

REGIONAL GI CLUSTER IN SUPPORT TO THE SDI DEVELOPMENT

Anders ÖSTMAN¹, Jan BJERKMAN²

ABSTRACT

Cluster development has received political interest due to its contribution to regional development. This is also visible in the EU policies for research as well as regional development. Future Position X (FPX) is a GIS cluster based in Gävle Sweden. Its aim is to promote regional development by supporting the growth of GIS businesses.

Spatial Data Infrastructure at the local level is mainly possible to larger cities. In order to provide equal opportunities also to smaller cities, some kind of coordinated actions are required. Regional GIS cluster initiatives may here play a substantial role in fulfilling these political ambitions, by taking a leading role in the development of regional SDI's.

During recent years, the FPX cluster has achieved substantial results in terms of business development in the region. The annual turnover among the GIS SME's have for instance increase by 98 % during the last two years, according to independent audits. The employment rate has also increased.

During the past two years, FPX has been the leading actor in implementing a regional SDI. By doing this, GI services are available also to citizens and companies in rural areas and small municipalities. The regional SDI have substantially decreased the operation costs for the parties involved.

In the coming years, the cluster development will be focussed on the commercialisation of R&D results, the spread of GI technologies to other sectors and international cooperation. The regional SDI is still in development phase, but it is expected that its financing will be sustainable and that new applications will be introduced in large as well as small municipalities.

Key word: GIS clusters, Spatial Data Infrastructures, GIS portal.

1. INTRODUCTION

Based on the work in economic science by Michael Porter, the concept of regional business clusters has gained importance (Sölvell et.al, 2003). The theory states that if, in a certain region, there is a substantial amount of people working in a specific sector, the potential for business growth is substantial. Depending on the sector and other regional

¹ **Prof. Dr Anders Östman**, Anders.Ostman@hig.se
University of Gävle, www.hig.se
Tel.: +46 26 648436, Gsm.: +46 706 491975, Fax: +46 26 648585.
Kungsback, SE-80176 Gävle, Sweden.

² **Mr. Jan Bjerkman**, Jan.Bjerkman@fpx.se
Future Position X, www.fpx.se
Tel.: +46 26 614400, Gsm.: +46 704 140633
Box 975, SE-80133 Gävle, Sweden.

factors, the size of this critical mass varies. But the basic idea is that you need a concentration of resources within a limited area (for instance 1 hour of travel time), in order to fulfill one of the requirements of Porter's cluster theory.

In 2001, the Swedish government announced the idea of supporting innovation systems, both within research as within regional development (Sveriges Riksdag 2001a, Sveriges Riksdag 2001b). These innovation systems were based on the Triple Helix model where industry, academia and the political sphere cooperate for business and regional development (figure 1).

The consequence of this initiative was that some, not all, research funding agencies also had to consider scientific excellence as well as the regional and economical impact of research initiatives. Since the initiative was operational in 2003, around 25 different Swedish cluster initiatives have received support for development. One of these initiatives is Future Position X. This cluster is based in Gävle and its aim is to strengthen the GIS business in the region.

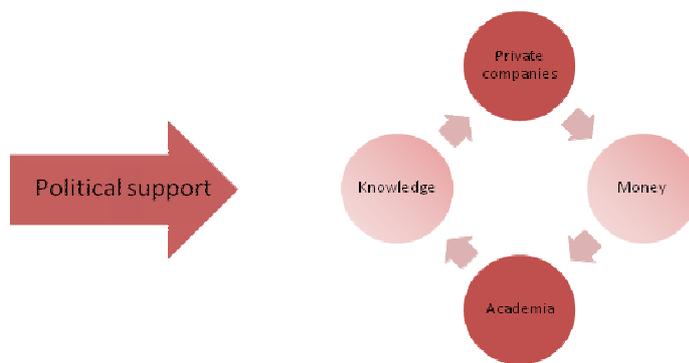


Figure 1. The Triple Helix model. The private companies consume knowledge and create monetary resources. The academia consumes monetary resources and produce knowledge. The political sector is here acting as a facilitator. It provides basic resources like infrastructure (roads, air traffic, rail, internet etc) as well as well educated human resources that enter the system.

It should also be mentioned, that the idea of regional clusters also has been introduced within the European programs. In the seventh research framework program (FP7), there is a new action item for "Regions of knowledge" (European Commission, 2009). This program supports the development and integration of research-driven regional clusters, operating according to the Triple Helix model. The first call, released in July 2009, was aimed for health-related economy. The next call, planned to be released in July 2010, is aiming at sustainable transport.

