# eGovernment Policy Evaluation Support using Multilingual Ontologies

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**Abstract**: The paper describes the problem associated with multilingual systems in the local government. The paper highlights the issues that are affected by the multilingual systems. Some possible solutions, such as a single ontology system, which deal with the multilingual problem are presented as well.

**Keywords**: eGovernment, Policy Evaluation, Ontologies, Knowledge Management

# 1 Introduction

The *QUALEG* (Quality of Service and Legitimacy in eGovernment) project is an innovative project sponsored by the European Union to promote the relationship between the local governments and the citizens. It aims at allowing the local governments to maintain a direct connection with the citizens through the ongoing adjustment of their policies according to the assessment of the citizens' needs. To realize this objective, QUALEG employs an ontology-based approach to enable the use of a single solution commensurate with the multilingual nature of the project. This approach embodies many innate advantages: it eliminates redundancy of knowledge bases and it establishes a common fundamental structure shared by individual eGovernment services. Thus, QUALEG can be extended to incorporate different aspects of local governments worldwide.

# 2 QUALEG

The *QUALEG* project aims at enabling local governments to manage their policies in a transparent and trustable way. This implies that local governments should be able to measure the performance of the services they offer, to assess the satisfaction of citizens, and to re-formulate policy orientations on such elements with the participation of citizens.

The basic rationale of QUALEG is expressed in an OECD [2001] report, ***"engaging citizens is a sound investment in public policy-making."*** As these new relationships have evolved and matured, local governments have increasingly recognized their reliance upon the active contribution of citizens in making better decisions and achieving policy objectives. In this perspective, strengthening government relations with citizens may be seen as a sound investment in tapping new sources of policy-relevant ideas, information and resources for implementation".

Among the driving forces that have led governments to strengthen their relations with citizens, are the needs to:

- **Improve the quality of policy**, by allowing governments to tap wider sources of information, perspectives, and potential solutions to meet the challenges of policy-making under conditions of increasing complexity, policy interdependence, and time pressures.
- **Meet the challenges of the emerging information society**, to prepare for greater and faster interactions with citizens and ensure better knowledge management.
- **Integrate public input into the policy-making process**, to meet citizens' expectations that their voices be heard and their views be considered, in decision-making by government.
- **Respond to calls for greater government transparency and accountability**, as public and media scrutiny of government actions increases and standards in public life are codified and raised.
- **Strengthen public trust in government** and reverse the steady erosion of voter turnout in elections, falling membership in political parties and surveys showing declining confidence in key public institutions.

The innovative technology of QUALEG implements a knowledge harvesting tool that supports and stores information provided by citizens. The project is conducted in France, Germany, and Poland. The project needs to provide one solution that can work in a multilingual environment. To achieve this goal QUALEG has a number of objectives:

- Homogeneous management of eGovernment services
- The use of ontology to convey semantics

- Knowledgeable debates

Technological domains relevant to these objectives are web services orchestration, semantic enhancements of web services, workflow management, workflow optimisation, ontology, intelligent agents, portals, and web contents management software.
The QUALEG solution aims at enabling:

- Local governments to facilitate citizen information, consultation, participation during all the policy cycle of public action by using workflows and semantics facilities provided by QUALEG solution.
- Local governments to dynamically adjust public action objectives to citizen perception, during all the policy cycle by using semantic and ontology facilities from QUALEG Solution.

## 3 The Challenge

QUALEG is a project that addresses information in multiple languages. A challenge that many multilingual information-based projects share is to avoid creating multiple presentations of the knowledge base in different languages. Today, most projects contain redundancy in representation, which makes it difficult to maintain the knowledge base. QUALEG aims at providing a single solution that functions in a multilingual environment without this redundancy in representation.

QUALEG, as aforementioned, has pilots in France, Poland, and Germany and thus currently focuses on three languages: French, Polish, and German. Since it is necessary to have a common platform for communication and interaction among the partners, both current and prospective, English is used. QUALEG translates from English to these languages. Although French is similar to English, other European languages, such as Polish and German, are more difficult to translate, and QUALEG must address these difficulties.

