

SDI Dynamics

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Introduction

In the mid of the nineties the first generation SDI's are defined and implemented. At the end of the nineties overviews have been made in what extend SDI's are developed world wide. The results of these studies are presented at the latest GSDI conferences. SDI's are set up world wide now and are becoming widespread instruments in the GI society. The success of SDI's does depend mainly on the creation of the right political and organizational conditions and involving the right stakeholders at the right time and moment. In my latest publications I emphasized the main conditions for success. These conditions are: vision, leadership, communication and the self-organizational ability of the GI sector. In the last three years we have developed the maturity model for SDI's in a changing organizational environment. We have qualified this maturity of our SDI in the Netherlands. The SDI dynamics are the most important conditions making the creation of the vision and leaderships context in the SDI approach successful. Vision and leadership are the important driving forces for successful SDI implementation. In this paper I work out some examples of dynamics which are of vital importance for the implementation of successful SDI's and cooperation between the continents for the creation of convergence of the different SDI's on global level.

In more detail; SDI dynamics can be described as the essential catalysts for the development and implementation of SDI's

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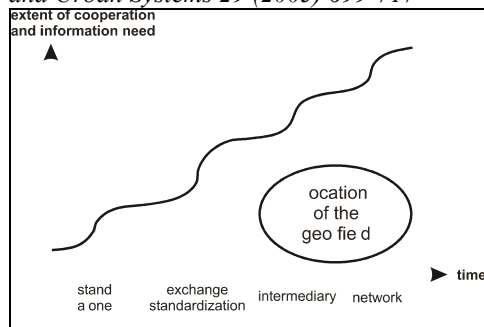


Figure 1: Conceptual view on development of NSDI

We distinguished for the development of NSDI's the stand-alone stage, the exchange stage, the intermediary stage and the network stage. In the stand-alone stage the SDI is not a priority of the organizations. In the exchange stage the stakeholders are being active in the development of a vision of the NSDI. During the intermediary stage in the process there is an increasing awareness for cooperation between the stakeholders. In the network stage a broad commitment exists for the NSDI vision and this vision is being continuously reviewed in an open communication process.

Figure 1 refers to an article of Bastiaan van Loenen and me which was published in the scientific magazine Computer, Environment and Urban Systems last November. In this article we have described indicators for the successful definition and implementation of NSDI and formulated assessment tools.

In this figure the basic elements of the organizational context for assessing the maturity of SDI's are summarized. In the intermediary stage the commitment of implementation of the vision is created, the leadership is accepted, the communication between the stakeholders is well organized and the community is active in helping to solve the identified problems. In the network stage the vision will be commonly shared and respected by all the stakeholders in an open interactive communication process and active working on innovation.

	Stand alone	Exchange	Intermediary	Network
<i>Vision</i>	Focus on individual organization	Developed with all stakeholders	Implementation	Commonly shared, and frequently reviewed
Leadership	Focus on individual organization	Questioned	Accepted	Respected by all stakeholders
Communication	Focus on individual organization	Open between public parties	Open between all stakeholders	Open and interactive between all
Self-organizing ability	Passive problem recognition	Neutral problem recognition	Actively helping to solve identified problems	Actively working on innovation

Table 1: Maturity NSDI's from an organizational perspective

In my paper I will show some key dynamics which are of vital importance for SDI implementation. I will work out the key dynamics for success in the Dutch SDI innovation process "Space for Geo Information". In my presentation I will show two other successful initiatives in SDI development, implementation and key dynamics which are vital for further successful implementation.

These are, the INSPIRE initiative for the creation of a European Spatial Data Infrastructure. This approach is based on a clear vision; it is supported by GI professionals European wide. The regulation of INSPIRE is in a final stage now. Other examples are the dynamics for the definition and implementation of the SDI visions in the States of Victoria, Queensland and the State of Western Australia.

