KW Partner: University of Trento

1 Overview

Challenge

In a geographically distributed and complex organization the coordination of the buying and managing processes of real estate is a relevant and strategic asset.

Solution

Matching information among descriptions of designs, maintenance techniques, estate descriptions etc. All of this information is emerging from different communities of workers: Order Managing, Research and Technology, Testing, Maintenance and Plant Engineering groups.

Why a Semantic solution

Semantics support a richer matching among concurrent descriptions of rolling stocks and railway materials. Semantics allow an effective design, maintenance, and transmission of train estate and materials during their whole life cycles.

Key Business Benefits

Coordinate 5.000 employees, according to their skills, over ten workshops (called Business Units, each is specialized on a different kind of rolling stock) which are geographically distributed in Italy and in charge of periodical maintenance of Trenitalia's rolling stock and materials.

Business Partners

Trenitalia and all the complex organizations that need to share knowledge among autonomous units, aimed at estate managing and buying.

Figure 1 – Trenitalia website

Semantics problems, dealing with communication and collaboration between different groups, are strategic in medium and big organizations where group heterogeneity is expected (such as network of organizations and networked organization). They can occur also in the case of companies merging, or in the case of growing companies, or when different points of view are considered strong values that should be managed.

The project is focused on providing a complete knowledge management solution to Trenitalia (Figure 1), in particular to the engineering department. The KM problems we pointed out in this Trenitalia department are strongly related to semantic heterogeneity, since the department is made up of several groups, each with its own point of view, own language and own way of doing things. This heterogeneity often forms a barrier to performing those organizational tasks where collaboration and communication is required. For that reason, the solution we designed includes also a tool able to face semantic issues, automatically matching different knowledge schema (ontologies), and then supporting the collaborative work while respecting the single group's semantics.

Buying and managing real estate is a relevant and strategic process for several organizations and companies. Briefly, this process is made up of the following phases:
   - Definition of estate features (documentation for the setting up of a call for bids)
   - Negotiation phase (the selection of the right provider according to the required features)
   - Order managing and checking (the process of monitoring the provider's work)
   - Running (estate's managing and maintenance)
   - Leaving (estate's dismissing and, eventually, selling)

Such a process is even more complex for public companies, due to European constraints and rules. The Business case described is one of the core processes in the UTMR department (Unità Tecnologie Materiale Rotabile) of Trenitalia s.p.a.

2 Current Practices and Technologies

2.1 Typical business practices

The headquarters of UTMR are based in Florence, and its core business deals are working on new rolling stock designing project and on the acquisition of new railway equipment.
The department consists of 5.000 employees, divided according to their skills, over ten workshops, called Business Units. Each one of them specializes in a different kind of rolling stock. The Business Units are geographically distributed in Italy and in charge of periodical maintenance of Trenitalia's rolling stock and equipment. Moreover UTMR includes different specialized communities. Some of them are focused on function specializations: Gestione Commesse GC (Order Managing), Tecnica e Ricerca TR (Research and Technology), Sperimentazione S (Testing), Ingegneria degli Impianti e della Manutenzione IIM

(Maintenance and Plant Engineering). Others are focused on projects crosscutting the whole organization: Community by component (workers spontaneously aggregate in order to share a common professional interest); Community by order (workers involved in a specific order, such as ETR50 or Pendolino share knowledge according specific projects).

Communities are involved in several UTMR activities, for instance the process of writing a Technical Procedure of Maintenance (Norma Tecnica di Manutenzione). A Technical Procedure of Maintenance (MTP) is a document that workshop people access in order to find all the information about the maintenance activities required for specific trains or railway equipment. The writing process of this document involves several UTMR workers, belonging to different communities. Their job consists in searching, merging and validating different sources (both internal and external to UTMR) writing the specific MTP. Currently, no technological system supports this practices (except for using shared folders in file system), that leads to a quite complex and difficult situation for the workers involved. In Figure 2, the processes of MTP construction are depicted:
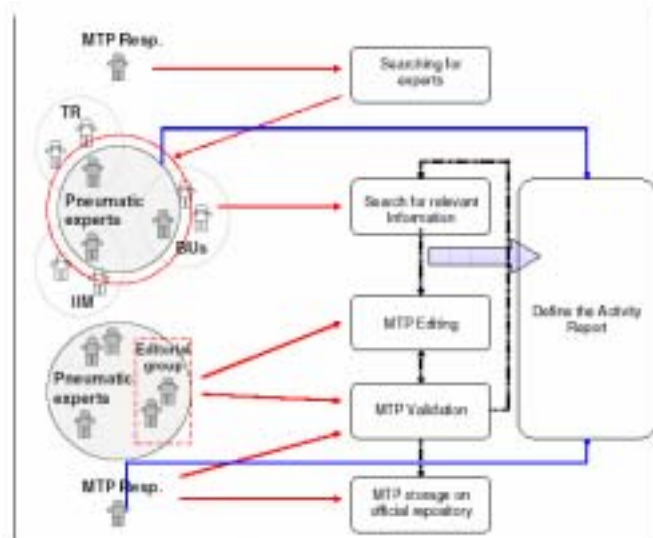

Figure 2 – Process of MTP construction

2.2 System requirements Analysis

From the scenarios described in this use case, we can derive the following system requirements:

Searching for experts and relevant information about MTP
> The system should provide retrieval tools able to find expert workers and documents dealing with the specific theme treated by the MTP.
> This means both tools supporting a full-text keyword search, but also tools able to match different categorization structures, since we can expect several different UTMR communities to use different ways of interpreting and referring to documents about the same subject. Obviously this introduces critical issues of semantics which can be solved by using semantic-based algorithms. Results could be then organized (and also ranked) according to the used search parameters.
> System requirements: Expert maps, Temporary communities creation, Search by keyword, and by semantics, Search on different sources (distributed search), Document indexing, Document sharing, Communication among groups and communities members (ex. chat), Documents upload on official repositories, Results ranking

Publishing the new MTP in the official company repository

The final phase of the MTP writing process occurs when the responsible person stores the MTP in the company official repository.

The system should allow the responsible person to upload the final document in a categorization structure which has been previously created by the system administrator. The MTP is now available to whoever needs it.

System requirements: Information storing by multiple views; Information searching by keyword and by attributes; Navigate repository's categorization structures

2.3 Review of the current systems

Unlike existing systems (GAD; SICUESE; Rete Ferroviaria Italiana web site, and RSMS) we conclude that these requirements can be best met by the use of semantic technologies. Moreover, there are no technological systems supporting UTMR in performing all of the described business practises. Therefore, a particular technological architecture has been proposed. This architecture includes three different applications which are integrated to properly support all process phases:

1. **KEEx**: it is a Peer-to-Peer document sharing system, which provides users with document management and retrieval functionalities based on lexical and semantic algorithms. Such algorithms allow users to perform both full text keyword search, and conceptual search thanks to a matching algorithm based on natural language and mathematics processing functionalities (http://www.dthink.biz).
2. **Verity K2 Enterprise**: it is a quite complex suite of content and information retrieval tools (like, for example taxonomy builder, social network tools, document and content retrieval tools, expert location tools) based on a proprietary search technology. In the proposed architecture it has been included as just the lexical search engine (www.verity.com).
3. **FileNet P8**: it is the FileNet's Enterprise Content management (ECM) platform (www.filenet.com).