SKALIS – A Method for Speeding up the Start of far-reaching Interoperability Work

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Abstract: For many years Skatteverket (The Swedish Tax Agency) and Lantmäteriet (National Land Survey of Sweden) have had a comprehensive exchange of real property related information. Major interoperability problems have been encountered since the exchange of information began. The problems have had several causes and have given rise to unnecessary costs and quality problems for both agencies.

Skalis was a co-operative project between Skatteverket and Lantmäteriet. The project was carried out during the period October 4th 2006 — April 4th 2007. The aim of the project was to quickly and at a limited cost obtain a general picture of several areas of activity in the real property sector. The primary goal was to obtain a good overview of the sector and thereby create a stable platform on which to continue the work. The Skalis project was a business-driven project and sharply focussed on organisational and semantic interoperability. Leading specialists in these areas of activity were engaged to provide access to a wide pool of competence. The aim was not to solve problems but rather to identify and describe them as well as to create a basis for setting priorities.

1. Background

In Sweden, issues related to the need for "basic data agencies" [1] have been the subject of discussions since the 1990s. The main principle behind the basic data concept is that it should only be necessary to supply a piece of information or a dataset once and that, thereafter, it could be used by other agencies. Three sectors and government agencies were identified as having a particularly important role in Swedish society: information about companies, Bolagsverket (Swedish Companies Registration Office), national registration (Skatteverket) and real property (Lantmäteriet). The issue of basic data agencies has been the subject of several official enquiries and government declarations, but very little has, in fact, happened. The issue of interoperability has been considered in official enquiries carried out by the Swedish Agency for Public Management (Statskontoret, now VERVA — The Swedish Administrative Development Agency) and reported in "Guidelines for the development of standard formats to facilitate the exchange of information using standard electronic documents" [2] and "Architecture and frameworks for interoperability" [3].

In the real property sector, Lantmäteriet has responsibility for registration of ownership, charges, mortgage certificates, real property procedures and maps. Lantmäteriet also has responsibility for municipal registers containing information on buildings, addresses and apartments. Skatteverket has responsibility for real property assessment and taxation and also for national registration. Together, Skatteverket and Lantmäteriet carry out a comprehensive programme concerning the analysis of real property prices and real property valuation models.

Since the autumn of 2004, Lantmäteriet carried out the Elips project, which aimed to develop collaboration with other bodies to minimise duplication of work in connection with

the collection and processing of information. This presupposes common definitions of information requirements. More integrated systems for storage and uniform interfaces for information exchange will result in decreased costs for internal development and management and simplification for users. The integration of textual and geometric information will be greatly simplified [4].

An important motive force for Lantmäteriet's Elips project has been the EU PSI [5] directive from 2003 and the then on-going work with the EU INSPIRE directive [6]. The Swedish government has appointed a Geodata Advisory Group with Lantmäteriet's Director General as chairman. The task of the Geodata Advisory Group is to co-ordinate activities within the geodata sector, to harmonise concepts and more. As part of this work the group has formulated a National Geodata Strategy [7].

In May 2006, Skatteverket initiated the FIFA project with the aim of standardizing all notifications and other extracts from the Real Property Register and increasing the efficiency of the maintenance of the system and the quality of the data. Initially, work in the FIFA project was concentrated on creating a concept model and, thereafter, an information model and finally developing a standardized XML schema for real property taxation [8].

2. The Skalis project – Purpose and goals

The aim of the Skalis project was to create sound pre-conditions for the continued development work - not to realise new technical solutions. Skalis was solely business-oriented. The three main results expected from the project were: (1) to be able to identify possible "one-stop-shop" solutions and to generate benefits for citizens; (2) to create sound pre-conditions for increasing the efficiency and level of automation of information exchange, and to decrease duplicate storage of information; and (3) to improved information quality within both government agencies. This would be achieved by modelling the flow of information between the agencies (processes), the information objects that are common in these flows, and the concepts that are used to describe the objects and their attributes. In addition, the ownership of information would be analysed and an enquiry carried out concerning the conditions for collaboration between the agencies.

