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**LESSONS TO BE LEARNT FROM THE IMPLEMENTATION  
GIS AT STATISTICS SWEDEN**

by

Submitted by Statistics Sweden<sup>1</sup>

**I. INTRODUCTION**

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1. At the beginning of the eighties, small-scale geo-statistical applications began to appear at Statistics Sweden. In the nineties the Market Profile System was the first commercially successful attempt to provide georeferenced statistical data. Another benchmark was the development of a geographical database. The geographical references can be downloaded and linked with statistical data produced within Statistics Sweden.
2. At present, the preconditions for developing GIS in Sweden are very good. The Swedish population registration system is based on personal ID numbers and registration on a unique unit of real estate (land parcel or cadastral unit) with attached x, y co-ordinates. There is a good supply of digital background maps. These conditions mean that GIS is an important tool in statistics. The revenue from commissioned work has increased over the years and is now about 10 million SEK per annum. The competence of our staff is on a par with the best in the commercial sector.
3. Furthermore, GIS development has been driven more by technology than by demand. The same trend can also be observed in sectors other than statistics.
4. Although our Business-GIS application is successful, the strategic development, competence building and research components are somewhat weak. Analytical and sampling applications are rare. Another drawback is that time dimension in statistics has no established spatial equivalent.
5. This paper will focus on problems still to be solved internally within Statistics Sweden and in the Swedish GIS community. One such problem, for example, is that Statistics Sweden has only twenty software licenses. Another one is that, although the demand for georeferenced statistics is steady, it is not increasing. Initially, most statisticians and clients are fascinated by GIS presentations but gradually the enthusiasm fades away, sometimes even turning into visual pollution in the eyes of the users.

## II. MAJOR OBSTACLES IN GIS DEVELOPMENT

6. GIS development at Statistics Sweden is obviously linked to the development of the other components of the statistical system. The possibilities to develop GIS in Swedish statistics are good but still many obstacles exist. The Swedish Development Council for Land Information has been surveying Swedish GIS development since the late 1980s. The latest survey was held in 1995 and encompassed about 3 800 persons using GIS in their daily work. Respondents' perception of the main obstacles for GIS as a tool for improvement and rationalization confirmed our own experiences. The results are shown in Table 1.

*Table 1: Top ten major obstacles in GIS development*

<b>Rank</b>	<b>Obstacle</b>	<b>Percent Stated</b>
1	Costs/Lack of data	60
2	Lack of co-ordination between organisations	59
3	Lack of access to data from other organisations	56
4	Lack of competence among operators	49
5	Lack of insight among decision-makers	41
6	Hard- and software costs	40
7	Data quality or data coverage problems	40
8	Software complexity	29
9	Software dysfunctionality	20
10	IT-system prestanda problems	18

Some of these obstacles deserve further attention and can be grouped as shown below.

**a) Pricing Policies and data accessibility**

8. The lack of data and high cost of its acquisition were considered the major obstacles in GIS applications. This is probably a reflection of the financial conditions under which Swedish government agencies operate. The government funding is decreasing and agencies have to work in market conditions, buying and selling data bilaterally.

9. These financing principles have hindered the dissemination of GIS methods and geo-referenced data. Several data providers collect and compile the same geo-referenced data, because the costs of sharing and harmonizing data are higher than those of data collection from scratch.

10. In a macro-economic perspective, this situation was not acceptable. A special government committee has been dealing with geoinformation-related policy issues since 1995. A proposal for a new government policy on dissemination of georeferenced data was prepared. The main idea is to define certain basic data registers/data sets as "public domain", with full accessibility for all users.

11. Another committee is presently working out the principles for provision of population data, data on enterprises/local units and real estate/cadastral data.

12. It is to be hoped that a policy change in the financial systems concerning basic geo-data will facilitate the overall development of GIS/GIT. A change would be in harmony with the pricing principles of Swedish statistics, where basic government-funded statistics are provided free-of-charge.

**b) Software Complexity and Dysfunctionality**

13. If statistics has to compete successfully with other types of information, they have to be available cheaply, quickly and comprehensively. The same applies to georeferenced statistics. One of the main reasons why clients are not returning to us is probably the complexity of the GIS application. Information that is simply produced by our experts is normally too difficult to produce for the occasional user of GIS software.

14. From this we have drawn the following conclusion. GIS software is complicated to use, and occasional users cannot maintain the necessary skills over time. If we are to be successful in producing geostatistical applications for planning, monitoring and decision-making, we have to build user-friendly applications.

**III. GIS AND REGISTER-BASED POPULATION CENSUS 2001**

15. The planned register-based population census in the year 2001 requires the creation of three new system components, namely i) a central address register based on input from the municipalities, ii) inclusion of single dwellings in the register, and iii) attaching the co-ordinates of buildings to population and enterprises. This is a mammoth task, involving ministries, municipalities and agencies.

**a) Information on Location for Addresses in Databases and Registers**

16. The usual goal of addresses is to deliver post to addressees. Limited misspelling, use of abbreviations, etc. is of little consequence when the address information's main task is to guide the mailman to the correct mailbox.

17. In the case of GIS, real estate/cadastral information is used extensively when putting statistics on the map. Address information, although often ultimately transposed into real estate-related centroids, is another important identifier. Two types of problems occur: poor standardization of street addresses and addresses that do not indicate a location. "PO Box" and rural mailbox-numbers are appropriate for mail delivery, but worthless for geo-coding purposes.

