An Ontology-Based System for the Marketing Information Management

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Outline

- AMI-SME (Analysis of Marketing Information for Small and Medium Sized Enterprises)

1. An introduction to the motivations of the project

- A general presentation of the AMI-SME solution.

1. The limitations of the traditional tools for searching the web as solution to the AMI-SME problem
2. The architecture of the AMI-SME system

Outline

- The main system ontology and the use of the ontologies in the system

1. The process of building the main system ontology
2. The use of ontologies in the AMI-SME system

- The naïve user and the use of formal ontologies in the future Semantic Web.

AMI-SME motivations

- The internalization problem.The competition for expanding to new markets becomes sharper for Small and Medium Sized Enterprises (SME)
- The marketing decisions depend on many factors: the strength of the competitors, the buying power of the customers, the legislation issues, etc.
- The SME's cannot afford to hire consultant companies for making detailed market studies because they lack financial resources
- We search a software solution that can help SME's in the internalization process.

AMI-SME solution

- The tools used by SME's for gathering information are web searching engines. Example :Google, Yahoo, AltaVista, etc.
- The limitations of these traditional tools for searching the web as solution to the AMI-SME problem

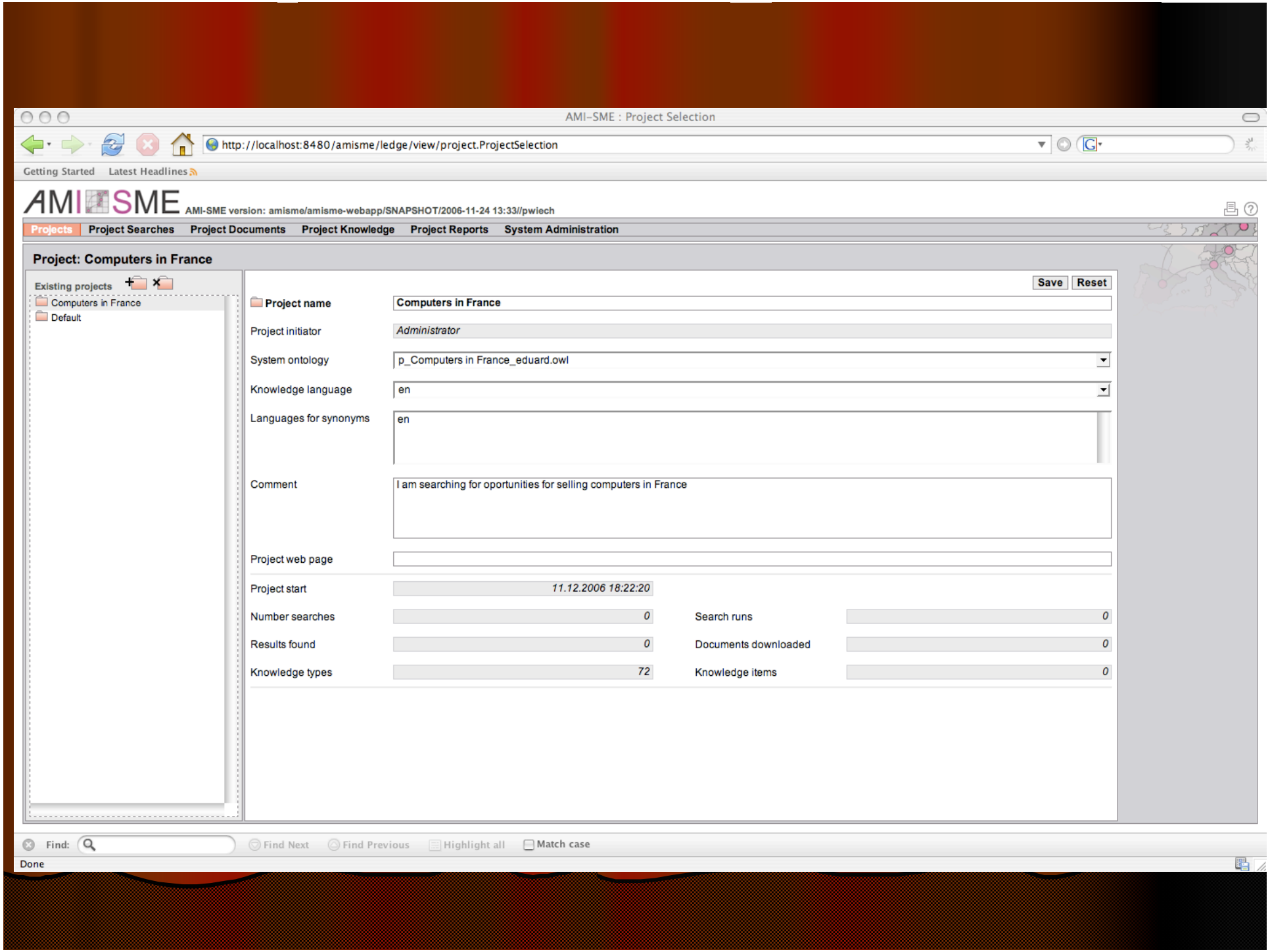
1. Lack of analytic support
2. Lack of support for the storage of information
3. Lack of support for organization of information

