“GeoPortal Network”—more process catalyst than project

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ABSTRACT: As part of the national innovation co-funding scheme ‘Space for Geo-information’ (RGI) the project “GeoPortal Network: Liberty United” ran from late 2005 until the end of 2008. The paper elaborates the stages the project went through; the software and IT-architectural developments that took place; three important spin-offs of the project (Atlas Demonstrator, the Red Portal and the reuse of components for the Romanian NSDI); the institutional aspects that were studied; the different ways ‘Liberty United’ has worked in the project; the different levels of engagement and the passing on of lessons learnt into other settings (both of one’s employer and national activities related to SDI development). It is concluded that GeoPortal Network can be seen more as a catalyst of the process of developing the Dutch SDI, rather than as a project in the usual sense.

1 INTRODUCTION

As part of the national innovation co-funding scheme ‘Space for Geo-information’ (RGI) the project “GeoPortal Network: Liberty United” ran from late 2005 until the end of 2008. In the application, three key questions had been raised:

1. How can societal questions be optimally answered using the existing supply of geo-information?
2. How can we surface the dormant questions and needs?
3. Which barriers (organizational, financial, legal, and technical) should be levied to increase the access to geographical knowledge?

These were translated into nine more concrete targets for the project (called objectives in Zevenbergen et al. 2006). They concentrated around the aim of developing a network of geoportals governed by a minimum set of rules laid down in a framework. These geoportals would be thematically organized and built on a layer of web services that connect to a variety of geodata sources. To facilitate end-users in searching, comparing, and combining geodata sets the products offered within the network should include clear metadata (including transparent licensing conditions and pricing policies). The notions would be tested by experimenting with actual built components in this infrastructure. Components of a layered network were developed, including a service-chaining environment, a web GIS application framework, and adapted licensing conditions based on the Creative Commons notion. The process of and challenges of creating the network would also be studied from a social science perspective. The proof of concept would be shown via a demonstrator.

These targets originally contributed to making the project more manageable. However, later it became clear that many were not attainable in their initial form, mainly due to ongoing developments in both ICT/Internet and the (national) institutional setting of the geosector. Keeping the original notions of the three key questions in mind, the targets were reformulated and reinterpreted.

In this paper we will elaborate on the stages we went through in the project, the software and IT-architectural developments that took place, three spin-offs of the project (Atlas Demonstrator, the Red Portal and the reuse of components for the Romanian NSDI), the institutional aspects that were studied and how the 'Liberty United' concept helped to make the project truly innovative. We conclude with an analysis of how the project contributed to the wider frame of the (ongoing) national SDI development.

2 STAGES

During the project, we went through several stages of focus. In the first months of the project, we formulated the following mission: "Upon completion of the GeoPortal Network project every user can find and use the geo-information from the participating dataset holders in a demand driven fashion and online. Potential usability, use conditions, and restrictions will be crystal clear at a glance" (also see Zevenbergen et al. 2006). This focus on the user was further highlighted in the 'Manifest on demand driven information supply', also established in the first months of the project. The following seven key aspects have been included in this manifest:

1. Clarification of the user's question
2. Freedom of choice
3. Interaction
4. Attainable
5. Manageable
6. To size
7. Comparable on price and quality (more in Zevenbergen et al. 2006).

In the remainder of the first year we specified a framework with a minimum set of rules regarding metadata, open standards, licensing conditions and pricing mechanisms, to allow a user transparent and easy access to geo-information through the network. These rules would allow the user to "be able to find and be allowed to use" the geo-information needed. This mainly concerned the two outer rings of the conceptual Access Model as depicted in Figure 1 (Backx 2003). The model shows three different, concentric rings a user will have to cross before it is likely he will consume a data product. Arranging the geodata in the inner ring in a clear, manageable, and reliable way was considered the prime responsibility of each dataset holder. It was assumed that was done more and more in a satisfactory way for the prime objectives of the dataset. However, later on in the project, and especially while working on the Atlas Demonstrator (see below) the geodata sets turned out to be much less useable for any additional application than originally thought. That is of course a serious impediment to combining geodata from one dataset holder with the dataset from another. Adequate metadata and transformation services can help enormously to deal with a variety of formats. However, the differences at the level of terminology, definitions, classifications, and representations will call for a completely new level of awareness and coordination. In some sectors work on such a 'thesaurus' has started, including a small pilot in the field of subsurface geo-information as part of the project (dubbed 'Logos'). At the end of the project, it was clear that any geodata-sharing project would need to address all three rings, and not limit itself to the outer two as the GeoPortal Network started out to do.

