifying the scope and status of the SDI
- building a consensus process
- exchanging best practices
- consider the role of management
- funding and donor involvement
- partnerships
- implementation of technical components

The purpose of this paper is to build on these findings. It presents the results of a survey that was designed to gather information about the experience of different national initiatives with implementing their SDI.

3. Method

The empirical research for this paper was carried out using the following methods. The aspects identified above were operationalised by developing items to be included in a questionnaire. The questionnaire instrument was used to carry out the survey via email over a four week period during March/April 2001, targeting national SDI directorates world-wide.¹ Once contact had been established, an appropriate respondent for the questionnaire was identified to report on the country's experience with respect to SDI implementation. Responses from the following 12 countries could be included in the analysis: Argentina, Australia, Bermuda, Colombia, Finland, Germany, Hungary, Nepal, Poland, Portugal, Sweden, United Kingdom. The survey data was analysed using

¹ The survey was administered in English.

qualitative methods to investigate the problems that were faced as well as the strategies that seem to be helpful in each country for the implementation of its SDI.

4. Survey results

The following presents the results of the survey according to the seven aspects identified in Section 2. Each item is discussed in turn, analysing the problems that were encountered in the different countries followed by a list of approaches that were found useful by selected countries.

4.1 Clarifying the scope and the status of the SDI

The responses emphasised the importance of clarifying the existence or absence of a SDI within a given country. Several respondents reported difficulties in obtaining complete information about all existing SDI initiatives within their country.

Status²

According to a number of respondents, the absence of a formal mandate presents a considerable obstacle for SDI development within their national context and they strongly believed that a formal mandate is required. Those whose SDI was built on a formal mandate considered it a major element that enabled SDI implementation.

Scope³

With respect to defining the scope of their SDI, the reports suggest very similar experiences. A fundamental problem seems to be to ensure that all actors have a similar understanding of what SDI is. While in some countries this seems to be due to a lack of knowledge of SDI in general, in others it appears to be a language problem since the same words are associated with a different meaning by different people. This is an ongoing problem because different people become involved in the debate over time. In some instances, the meaning of SDI and what it can deliver was seen to be a source of continuous debate that made it difficult to develop a scope that was seen to be of value to the participants. In others, there were concerns that SDI is easily defined too narrow. It seems problematic to create an understanding of the need for a SDI that is not limited to only one discipline or sector. Additional problems with defining the scope of the SDI stem from the more general data administration policy arena when there are competing outlooks, for example, on how to develop the eNation or eGovernment.

Table 1 presents approaches for defining the status and the scope of a SDI based on the experiences from a number of countries included in the survey.

² SDI can be categorised as resulting from a formal mandate or emerging from existing co-ordination activities (Masser 1999).

³ SDI may be inclusive of all interest groups or focusing on a subset of stakeholders (Masser 1999).

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Table 1: Strategies for defining the status and the scope of a SDI

Country	Approach
Argentina	<ul style="list-style-type: none"> ▪ SDI principles were incorporated in organisations due to the vision of those who understood the advantages of collaboration in the information age, and through the experiences and knowledge coming from other countries. GSDI conferences and complementary initiatives have been an important contribution over the last few years. ▪ The most important action was to establish a common understanding and belief through effective co-operation (national and international). ▪ Also carrying out co-operative multi-organisational projects which pooled highly differing experiences. ▪ Inter-organisational efforts to define future legal framework.
Australia	<ol style="list-style-type: none"> 1. Circulated a discussion paper which set out vision for ASDI (http://www.anzlic.org.au/asdi/anzdiscu.htm) 2. Comments were sought 3. The vision was consequently refined
Colombia	<ul style="list-style-type: none"> ▪ Consider the definition of scope and status of ICDE (the Colombian SDI) a process that can allow stakeholders to clearly establish their role and responsibilities for building ICDE. ▪ It can be used to define different levels of participation and achieve compromises according to variable capacity. ▪ Follow the National Development Plan guidelines and evaluate the information needs of different related national, regional and global programs and projects. ▪ Research on SDI implementation experiences world-wide, including integration strategies for building regional and global initiatives. ▪ Report on ICDE advances frequently and evaluate how ICDE status and scope must adapt to the changing social and economic conditions of the country.
Finland	<ul style="list-style-type: none"> ▪ High level working groups for defining national and sectoral GI strategies (strong political support). ▪ Comparing the national situation to the international trends and other countries. ▪ Demonstration of the potential benefits of well functioning SDI with case studies and pilot projects.
Germany	<ul style="list-style-type: none"> ▪ Meetings - of GI data owner, vendor and user as well as academia, economy and government - are necessary to get a common understanding and definition of common goals.
Hungary	<ul style="list-style-type: none"> ▪ Clear share of responsibilities between the two NMAs that have an interest in SDI was established by the law on surveying and mapping activities in 1996.
Portugal	<ul style="list-style-type: none"> ▪ The SDI co-ordinating body was created, out of the GI production realm, as a public agency. The mandate did <i>not</i> include the production of geographic data in order to ensure the availability of resources for SDI implementation and to ensure that the other stakeholders would accept its role and join the process.
UK	<ul style="list-style-type: none"> ▪ Employing an independent consultant that could get the respect of all players. ▪ Consultant took soundings, drafted a scope that appeared to capture the various opinions and presented it for their agreement and adoption. This did achieve a closer vision for all participants.