The concept of Spatial Data Infrastructure (SDI) was given a wide attention with the announcement of the presidential decree in 1993 (Federal Register, 1993). Here it was stated that the US federal agencies should share their geospatial information by using internet based services. As a response, although quite late, the European Commission

launched the INSPIRE initiative in 2001 (CEC, 2002). This initiative resulted as a directive in 2007 (European Commission, 2007), stating that each member state shall provide specific geospatial data according to certain specifications.

Although most European municipalities are not directly affected by the INSPIRE directive, there is a considerable interest in creating such local SDI's also at a municipal level. Improved services to the citizens and to the business sector, as well as cost reductions within the public administration are some of the driving forces for this development. But municipalities vary a lot in size and economical resources. In order to provide opportunities for SDI development also within smaller municipalities, some kind of coordinated development is preferred. Since this is a matter of regional policies, regional GIS clusters can make considerable contributions to this type of development.

To summarize, we have a political development where the concepts of regional clusters based on the Triple Helix model are gaining importance. In addition, we have a continuous development of local SDI's at the municipal level. But since some agencies, like the regional rescuing service, are operating at a regional (county) level, the development of local SDI's should be harmonized. From a political point of view, people living in small municipalities should for instance have equal access to rescuing services as people living in larger municipalities.

GIS clusters, like Future Position X (FPX) in Gävle, are well suited to deal with both these issues. The objective of this paper is to describe the operations of FPX and the results it has achieved, with respect to business development and the development of local SDI's.

2. FUTURE POSITION X

Since the National Land Survey has its main office in Gävle, GIS has early been recognized as an important sector in the region. In order to share resources for development, Future Position X (FPX) was established as a non-profit organization in 2004. Its statutes state that FPX is a regional GIS cluster, aiming to promote the regional development by promoting the local GIS-related industry. Its membership consists currently of around 30 organizations, mainly SME's. The members can roughly be grouped into four categories, namely

- Traditional GIS companies like ESRI S-Group, GeoIntel (distributor of SuperMap software from China) and SWECO Position (GIS consultancy).
- IT-related companies, applying GIS technology for specific sectors, like OpenCare (health), Fiberdata (networks, hosting etc) etc.
- Public authorities like the National Land Survey of Sweden (Lantmäteriet), City of Gävle and the University of Gävle.
- Large enterprises, being GIS users. Examples in this category are Korsnäs (forestry) and Sandvik (steel).

In 2008, FPX received financial support (EU structural funds, regional funds etc) for building up the cluster activities. During the years 2008 – 2009, main attention has put on providing business opportunities for the members and to strengthen the international

collaboration. When evaluating the results presented below, it should be noted that Gävle is a quite small city. The city of Gävle has around 94000 inhabitants. The population in the entire county (Gävleborg) is around 276000. Based on external auditing, the following results have been reported.

- 156 companies / organizations have participated in the cluster activities
- The gender distribution among the participants is fair, but not entirely equal. Around 34 % of the participants are female.
- Agreements with 6 non-Swedish partner clusters have been signed.
- 8 new companies established
- 42 new services have been developed
- 254 new business contacts for the members (leading to new businesses)
- 9 companies have entered the international market
- Annual turnover among the SME's increased by 98 %
- Employment among the SME's have been increased by 79 %.

According to regular surveys by ULI, the market has increased by 25% annually, for nearly 20 consecutive years (ULI, 2005). The growth among the SME members in the FPX cluster is however much higher. But due to the limited period for comparison (only two years), these figures may only serve as an indication of the success of the FPX cluster.

Due to changes in the regional policies, the size of the region is expected to increase within a few years. The new region, which will correspond to the NUTS level 2, will consist of 3 old regions. This means that the new region will cover 41 municipalities instead of the current 10. But since the cluster theory assumes also a geographical focus, the GIS cluster will still be based in Gävle. However, other major cities in the new region also have their clusters, for instance the ITS cluster in Borlänge and the paper packaging cluster in Karlstad. An increased cooperation between these sector clusters is however to be expected.