The architecture of the AMI-SME system

- The AMI-SME system is an ontology based flexible meta-searching engine coupled with a series of components for information extraction.
- Some basic concepts of the AMI-SME system:

- Information Source: any data repository or any software that exposes an interface for querying a data repository (Examples: web search engines, database systems, the user file system)

- Project: high level context that binds the user query, his/her personal ontology and the documents he/she is interested in


AMI-SME : Project Selection
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Getting Started
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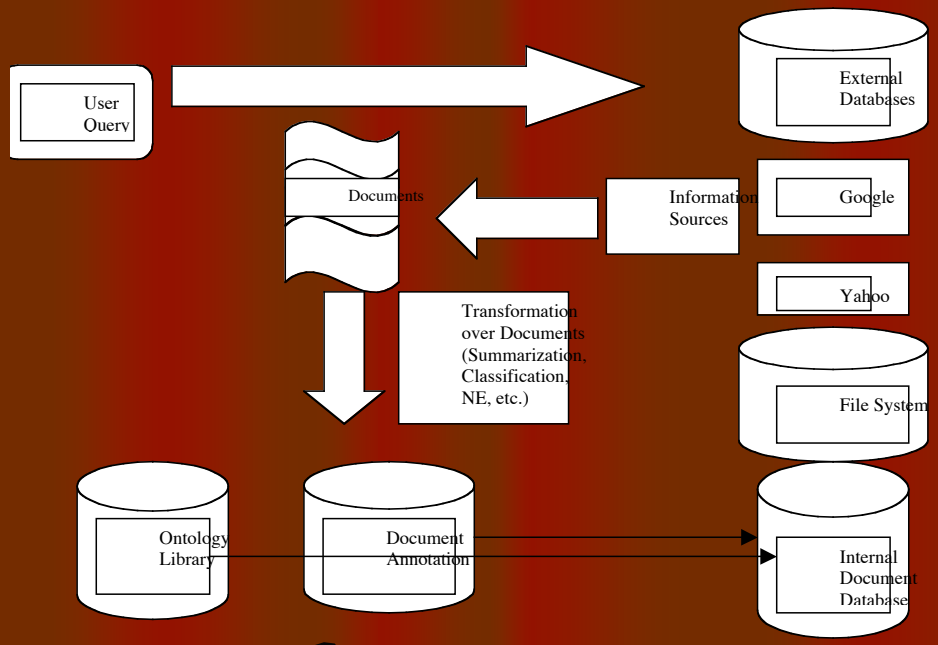
en
Languages for synonyms
en
Comment
I am searching for oportunities for selling computers in France
Project web page
Project start
11.12.2006 18:22:20
Number searches
0
Search runs
0
Results found
0
Documents downloaded
0
Knowledge types
72
Knowledge items
0
Find:
Find Next
Find Previous
Highlight all
Match case
Done

The architecture of the AMI-SME system

- Ontology library: The ontologies that are present in the system
- Internal Document Database: A database were the useful documents are saved.
- Annotation Database: A database were the document annotation, user comments and automatically generated summary are stored.

The architecture of the AMI-SME system



The main system ontology

- The ontology is called General Marketing Ontology (GMO) and formalizes the marketing domain for a company that wants to internationalize.
- The building strategy for GMO followed the next steps:

1. Definition of the domain and purpose of the ontology
2. Discovering the main ontology concepts
3. The language for representing the ontology selection and the effective modeling

The Domain of GMO

- A company that wants to internationalize needs a detailed perspective on the target market. GMO should contain concepts like “Market”, “Competitor”, “Product”, etc.
- The AMI-SME system gives the possibility to modify the ontology. GMO will be instantiated in different ways by different companies.