4.2 Building a consensus process for implementing SDI

Getting concerned stakeholders on board

Dealing with a small number of stakeholders from similar types of organisations can be an advantage for building consensus. For example, the report from Australia indicates that a good spirit of co-operation exists between the stakeholders, in this case the nine jurisdictions.

However, according to several responses, the main problem with getting stakeholders on board appears to stem from a lack of understanding of SDI and its potential benefits. Often the stakeholders are therefore not motivated to participate actively in the development. They were perceived to expect other organisations to take the lead while they wait for preliminary results to comment on. It was also considered difficult to identify the right stakeholders who will also play an active role and develop the issue. In some cases, lack of enthusiasm and lack of encouragement from central government was perceived to be hindering SDI development.

One report suggests that during the years before a public agency was officially instated to co-ordinate the SDI, most of the stakeholders had avoided making any significant steps in getting involved in the preparatory work. In this particular example, it had been taken for granted that if there was no agency in charge of it, SDI would never become a reality.

Building on common interests of the various stakeholders

According to the majority of the reports, building on common interests of the involved stakeholders often proved to be difficult because of competition - between government departments, among companies and other organisations. Different interests of the different sectors and organisations were mentioned and even different personalities proved to be barriers to consensus building among the stakeholders. Some reports suggest that controversy over irrelevant issues have caused delays in SDI implementation.

Creating a common vision on spatial data collaboration and co-operation

Some accounts indicate that many changes in the spatial data domain have occurred recently at different rates for each organisation often with different approaches and without vision of SDI. While the respondents generally considered a common vision essential to SDI implementation, they also stressed that merely signing an initial agreement is not sufficient. In one particular experience, the vision was presented in a launch paper but, from the beginning, it was not embraced by the group of stakeholders. According to the respondent, the group failed to own the uncertainty and to get rid of it quickly. There was no clear vision of the outcomes and tension existed between the long term strategy and short term deliverables.

Based on the experiences from a number of countries included in the survey, Table 2 presents different approaches to consensus building.

Table 2: Strategies for consensus building

Country	Approach
Argentina	<ul style="list-style-type: none"> ▪ Extending the human network through existing organisations (public, academic, private and NGO). ▪ Establishing a continuous communication and participation process with available organisations, communications tools and resources, in order to improve the common understanding of GSDI concepts, benefits and implementation processes with as many people as possible. This has to