When analyzing the needs of the GI-sector, the following driving forces may be observed

- For the time being, a massive attention is currently focused on the SDI development. However, the users and potential users of SDIs, within the public sector as well as among private companies, are neither familiar with the potential of external geo-information nor with the value added which may be yielded. In addition, the technology providers are also new to this changing market.
- There is a fast growing amount of geospatial data from many sources worldwide. From the private sector we can now obtain data from companies such as GeoContent, Navteq, Teleatlas and Blom. They are all large companies acting on the global market. Also within the satellite data sector we see new initiatives, for instance RapidEye and GeoEye.
- The sensor development has also resulted in many different dataset related to weather, traffic, environmental data, observation of critical infrastructures etc.

- New directives at the European level, such as INSPIRE, the Public Sector Information directive (PSI), the SEIS initiative and environmental directives like the Water Framework Directive (WFD) creates new demands and opportunities for the sector. In addition to this, there are also some additional EU programs that contributes to this development such as Galileo and GMES
- There is an intensive on-going standardization work, lead by the Open Geospatial Consortium (OGC). Their specifications (industry standards) are then usually adopted by the formal standardization bodies like ISO and CEN.
- The leading software industries in the field of geo-technology have recently launched new developments, such as Microsoft and their Virtual Earth Platform, Google with Google Maps and Google Earth and Yahoo with Yahoo-Maps. In addition to this, many providers of database software are integrating spatial data types in their relational database systems like Oracle, Microsoft SQLServer, Postgres/PostGIS, MySQL etc.
- GI technologies are increasingly used in mainstream products, for instance for navigation, GPS, mobile devices, geo-social-networking etc.
- The virtualization of hardware and software platforms provides a potential of considerable cost reductions. This development is sometimes called Infrastructure as a Service (IaaS) within the cloud computing community.

Considering this massive development, it is obvious that commercial companies must have deep insight in the technological development, the political or societal trends as well as the changing needs of their customers. This is not an easy task to fulfill for SME's and local governments, which usually have limited resources. Seen in that perspective, the role of FPX as business facilitators and knowledge providers will increase in the future.

3. LOCAL AND REGIONAL SDI'S

In the late 1990's, the city of Gävle started to coordinate its geographical information in order to create what we today would call a local SDI. One of the driving forces was the realization that the social sector had very large costs but also a large potential for improved efficiency. In order to support the development of IT systems in the social sector, basic spatial information had to be made available. As a result, some very simple but also very efficient applications were built, for instance the one dealing with the availability of doctors and nurses (figure 2). This is special importance during the summer vacation period, when some health care providers are closed and clients must be redirected to other places nearby. Other successful applications deal with crime statistics, planning of bus transport for school children, digital archive of detailed plans, demographic statistics, land ownership and environmental concerns like radon emission.

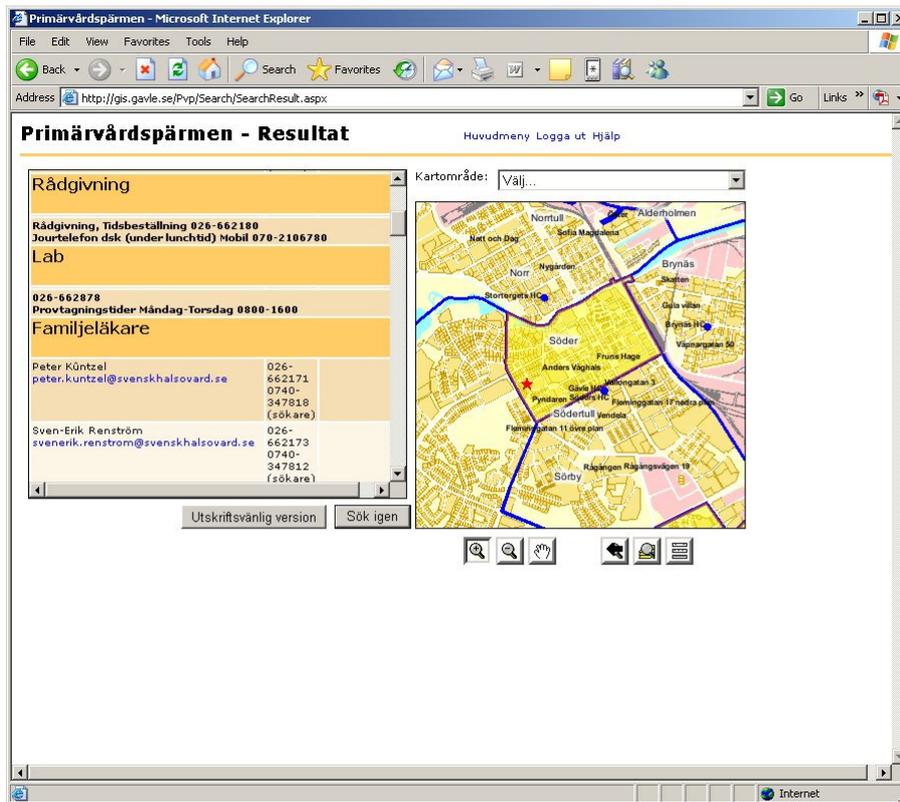


Figure 2. Early application showing access to primary health care.

