Use Case 4 in Technology Provider
A Corporate Knowledge Management Portal Supporting Customer Management Services

Challenge
An advanced corporate portal supporting sales and technical people in the customer management.
Solution
A flexible platform for the configuration of corporate portal by combining components for semantic search on the web, advanced user profiling and creation of personalised e-consulting and e-learning modules
Why a Semantic solution
To exploit the most innovative techniques for an exhaustive retrieve of the corporate knowledge and information from the web, combined with the profiling of the customers in a semantic portal, to support employee and customers
Key Business Benefits
A flexible, economic tool for the e-CRM to be exploited by the marketing and technical divisions of TXT; a set of open, configurable components to be added to the TXT Content Management Solution.
Business Partners
CMR (Milan Research Center)
Allaxia (Italy)

Keys components

Existing Software
Content Management Platform
Domain ontology and semantic nets for modelling competencies and corporate knowledge
Products and users DB (Product Portfolio)

Research and development
Semi-automated ontology/context creation
Semantic search engine
Semantic matching

Technology locks
Corporate domain ontology building and maintenance
Dynamic discovery of contents
Semantic Aggregation of content

1. Overview

The R&D division of TXT e-solutions is responsible for a national project, named e-Relations Hub, whose final objective is to provide a low-cost solution to the CRM (Customer Relationship Management) market, that is in continuous expansion but does not match the expectations of a great number of European companies. Currently available solutions can be divided into monolithical, complex and expansive proprietary products, focused on the needs and budget of medium-big companies, or much more simplified solutions, that can be to call-centers, that are scarcely customisable and do not provide added value services to the customers.
The TXT e-Relations Hub is a platform equipped with a suite of "plug-in" modules that can be easily combined by a company in order to create a CRM portal that provides personalised and configurable services both to the internal marketing and sales people and to the customers.

Example of the application of new services dedicated to the customer management via a corporate portal:

The TXT e-Relationship Hub will adopt a component based, open source approach to provide a platform for the creation of Corporate CRM portals.
Such platform will be equipped with base components for:

- Search and Knowledge retrieval from the Web (**e-Mining** module): the objective of this module is to implement a web-mining system, integrated in the e-Platform, for monitoring the sites of interest, retrieve information from them, cluster the information with a relevant semantic content and graphically present the results to the user of the portal. The e-mining module will improve the corporate portal by providing information on the external world and, more specifically, support analysis on new market trends.

- advanced user profiling (**e-Profiling** module): this module automatically classifies portal users exploiting an mixed (explicit an implicit) approach where information provided by the users, by compiling forms on-line, are integrated with information A sophisticated classification of the customers will allow the portal manager to dispatch them personalised information: contents, advertising, updates for manuals and instructions etc…

and more specific modules for:

- training of internal personnel (**e-Training** module): a system supporting the customisation of the training services should face the problem of the evaluation of the competences of an employee before, during and after the training period. Such competencies should be compared with corporate competencies that it is aimed to provide and improve by the learning services and that are necessary for a optimised usage of the corporate products. The e-learning module is composed of the following sub-modules:
  - **Ontology-based model of competencies,** for the representation of the competency hierarchies and their relations, enriched by the representation of the working situations and of the temporal knowledge.
  - **Competency editor** for the management of semantic nets representing corporate competencies, based on the above ontologies;
  - **Corporate competencies evaluator**, for the definition of the core corporate competencies, based on the information provided from different levels and sectors of the company;
  - **Personal competencies evaluator**, for the evaluation of individual competencies and of the skill gaps;
  - **Match-making algorithms**, to detect the candidates for a training plan, based on the matching between request (based on corporate competencies model) and offer (based on personal competencies model).