3. The Scope

3.1   The activities involved

The flows (processes) were modelled on three occasions. At the first occasion 13 processes in which information was exchanged between Lantmäteriet and Skatteverket were identified. After setting priorities, the following 5 processes were selected as the most important for modelling:
1. Changes to the division into property units
2. Acquisition of properties or buildings and site leaseholds
3. Preparatory work (which included five sub-processes)
4. Annual notification of real property tax assessment data
5. New registrations, changes and removal of buildings

3.2   Involved dimensions of interoperability

The European Interoperability Framework (EIF) defines generic standards with regard to three dimensions:
1. *Organisational interoperability*. This dimension concerns definition of activity goals, modelling of activity processes and supporting co-operation between organisations that

exchange information, even though these organisations may have different internal structures.

2. *Semantic interoperability*. This dimension defines the exact meaning of the information that is to be exchanged so that it can be interpreted by applications that have not been specifically developed to handle the type of information. Semantic interoperability makes it possible for systems to combine received information with other information resources and to process it in a meaningful way.

3. *Technical interoperability*. This dimension focuses on the technical issues that can arise when computer systems and services are to be linked. These issues include areas such as open interfaces, data integration, middleware, data presentation and exchange, accessibility and security.

In the Skalis project, efforts have primarily been concentrated on the upper levels where organisational interoperability has been dealt with in the Division of Responsibility [9] and Rules for co-operation [10] reports, and by modelling the information flows. Semantic interoperability has been dealt with in the Information object model and the Concept model. The technical level has not been included in the project.

4. General strategic options

At the start of the Skalis project it was decided that the work should be carried out quickly (6 months), with a high level of quality and with a limited budget (SEK 4 million), but that it should, nevertheless, cover the most important areas of activity. The project should also describe both the current and anticipated future situation. It was, therefore, necessary to place the modelling work on a very high level.

The strategy that was chosen for Skalis was to avoid entering too deeply into problems that required far-reaching, in-depth analyses. These major and/or difficult problem areas have, instead, been "red-flagged" and placed on a list for future attention.

5. Implementation

5.1 Methods

Methods that are common in system development projects were used in the Skalis project. Initially, UML notation was used in the modelling work and Visio for documentation. It became apparent that the methods had a number of weaknesses that were due partly to the high level in the modelling and partly to the qualifications of the participants who, although they were specialists in their own specific areas of activity, were not always activity/system developers.

For process modelling, UML functioned reasonably well during the actual modelling work, but the models were difficult to present to persons who had not participated in the modelling. The flows were rewritten in Astrakan's note sheets model [11] for the final report. The Astrakan model, were each step in the process is linked to the concerned information resources, was definitely much better for illustrating unnecessary double storage and quality deficiencies in a system.

The information object modelling was very unstructured from the start: partly because the participants had different interpretations of what was meant by "information object", partly because the activities in question are very complex, with difficult relationships between the objects and several exceptions from the principle rules. The models became much easier to interpret when we separated the "true" activity objects - phenomena that have an existence of their own disregarding the interests that the agencies have for them - from information concerning agency-related procedures.

For the concept modelling the Swedish Centre for Terminology's (TNC) methods were used for terminological issues. Experts from TNC were also engaged in the project to assist with the modelling. This proved to be a wise decision, as more than only expert knowledge in one area of activity is needed to be able to formulate clear and unambiguous concept definitions and terminological expertise is also needed. The concept modelling work was co-ordinated with activities with FIFA (in which TNC was also engaged), so that a common concept model could be finalised.

In accordance with the directive, Skalis should describe both the current and envisaged new scenarios. This caused problems for all types of modelling as the distinction between the two scenarios was not made sufficiently clear. Both are described in the same model and although attempts were made to highlight the difference — for example by using different colours — the results were unsatisfactory and the differences not clear.

5.2 General workflow

The project had two very clear peak production periods during which many persons were engaged. The first was between October 23 and December 5, when all planned modelling was done, and the second was during March 2007 when results were being circulated for comments.