Due to the success of the local SDI in Gävle, requests for similar solutions but on a regional level were raised in 2004. There is a large variation in resources among the municipalities in Gävleborg County, but all have similar needs. In order to share investment costs, a regional SDI was established, consisting mainly of a shared database with geospatial data (cX database). Since the city of Gävle was the one having most experiences and resources, they were selected to host and maintain the database.

An enlargement of the regions is currently being considered by the Swedish government. If and when such an enlargement takes place, the new region will be increased to 41 municipalities as compared with the current 10 municipalities. The main part of this new region is to be characterized as rural. In order to achieve an effective regional SDI, a new shared database with corresponding applications has to be developed. This new initiative should of course be based on the cX database but also considering the systems implemented in the other cities too.

A new project (GIS-Arena) was initiated in 2008. It has been supported by various regional funds but also the structural funds of the European Union. The purpose is to provide detailed spatial information to all actors in the society (citizens, companies, authorities, non-governmental organizations etc). The aim is not to produce data, but to make existing data available. In this sense it is similar to the implementation of the

INSPIRE directive at the national level. However, the main difference is that the INSPIRE directive is a legal act, while the regional SDI is based on volunteer cooperation. This means that the financial conditions are different. Another difference is that the INSPIRE directive mainly deals with national data which may have quite low resolution sometimes. The regional SDI deals with high resolution urban data, sometimes with cm accuracy.

The GIS-Arena project has been split into three major tasks, namely the establishment of a basic geospatial database and associated web services, secondly the establishment of shared applications for urban and regional planning and thirdly the dissemination of information and results. The project was finalized in 2009 and the objectives were reached within budget as well as time (GIS-Arena 2010). The main problems which occurred during the project were related to communication among the participants and late delivery of basic data from major data providers. Also some problems in software development have been recognized.

What also should be noted is the increased interest in application development that has been observed. Due to the wide use of the SDI, new applications like flood prevention planning and on-line submission of building permissions are under development. Also the smaller cities do now have access to applications that earlier were only available at the larger cities, for instance about primary health care, bus routes etc. There is also a substantial interest from local industries to develop new applications, related to for instance logistics.

4. PERSPECTIVES ON THE FUTURE

There are several challenges that lie ahead of the FPX cluster. The rapid technological development is one such factor. Shifts in the macro-economical climate as well as other climate and environmental changes will give new opportunities as well as new problems to solve. The current cluster development activities are along three lines, namely

- Commercialization of research and development projects. One such example is the GeoTest project, where procedures for testing GI services have been developed (Östman et.al, 2009 and Östman, 2010). This type of tests are required for the implementation of the INSPIRE directive, but are also essential for the development and tuning of regional and local SDI's.
- Widening the scope of GI development and the use of geospatial information. Future Position X has recently received funding for a new project (daGIS), aiming to widen the use of geospatial information to new sectors in the society and to increase the involvement of the academic sector in the regional development.
- There is a need to improve the international contacts, mainly among the business partners of the cluster. For this reason, a series of international GI cluster conferences have been organized. The first conference was held in Gävle in 2008 and the second one in Biloxi (USA) in January 2010 (Directions Magazine, 2010). Future similar conferences are expected, where cluster development issues are discussed

The regional SDI as implemented by the GIS-Arena project is now going to be based on a sustainable base. Initial estimates shows that the annual cost for operating the entire system is around 0.25 € per inhabitant. This is about 0.15 % of the total tax income for the participating municipalities. Combined with the expectation that the benefits will be larger than the costs, this hardly visible budget line is not believed to be a major obstacle.

The current system is built on web technologies. There is a new trend on virtualization, or cloud based solutions. According to Östman (2010) there are some not fully reliable cost analysis which claims that the operational costs may be cut by a factor of up to 50 % by going cloud based. To what degree these claims are based on real facts or wishes, remains to be seen. But there certainly is a potential for reducing the operational costs further. By cooperating and making use of the scaling advantages is one successful way to go.