We also aimed at composing the network of several 'colorful' geoportals that target existing application domains, like the "Red Portal" for the built environment and the "Brown Portal" for subsurface data. The idea was to have these portals and the network based on the framework, allowing other organizations to add their portals or especially their web services if they were willing to meet the minimum requirements of the set of rules laid down in the framework. A number of these portals were launched. Their impact differed a lot. An important lesson from this exercise was that for available data to become multi usable, more work was needed than expected. Not only the (standardized) metadata needed attention but also the data needed (re)structuring, sizing, and standardization to meet the requirements from a user point of view. Complications with different versions of (meta) data standards and compliant software applications also had more impact than expected (Vanmeulebrouk et al. 2009a). Secondly having data services in place, even when these

Figure 1. Access model (Backx 2003).

are easily accessible through the concept clearinghouses, is not enough for being used. To meet the user needs data should be delivered as the real information being an answer to the user questions (see also below with regard to the Red Portal).

About half way, the project it appeared that developments occurring in the geo-information sector unnecessarily tend to take place in isolation became very strong. Spatial data is of course special but in essence not so special that we should not take advantage of mainstream IT-developments. This not only applies to technical issues, but also to social and institutional aspects. For example, the sector-specific geoportals set up for different domains is a typical data driven implementation. Instead, a more demand driven approach is needed. In the project, this was addressed through the demonstrator. An experimental geoportal for the physical and social developments, which affect the human environment, was set up. This initiative formed the base for the Ministry of Housing, Spatial Planning, and the Environment (VROM) to set up the "Atlas Demonstrator" geoportal (see below).

The last stage of the project was characterized by the fact that consortium members that had been active within the project were using experiences gained in the project elsewhere. On the one hand, they applied these in their daily work, which called for consolidation of what was achieved before ending the project. In addition, a need was felt to find means to be able to continue in the future. This has been achieved by providing a demonstration platform as a base to start a community in which forces can continue to be combined, and knowledge to be shared to continue innovation (see www.cartafabrica.nl). On the other hand this has already happened by the spin-offs as is described later this paper, and the lessons learnt in the project that have been passed on by consortium members into the development of the national Dutch SDI.

3 SOFTWARE COMPONENTS

As part of the reformulated targets, several new software components and applications were developed. These include a search portal for geo-information (dubbed 'Bibber'), a web mapping

application
layer

rights management layer
(authentication, licensing, payment)

data layer

Figure 2. Architecture of a spatial data infrastructure based on web services.

Flash viewer (dubbed 'Luigi'), a service chaining application that allows developers to compose aggregated services or new applications (dubbed 'Designer') and also a true OGC/ISO compliant catalogue server component (dubbed 'eXcat') (see Vanmeulebrouk et al. 2009b).

The original architecture intended includes three layers: a data layer, a web services layer, and an application layer. Any combination of information from the available datasets, portals or web services should be available to the user for viewing and mixing, which is facilitated by intermediate services (called 'service layer' in Zevenbergen et al. 2006). The general trend is that data is increasingly published by the dataset holder through services supporting the geodata (WMS, WFS or WCS), and that the 'service layer' is more focused on services supporting metadata of the geodata (discovery/catalogue services), gazetteer services (allowing the transformation between different types of geo-codes (e.g. addresses to coordinates)), and services related to authentication, licensing and payment (see Figure 2).

4 SOA SO WHAT?

During the project, it was realized that for the geo-information sector IT-mainstream development should be used more commonly. For that purpose two master classes were set up to provide more basic knowledge at one hand, but also to raise more awareness on what is happening outside the geo-information community (Bulens & Rip 2008). Since developments are not strictly limited to technical issues, one master class was dedicated to organizational issues, the other to the technical concepts of a service-oriented architecture. In the master classes only open source and freeware components were used to demonstrate it is very well possible to set up spatial web mapping and data services as well as catalogue services with little investment. It appeared to be reasonably simple to set up services straightforward by using open source and freeware components. More important, and after all not surprisingly, it appeared that freely available software is more compliant to international standards than proprietary software products. Another conclusion was that developments in the spatial domain very well fit with what was happening on a national level in The Netherlands, and that already efforts had been made to integrate the national strategy in e-government architecture and the SDI developments in the geo-information sector.

