ONTOLOGIES IN KNOWLEDGE OFFICE SYSTEMS

Ivan Polášek[1] and Jozef Kelemen[2, 3]
[1] *Institute of Informatics and Software Engineering, Slovak Technical University, Bratislava, Slovakia*
[2] *VSM College of Management, Bratislava, Slovakia*
[3] *Institute of Computer Science, Silesian University, Opava, Czech Republic*

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Abstract: The paper shows one concrete implementation of *Knowledge office*, where the control of the company and its knowledge are implemented within the real user-defined document workflow and content management system. The new planned module is designed to extract the existing knowledge from various types of documents (source code, documentation, agreements, etc.) by using prepared domain and document ontology and the *Knowledge System* to help the user to create new document.

1 INTRODUCTION

The rapid progress in developing and application of knowledge-based systems in different areas of the research, industry and administration caused several problems concerning the management of knowledge (Kelemen and Hvorecky, 2008).

Knowledge management (KM) means the large spectrum of activities (McElroy, 2003) connected with management of company's shared knowledge (decomposition, distribution, innovation, acquisition, accessibility, preservation, etc). The direct use of knowledge is often shifted to information technology – to the knowledge-based systems (Stefik, 1995). For the future, *knowledge managing systems* (KM Systems, in short) seem to be a promising field of research and engineering, and then perhaps also of huge applications of developed systems.

2 KM SYSTEM – A CASE STUDY

Gratex Knowledge Office (*GKO*) is designed for the management of the company and its knowledge base, control of the company's internal processes and project management. It can be used in a wide variety of companies with diverse specializations.

GKO.NET is now a user-defined document workflow and a content management system. Its variability and document distribution make the company's control system more effective and transparent. It enables internal information sharing and management, based on predefined unified procedures and regulations. Information is transmitted via electronic documents of diverse types and saved on the central server. These types of documents register the development of internal processes in companies. The system enables definition of roles and powers of employees transparently. It is an appropriate tool for global organization control and effective teamwork.

GKO.NET offers opportunities for effective management of key company processes, such as:

- ***Standard processes*** (such as business administration, decision-making processes, quality management, purchasing, sales, etc.).
- ***Safety management*** (management of information systems and storages, assignment of system rights and accesses to individuals and groups, risk monitoring, monitoring of weaknesses, threats, and damages, etc.).
- ***Document administration*** (registering, sharing, updating, backup and printing of various documents, and templates administration).
- ***Human resources*** (hiring, profiles, qualification, trainings, and courses etc., availability information, such as attendance, absences, sick leave, business trips, payroll administration, etc.)
- ***Asset management*** (registration and categorization of assets, allocation of work tools to the employees).