  The e-Training module can also be extended so as to support customers online training.
- Provide problem solving facilities through best practices, solved problems, adopted solutions etc (**e-Consulting** module): the module supports the definition of the typical consultancy procedures for the analysis of the customer needs as well as the technical procedures for the installation, start-up, and maintenance of the products that have to be installed at the customer premises. The e-Consulting module is composed of the following two sub-modules:
  - CSCW: computer supported cooperative work module which integrates the classical groupware functionalities with the workflow management
  - Knowledge Management module which thanks to state-of-the-art ontology management tools can not only draw conclusions from partial knowledge but also generate new knowledge due to an auto-configuring ontology-based mechanism
- Intelligent document management system for on-line supporting (**e-Support**): for the management of the documentation related to a corporate product/project, equipped with querying and reporting functionalities. The products and projects that are covered by the e-support services belong to core business areas specific for the company. Thus it is possible to create an ontology that describes concepts and relations of these areas, that allows classifying the knowledge and that supports intelligent search and retrieve services. The classification process will create a semantic net that, being the domain well defined and limited, can be easily managed and related to the semantic net representing the corporate competencies.

It is worthwhile noticing that the objective of the TXT e-Relations Hub project is to define a flexible and general architecture upon which it is possible to create portals by combining the above mentioned modules as configurable plug-ins that can be used to create valuable services from contents of very different kind and nature, thus not limited to the Customer Management.

2. Current Practices and Technologies

2.1. Typical business practices

It is possible to imagine different scenarios for the usage of the services provided by the eHUB modules.

e-Mining module

A typical usage is the analysis of the data on contacts established with the customers. Most of the companies provide supports by phone, e-mails, fax and SMS. Each contact contains structured data (personal information, requests of products or services, contact preferences, etc..). In addition, due to the complexity of the interactions with the customers, non-structured information are necessary to define the details of the requests and of the provided services. Such unstructured data is usually analysed for a very limited percentage (5-10%) by call centers of big companies. The *text mining* functionalities of the e-mining module allow to exploit these information and present the results of the application of analysis functions through different views, depending on the needs of the user of the module.
For example

- The responsible of the customer care service that aims to improve the productivity of its office and the customer satisfaction, contemporaneously reducing the costs, can analyse the information filtered through the skills and competences of the employees, and create a database of FAQ;
- The analyst responsible for the product development will focus on the real-time discovery of problems and bugs;
- The marketing responsible is interested on the analysis of the behaviour of the customers that is buying a new product: the results of such analysis will lead to the development of winning products.

The same scenario can be extended to the case of information retrieved from multimedia web resources. For example, it is very useful to analyse the impact on customer satisfaction of information provided in a graphical format.

e-Learning module

A new product/service has been realised by the company and made available to both the external users of the portals (customers, for example) and to internal users (sales people, for example). The message that has to be provided to the visitors of the portal must be synthetic but effective, available also in SMS/MMS modality to be immediately available. On the contrary, the message to be provided to the sales people that have to advertise and sell this new product/service must be more complete and must make the salesman able to reply to possible questions and requests of clarifications on the product and on similar solutions already present on the market.

e-Consultancy module

A typical scenario in which e-consultancy services are exploited by the portal user is when he/she wants to notify to the company about a problem to be solved. The portal dynamically generates a form for collecting the information that are relevant for that particular case (requests of clarifications on some product services, difficulties on usage of a product, bugs reporting, generic request of consultancy, etc...) and that allows to notify the portal about the problem, assign the most competent persons and set-up an interactive environment to define a solution for the problem.

The assignment of the expert is done by a match-making between the competencies requested by the problem and the personal competencies (not only technical skills, but also customer management expertise, for example) of the available persons.
The expert can cooperate with his support team in order to solve the issue in a fast a complete way.

e-Support module
The launch of a new product/service and/or the closing of a very complex and relevant project that produced deliverables that could be interesting for the community (company employees but also customers), are events that need to be carefully supported with the objective of providing web-based services to the customers. A powerful and flexible archiving/cataloguing system, combined with a dynamic management of product/project documentation and multi-media contents are integrated in a cooperative environment with the objective of providing personalised services to the users of the corporate portals.