5 SPIN-OFFS

Several concrete activities that have taken place in the project have led to spin-offs.

5.1 *Atlas demonstrator*

The largest spin-off is the 'Living Environment Demonstrator' (Leefomgeving Demonstrator; LOD), a geoportal directed towards information on the environment in one's neighbourhood. While the preparation of this work package was still ongoing, a similar initiative 'Atlas' was launched by the Ministry of Housing, Spatial Planning and the Environment (VROM) and assigned to the National Institute for Public Health and the Environment (RIVM), a consortium member of GeoPortal Networks.

The Ministry of VROM wants to provide citizens all the information that is available in their neighborhood in order to comply with requirements of the Aarhus Convention (Convention on Access to information, public participation in decision-making and access to justice in environmental matters, adopted at Aarhus, Denmark on 25 June 1998). This information is collected on a regional and local level, which means there are many dataset holders who should provide information to be presented for all of The Netherlands. The project team Atlas decided to use the approach and the architecture (including some of the components) developed by the GeoPortal Network project (Bulens et al. 2009a). In line with the INSPIRE principle the data will be located and maintained at its source. In a technical way, the expertise and skills were known but were not always present on the level of the dataset holders: the provinces and the municipalities. Although their level of development and experience differs a lot, it appeared there was sufficient support available with the pilot partners to set up the initial services. A more difficult task is the integration of the datasets covering the same theme but different regions (i.e. provinces). A WMS-integrator was developed to overcome the technical issues of integration but, more importantly, what remained is the integration of the content. Harmonization of information appeared to be a difficult task. Methodologies to derive data, classify data and the color schemas (legends) for representing the data were not easily brought to a common agreement. Especially the methodology to derive aggregate information to summarize in an understandable indicator is an issue that is not solved yet for the Demonstrator. However, raising these issues was essentially the purpose of using a demonstrator before realizing the final portal. In addition, technical issues like the performance of all different services used, the availability of these services, and the quality aspects of the information presented are being evaluated by using the Demonstrator.

5.2 *Red portal*

Another important spin-off relates to the development of the Red Portal. This portal was developed to assist in accessing geo-information of the built environment. During the development of the Red Portal a web service was used that allows access of the data directly from the base dataset. This allows for on-line access to information on characteristics of the location, the constructional status, the (permitted) usage, and the surroundings of more than 6.7 million built objects. In designing the Red Portal, the 'Manifest on demand driven information supply' (see above) was applied. The seven key aspects have been taken into account in the following way:

1. Clarification of the user's question

The desired information of the built environment is selected and found in a dialogue with the user. Clearly described metadata on the quality, the availability, and the definition of the requested data is used to make this possible.

2. Freedom of choice

The user is given optimal freedom of choice in selecting the set of data he wishes to use and the way he wants to receive this data. No standard products are offered, but a palette of information is presented as a base for the user to compose his personal Real Estate Report.

3. Interaction

Any user can respond to the available data at any time. Possible omissions in the quality or completeness of the selected data can be signaled directly. Such signals are subsequently reported

back to the original dataset holder, who can use the signals in the ongoing process of quality control and improvement of the available data.

4. Attainable

Because the Red Portal is part of a network, it is possible to be connected to it from a number of other portals. This allows for an optimal attainability of the Red Portal.

5. Manageable

The Red Portal provides access to data of 325 original dataset holders. On their behalf, one set of licensing conditions is used and not 325 different ones. Thus, the user can use the available data in a well manageable way.

6. To size

Originally, the Red Portal was designed as a web shop. Based on among other user requirements, it is now also possible to get data to size via a web service. The web service—embedded in other websites—is presently used more than the web shop.

7. Comparable on price and quality

On behalf of over 325 original dataset holders, only the costs of dissemination are charged. These charges are independent of which dataset holder is the original source. There is a clear added value for the users to be able to find and access the data through one portal with one access policy and pricing regime, thus avoiding different access policies (and prices) depending on the source of the data.

The consortium partners ESRI and DataLand have made the development of the Red Portal possible. DataLand (www.data-land.nl) is the largest cooperation between municipalities in the geosector in The Netherlands. On behalf of over 325 municipalities, DataLand supports the access to address level real estate related data of more than 6.7 million built objects (Jellema 2009). Directly after the Red Portal was implemented, DataLand decided to start using it to support access to municipal geo-information. Before, the data was only available off-line (via DVDs) but with the Red Portal, it became available on-line. Especially the design of the web service gave an extra boost to the reuse of this public sector information by, among others, realtors, financial advisors and the emergency services.