The Polish language seems to be chaotic to many people who come into contact with it for the first time. Polish is marked by many endings and alterations in words. Grammatical structures are essential for effective communication in all languages, but in Polish the connection between grammar and meaning is particularly important because it determines the form of the word to a larger extent than in western European languages. The position of a word in a Polish sentence does not play an important role and there are no articles, as in English. Words themselves contain the grammatical function, so if an inappropriate grammatical rule is used, communication can be disturbed or even made ineffective. The knowledge of the basic forms of words given in a Polish dictionary is not sufficient to make comprehensible sentences, since Polish word endings change both the form of the word and their function in the sentence.

The German language possesses its own difficulties. For instance, German is famous for its very long, complicated words. The reputed longest word in the German language, the forty character long word Donaudampfschifahrtsgesellschaftkapitaen, was the name of a Danube steamship company, once the world's largest riverboat operator, which went bankrupt nearly a decade ago. The length of the words, comprised of other words, makes translation difficult. [German, 2005]

In addition to language-specific difficulties, working with different languages entails difficulties in translation. One difficulty is that many languages contain words that do not have exact parallels in other languages. A word in one language may have some nuances that are hard to include in a translation to a word in another language. Some words are hard to translate if one wishes to remain in the same grammatical category, since a word in one language may correspond to a word that is a different part of speech in another language.

Another common difficulty addresses parts of speech. For example, prepositions are a hazardous area in any language, since these short, seemingly innocent words often result in different meanings in different contexts. Translation must pinpoint the meaning to be accurate. Another difficulty in translation arises since often a given word has different meanings and thus the translation of one word into another language can yield many different options. For example, the verb "to get" in all its various uses covers nearly seven columns of the most recent version of the *Robert-Collins* French-English dictionary.

The first solution that comes to mind when working with multiple languages is to use automatic tools for language translation. However, this solution is not viable, since automatic machine translation (MT) currently suffers from several critical limitations.

Today there are many applications that attempt to perform machine translation. Some of these tools have been under development for more than twenty years. However, these tools have yet to achieve a level of proficiency comparable to human translation. Although there are no universally accepted evaluation methods, different methods of the evaluation of adequacy of MT systems in specified operational contexts still indicate that MT does not attain a sufficiently good level, in terms of measures such as intelligibility, accuracy, fidelity, and appropriateness of style.

Furthermore, the issue of diagnostic evaluation to identify limitations, errors, and deficiencies, which can be corrected or improved, has been the subject of much discussion in recent years. Human translation has the ability to identify its own limitations and thus avert translation errors. MT, in contrast, has yet to acquire this ability and therefore incurs errors. Moreover, a person who makes a mistake once can profit from this error and learn for the future. MT has yet to acquire this ability, too. [Arnold, 1993], [Arnold, 1994]

Therefore, since machine translation is not appropriate in this instance, QUALEG adopts an ontology-based approach for representing knowledge to facilitate the multilingual interaction between citizens and local governments.

## 4 Ontologies

According to one definition, **an ontology is a description (like a formal specification of a program) of the concepts and relationships that can exist for an agent or a community of agents**. **What is important is what an ontology is *for***. [Gruber, 1993].

Another definition of an ontology is a specification of a representational vocabulary for a shared domain of discourse -- definitions of classes, relations, functions, and other objects.

An ontology defines the terms used to describe and represent an area of knowledge. Ontologies are used by people, databases, and applications that need to share domain information, when a domain is just a specific subject area or area of knowledge, such as medicine, tool manufacturing, real estate, automobile repair, financial management, etc. Ontologies include computer-usable definitions of basic concepts in the domain and the relationships among them. They encode knowledge in a domain and also knowledge that spans domains. This way, they make that knowledge reusable. [W3C, 2005]

The word ontology has been used to describe artifacts with different degrees of structure. These range from simple taxonomies (such as the Yahoo hierarchy), to metadata schemes (such as the Dublin Core), to logical-based theories. The Semantic Web needs ontologies with a significant degree of structure. These need to specify descriptions for the following kinds of concepts:

- Classes (general things) in the many domains of interest
- The relationships that can exist among things
- The properties (or attributes) those things may have

Ontologies are usually expressed in a logic-based language, so that detailed, accurate, consistent, sound, and meaningful distinctions can be made among the classes, properties, and relations. Some ontology tools can perform automated reasoning, and thus provide advanced services to intelligent applications such as: conceptual/semantic search and retrieval, software agents, decision support, speech and natural language understanding, knowledge management, intelligent databases, and electronic commerce.

