

Experiencing Paneuropean Semantic Web Services: A Public Organizations' Perspective

Ioannis SAVVAS¹, Alberto DEIRO²

¹*Region of Central Macedonia, K. Rossidi 11, Thessaloniki, 54008, Greece*
Tel: +30 2310 409180, Fax: +30 2310 427420, Email: savvas@rcm.gr

²*Comune di Torino, Via Meucci 4, Turin, 10121, Italy*
Tel: +39 011 4430557, Fax: + 39 011 4430583, Email: alberto.deiro@csi.it

Abstract: This paper provides experiences from the establishment of Semantic Web Services in the frame of a European IST project. It presents the way of work and the lessons learned during all the phases from the selection of the service to the implementation of the portal. It also provides a first assessment, of the possible results that the provision of semantic web services will have to the effectiveness and efficiency of a Public Organization. Experiences are gathered through two showcases, in different kind of Public Organizations, for different services and in different countries.

Keywords: semantic web services, interoperability, public services, requirements, SemanticGov project

1. Introduction

The City of Turin (CoT) and the Region of Central Macedonia (RCM) participate, in the “Semantic gov project” as user partners. Through this project they have the opportunity to experience Semantic Web Services (SWS), to establish a sound communication with the citizens abolishing the barriers between administrative and common language. In addition SWS facilitate direct communication between European Public Organizations (POs) too, addressing interoperability issues concerning administrative semantic differences.

In this paper we present the results in the form of experiences of public servants (domain experts and administrators) and lessons learned that will help the replication of SWS to other organizations and services. A first assessment of the project products (portal, tools etc.) made by citizens and public servants both in Italy and Greece is also presented.

The experience concerns the way and the effort needed to model and set up SWS, while assessment of the products refers mainly to usability and efficiency issues. Effectiveness aspects are regarded from public administration’s point of view. The assessment was made in relation to the project goals and the goals of citizens and public servants as identified through a first interim circle of communication between them and the project members.

2. Objectives

Before a client (citizen, business, civil servant) can request a service, (s)he has to discover what (kind of) service fulfils her/his needs. The service identification and discovery is currently performed on an ad hoc basis by the client alone, without substantial help from anywhere else, in a time and energy consuming, as well as frustrating way. In most cases, the client has to contact a series of potential service providers to get information about the services they may provide.

This project aims to address the above needs and help clients to [1]:

- Identify the needed services by providing an infrastructure for mapping needs-to-services.
- Discover the service through a National PA Service Directory.
- Execute and monitor the service by providing an infrastructure for on-the-fly, semi-automated composition, execution, and monitoring of complex PA Services.

Furthermore it aims to support European citizens, businesses and civil servants to access Pan-European E-Government Services (PEGS), by providing a Communal Semantic Gateway to resolve semantic incompatibilities amongst different administrative systems.

This paper is trying to present the experiences gathered from the standardization and the modelling processes during the establishment of SWS. These experiences could be replicated to other PA services. The first assessment of the products' usability and the prospective effectiveness and efficiency gains, from the use of SWS as implemented through Semantic Gov project in real life Public Administration's (PA's) services both in Italy and Greece are concerned too. Thus, scientific innovation of Semantic-gov project is tested for usability in both the supply and demand side of public service provision.

3. Methodology

To achieve the goal of deploying two semantic web services, RCM and CoT followed a unified process based on: the identification of the suitable for implementation services, the description of the services' use cases, the identification of the goal tree and finally the development and validation.

The identification of the suitable services was made using specific criteria:

- The showcases should cover semantic interoperability requirements
- They should concern services that could be re-engineered
- They should have a pan-European dimension
- The showcases should be of different nature

Moreover, the stakeholders as well as the target groups were defined in this first phase. Actually, the target groups, which were (i) mobile citizens (who live and/or work in another country than their countries of origin) (ii) companies involved in cross-border activities, (iii) actual service providers and (iv) actual service suppliers, are parts of all stakeholders.

The services concerning the 'mobile' citizens were classified into five clusters:

1. Permits and Licences
2. Social Security
3. Education
4. Work
5. Income Tax Declarations and Refunds

The results of this phase showed that both 'mobile' citizens and companies face many problems when moving from one country to another. These problems have to do with [2]:

- Difficulties in finding information on administrative obligations;
- Difficulties caused by the different language (administrative documents need to be translated and information about services is available only in the national language etc.);
- Difficulties in getting help from the responsible Public Administrations
- Difficulties caused by differences in legislations.