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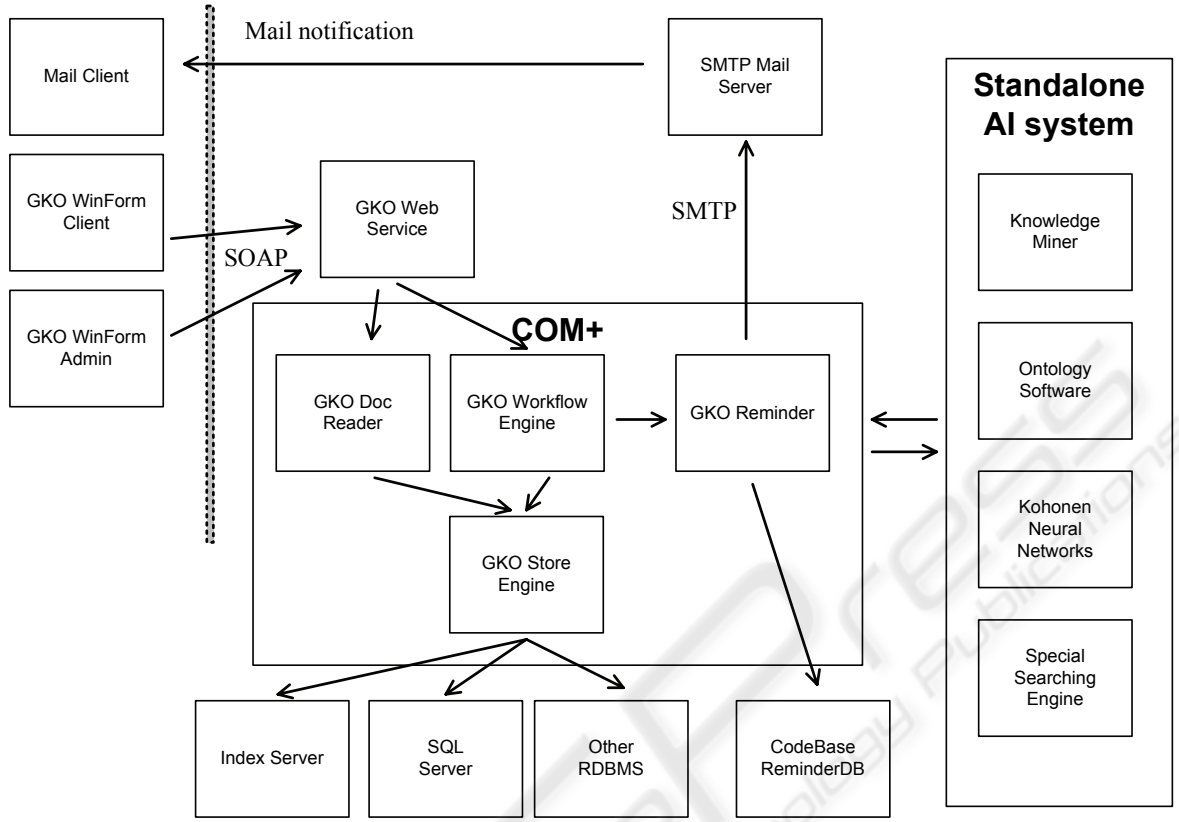

Figure 1: The schematic view of the *GKO.NET*.

- ***Project management*** (definitions of project teams, scopes of delivery, deadlines, risks, assumptions, documentation, task planning, recording suggestions and changes, quality management, controlling etc.).

Access of users to *GKO.NET* is simple, enabled through a common network, or the Internet, and its implementation requires no significant changes in the existing infrastructure. The application is easy to adapt to specific customer needs. It provides for a flexible administration and specification of security rights and rules. It can be integrated with other systems. The overall scheme of the *GKO.NET* in the context of some other support systems is depicted in Figure 1. *Standalone AI system* communicates with business layer, which contains business logic (*Doc Reader*, *Workflow Engine*, *Store Engine*, *Reminder*).

3 HOW GRATEX KNOWLEDGE OFFICE WORKS

At the beginning of the integration, it is important to identify needful entities (*Project*, *Request*, *Document*, *Task*) with their state spaces (*Initial*, *Canceled*, *Completed*, *Frozen*, *Rejected*, *Quality Assurance Approved*, *Frozen*, *In Progress*) and report criteria, data joins and user filters. This is the way to create the model of the company and monitor its life.

For all users, we need to create individual *entities* with *attributes* and their *State Spaces* (workflows) with the special activities in the states. This is the first step to implement precise knowledge management of the individual company.

The next step is to implement input and output forms with their rules, triggers and criteria to report the actual situation in the company.

They are clustered primarily as the project groups, then secondarily by their states and date, but they could be ordered in another way.