The purpose of ontologies

The ontologies in the ontology library have a threefold purpose:

-They assist the user in better formulating his/her query.

-They are used for labeling the user documents with relevant concepts and instances.

-They are used in NER and summarization tasks.

Building GMO (I)

Resources used in concept identification:

- Philip Koetler's *Marketing Management.* From this book we "borrowed" the top level vision on the market. A central part of our ontology is constituted by Porter's five forces (Supplier Power, Barriers to Entry, Threat of Substitutes, Buyer Power, and Rivalry)
- A set of web dictionaries about marketing mined with the TextToOnto tool
- The competency questions formulated by the users

Building GMO (II)

- Princeton WordNet for enriching the ontology with synonymous terms

- At the end of this stage the ontology had around 300 concepts taxonomically arranged and 150 relations and attributes. After the interaction with the users we reduced the number of concepts in the ontology to 100 and the number of relations and attributes to 50.

The language

Two conflicting requirements:

- Reusability and usage of the ontology on the SW. This means that the ontology should be represented in RDFS or OWL

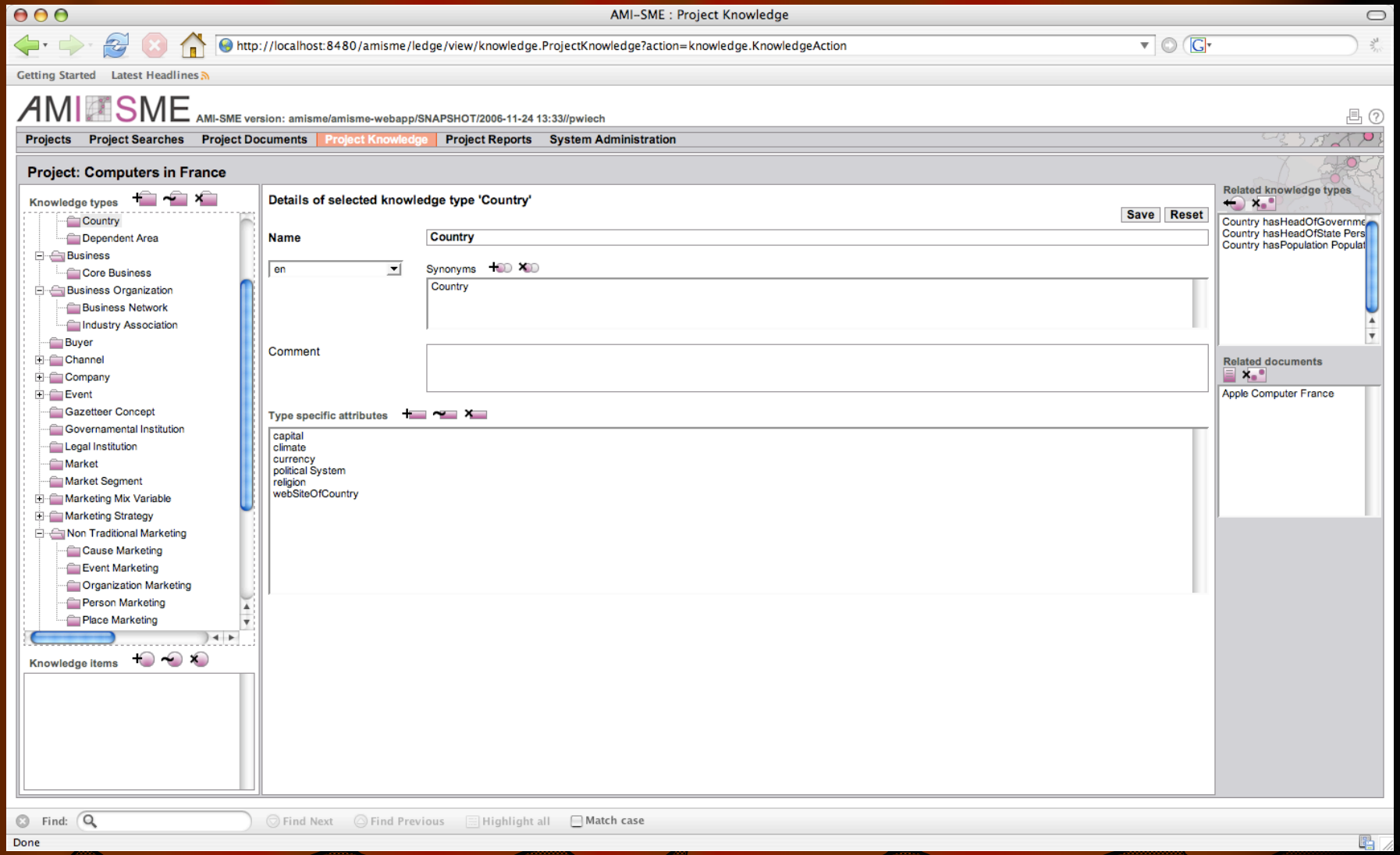
- The users requirements. They do not want to see “odd” OWL constructs (ex. disjunctions,hierarchy of properties)