Thanks to among others the experiences gained with, and the reaction from (potential) users of the Red Portal, the portal has been further developed. This has been done outside the GeoPortal Network project, and DataLand has teamed up with the VNG (Association of Netherlands' municipalities) and Kadaster (Netherlands Cadastre and Land Registry). This cooperation has resulted in the launch of the new and innovative geoportal www.geoz.nl. This website allows combined access to municipal and cadastral data of more than 5 million built objects in The Netherlands. Furthermore, information on the value of dwellings is available. Finally, examples of municipal (innovative) service initiatives are presented, as far as they make municipal and cadastral data accessible.

In conformity with the 'Manifest on demand driven information supply' users of www.geoz.nl are requested to contribute to the further development of the site. The aim is to stimulate new forms of cooperation and initiatives for combining and opening up of a multitude of public sector information.

5.3 Romanian NSDI prototype

The GeoPortal Network project also encouraged the reuse of its deliverables. A twinning project carried out by Kadaster (Netherlands Cadastre and Land Registry) and the Romanian Cadastre (ANCPI) made use of components developed as part of the GeoPortal Network for creating a prototype NSDI in Romania. In this twinning project, a report with recommendations to the Romanian geo-sector for developing a national spatial data infrastructure was prepared (Bulens et al. 2008). Such a national SDI is needed, inter alia, for complying with the INSPIRE Directive (Directive 2007/2/EC of 14 March 2007 establishing an Infrastructure for Spatial Information in the European Community). Because the components were already available the twinning project used, the knowledge gained in the GeoPortal Network project and the components were made available for training and presentation purposes. An actual operational prototype of two different geoportals situated in the Romanian context was prepared, one being a discovery portal as an

example of a National Geoportal. It shows how to use metadata effectively to discover spatial data sets. The other geoportal is a data delivery or web shop portal for the Romanian Cadastre in which the available datasets are presented in an explorative way and can be obtained through the portal (see also Bulens et al. 2009b).

6 RESEARCH INTO INSTITUTIONAL ISSUES

The scientific research that was planned as part of the project also had some shift of focus. The study into what was originally described as identifying the factors of success and failure of the geoportals and its connecting network, as such, soon progressed towards studying the project in its broader context, by looking into the developments of a number of earlier geo-sharing projects in The Netherlands. The study was set up as an investigation of cooperation in geo-information, comprising four study cases. These study cases include National Triangulation (RD), Large Scale Base Map (GBKN), National Clearinghouse Geo-information (NCGI), and the GeoPortal Network project. A narrative approach was chosen, rooted in anthropological methods, with emphasis on professional and corporate cultures among those involved in initiating, lobbying, and executing these projects. The narrative on the GeoPortal Network will be written in 2009 after the completion of the project. The narrative will be based on both participation in most project meetings and events, as well as on additional interviews with key actors. For more on this research see e.g. (Koerten 2007; Koerten & Veenswijk 2009).

The aim to develop an improved access model for geo-information, making (legal) licensing conditions and the (financial) pricing mechanisms more transparent led to an extensive research into the possibilities of applying the Creative Commons concept in the Geo-Information sector. Although much of the concept is useable, some variations, especially regarding the possibility to include some form of pricing, are needed, which also means that the use of the term 'Creative Commons' will not be permitted. During the final months of drafting of the INSPIRE Directive, we even had contacts with the representatives of one member state to include this concept in rewriting article 14 and adding Annex IV to the Directive as an example of how transparent licensing conditions could be framed. However, these were not included in the final Directive. Licensing and (re)use terms constitute a part of metadata that has a large impact on what the user can do with the data. When these terms are standardized in a limited number of profiles, this information can be shown in a simple and effective way, e.g. through symbols. A limited implementation of this was made in the developed search portal 'Bibber'. Although some public sector geodata set holders are now considering switching to Creative Commons licenses, others still adhere to strict licensing conditions. In effect, reuse for value adding with written permission in advance is still the norm when combining datasets. For more on this research see e.g. (Welle Donker & Zevenbergen 2007; Welle Donker 2009).