For example, we prepare for a client the program *Support Server* with the objects *Client*, *Incident* and *Expert* with their attributes and state spaces. Then we can generate reports to monitor the support processes with the various states (*In Progress*, *Solved*), and criteria values (*Client = IDClientID* or *Name = <ClientName>*, *Importance = BusinessDown*), and aggregate them by various

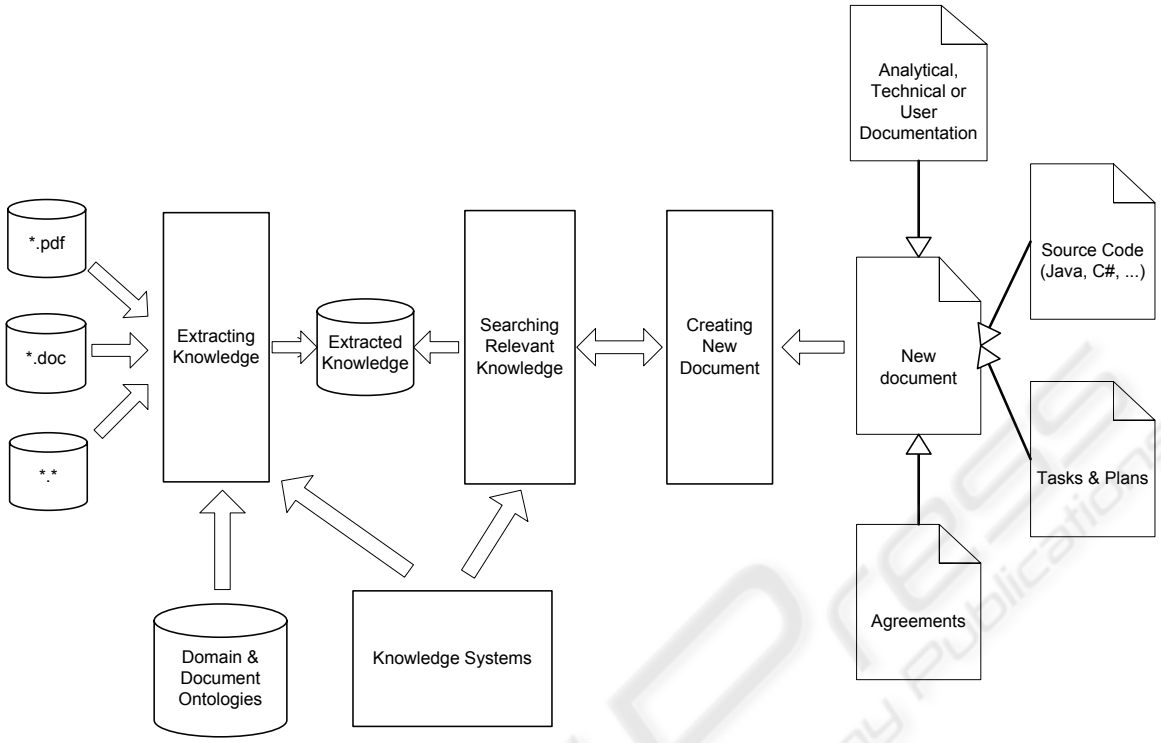

Figure 2: The process of extracting knowledge and creating new document.