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	<p>be done in a culture of increasing participation. A communication process involving persons working in organisations related to geoinformation has to be established.</p> <ul style="list-style-type: none"> ▪ Use of e-mail for continuous communication in order to distribute general GSDI information, and to identify stakeholders in different locations for more specific GSDI actions and initiatives. ▪ Communicate real experiences and results in order to broaden the interest in GSDI. ▪ Establishing organisational processes for allowing planned development. ▪ Working with the SDI groups, such as PC IDEA and their work groups. ▪ Working in partnerships in order to multiply strengths (PC IDEA) ▪ Contributing to existing forum with common interest (PC IDEA), National Forum for Cadastre (CFC), for disseminating general knowledge and common understanding, and also to define common initiatives to co-operatively search for economic resources.
Australia	<ul style="list-style-type: none"> ▪ The fundamental issue which was essential for building a consensus process was to agree upon a common vision for ASDI. ▪ That is, to reach agreement on what it was we were aiming for, how we were going to build it and what the benefits were. ▪ It was important to emphasise that agencies would retain control of their data, that it was not a proposal to centralise data.
Colombia	<ul style="list-style-type: none"> ▪ Establish the National Development Plan and Policies as the framework for ICDE in order for organisations to pursue the same general goal. ▪ Evaluate organisations' interests, and define priorities for the ICDE implementation process. ▪ Assess user needs related to products and services and promote co-operation agreements for joint geographic information management. ▪ Carry out strategies for linking private sector, academia and researching community to SDI implementation.
Finland	<ul style="list-style-type: none"> ▪ High level co-operation between ministry departments, national institutions and private companies (strong high level support and co-ordination). ▪ Active publicity and open discussions in seminars, newspapers and organisations. ▪ National GI association as counterpart.
Germany	<ul style="list-style-type: none"> ▪ Creation of an interdisciplinary and non-profit umbrella organization covers all GI-relevant arms and disciplines. ▪ Lobbying especially on political level. ▪ Definition of common interests of all GI related organisations and disciplines.
Hungary	<ul style="list-style-type: none"> ▪ The common interest was found in the core data sets, standardisation and facilitating access to data, products and services. ▪ A common vision was transformed into practice in the case of the implementation of the national cadastral programme whereby the local governments are included as key stakeholders. ▪ Raising interest of the parliamentary committee members: parliament is to debate spatial data issue in April 2001.
Poland	<ul style="list-style-type: none"> ▪ Creating a common vision on spatial data collaboration and co-operation taking into account the specific national experiences. For example, the Polish SDI is very different from western countries and also from other Central and Easter European Countries.
Portugal	<ul style="list-style-type: none"> ▪ Get the involvement of the leading agencies in the field of creating digital spatial databases while getting the other stakeholders to join the process at a very early stage based on the visibility that the first ones got.

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Sweden	<ul style="list-style-type: none"> ▪ Many years ago, a strong forum for co-operation and co-ordination was established - Utvecklingsradet for landskapsinformation, ULI (the Council for Research and Development within Land information). Today ULI has some 150 members (private enterprises, state authorities, municipalities, universities etc). ▪ ULI has taken initiatives concerning standardisation, establishment of metadata services, R&D, education, and produces reports, arranges seminars and meetings in order to develop the GI infrastructure. ▪ Within the state administration, Lantmateriet (National Land Survey of Sweden) has got the responsibility to co-ordinate the work with geographic information. Lantmateriet does this by taking an active part in ULI, the standardisation work (holds, for example, the chairmanship of the board for the Swedish standardisation project concerning GI and is the main financial contributor), but also by working with database specifications in close co-operation with other data providers and users of GI.
UK	<ul style="list-style-type: none"> ▪ Agreement on a short term deliverable (e.g. metadata service) and identify how that could fit into the big picture. ▪ Then cajole and build on the personal commitments of the decision makers to get something to happen.

4.2 Outreach and awareness creation: Exchanging best practices of SDI components locally, regionally and globally

Activities for creating awareness about SDI were considered vital to success (for a selection, see Table 3). No activity was identified as being most important; rather, a combination of several different activities was seen to be most useful and effective. However, it was also suggested that the success of outreach activities is dependent on the quality of the people involved and on the political and institutional support they have to carry on with the activities they are supposed to do.

Table 3: Selection of awareness creation activities

Presentations to promote SDI principles
Gaining support for SDI from high-profile individuals
Networks to exchange experience with SDI implementation
Pilot projects
Workshops and training courses
Information sharing (newsletters, web pages, publications, course materials)
SDI-sponsored activities
Working groups and subcommittees

In some cases, problems were encountered with gaining credibility for the vision of SDI and its benefits. It seemed that real action and results are needed. In Finland, awareness creation efforts were met with doubts about slow international standardisation processes and results. In Colombia, it was realised that initially activities were too focused on diffusing information about the technical issues of SDI implementation while they did not transmit tangible benefits for all sectors. Experience from the UK suggests that the outreach activities were not effective because of a mismatch between the business case for the SDI infrastructure and the actual application requirement of major government departments for whom a good infrastructure already exists.