At the beginning of the analysis phase there was a need for some complementary modelling. This was done at the end of January and beginning of February. All persons who had previously been engaged in the project, were invited to review the results of the project. All had a defined responsibility for special scrutiny of a specified process from a specified perspective (current or envisaged).
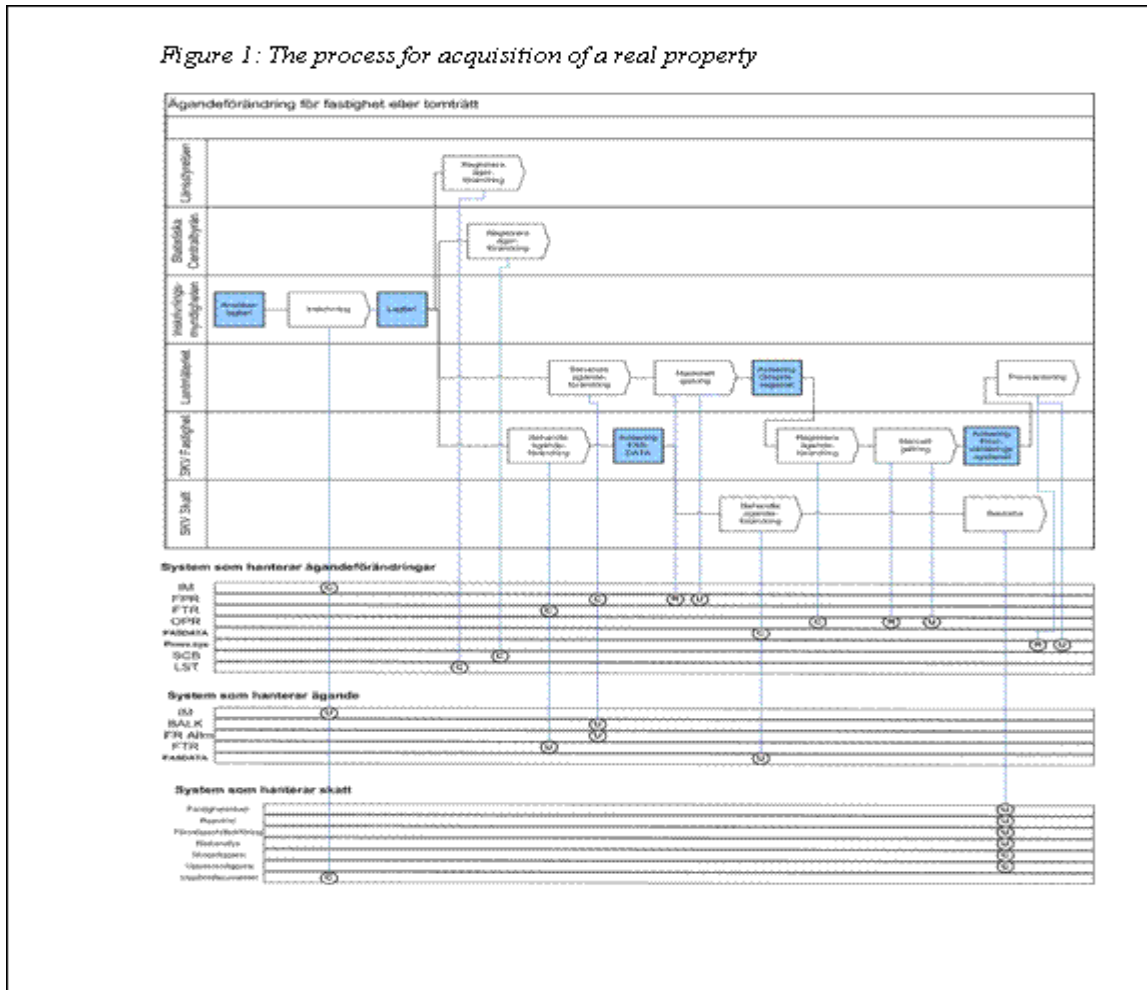
5.3 Evaluation of the method