2.2. Technologies

The **e-mining** module integrates:

- Intelligent search engines able to indexing web pages through criteria based on text analysis, using thesaurus, layout analysis and classification of images
- Text and multimedia mining tools based on formal definition of domain knowledge (ontologies) and on cataloguing and classification tools of graphical elements contained in web pages, based on the concepts defined through the ontologies
- Graphical 2D and 3D environments for the visualisation of results

The **e-learning** module manages the corporate competencies as a basic block for the construction of learning programmes focused to the corporate objectives but, at the same time, highly customisable on the needs of each single user.

The definition of the knowledge and skills available inside the company and where it is located is modelled by semantic nets. It can be exploited also to calculate potential gaps or areas in which there are the strongest competencies. A particular case of semantic net is the "ability map". People working on the company are linked by different topics/arguments and the information on the competency degree may be attached as well.
The methodology for the definition of the learning program is based on the basic learning unit (learning objects) that can be combined and configured in a flexible way. The generator of the learning graphs uses the content management at a high level of abstraction, exploiting metadata and ontologies, to define personalised learning programmes and also to evaluate gaps and results.

The e-supporting module provides services for modelling the knowledge items that are based on standard ontology technologies (languages and tools) adapted to capture the dynamic aspects of the corporate knowledge. It is frequent that a concept modelled within ontology is modified, cancelled or substituted. The ontology meta-editor of the e-supporting module is based on W3C RDFS (Resource Description Framework Schema) and Web Ontology Language (OWL) and allows not only to create a new ontology, but also to manage its life-cycle as part of the corporate process, for example for the introduction of new product features, the modification of the existing ones or the creation of new roles within the company. The ontologies developed through the meta-editor will cover different areas of the company core business and will be exploited by all the repositories and services of the portal that needs

to share a commonly accepted representation of a company area (competencies, knowledge, internal organisation etc..) .

2.3. Review of the current systems and Open research topics

e-mining module

One of the objective for the development of this module is the integration of the web-mining techniques (text and multimedia mining, base on Natural Language Processing techniques) with semantic technologies to precisely define the semantic of the analysed knowledge sources (for example, sets of documents) to provide, as a result, schemas of emerging trends and evolution of the contents. A possible approach to eliminate the ambiguities of the natural language is based on the association of semantic features to words, phrases, by exploiting domain ontologies.

e-learning

Semantic nets and ontologies that are used to classify and organize documents can be used to calculate similarities that are interesting, for example, to identify people with similar interests and to construct relations within large companies, with also the internal persons do not know each other very well and would like to be in contact with colleagues that are working on similar arguments or have particular competencies.

Ontologies could be used also to model personal knowledge and competencies. It would be very interesting to find mechanisms and solutions to put these "personal" ontologies in relation with the corporate ontologies. The objective of creating a semantic net modelling the corporate knowledge and competencies is to provide a "high level" model to be used to create the personal ontologies that accurately and un-ambiguously model each user and thus can be exploited to highly personalise services and contents

e-supporting

The tools available on the market for the ontology management allow the creation of new ontologies but lack the support for their life-cycle management. In a static environment, knowledge classification criteria, for example, can be edited just once and remain the same, with no need of periodical reviews. A dynamic environment (as in the case of companies with a highly technological profile) the management of concepts and relations requires tools for revision, modification, cancellation them and propagation of ontology modifications to all the services and repositories that share the same models.

The TXT e-Relations Hub e-Support module will extend the concept of co-working and groupware so that it includes workflow facilities.

Since the aim of the TXT e-Relations Hub project is the development of a powerful content management Platform to be commercialised at a low cost and developed by open source technologies, the usage of ontologies, semantic technologies and open-source existing tools is the alternative to the integration of other powerful but very expensive products (for example for the non-structured information retrieval) that are emerging on the market.