Targeting the appropriate people and convincing them of the relevance of SDI was also considered problematic. According to several country reports, SDI is not an attractive

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topic in the political scene and does not receive enough attention from decision makers and society at large. It was considered difficult to have open discussions across disciplines and sectors. Similarly, others stated that while awareness creation within the spatial information community is quite successful, it is difficult to engage other sectors.

A more pragmatic concern was that much SDI documentation is produced in English which means that research and documenting processes take additional time for non-English speakers. Moreover, most of the material on SDI was seen to refer to initiatives in industrialised countries so that adaptations to the specific conditions of in developing countries are necessary.

The experience of several countries regarding useful outreach and awareness creation activities are listed in Table 4.

Table 4: Strategies for outreach and awareness creation

Country	Approach
Argentina	<ul style="list-style-type: none"> ▪ Consolidation of the human network through combined activities. ▪ Implementation of a database for communications via e-mail between government, academia, public and private sector organisations related to geospatial information (in execution) in order to disseminate information about SDI. ▪ Participation in international initiatives related to GSDI ▪ Participation in national and international events related to GSDI; ▪ Dissemination of information about GSDI co-operatively with the Federal Council Cadastre, the Communications Group of PC IDEA and the Military Geographical Institute.
Australia	<ul style="list-style-type: none"> ▪ Having to continually present the same message over and over again, one may forget that while one has given this presentation dozens of times, the audience to which one is speaking now has not heard it before. ▪ Just keep repeating the message over and over again in as many forums as possible.
Colombia	<ul style="list-style-type: none"> ▪ Presentations focused on obtaining support from decision-makers, showing social and economic benefits of SDI and how it can specifically help a developing country like Colombia. It could create valuable opportunities for formulating sponsorship proposals to national and international organisations. ▪ Promote active participation of specialised professionals on working groups and subcommittees, who will be in charge of implementing SDI projects within organisations. ▪ Make the people directly involved in geographic information production aware of the importance of their participation in building the infrastructure. ▪ Document the implementation process and share experiences through SDI networks and publications (printed and on-line).
Finland	<ul style="list-style-type: none"> ▪ Pilot projects that are clearly and strongly supported by national bodies
Hungary	<ul style="list-style-type: none"> ▪ The GSDI 6 venue was won by HNAGI and will be an excellent opportunity to bring much attention to the SDI subject.
Sweden	<ul style="list-style-type: none"> ▪ In most counties (Sweden is divided into 21 counties), there are regional organisations which can be considered to be sons and daughters of ULI. ▪ Lantmateriet (National Land Survey of Sweden) also have one person working at the county level on the co-ordination of GI. An important part of the work is to be the link between the national SDI activities and the daily work on the regional level.

4.4 The role of management in implementing SDI

Difficulties were reported with reaching the top management level in organisations that use spatial information to a large extent because of their focus on their own business. This problem also extends to the public sector. In several countries, the recent focus of the public sector on its core business made it necessary to identify real, tangible benefits of the involvement in infrastructure initiatives. In terms of providing leadership, task and responsibility acceptance was also reported to present a problem because it depends on sectoral budget limitations and sectoral priorities of the participating stakeholders. According to the perception of some respondents, GI stakeholders seem to support SDI implementation only as long as there are no dramatic funding or other economic implications for them.

Reports that SDI components are developed separately within organisations and that standards implementation suffers from a lack of experts available for the tasks needed stress the importance of gaining management support for the implementation of SDI. Several approaches from different countries are listed in Table 5.