We opted for OWL-DL language and for supporting a limited subset of constructs:

- State that a concept is in the IS-A relation with another concept (for example state that “Administrative Area” IS-A “Area”).
- State that two concepts are related via a certain relation (e.g.: the concept “Product” is related via the relation “hasSeller” with the concept “Seller”)
- State that a certain concept has a certain attribute (e.g.: the concept “Product” has the attribute “price”)

- Provide alternative notations for a certain concept. (In English the notation concept “Product” is “Product”, in Italian is “Prodotto”.)
- Add synonyms for the concepts in the ontology.
- State that a concept has a certain instance (“IBM” is an instance of the concept“Company”).
- Add statements about instances (“Dell” competes with “Apple” or Dell hasBudget “$500,000,000”).
- Add comments in the chosen language to concepts, instances, attributes and relations.

A view of the ontology



The roles of the ontologies in the AMI-SME system (I)

- Currently, AMI-SME Ontology Library comprises GMO and other ontologies which describe the products sold by two industry partners.

- The roles that the ontologies in the Ontology Library have are:

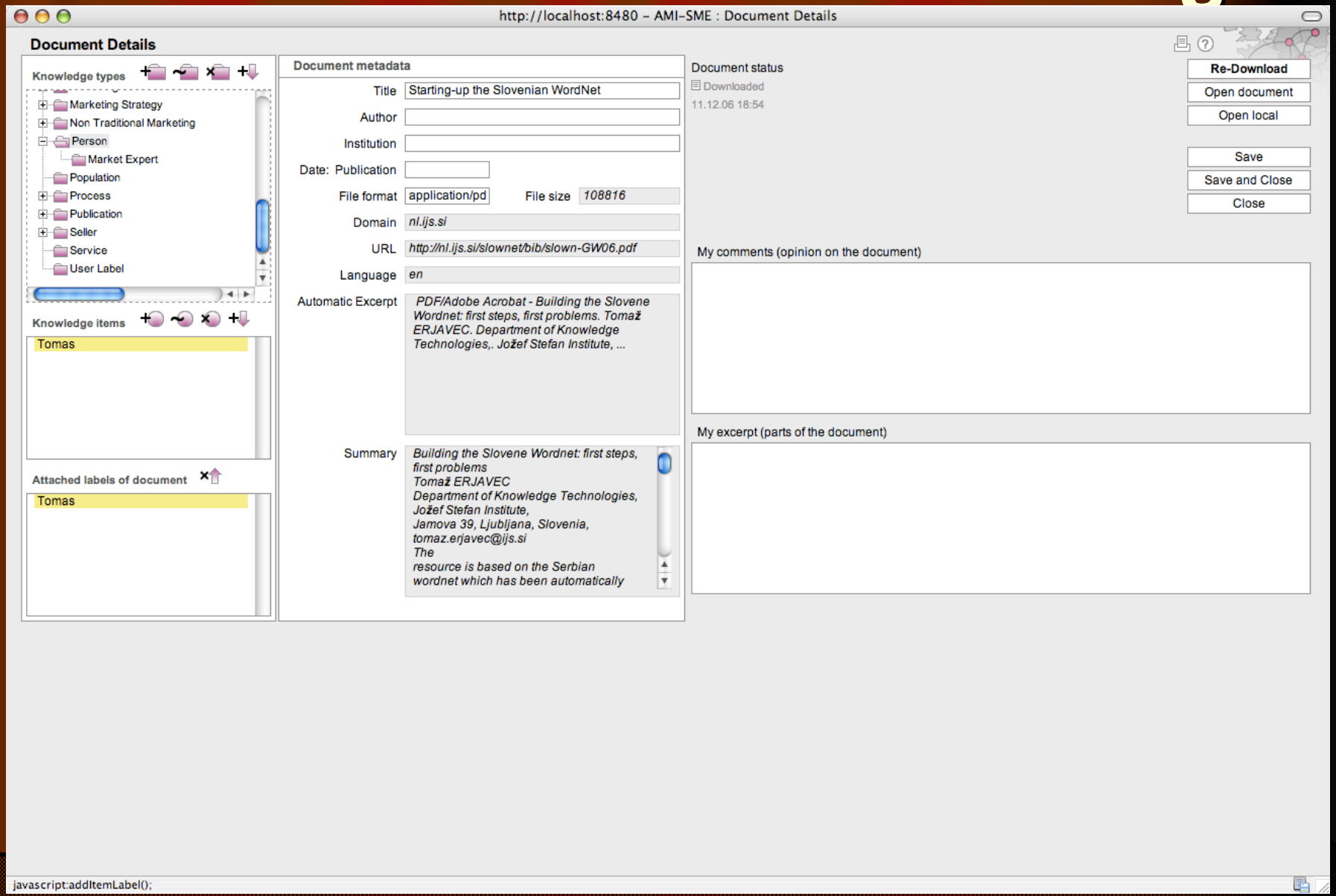
- *The annotation role*. The concepts and instances in the ontologies are used for document annotation. The annotation process takes profit of the taxonomic part of the ontology.