Other SDI's in the world have developed other dynamics for successful SDI implementation. Transparency of these key drivers is of vital importance. They are needed for bridging the gaps between the SDI's in the different continents. In this way a process of SDI coherence on global level can be started and leads to an agenda setting addressing pressing global societal issues in the future.

Dutch Space for Geo Information Program for SDI innovation

In general we came in our article to the conclusion that in the Dutch NSDI the vision had been defined in the structure plan for land information and further developed in cooperation with all the stakeholders and we are currently working on SDI implementation.

In the current stage seven geo registrations are being identified as so called Authentic Registrations and regulated as a vital part of the Dutch e-government program. But at the other hand initiatives had been taken for SDI innovation with all the relevant stakeholders.

In the Netherlands the development of the SDI is just in between the intermediary and the network stage from 2003. (figure1). For that reason the Geo Community succeeded in getting a € 20 million funding of the Dutch government for SDI innovation. The GI society has the self organizing ability to organize the commitment of €27 million paid by the public sector, private sector, universities and knowledge institutes.

Based on the characteristics in table 1 in the Netherlands SDI vision was commonly shared and frequently reviewed. Based on this vision the program proposal for the Space for Geo Information program was set up. And the proposal got the support of the GI sector. We organized meetings to show the ambition, to create commitment for our plan. We challenged the sector to join the consortium, to provide the funding for the program, and requested to submit project proposals in cooperation with other partners.

The Minister of Housing Spatial Planning and Environment is responsible for the coordination of GI in the Netherlands. At the one hand the leadership is accepted, because of the large support of the Geo Information sector in the Electronic Government Program for the creation of Authentic Registrations. Public sector organizations are obliged to use these registrations. At the other hand the leadership is questioned because of the tensions between the autonomous public GI organizations for the development of a own pricing policy and the access policy of central government which tends to an access policy providing public data to citizens and private companies for free. Now in 2006 we are in the phase that leadership seems to be accepted because of the foundation of a strategic forum with high level government executives from March 2006. This forum formulates advises and priorities for the Minister which strategic GI activities need to be worked out and implemented on short term and longer term. The high level forum is considering an updating of the current Structure plan for Land information. The communication is open and interactive between all the relevant stakeholders and the GI community is still actively working on innovations.

Before I describe the key dynamics for the vision, leadership, communication and self-organizing ability I will shortly explain the Space for Geo Information program and the way in which the innovation program is executed and reviewed.

The Space for Geo Information program creates dynamics for innovation of the GI sector. In the year 2000 the GI community took the initiative to send in a project proposal Space

for Geo Information to the Dutch Ministry of Industry for the realization of Dutch SDI innovation. Every six years the Dutch Government selects and provides subsidies for innovative projects increasing the Dutch (inter) national research performance and results, enhancing our knowledge infrastructure, raising investments and enlarging international outreach and involvement. It was for the first time in history the GI sector had submitted this type of innovation proposal. It took three years to define the SDI innovation vision, to involve the range of stakeholders in the process in getting them committed and providing the funding for the Space for Geo Information program. The Steering Committee which was responsible for the preparation of the proposal organized a financial commitment of 27 million Euros with one hundred partners from public sector, private sector, universities and research communities.

On November 28th 2003 the Dutch Government took the decision to provide the Netherlands Council for Geo Information (Ravi) a subsidy of € 20 million for the innovation of the Netherlands Geo Information Infrastructure (NSDI) in the project "Space for Geo Information. The turnover of the project amounts approximately € 40 million. The Dutch and also the international partners were invited to bring in proposals prepared by consortia from public sector organizations, private companies, research institutes and universities to stimulate the innovation of the NSDI and the Dutch knowledge economy, and the proposals if submitted and accepted, will be financed by 50% by the Dutch government. The program will be finalized in 2009.

The program is subdivided in the following subprograms.