5. CONCLUSIONS

The conclusions of this paper may be summarized as follows

- Cluster development is of high political interest today, due to its potential to promote regional development. The Triple Helix model is here essential.
- GIS clusters have a great role to play in the establishment and development of local and regional SDI's.
- Regional SDI's have a potential of reducing the operational costs for GI systems as well as increasing the usage of geographic information within various sectors in the society.
- During recent years, the FPX cluster has achieved substantial results in terms of business development in the region.
- In the coming years, the cluster development will be focussed on the commercialisation of R&D results, the spread of GI technologies to other sectors and international cooperation. The regional SDI is still in development phase, but it is expected that its financing will be sustainable and that new applications will be introduced in large as well as small municipalities.

6. ACKNOWLEDGEMENTS

This work described in this paper has been sponsored by the structural funds of the European Union, VINNOVA, Lantmäteriet, City of Gävle, University of Gävle and Region Gävleborg

7. REFERENCES

CEC (2002): Commission of the European Communities, Memorandum of Understanding between Commissioners Wallstrom, Solbes and Busquin: Infrastructure for Spatial Information in Europe (INSPIRE), Brussels, European Commission (www.ec-gi.org/inspire/).

Directions Magazine, 2010. GIS Clusters From Around the Globe Gather in Mississippi for 2nd International GIS Cluster Conference.
<http://newsletter.directionsmag.com/link.php?M=89458&N=2468&L=30109>

European Commission, 2007. Directive 2007/2/EC of the European Parliament and of the Council of 14 March 2007 establishing an Infrastructure for Spatial Information in the European Community (INSPIRE). http://www.ec-gis.org/inspire/directive/1_10820070425en00010014.pdf

European Commission, 2009. Regions of Knowledge. http://cordis.europa.eu/fp7/capacities/regions-knowledge_en.html

Federal Register, 1993. Coordinating Geographic Data Acquisition and Access: The National Spatial Data Infrastructure. Federal Register, Vol. 59, No. 71 Wednesday, April 13, 1993. <http://www.archives.gov/federal-register/executive-orders/pdf/12906.pdf>

GIS-Arena 2010. Projekt GIS-Arena. <http://gisarena.fpx.se/info/info.htm>

Östman A, Abugessaisa I, Tanzilli S, He X, El-Mekawy M, 2009. GeoTest: A Testing Environment for Swedish Geodata. Paper presented at the GSDI 11 World Conference, Rotterdam, June 15-19, 2009. <http://www.gsdi.org/gsd11/papers/pdf/234.pdf>

Östman A, 2010. Network for testing GI services. Invited paper to the GIS Ostrava 2010 Symposium, January 24-27 2010.

Sölvell Ö, Lindqvist G, Ketels G, 2003. The Cluster Initiative Greenbook. Ivory Tower AB. <http://www.cluster-research.org/greenbook.htm>

Sveriges Riksdag, 2001a. En politik för tillväxt och livskraft I hela landet. Regionalpolitisk proposition 2001/02:4. <http://www.sweden.gov.se/content/1/c4/21/04/e3e0daba.pdf>

Sveriges Riksdag, 2001b. FoU och samverkan i innovationssystemet. Forskningspolitisk proposition 2001/02:2. <http://www.sweden.gov.se/content/1/c4/21/09/a7c6f100.pdf>

ULI, 2005. Geografisk information i Sverige, 2003. ULI-rapport 2005:1. <http://www.geoforum.se/page/158/180/1295>

6. BIOGRAPHICAL NOTES OF THE AUTHORS



Anders Östman is currently professor in geomatics at the University of Gävle. He made his PhD in Photogrammetry at KTH in 1986. He then worked for Intergraph Sweden, before returning back to academia and a professorship in Geographic Information Technology at Luleå University of technology. His current research interest is Spatial Data Infrastructures and the quality and usability of geospatial data.



Jan Bjerkmann has since 1996 worked as a business developer at the city of Gävle. The work has mainly been aimed at supporting the establishment of new service-oriented companies in a wide meaning. Since 2004 he is full time working with supporting Future Position X in Gävle. Here he has the role of a senior cluster developer and is currently occupied by strengthening the cooperation according to the Triple Helix model and long term financial support. Before 1996 he was working with regional policies and employment issues for more than 30 years.