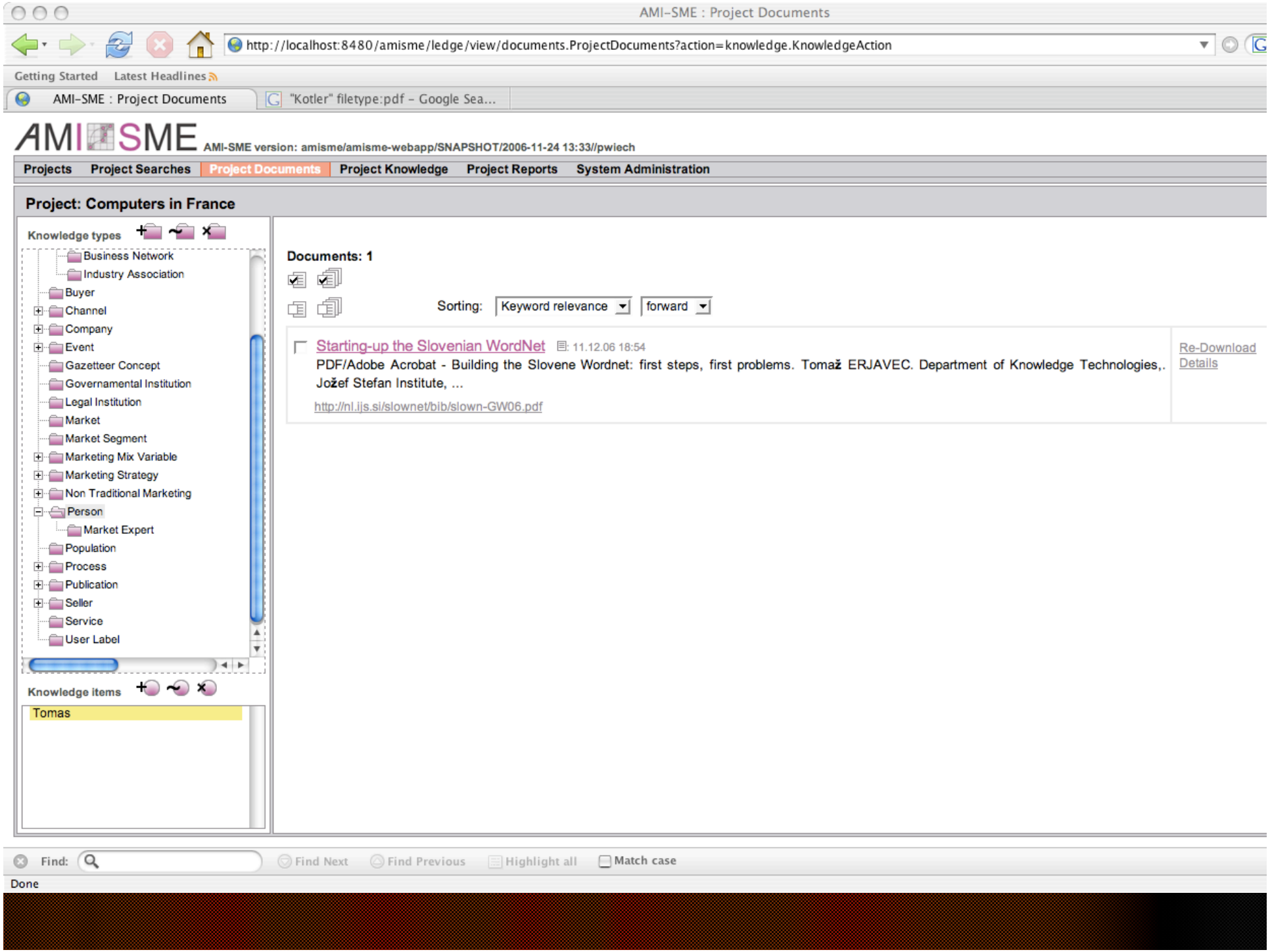
The roles of the ontologies in the AMI-SME system (II)