1. Societal issues (sub program 1). The main target of this program is the creation of GI innovations, new networks, new products and applications in the GI sector for solving the most pressing societal issues. This program is focusing on the relationship between societal issues and geo information. Examples are the use the introduction of the GI sector for innovation for enhancing safety, homeland security, the improvement of interaction between government and citizens, and stimulating the development of consumer based products.
2. The NSDI (sub programs 2 and 3) will be innovated. The NSDI is currently insufficient for providing the right information to citizens for services, participative democracy and stimulating social coherence in neighborhoods. Public data need to be integrated. New techniques and organizational agreements are necessary. This program is especially focused on the creation of infrastructures in the different sectors such as infrastructures for the water authorities, rural areas, the subsurface and the creation of linkages between the different infrastructures. The challenge is to link these initiatives in the different sectors with the existing SDI on national level.
3. Program 4 stimulates the improvement of public information access, by the development of new products, data integration, new applications and new portal tools.
4. Fundamental and strategic research (sub program 5) stimulates the national research and knowledge basis.
5. Company and product innovations are strengthening the international position of the Dutch geomatics- sector

6. The sub program knowledge development stimulates learning by doing and interaction between administrators, researchers, scientists and GI professionals.

The main goal of the Space for Geo Information program is: “The enhancement and innovation of the geo information infrastructure and the geo knowledge community in the Netherlands towards a sound and efficient public administration and a robust business”

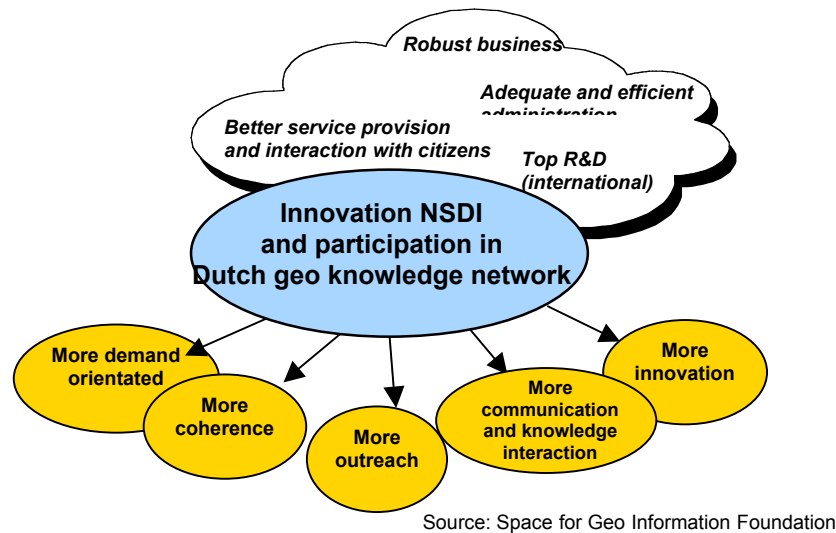


Figure 2: Strategic framework Space for Geo Information

That means in detail the improvement and innovation of the Dutch SDI and the geo knowledge society in the Netherlands for the realization of an adequate and efficient administration and a sound private sector. It results also in an improvement of the service provision to citizens, a more intensive participation of the citizens and the creation of top R&D.

The main targets for the SDI innovation are:

- Creation of a more demand oriented approach
- Enhancement of knowledge exchange and knowledge transfer
- Realization of an adequate coherent SDI.
- Creation of more outreach of the Space for Geo Information process.

For the creation of an innovated SDI the following innovation targets (milestones) scientific, economic and societal output targets are formulated.

In other words: in the year 2009 the SDI should be used as a basic instrument for GI coordination, innovative access tools for the GI sector should be developed by the administration, private sector in cooperation with the research and knowledge community. In the year 2009 75% of the GI knowledge society should understand the importance of the Dutch SDI. The SDI should be embedded in the European Spatial Infrastructure (INSPIRE) in 2009 as well.