Ontologies figure prominently in the emerging Semantic Web as a way of representing the semantics of documents and enabling the semantics to be used by Web applications and intelligent agents. Ontologies can prove to be useful for a community as a way of structuring and defining the meaning of the metadata terms that are currently being collected and standardized.

In recent years the development of ontologies has become part of many projects. The reasons to develop an ontology in a project include: to share common understanding of the structure of information among people or software agents, to enable reuse of domain knowledge, to make domain assumptions explicit, to separate domain knowledge from the operational knowledge, or to analyze domain knowledge.

## 5 Multilingual Ontologies

QUALEG adopts a multilingual ontology-based approach. Ontologies enable the representation of the eGovernment domain information and the relationships between its concepts. The multilingual ontologies can allow the correlation between different local governments and their appropriate languages and topics of interest. Thus, the solution that QUALEG proposes incorporates one ontology system with multiple representations of the topics in the local languages. In other words, the one representation of the ontology allows multiple mappings from each language to the same ontology.

Furthermore, to maintain uniformity and to avoid repetitive translations, QUALEG processes the information from the input, for example debates and emails, in the local languages. The processing stage identifies the main topics, the contexts, of each input. The next stage is the mapping of the information to the appropriate ontology, which is also performed in the local languages.

Each ontology is represented in multiple languages. Each topic, such as School or Teaching Material, defines an ontology. For each ontology multiple translations of a set of words defining the ontology are assigned. These words can be in each of the local government languages and are not limited in number.

An example of the mapping process is outlined in Figure 1. A sample Multilingual Ontology is displayed in Figure 2.