Table 5: Strategies for gaining management support for SDI

Country	Approach
Argentina	<ul style="list-style-type: none"> ▪ Widen common understanding about the benefits of working with a SDI vision.
Australia	<ul style="list-style-type: none"> ▪ Develop document with business case or series of case studies to demonstrate benefits of agency involvement in ASDI to gain management support.
Bermuda	<ul style="list-style-type: none"> ▪ Workshop and questionnaire.
Colombia	<ul style="list-style-type: none"> ▪ Obtain support from high-level government to formulate information management policies. ▪ Diffuse the global strategy about "information for all", using Information Technology. ▪ Promote generalised use of international standards in order to fulfil interoperability of framework datasets. ▪ Direct information management activities to generate products and services by demand and create value added information. ▪ Document and disseminate the benefits of linking the country to the global economy.
Finland	<ul style="list-style-type: none"> ▪ Well-grounded visions and strategies with reasonably funded development programs where the role of each player is clearly defined. ▪ Describing the real benefits of the SDI and steps taken in other countries. ▪ Reasonable approach, less hype/promisware.
Hungary	<ul style="list-style-type: none"> ▪ Reach sectoral acceptance for one or more key actions of SDI implementation.
Portugal	<ul style="list-style-type: none"> ▪ The possibility to offer them something that they could not refuse (communications servers, data servers, Internet service, data conversion to digital formats, help in organising geographic data bases, etc.)
Sweden	<ul style="list-style-type: none"> ▪ Talked not so much about geographic information, but instead about IT and information management in general. ▪ Produced articles for business magazines, give presentations at Business Schools.
UK	<p>Infrastructures that are:</p> <ul style="list-style-type: none"> ▪ simple to achieve, ▪ perceived as being useful in their own right, ▪ solve cross-government requirements, ▪ secure government finance.

4.5 Funding for SDI implementation

The responses confirm that funding SDI presents a particular challenge for the developing countries. One developing country reported that there is no funding at all available yet for SDI so that its development is reliant on voluntary work. In others, funding has also not yet been secured. In Argentina, SDI implementation is reliant on the collaborative efforts of individuals in obtaining funds from their organisations or sponsors. In Colombia, funds are provided by some institutional contributions that effectively depend on the national government and therefore are restricted by the limited public sector budget.

The reports from the industrialised countries are not altogether positive. While some of the industrialised countries experienced no problems as their governments had accepted to fund their SDI initiative, funding did present an obstacle to others. For example, the SDI initiative in the UK found that subscriptions from participating organisations proved to be an unsustainable way of funding. Fortunately, it was possible to move to a central funding mechanism. The German initiative is still lobbying for funding from government at state and federal level. A third initiative is trying to change the current funding situation but has no obvious source of funding to target. Finally, for another initiative, the decentralised budget is uncertain and unbalanced in some cases and it is difficult to find stable financial support.

The underlying problems with attaining adequate funding resonate with those presented in the previous sections. In particular, a lack of understanding of SDI and difficulty to justify its value, not enough awareness within the private sector and difficulty with defining a common and closed concept for the whole GI sector. Moreover, the process of finding donor organisations itself is often problematic because it is time and cost consuming.

Different approaches to funding SDI implementation based on the experience of several countries are detailed in Table 6.

Table 6: Strategies for funding SDI implementation

Country	Approach
Argentina	<ul style="list-style-type: none"> ▪ Collaborative efforts of individuals in obtaining funds from their organisations or from sponsors.
Australia	<ul style="list-style-type: none"> ▪ Endeavouring to learn from other countries (e.g. Canada) with regard to funding SDI at the national level.
Colombia	<ul style="list-style-type: none"> ▪ Evaluate and define mechanisms to equitably share the costs among the ICDE beneficiaries. ▪ Promote the creation of a ICDE funding association including public and private sectors and multilateral organisations. ▪ Justify the ICDE benefits versus implementation costs to the national government in order to include ICDE in the National Development Plan. ▪ Proposals to multilateral organisations for getting non-refundable resources.
Finland	<ul style="list-style-type: none"> ▪ High-level inter-ministerial working group (GI council) with reasonable funding possibilities to develop the public SDI elements (strong support and co-ordination, budgeted funds). ▪ Good public-private partnership in developing commercial parts of the SDI (e.g. data clearing houses, on-line services etc.)
Germany	Lobbying on political level to reach <ol style="list-style-type: none"> 1. leadership and also funding from government on state and federal level 2. co-operation with industry
Portugal	<ul style="list-style-type: none"> ▪ Convince the government that without the funding mechanism, there will

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	be no SDI, or its implementation would take long and it would bring inefficiencies.
Sweden	The standardisation work is divided into two parts: <ol style="list-style-type: none"> 1. Framework financed by 20 different organisations, mainly state authorities, but also some private enterprises. ULI is co-ordinating this work and sets up the agreements with the contributing organisations. 2. Applied standards (e.g. standards on road networks, utility networks, addresses etc.) For each of these standardisation activities, a group of interested bodies are set up and it is up to the participating organisations to finance the specific activities. They must also pay a contribution to the work with the framework.
UK	<ul style="list-style-type: none"> ▪ Explaining the issues as barriers, illustrating how the infrastructure could remove barriers. ▪ Most importantly having an enthusiast in the right part of government.