A special evaluation of the project was carried out and the methods that were used. The evaluation was done through interviews and group discussions. The evaluation showed that the participants were very satisfied with the project and that they had found the work stimulating and educative. The greatest benefits were stated to be: the clarification of concepts, the opportunity to meet each other and the possibility to obtain a common, general view of activities. Factors which were considered to facilitate the work were: the project organisation, a well-functioning dissemination of information and the fact that the participants, in general, had the correct competence Things that could have been done better included: more clarity concerning handling of the current envisaged situation and more time should have been reserved for "homework"; There was also a feeling of uncertainty concerning what would be done next. How will we make full use of the work we have done?

6. Results

6.1 Processes and information flow

The prioritised processes were modelled [12]. The building permit process was modelled in a partly different context together with Statistics Sweden, the Swedish Association of Municipalities and Regions and representatives for five local authorities. Astrakan's note plan model was, as is stated above, far the best tool for clarifying problem areas. Below is an example from the process for acquisition of a real property.

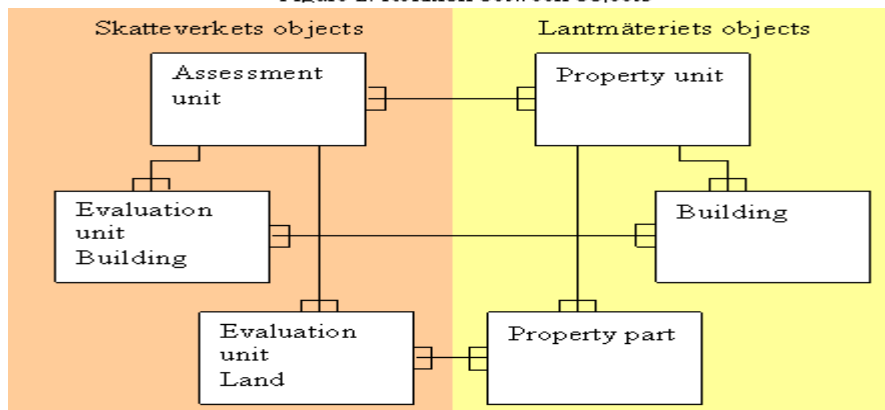Figure 1: The process for acquisition of a real property

Ägandeförändring för fastighet eller tomträtt

System som hanterar ägandeförändringar

System som hanterar ägande

System som hanterar skatt

Note that a refinement of the information takes place in every stage of the process although there is no feedback to any previous data source.

6.2 Information object

A general object model was created together with several special views in order to illustrate the most interesting objects [13]. A basic problem that was encountered in connection with information exchange between Lantmäteriet and Skatteverket was that — although the most important business objects are similar and often have the same extent — there **are** exceptions which result in the relationships being consistently "many to many."

Figure 2. Relation between objects

Skatteverkets objects

Lantmäteriets objects

Assessment unit

Property unit

Evaluation unit Building

Building

Evaluation unit Land

Property part

In its development work Lantmäteriet works with objectification of the information e.g. information in registers about, for example, a property is kept together with the spatial information for the property as an object. At present, Skatteverket does not have spatial data about its objects. An attractive solution to the interoperability problem would be that Skatteverket obtained its own spatial description of its objects. Communication can than be possible by referring to the area on which the object is placed.

6.3 Concept model

Work with the concept model was co-ordinated with FIFA so that a model containing 90 concepts could be created [14]. Several of the interoperability problems are caused by dissimilarities in interpretation. This can be illustrated for the concept, building. For Skatteverket building is almost any kind of permanent construction, which is in accordance with the Land Code. For Lantmäteriet, buildings have to look like houses, which corresponds to the definition in the Planning and Building Act. In addition, every local authority has its own interpretation of the concept.