This phase proved that there is high demand for PEGS both from the 'mobile' citizens' and from the businesses' side, since in most cases the problems they have cause frustration, delays and additional costs.

This first stage led to the identification of the services "Change of Residence from abroad to Turin" provided by the CoT and the "Naturalization" provided by the RCM. For these two services SWS should address both efficiency and effectiveness problems. They

should accelerate/speed up the production of sound administrative acts, giving the right information to citizens about the necessary documents. Furthermore, they should provide necessary information to citizens and civil servants, in order to distinguish services from one another and select the appropriate. Requirements have been set for both of these functionalities, meaning that every citizen who is eligible for this service would utilize it if (s)he wants to. Furthermore that every citizen that utilizes this service could not make use of any other similar, more beneficial for him, service instead of it.

CoT & RCM have to provide semantically rich information to all potential users (POs, citizens and public servants), which (requirements):

1. Will help them realize if they are potential users (and if this is the best choice for them) and what documents they are obliged to bring in,
2. Could be “personalized” without acquiring sensitive profile information, due to barriers for personal data protection
3. Concerns matters of identification – authentication and identity management to be taken under consideration.
4. Should be provided in a friendly and usable interface
5. Should be provided in many languages
6. Should be provided in a seamless way
7. Should be inclusive meaning that it takes care for all citizens, not only for those who have internet experience.
8. Should be provided for all European citizens and administrations in an innovative way and longlasting perspective.

Not all of the above requirements though are in the scope of semantic gov project. For the time being we focus on the requirements 1, 4, 5, 6 and 8. Other significant requirements mentioned before like “less time” and “less effort” for citizens are incorporated to the demand for efficiency on behalf of POs.

4. Technology Description

The SemanticGov system provides a comprehensive framework to deploy and execute SWS. From the end-users’ point of view it is possible to consider two main sets of components that have been the object of our experience:

1. The powerful runtime engine, which is able to discover and execute web services.
2. A set of management tools that allow system administrators and domain experts to configure the overall system, to deploy the services composing different web services, to build the specific service ontology and to enable the data mediation.

The discovery process is built inside the component called SemanticGov portal. This component provides a simple and effective interface to browse among goals identified by answering to specific questions, and detect the specific instance of the service that matches the user needs. Once the service is discovered a tailored interface is presented to permit the completion of the service by the citizen.

The management tools have been designed to allow the configuration of the whole system. The main tools used by system administrators and public servants responsible for specific domain are:

- Goal tree editor. A tool to design the goal tree which directly configures the appearance of the end user interface of the portal.
- A web service modeling toolkit. A collection of editors based on the Eclipse framework that provide the functionalities to edit WSML ontologies and a semi-automatic approach to create mappings between a source and a target ontology.

- The Semantic Web Service Composition Engine, plug-in for WSMO-Studio which performs the composition of a set of semantically described PA services deployed on SemanticGov WSMX server.

5. Use Cases

The two business cases that were used for the establishment of semantic web services are:

5.1 *Change of Residence from Abroad to Turin*

This is one of the most requested services by citizens coming to live in Turin. Both Italian and foreign citizens can request to register in Turin, providing information about him/her self, about his/her own family and about the country from which s/he is coming from. This kind of service requires a communication process between the citizen and the Municipality of Turin and between the Public Administration of origin and the Demographic Department in Turin. During these communication steps a large number of different data are shared and stored in the respective repositories. Usage of data usually reveals semantic differences:

- In evidence. They occur when the type of information stored in the country of origin has a different meaning from the corresponding information stored in Turin. They can be differences in naming of the evidence, in metadata, in possible values or that a corresponding type of evidence is not available.
- In effects. E.g. specific marital status could not be recognized from Italian legislation
- In security context. For example some information that the City of Turin asks for, since classified as public, may have a different ‘level of confidentiality’ in another country.