There are 4 GI research spearheads (scientific output) defined. These spearheads are the backbone of program and must lead to a high competitive international GI research

position in the world. These spearheads are Geo Information Infrastructure Concepts, Spatio Temporal Modeling, Man Machine Interaction and Geo Information and Society. Ten gamma scientists should be introduced and twenty international scientists should be introduced in the Space for Geo Information projects.

The economic output will be created by the introduction of five studies. Important studies are the visualization of the GI demand in the Netherlands, increasing transparency of the SDI innovation maturity process and the realization of five specific SDI's for water, rural areas etc, which are embedded in the national SDI.

The societal output means that GI should be rooted in educational programs. In three new application domains pilots should be started to show the benefits in using GI for pressing societal issues. Three application areas are introduced to improve the interaction between the administration and citizens.

From 2004 to 2006 23 projects are realized for the enhancement of SDI innovation and scientific, societal and economic output.

Quantitative targets are defined, such as the facilitation of PhD's, the publication of 50, 90 and 30 articles, respectively in scientific, professional magazines and national and international papers, 50 presentations for GI professionals, the execution of twenty projects in cooperation with the government, the creation of a consortium of 95 partners and 35 private companies which are using the knowledge results of the Space for Geo Information program.

The first review of the Space for Geo Information Program has been executed and published. The results are very positive. The quality level of the consortia is high. The participation level of the private sector is very high. (25 to 30 %). Every consortium consists mainly of a GI public sector organization, a research institute, a university and a private company. The consortia are well composed.

All three *scientific milestones* have been started. In the four spearheads PhD's are introduced, with gamma scientists as well. The quality control of the four spearheads is managed by respectively the Delft University of Technology, Wageningen University and the ITC.

The milestones of the *economic output* are reviewed. All the defined activities are started. Sub infrastructures of water and rural areas are in development. A detailed quantification of the economic bottlenecks by using current SDI infrastructures is in execution. Projects are started to show the insight in lowering administrative burden by using GI and Geo ICT, to create product innovations for consumers, to develop business models for product innovations by using SDI's.

International involvement in the program is a point of concern. International partners from Canada, Australia, Germany, and USA are invited to submit project proposal. With JRC a structural cooperation exists.

The *societal output* needs more attention. The major priority is given to safety and homeland security issues.

In summarize. The initiatives for innovations in the Space for Geo Information Program are mainly focused on the creation of new products based on the users needs. These practical needs are the basis for further fundamental and strategic research, which will

lead to new innovative applications and new knowledge. The consortium consists of 92 partners and is well composed. This milestone is realized.

The relationship between the main SDI elements and our national safety and homeland security priorities has been mapped. The relationship with private companies, consumer needs, and the needs of citizens are visualized as well. This relationship model will be used as a basic document for communication in the way in which SDI innovation target will be realized by the execution of the Space for Geo Information projects.

The organization of the independent reviewing process is well managed.

The *research output* (four spearheads: geo-information infrastructure concepts, spatio temporal modeling, man-machine interaction and geo information and society) will be reviewed by a standardized audit system which will be used by the Dutch Universities and the Dutch knowledge institutes. The program as a whole will be reviewed regularly by an independent government committee. The results of these reviews are regularly publicly available.

Key dynamics in the Space for Geo Information program

The development, implementation of the *vision* and the commonly sharing and reviewing of this vision is an important condition for successful implementation in the network phase of SDI's. The right resources, finances were available during the start of the Space for Geo Information program. In this type of process there is a need for a small group of people which understand each other, with the right disciplines and a strong believe in the mission. This group played a crucial role in the preparatory phase of the Space for Geo Information program.

Another condition is the need for support of the main public GI data producers, such as the Dutch Cadastre did, and the Ministry of Roads and Waterworks and Ministry of Agriculture and the main Dutch Universities as the Wageningen University, the Delft University and the Dutch knowledge organization TNO did as well. All the main public sector organizations should be a firm believer in sharing the vision, and they recognize the importance of organizing the commitment of all the relevant stakeholders.