- *The NER and summarization role*. The NER sub-system in AMI-SME has two parts: the first part is a Gazetteer Based Name Entity Recognizer. The second part of the NER subsystem is based on the user's personal ontology.The ontology instances are searched in the documents.The personal user ontology concept and instances are also used in the summarization task.

- *Assisting the user to formulate his/her query role*. Because the ontology is bound to a certain project, it reflects a particular user interest.

Summarization and labeling

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Projects
Project Searches
Project Documents
Project Knowledge
Project Reports
System Administration
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Knowledge types
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Legal Institution
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Market Segment
Marketing Mix Variable
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Re-Download
Details
Find:
Find Next
Find Previous
Highlight all
Match case
Done

Ontologies and Semantic Web

- The frustrating experience the users have using web search engines like Google or Yahoo was one of the reasons for proposing the new Semantic Web.
- The problem: the lack of common semantics between men and machines.
- To bridge the gap between men and machines it is proposed that the semantics of the future web to be specified by formal ontologies (expressed in languages like OWL).

Ontologies and Semantic Web

- Formal ontologies reflect the intuition of the ontologist, i.e. a trained individual that masters the language of logic.
- But the naïve users cannot commit to formal ontologies.
- The naïve users have difficulties understanding some basic constructs like:

Ontologies and Semantic Web

- The semantics of the IS-A relation. For them the IS-A relation is a relation that links highly similar concepts.(Ex.: Marketing Expert put under the concept Market)
- The semantics of the relations themselves. They wanted to use the same relation names over and over even if the ontological meaning of the relation were different.
- The distinction between concepts and instances.
- The distinction between attribute, relation and concept is hard to grasp. For example “color” should have been a property of a certain product in one of our product ontologies. When confronted to the problem of adding the label “color” to the ontology, the users added it as a concept.

Ontologies and Semantic Web

- It should be clear enough from these remarks that an untrained user does not understand a formal ontology. For him/her an ontology is a collection of labels loosely coupled. His notion of ontology resembles more to the psycholinguist's semantic memory than to formal ontologies. Without training, the average user will never really commit to a formal ontology.

Conclusions (I)

- Up to now the information related to market obtained by Small and Medium Size Enterprises was hard to manage. To overcome this obstacle we developed the AMI-SME system, a meta-searching engine coupled with a series of useful components for information extraction.

- The system uses a library of ontologies to manage the information related to market.The core of the library of ontologies is the General Marketing Ontology, an ontology that formalizes the marketing domain for a company that wants to internationalize.

Conclusions (II)

- The AMI-SME system features were agreed with the project partners from industry. Because the system is still in the testing phase we did not perform a comparative testing of the AMI-SME system with other similar systems.

- The AMI-SME architecture allows for an easy integration of other information management components and allows for the easy extension of the library of ontologies. In the future, we plan to enhance the functionality of the system.