Service analysts who participate in the project were involved in the work regarding the deployment of a SWS which allows a citizen to discover the specific instance of change of residence tailored on his needs and to complete the service with a unique on-line process without having to spend time in fulfilling paper based documents and addressing them to different offices. This work, from the perspective of the Local PA, focused on three tasks:

1. Analysis of the existing web services in order to provide the needed requirements to compose the final web service
2. Provisioning of the domain knowledge to permit the creation of the specific service ontology and the goal tree ontology used by the citizen to discover the final tailored service
3. Provisioning of the needed information to configure the correct data mediation among the different ontologies involved in the service.

5.2 *“Naturalization” for RCM*

Naturalization service is offered to all foreign citizens (both from the EU and other countries) who want to become Greeks. It concerns, as main categories, foreigners who are married to Greeks, with or without children, refugees, Olympic athletes etc. A special category of the potential users of the service are citizens of European countries (especially countries of the former Soviet Union) that their ancestors were Greeks.

This kind of service requires the communication between the citizens (and POs of country of origin) and RCM, for the provision of several documents containing necessary information. Between entities taking part in such procedures semantics could refer to:

- The name of the information, (e.g. a difference in metadata or possible values),
- Differences in object definition (e.g. “adult”, “residence”, etc. - contextual information).
- Differences in organizational matters (the way a PA is structured and undertake responsibilities)
- Differences in legislation for personal data protection

6. Results

As the above analysis showed the problems concerning service provision refer to the ability of a PO to transmit an understandable by everyone, ad hoc, message about the information it needs. The work done to set-up the showcases and manage the overall infrastructure allowed RCM and CoT to learn two important lessons.

The first one is about the approach that should be followed in the future, regarding the development of new on-line services. Based on this experience, it is important to have a holistic view as reference while designing the architecture and the knowledge system that are beyond the new services. If it is possible to map the services provided by the local PA on a common ontology and at the same time to develop future web services describing them semantically based on the same ontology, a strong basis for future interoperability is being built. Besides a semantically enriched web service registered on a common infrastructure gives the possibility to build a comprehensive catalogue of all the services available by local PAs, helping them to compose single atomic services and offer enhanced services to citizens and professionals.

The second one is from the citizens' perspective. RCM and CoT realized that it is possible to provide services that map to their citizens' needs developing semantic web services. For example, with the change of residence service the Municipality provides just one service able to satisfy the request of the citizen in the simplest possible way, achieving different advantages:

- Simplified user interface, thanks to the goal tree discovery process (req. 4 of the requirements list mentioned in page 4)
- One stop service that hide the complexity of different atomic services that compose the final one. (req. 5)
- Direct communication channel between PAs of different countries, simplifying also the data mediation process. (req. less time, less trouble, efficiency)

A first assessment of the demo portals and administrative tools was made during June 2008. The evaluation was held by three types of users:

- Citizens: they assessed the functionalities provided by the Portal in order to discover the service that addresses their needs.
- Domain experts: They used the administrative tools assessing the ability to edit the service ontology, the mediation mapping and the goal tree.
- System administrators: they assessed the ability to manage the SemanticGov system using the available tools in order to create, update, deploy and configure services and ontologies.

The evaluation involved about 60 persons from all the above categories, both from Italy and Greece, who tested the SemanticGov tools and answered an evaluation survey focused mainly on two quality aspects, efficiency and satisfaction.

The first feedback gathered from citizens, about the Portal functionalities, is quite positive. They confirmed the portal usability. Functionalities are easy to be used and quite intuitive. The messages and labels are clear and they didn't need help. Concerning efficiency, they reported that the question and answer tool is browsed rather quickly even if sometimes it might be easier to group and show more questions together. From the point of view of general satisfaction the citizens were satisfied with the question and answer tool, because they feel like being the centre of the service and they look forward to use a customized service. This last point is the key factor from the citizens' perspective. In fact RCM and CoT realized that having modelled the services provided according to a common ontology and having described each single goal of the services in a goal tree editor, they allow the citizen to search in very fast way and they provide to him a method to identify the service tailored on his needs.

The second feedback comes from the public servants and system administrators who evaluated the administrative tools. This feedback is positive thanks to the graphical facilities provided in order to configure the system and a very intuitive interface. In addition, using these technologies it is possible to set up new advanced services composing single web services. Furthermore the use of data mediation allows provision of services that map in an automatic way the terminology used in different countries or even in different PAs within the same country.