4.6 Partnerships for SDI development

Partnerships were considered essential for SDI development because they allow organisations to work together on achieving SDI goals and to share implementation, responsibilities and benefits. Several reports, among them Portugal, Sweden and Argentina, were entirely positive in this regard, stating the ease and success of establishing partnerships for implementing their SDI. For example, according to the Argentinean experience, partnerships for SDI implementation generally succeeded as soon as they were proposed. Agreements were made between different levels of public sector, private sector and academia

However, the experience of several other countries included in the survey shows that a number of problems were encountered with establishing partnerships for SDI implementation. In Finland, problems with establishing partnerships were conceived at every level: public; local versus national; and public versus private. The main reasons were seen to be scepticism and doubts about 'massive' programs and a fear of losing local foothold in the business. In Colombia, initially there seemed to be a lack of awareness of the benefits of partnerships for all involved parties. A process of change was necessary for organisations to learn to work together. Some organisations seemed to believe that partnerships would have only long term benefits and that the partnerships activities would imply much effort. Another obstacle for some actors was how the acquired commitments may affect the interests of their institutions. More generally, the partnerships suffered from a lack of participation from the research and education communities and from the private sector. In Australia, for public-private partnership, the absence of a single body representing the range of all spatial data businesses was considered problematic. The focus of existing associations was considered too narrow, representing only individuals. Other experiences suggest that partnerships suffered from a lack of focus and that there were difficulties with gaining a common vision, funding, and buy-in from the participants.

Selected experiences with establishing partnerships for SDI are presented in Table 7.

Table 7: Strategies for establishing partnerships for SDI implementation

Country	Approach
Argentina	<ul style="list-style-type: none"> ▪ Identification of common needs to be satisfied. Proposal of working together where the involved sectors could benefit. ▪ Starting with unambitious activities in order to achieve some results in a short time. ▪ Proposing an easier way of organising the work because time is actually a continuous constraint for everyone.

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Australia	<ul style="list-style-type: none"> ▪ ASIBA (Australian Spatial Information Business Association) will provide a body with which government can engage to address industry development issues. ▪ The main factor in the development of ASIBA has been the economic environment but also the technological environment has played its part because the business of spatial information is now accessible through the wide availability of GIS software and systems to many sectors and the industry had to unite to address those issues.
Colombia	<ul style="list-style-type: none"> ▪ Promote the integration of all sectors in SDI implementation. ▪ Define clearly the role, responsibilities and benefits of organisations in the partnership. ▪ Link sectors through the definition of common interests and commitments. ▪ Carry out strategies for removing barriers to standardisation and sharing of information and technology. ▪ Make the geographic information community aware of the importance of working jointly for the development of the country.
Finland	<ul style="list-style-type: none"> ▪ Clear definition of the roles of the each player. ▪ Open policy of the public organisations. ▪ Clear description of the role of GI technology/SDI as one effective technical tool in helping various disciplines.
Portugal	<ul style="list-style-type: none"> ▪ Establish the terms of the agreement between the parts. ▪ Try to keep strong ties with staff of each stakeholder. ▪ Create opportunities for training courses. ▪ Regular meetings to discuss common problems. ▪ Publishing a magazine to discuss implementation issues.
Sweden	<p>According to the Swedish experience, the road to success in co-operation between different agencies must be based on:</p> <ol style="list-style-type: none"> 1. A shared view on the questions of common interest. The needs, aims and directions must be defined as clearly as possible as well as timetables, financing, etc. 2. The co-operation must be supported by the top management in the co-operating organisations. In some cases support must also be given from the Ministries under which the agencies are working; 3. It is essential to establish a firm organisation for the co-operation (with clearly defined responsibilities for the persons involved); 4. The results from the co-operation must be followed up.
UK	<ul style="list-style-type: none"> ▪ Giving participants a warm feeling - a feeling of being needed. ▪ Although very difficult, ensure that participants believe that they get some business benefit by being involved.