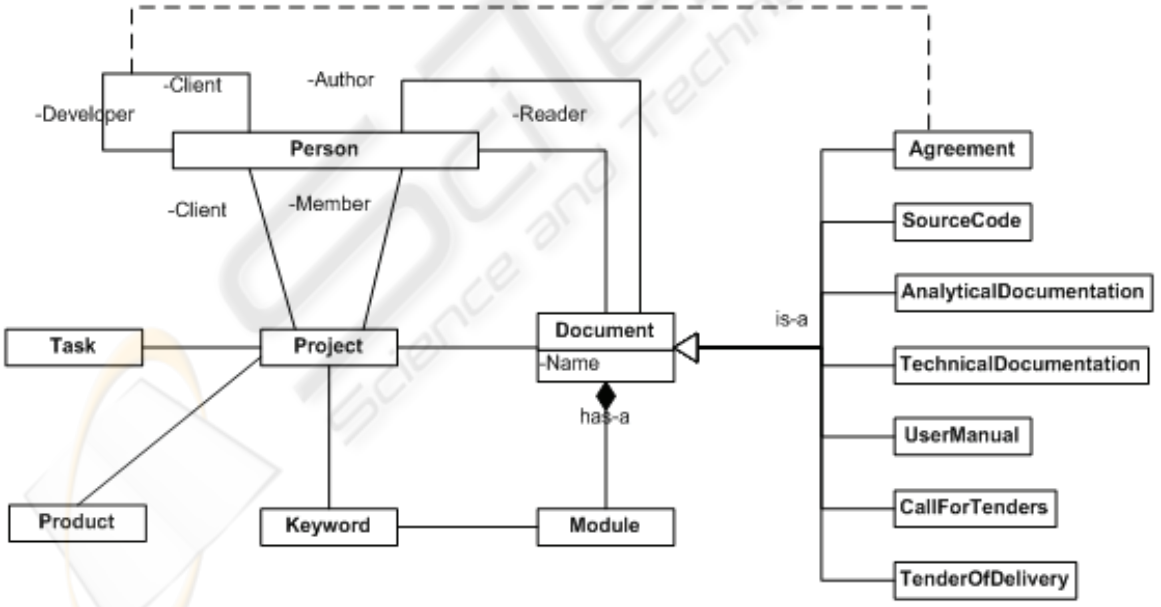

Figure 3: Semantic model as a draft for domain/document ontology.

states or clusters.

The new planned module is supposed to manage the existing knowledge in documents in the institution in order to help the user to create new ones. Figure 2 shows the process of extracting knowledge from various types of documents by using prepared ontologies and the *Knowledge System* (in the left side of the schema), and the process of creating new document and searching relevant knowledge from prepared knowledge base

in the right part of the diagram. Process *Searching Relevant Knowledge* offers interesting information and knowledge as the parts of other documents for creating the new one. It needs extracted and indexed knowledge from existing documents, parsed by the ontology, and the knowledge software. The *New Document* item could be documentation, agreements or source code.

Figure 3 shows the first draft of the semantic model as a basis for the *domain* and the *document ontology*. It is familiar with the other systems in this product line (Assali, 2007) in some analogical features.

We can use the relationship between the *Project*, *Document* and the *Keyword* to prepare knowledge mining with the keyword vectors using graph and clustering algorithms, the Kohonen *Self Organizing Maps* (using keyword vectors) and the mining of associative rules to find relevant documents.

Also we can find the relation between the users, authors and the documents to prepare corresponding rules for the user history and authors of different sources for the knowledge system. Except for the title and the authors, document contains also the modules (chapters, appendices, classes, packages, paragraphs). Concrete structure is specialized in the independent types of the document with their proper ontology (the source code is quite different from the analytical document or agreement).

In this manner, these dynamic (mainly the new, created one) document ontologies increase the power of the system to deal with the given document, how to understand its content and its relevance to other documents in the systems depository. Domain ontology for the whole system could be also dynamic, to map the various type of the companies and areas (economical processes, SLA, financial institutions, law companies, manufacturing corporations, construction companies, software houses, etc.).

The visual model of ontology is creating for our designers, using model close to object-ontology mapping (Bartalos and Bielikova, 2007), but we need the code for the parser in the next step.

4 CONCLUSIONS

At the present time, Gratex Knowledge Oficce is working 24 hours per day and supports the management of five diverse companies (Arca-capital, Hornex, Milking, Elvea, Gratex International (all internal and economic processes) and Gratex SLA (Service level agreement for Allianz)). In GKO we implement the knowledge management to the system using DMS and the workflow development.

Our new designed module would help to use knowledge from the documents to create the new one. First pilot was created in cooperation with Slovak Technical University and Gratex International, next version will be published with the closed set of ontologies for the software company domain, type of documents and problem areas (banking, insurance, etc.).

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