The group needs to develop the strong lobby network to convince the strategic executives and politicians that the start of a separate GI innovation program is necessary.

An open minded approach for user needs, e government developments and international developments is of vital importance for the definition of a qualified innovation proposal.

Another condition is that strategic high level executives and members of parliament need to understand the content and the challenges of the vision for SDI innovation. SDI's are important instruments which can be used for solving of pressing societal problems.

A sound cost benefit study of the impact of the implementation is of vital importance in the preparation phase of the program.

The knowledge exchange and knowledge transfer need to be defined and organized.

Strategic support at high level is a prerequisite for success.

Reviewing mechanisms need to be available and independent audit instruments need to be used.

For the *leadership* regulation for GI coordination should exist and for the execution of the GI coordination framework high level executives are responsible.

Finally the *self organizing ability* is crucial in the process. The GI society needs to be actively involved in consortia and the willingness of stakeholders to participate in the innovation projects and the willingness to pay. All relevant stakeholders from government, private companies, universities and knowledge institutes play an active role in the innovation process. They formulated milestones with a high ambition for innovation. The formulated milestones in the program are being monitored regularly in formal independent auditing procedures. The GI society plays an active role in the introduction of new networks (safety and home security sector). There is a willingness to work with new initiatives (Google Earth, Tom Tom).

In my opinion the Space for Geo Information is an SDI dynamic which fit with the vision and the sector ability criteria. The leadership criteria are less developed in the Netherlands because of the lack of regulation in the Netherlands for the continuity of SDI innovations in longer term. At the other hand in the Dutch e government programs authentic registrations play a crucial role in this process. These registrations are getting a legal base and these registrations are mainly based on our Structure Plan for Land Information which had been set up in the beginning of the nineties. Other important dynamics in the Netherlands from the leadership's point of view are digital spatial planning processes which will be regulated in laws and the upcoming bill for the registration of cables and pipelines, related with the other authentic registrations. Recently a national standardization council has been installed by the government for the realization of e government targets. In this high level group the GI sector is well represented.

The second important initiative in Europe is INSPIRE. The dynamics of INSPIRE are the execution of the priorities in the environmental policy of the European Commission, such as the implementation of the Aarhus Convention and GMES for the Global monitoring of Environmental Systems, which are focused on the improvement of access for environmental information at European and global level. The other dynamic of the INSPIRE program is the communication and commitment strategy of the European Commission/ JRC and Eurostat for the implementation of the vision for the creation of a European Spatial Data Infrastructure based on regulation.

The initiation of drafting teams for standardization, meta standards, services etc. is a dynamic for the realization of INSPIRE and the introduction of a communication and commitment strategy by Legal Mandated Organizations is a dynamic as well. The impact of this initiative is a huge involvement of GI professionals in the development of a European Spatial Data Infrastructure. This is a very unique result. This is a very complicated process because there are huge differences between the European countries, in cultural, legal, organizational, historical point of view. But this GI harmonization process on European scale seems to succeed in a very short time and is a very successful result.

The third example of successful dynamics is the SDI development in Australia. The first successful SDI dynamic is the Australian Spatial Information Industry Agenda of the Department of Industry, Science and Recourses of September 2001. This program will be executed for the creation of the Virtual Australia objective. Other important dynamics in Australia are the initiatives in the State Queensland in which the sustainable development of the state plays a crucial role in the SDI development and in the State Victoria as well. The third dynamic in the Australia are the initiatives in the State of Western Australia of the Shared Land Information Platform for the provision of integrated emergency management information, natural resources information, electronic land developer information and integrated land information based on the recently developed e government ambition of the prime minister.

It is interesting to know each others successful dynamics in other parts of the globe. I invite others to present their realized dynamics as well. These results show in which way SDI dynamics in vision, leadership, communication and self ability of the GI sector develop during the several years. This insight is important in bridging the SDI's all over the world, which will lead to SDI convergence at global scale.

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