6.4 Division of responsibility

The analyses of ownership of information was difficult, partly because laws are normally defining the concepts used by public agencies and than the ultimate owner of the concepts is, in a sense, the parliament. However some practical responsibilities in the maintenance of the concepts must fall on the agencies concerned. In order to achieve interoperability within a sector a body must be given the responsibility to co-ordinate the maintenance and the work with harmonization of concepts. The project analysed roles and responsibilities at different levels and described the necessary co-operation between different roles. During the course of the project it has been possible to identify where responsibility for the definition of concepts and information should lie. We have proposed that responsibility for definition of concepts and information should be broken down into the following four areas and roles:

- *Definition owner*: The organisation that has/owns the right to define a concept (a term)
- *Delegated definition owner*: The organisation that presents publishes and explains the definition. This role also includes feedback to the owner of the definition if a definition fails to function in practice
- *Information owner*: The organisation that interprets the definition and is responsible for the definition being created
- *Delegated information owner*: The organisation that is responsible for the storage of the information in which the information is kept

Additional analyses have been carried out concerning how the interplay between the different roles can function.

6.5 Pre-conditions for co-operation

The modelling resulted in a list of just over 90 issues, which should be carefully considered and possibly resolved before the introduction of an automated exchange of information. During the modelling these issues were divided into the following problem groups: economic, cultural, organisational, political, technical, practical and legal.

Additional analyses were carried out in which the problems were grouped as general problems in connection with co-operation between agencies and problems that are specific for Skatteverket and Lantmäteriet.

7. Impact on activities

7.1 Direct impact

The Skalis project gave both agencies a stable foundation on which to base new development projects and assignments. A number of projects were started before the project was completed including the FIKA project, which is aimed at objectification of Skatteverket's information and providing the objects with spatial attributes. The FIKA project also includes Skatteverket's input to the creation of the future SOA platform.

The total cost for the Skalis project was approximately SEK 4.5 million (=500.000 euro). Additional investments done by Skatteverket during 2007 and 2008 will be approximately SEK 10 million and during 2009 approximately SEK 5 million. The benefits for Skattverket during 2008 have been estimated as approximately SEK 10 – 20 million. Annual benefits in the future will be between SEK 35 – 45 million. In addition, the quality of the information will be improved.

7.2 Work after Skalis

A steering-group was appointed to co-ordinate future development work, the scope of which has been extended to now also include national registration. Within both Lantmäteriet and Skatteverket a large number of development projects are being carried out in which the issues that were red-flagged during the Skalis project are being worked on - some by both agencies together, others separately. The largest and most important concerns the creation of the future SOA platform. Some of the services have already been tested.

Work has also been started on other topics: Lantmäteriet is working on a new business model to facilitate co-operation; Skatteverket has initiated a pilot study concerning the establishment of a standardization committee led by the Swedish Standards Institute (SIS). The work has started with the analysis of a number of legal issues and proposals concerning changes to current legislation have been prepared.

On an overarching level, co-operation between the agencies has functioned well, but at the operative level less well. At a meeting on 2008-04-17 a decision was taken to start 17 working groups each containing representatives from the operative level, with a well-defined responsibility, from both agencies.

8. Conclusions and recommendations

The Skalis project was carried out as initially planned - according to the set timetable, within the given budget and with a result that came up to expectations. The work that has been done since the project was completed has run smoothly and the co-operative climate has significantly improved. The indications are that investments in the project will rapidly be recovered.

The implementation of the Skalis project was characterised by speed, the high level of the modelling, the breadth of the areas of activity that were studied and the way "red-flagged" issues were handled. We can recommend a similar approach for other interoperability projects for the following reasons:

- It is a rapid and cheap way to get started
- It provides a good overview and a stable basis for setting priorities
- It provides a stable foundation for follow-up projects that can be given well-defined targets and have access to available models to start from
- It results in an improved co-operative climate

Skalis was a dedicated activity-related project. This is important as it is an activity's requirements that should be the motive force for development. Methods and tools are,

however, developed by and for technicians and this can give rise to problems. It is important to obtain tools and methods that support a development that is carried out within and for an activity and which is steered by accepted models

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