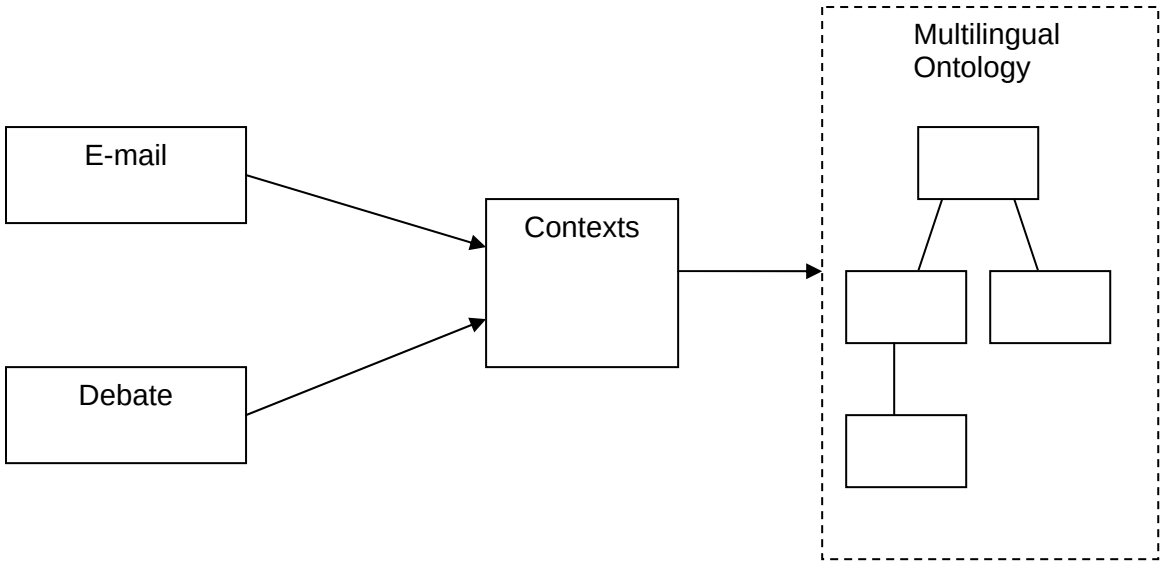


Figure 1 – Mapping to Multilingual Ontology

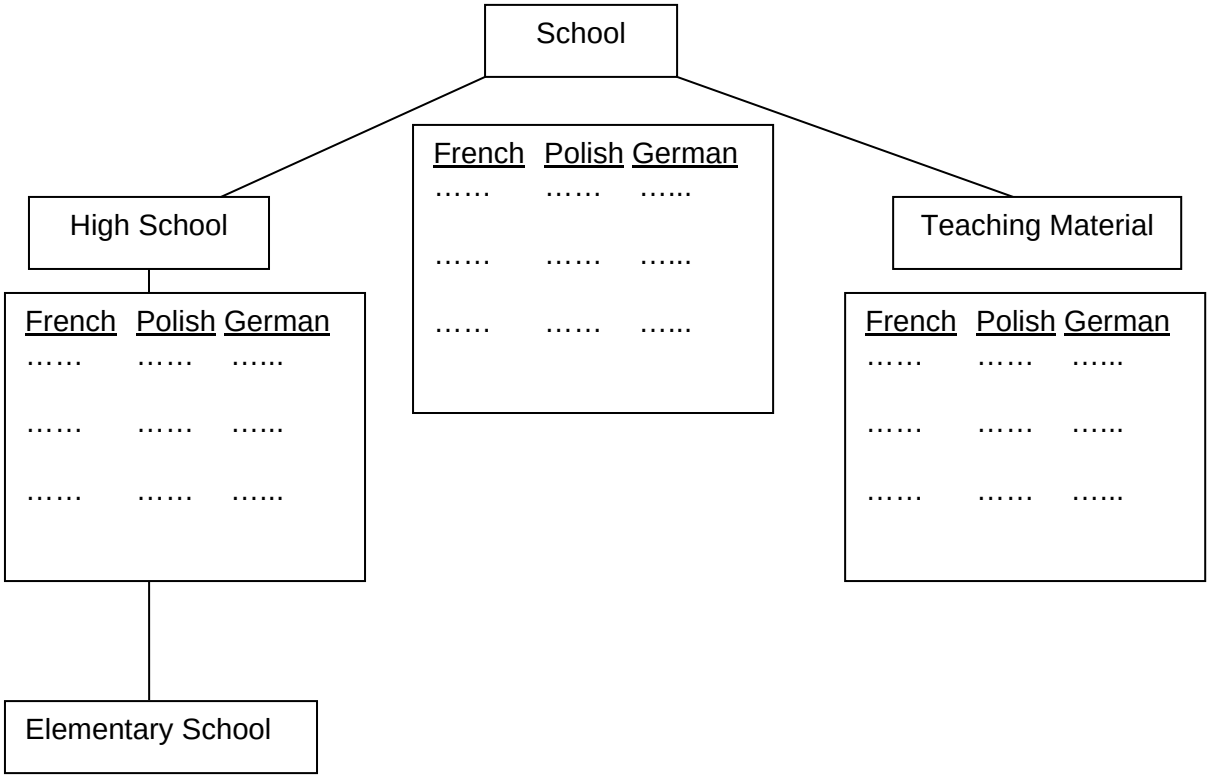


Figure 2 – Multilingual Ontology

## 6 Advantages

The main advantage of a multilingual technology based on a single ontology is that it saves having to build an identical system in each language. This prevents the redundancy of representation. Redundancy in representation leads to complex system maintenance and frequent mistakes in updating similar information in each of the local languages.

Another advantage is that such a multilingual ontology system can place different emphases on each topic according to the importance specified by the local government. This allows the local governments to customize the application according to their individual and changing needs. A system built on multilingual ontologies enables adaptability, thus facilitating current and future changes. This quality of adaptability serves as a basis for future expansion and permits the use of ontologies already created in different languages.

A further advantage of the multilingual ontology-based technology is that such a system supports the realization of the importance ascribed by the local language to each topic through the use of multiple synonyms. Each language can supply a set of words describing each ontology. The length of the list of words and the variations of different meanings for each ontology can emphasize the importance of the ontology to each language.

## 7 Conclusion

QUALEG is a project that aims at supplying local governments with new techniques and tools to manage their policies. Future directions of research and development include identifying methods for allowing real-time interaction between local government representatives and citizens through the use of multilingual ontologies. Other aspects of research include identifying the ability to recommend a policy to the local government, based on the information in the ontology. Additional directions are automatic translation of words which define the ontology based on their context.


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