7 LIBERTY UNITED

This motto was the subtitle of the project, and was clearly formulated to show the difference with the top-down approach from earlier attempts to set up the Dutch NSDI, especially the National Clearinghouse Geo-Information (NCGI). Within the consortium, the motto worked in such a way that not all members had the same level of participation, and that this also changed over time. While the key questions were translated into concrete targets, these targets were subject to discussion during the whole project. Gradually the aim of the project shifted from building a concrete network of geoportals (in accordance with the framework) towards working on specifications for an architecture and developing (beta versions of) software that demonstrated the notions of the project, whilst keeping up with the ICT developments. This level of flexibility was essential for allowing true innovation to continue.

Some participants in the consortium held a dormant position; others were actively engaged in discussions and software development. A small subgroup emerged out of the whole set of participants, called the 'Core Team'. The Core Team met and worked together for a day every week. In addition to overall project management, guidance of the software developers was an important

activity of the Core Team. To increase effect, concrete activities were assigned to groups only bringing a few consortium members together (and preferably in close coordination with the Core Team). One could say that a stricter project management approach developed for an inner core of the project, with another circle of members contributing with the 'Liberty United' approach. In the end RGI was only a co-funding scheme, meaning that all members still needed to pay more than half the costs themselves, and thus needed to see and feel the added benefit of the endeavor for their own corporate mission(s). The constant ICT developments changed the project's technical landscape, breeding new architectural, standards and software approaches. The Core Team devoted much discussion to questions on whether or not new technologies should be incorporated into the GeoPortal Network's architecture. In the fast moving ICT environment, it was hard to choose the right standards. Input was given in several ways to ad hoc and standing committees that were dealing with this issue for the Dutch geosector as a whole, and the national SDI in particular.

This and other lessons learnt have thus been passed on and applied in the development of the national Dutch SDI, which picked up quite some speed during the last few years. Much of this passing on came from persons who had participated in the project, but in their regular job hours and not as part of their project funded time. This is a clear demonstration of the network approach paying off, and having 'knowledge flow', as was a motto of RGI. In this way, the activities can be seen more as a catalyst of the process of developing the Dutch SDI, rather than as a project in the usual sense.

As part of the active communication strategy of the project every year a one-day event was organized (2005 in Wageningen 2006 and 2007 in Utrecht and 2008 in Amersfoort) in which not only results were shown, but also interaction with the audience was sought. Every year the circle of the audience was widened, starting with closely related circles, expanding to all other RGI-projects, the geosector and finally society as a whole. Early 2008 a number of master classes on actual implementation of components of state-of-the-art architecture were organized for a wide audience for the geosector as well (see above). A number of newsletters, a website, and a movie were also prepared.

8 CONCLUSIONS

It appears that the vaguely formulated key questions of the GeoPortal Network were adequately reformulated by the consortium members into a well-defined project. Nevertheless, the development of an operational network by the end of 2008 did not really materialize. Instead the notion of having datasources as raw materials in place and revalue these ingredients into information products based on user demands appeared to be more contributing to the realization of a real SDI. Nevertheless, during the work on the network, many innovative approaches were developed, tried, and often trickled through to other activities, within the participating organizations, in cooperation with the wider RGI community and even in Romania. All of this combined with the ongoing ICT developments produced a permanent discussion on the specifications of the GeoPortal Network. The increased expectations for more binding specifications as part of an ensuing national SDI made the consortium members reluctant to finalize (suboptimal) specifications within the project. Nevertheless, ideas and experiences were inputted in these wider discussions.

Retrospectively we may conclude that, for the factual development of an operational network, the project came too early and the consortium's scope was too narrow. Developing a sound infrastructure that will last, calls for strict norms and specifications in advance, combined with strict project management (Edwards et al. 2007). Since such an approach would have been contradictory to the innovative character of RGI, it was wise that no real operational network was developed. The experiences gained and shared have helped to move the Dutch geosector to a more mature position where the conditions that Edwards et al. mention as needed for infrastructure development, are now in place. Based on those a successful implementation of the national SDI as described in (GIDEON 2008) is in reach. Nevertheless, it remains an unresolved issue how to reconcile the dynamics of ICT developments with the need for strict norms and specifications to set up an infrastructure (see Koerten & Veenswijk 2009).

In (Zevenbergen et al. 2006) we said that at the end of the project "we will know if the concept has really caught on and helped bring the Dutch geo-information infrastructure to the next level".

We can conclude that the Dutch SDI has been brought to a higher level over the past years. In addition, it is our belief that the project has contributed to this, be it more as a catalyst and by trickling down effects, rather than by being one grand demonstrator. In the end, this fits well with the notion of a network approach in which the sharing of knowledge strengthens the power to innovate.

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