18. For obvious reasons, the postal function has set the standards also for data registers. Geo-referencing presumes standardized identifiers and precisely described location. At present, Swedish data registers do not provide this. Data from the Statistics Sweden Population Register (a copy of the National Tax Board's register) is extensively used for statistical purposes. However, it cannot be geocoded without extensive corrections and matching against Statistics Sweden's own geographical database. A similar situation pertains to the Swedish Business Register, administered by Statistics Sweden.

19. A national standard for addresses is now being developed by *the Swedish General Standards Institution (STG)* and has recently been remitted for comments. The resulting standardization will eventually enable more efficient GIS applications with better quality.

#### **b) Registers on Buildings and Apartments**

20. A project aiming at digitization of *buildings* was completed by the National Land Survey in 1995. A similar digital register for *apartments* is under development and tests are being carried out in some municipalities.

21. Municipalities will have to play an active part in the creation of a central address register and a register for buildings and apartments. They - and only they - have the knowledge and information on names and locations within their administrative realms.

22. At the same time, there is a pledge from central government that no new duties will be added to local governments' administrative burden, in order to keep the local taxation at the same level. There are some indications that municipalities could avoid this new task with reference to the above-mentioned central/local agreement. Opinions also differ between various stakeholders in the public sector. The foundations for the new system are not yet well established.

### **IV. INTERNAL CHANGES AT STATISTICS SWEDEN**

#### **a) The GIS Organization**

23. During 1996 and 1997, discussions regarding the organization for GIS in Statistics Sweden have been in focus. In order to develop, promote and launch GIS-based methods, Statistics Sweden has initiated a GIS project with the author of this paper as project leader. The project budget is about 1.4 million SEK annually and the funds are used primarily for infrastructural and strategic purposes.

#### **b) Building a Register System with a Spatial Dimension**

24. In spite of good preconditions, Statistics Sweden has not fully succeeded in creating a register-based statistical system and, to a large extent, data has been collected through censuses and surveys. To some extent this is due to confidentiality legislation and its interpretations. However, the attitudes towards data registers seem to have changed with the spreading of information technology in society, and the need to achieve a cost efficient statistical system.

25. Inspired by experiences from our colleagues in Denmark, a "register project" was launched in the beginning of 1997. The envisaged system is built around a core of four basic registers covering the demographic labour market, economic and geographical data. Seventeen satellite registers - or register modules - on education, income, occupation, etc. are attached to the core.

26. Of particular interest is the explicit geographical dimension and GIS module in the register system. This means that all statistical data will have a location expressed with x, y coordinates attributed to it. The development and implementation of a register-based system will take several years, and there will be reasons to come back to this in future ECE conferences.

### c) **A New GIS Strategy**

27. As mentioned earlier, the implementation of GIS has largely been technology-driven. The value-added character of geo-referenced statistics has been difficult to establish, sometimes more difficult internally in Statistics Sweden than among clients. This called for a new strategy that has been developed within the GIS project. The main components of the revised strategy are presented below.

#### 28. **An Active Search for "Most Relevant GIS Applications"**

We aim at actively looking up statistical products where the geographical dimension is crucial, instead of working with products where colleagues are motivated, but the spatial dimension in their products is less important. The proposed register system clearly indicates where our efforts should be focused. The desire to be a learning organization is better realized by giving highest priority to commissioned work which also improves the competence of our staff.

#### 29. **A Broader Range of Products and Services**

Another component in our new strategy is to broaden the range of GIS products, from simple "press button solutions", Internet or Excel-based GIS applications, via Mapinfo- or ArcView based applications, to very specific ArcInfo-based solutions.

30. We also try not to let our success with relatively simple Business-GIS applications detract us from developing an infra-structural GIS that can be used for more advanced purposes, for example analysis and sampling. With the down-sizing of our IT-system, we are planning to simplify access to Statistics Sweden's geographical database and to promote its internal use.

#### 31. **Mainstreaming**

*Mainstreaming* of GIS will be more important during the coming years. We will focus on participation in strategic development projects in statistics, rather than running separate GIS projects. In this respect, the above-mentioned register project is one of the most important.

#### 32. **Co-operation with Other Stakeholders**

We aim at joint ventures with our most important counterpart, the National Land Survey, in order to more closely link statistics and land information. A test project is currently running where integrated statistics and geo-data (i.e. base maps and real estate co-ordinates) can be accessed via Internet without using traditional GIS software. It is a good example of the "thin" client applications executed at the "fat" server-end of the system.

### **33. International Co-operation**

Sharing experiences with other NSIs and international organizations and learning from their success and failure is increasingly important for Statistics Sweden. Bilateral co-operation with other countries and GISCO/Eurostat has a significant place in our plans, in particular in developing a European GIS beyond today's polygon-based approach.

## **V. CONCLUSION**

34. In GIS the sophisticated solutions which are technically possible might not be financially reasonable, socially acceptable and with the desired quality. Focusing on the technology itself does not explain the causes of potential failures.

35. However, there is a good reason to be optimistic about the future of GIS and geo-referenced statistics in Sweden. With our new internal strategy, a change of government pricing policy, and access to additional geodata on buildings and apartments, the prospects look good.