The evaluation showed that the requirements set from the business perspective are addressed. It is possible that more attention was paid on efficiency issues (meaning that a citizen could be informed if (s)he is eligible for a service and what documents is obliged to bring in) than effectiveness matters (if this is the best choice between similar services) but this is something that will be confirmed from the results of the second phase of evaluation which will be held by autumn of 2008.

7. Business Benefits

From this project RCM and CoT gathered important feedback about the type of work needed to achieve interoperability amongst PA agencies within a country as well as between countries, easing the discovery of PA services by its customers and facilitating the execution of complex services often involving multiple PA agencies in interworkflows. More importantly, this infrastructure can be exploited as an enabler for total reengineering of PA service provision, and propose a paradigm shift of today's modus operandi.

Participation of public servants in the following activities gave them the opportunity to gain valuable knowledge. Once the use cases of the two services had been fully described the development phase started. During this phase the local PA main contribution focused on the semantic description of the services. In this case the domain knowledge owned by the two local PA experts was used in two different tasks: the first one related with the work needed to map the specific service concepts on the GEA model [3] in order to build the service ontology. The second task was the identification and confrontation of the interoperability problems across the information systems of European PAs involved in the showcases. In particular, an ontology mapping was made in order to solve the detected interoperability conflicts involving GEA concepts like evidences, evidence placeholders, service preconditions, service effects and clients.

The final task that involved the two local POs focused on the description of the service goal tree, a specific domain analysis aiming at providing a multi-step question-answer approach involving the end-user in order to identify the specific instance of the service which addresses citizens' needs.

The whole activity done by the Region of Central Macedonia and the City of Turin involved two types of users: Domain experts and System administrators.

The interoperability issue and the deficit in the back-office communication amongst the different PA agencies remain issues of critical importance for the implementation of citizen-friendly PA service provision. To this direction, SemanticGov provides guidelines, and valuable concepts.

RCM and CoT will make use of the SemanticGov proposed concepts, and solutions to demonstrate seamless, electronic service provision between their countries and other EU members. They will exploit this case, internally as a guideline for future eGovernment services development, and disseminate this experience externally as a best practice to be communicated to national and European forums.

8. Conclusions

Experiencing the building of SWS for 2 ½ years taught RCM and CoT useful lessons for what they can expect from the use and what they can reuse as best practice in PA domain. Achieving interoperability in a semantic level both amongst POs and between PA and external entities, like citizens and businesses could surely help to the effectiveness and efficiency of the provision of services by a PO.

More specifically, service provision for the two case studies is supported from the use of SWS in the following:

Change of the *modus operandi*. There are changes in the way that RCM and CoT communicate with other entities (POs, European citizens etc.), in order to describe them the information needed. This consequently impacts on citizens, fulfilling their requirements for less time and trouble during their interaction with PA and on public servants lighten them from recurring routine tasks, increasing their available time for back office procedures. These changes improve efficiency performance, while on the same time address problems of effectiveness too. Additionally, the new service adheres to the EU principles like Paneuropean dimension, innovation and sustainability.

The standardization and modelling of services according to GEA concepts allows the reengineering of services so as to be provided in an easy and efficient way. New standards provide the necessary infrastructure for enhanced semantic web services in PA.

To this context the use of knowledge of domain experts becomes possible and necessary for the entire needed software infrastructure (e.g. description of the service goal tree).

With the use of Semantic web services it could be possible to provide an on-line service accessible to all kind of citizens. In fact achieving semantic interoperability among web services it could be possible to create interactions between different web services providing information to different Departments inside European Public Administration. Furthermore, it could be possible to gather citizen information directly from the Country of origin, without having to ask citizens for these data.

Acknowledgements.

This work is funded by the “SemanticGov” project (FP6-2004-IST-4-027517).

References

- [1] V. Peristeras, T. Vitvar, A. v. Overeem, SemanticGov: D1.1: Extended Project Presentation, 28/2/2006
- [2] M. Billiet, S. Bonomi, E. van der Graaf, E. Kirgiannakis, N. Loutas, A. van Overeem, V. Peristeras, K. Tarabanis, J. Witters., SemanticGov:D 2.1 Business, semantic and technical requirements analysis for semantic e-Government services at the national and pan-European level. 13/12/2006
- [3] V. Peristeras. The Governance Enterprise Architecture - GEA - for reengineering public administration. *Business Administration, University of Macedonia, Thessaloniki, 2007*