4.7 Implementing the technical components of a SDI

The usefulness of accompanying the implementation of the technical components of a SDI with activities such as user involvement was stressed by most respondents. These kinds of activities were considered to help involve potential stakeholders, facilitate the technical work, to expand SDI coverage and contribute to its sustainability in the future. More fundamentally even, it was argued that the implementation of technical components and outreach activities are inextricably linked because community support is essential for the implementation of clearinghouses and standards - yet clearinghouses and standards are also required to enable the community to participate in the development of SDI.

One report suggested that owing to the cutting edge nature of the technical work, they had difficulties to find end users with the right approach to these new opportunities. Another questioned whether current standards are ready enough to be promoted as part of SDI and also reported problems to convince stakeholders to create open and standard-based systems for future common needs.

Different approaches to activities accompanying the implementation of the technical components of a SDI are shown in Table 8.

Table 8: Strategies for fostering the implementation of the technical components

Country	Approach
Colombia	<ol style="list-style-type: none"> 1. Implement an on-line directory of ICDE documentation 2. Update and maintain the ICDE website 3. Create a permanent discussion list on ICDE 4. Produce and disseminate ICDE documentation to developing countries. 5. Propose an academic program on SDI in Colombia 6. Contact key people in order to gain support and participation for ICDE implementation.
Finland	<ul style="list-style-type: none"> ▪ Follow-up and seminars of international GI standardisation. ▪ Participation in the research and pilot projects (MADAME, LaCLEF etc.) ▪ High level speakers in national seminars and symposiums ▪ Clear lobbying strategy and activities
Poland	<ul style="list-style-type: none"> ▪ Long traditions cannot be changed too fast, otherwise the damage can be greater than the benefits. ▪ The best way of implementing SDI components is moderation and common sense.
Sweden	<ul style="list-style-type: none"> ▪ A rather big group of experts have been able to take an active part in the development of international standards or, at least, to closely follow the work. ▪ The temporary Swedish framework - based on CEN ENV - has also been used for the development of some applied standards and the experiences have been brought back to the ISO work. ▪ People from this group have been active in different kinds of seminars, pilot projects etc, which means that a lot of other people have got a higher awareness.
UK	<ul style="list-style-type: none"> ▪ Producing demonstrators and visualisation material did help to enthuse some potential end users. But our 'pragmatic' demonstrator still did not describe the level of service expected by the end user. ▪ There needs to be fast and substantial progress in e-business, open systems and heavy investment in getting data in standard forms to be able to deliver what the user really wants - i.e. a map of their chosen area with a set of layers available immediately for them to be able to manipulate and some simple, intuitive software to be able to answer simple queries - in fact all the sorts of facilities in location based services but available from all parts of government.

5. Reconsideration of SDI Cookbook recommendations

A successful strategy for implementing the various components of SDI involves dynamic consideration of the appropriate options. Not only technical skills and capabilities are required but also many social skills and activities. The results of this survey highlight again that the particular challenges vary for each country and that it is necessary to tailor their approach to SDI accordingly. Some face the challenge of making the most effective use of extremely limited resources to achieve their objectives.

The recommendations presented in the SDI Cookbook with respect to the options for outreach and capacity building for implementing a SDI consist of a number of guidelines. In terms of content and relevance, these guidelines have been confirmed by the responses from different countries presented in this paper. In addition, the

collection of approaches considered here can be regarded as an extension to those guidelines. By drawing on the experience of other countries, it is possible to tailor the SDI implementation strategy to the specific socio-economic, technological and political context of each country. Since the implementation of a SDI is not a once-off effort but a process that sometimes proceeds in unanticipated ways, it may also be useful, at regular intervals, to assess and reconsider different outreach options and awareness creation activities to foster its development.

6. Conclusions

A fundamental problem that emanates from this survey is to convince the stakeholders and to justify the value of a SDI. Many countries have already made outstanding efforts at outlining the benefits. Yet emphasising the benefits seems to have been often insufficient. While the study into the business case for SDI (CIE 2000) can provide useful information that can be fed into outreach activities, it cannot be expected to supply the required information to address this problem. A combination of different obstacles prevails in each national context. Moreover, it is highly likely that the benefits perceived by the promoters of SDI are not matching the perception of the audience that they are addressing. More detailed studies at the country level can provide insights into what drives the different stakeholders and how their needs can be addressed by SDI. As the benefits may vary for different stakeholders and sectors, the scope of this kind of research would need to encompass the whole community of potential stakeholders, not just the 'fans' of SDI.

7. References

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