Transfer of the project MENTAL research results into practice and their further extension

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Abstract. *The article is based on the outcomes of the project MENTAL which was put into practice in the defence sector of the Czech Republic. It has been implemented into the Staff Information System of the Czech Army and followed by a search for other suitable application areas for the knowledge systems based on the theory of Topic Maps. The choice fell on the issues of Lessons Learned from military missions abroad, as shown hereinafter. The paper presents the results of documents analysis related to ontology design and creation (classes and their attributes, relationships between classes and occurrence of classes). The article further presents the decomposition of documents into parts in ATOM2 software environment and indicates additional steps to creating a knowledge base.*

Keywords

Knowledge system, MENTAL, implementation, ACR, Lessons Learned.

1. Introduction

The defence research project entitled 'Network Enabled Capability (NEC) Knowledge Management System (KMS) in the Army of the Czech Republic (ACR) – MENTAL' (Documentation, 2011) was the first project dealing with the Knowledge Management at the Ministry of Defence (MoD) of the Czech Republic. The KMS theory is based on Topic Maps that is a standard ISO/IEC 13250:2003 for the representation and interchange of knowledge.

The project was successfully completed and the created knowledge base about NEC was implemented into the Staff Information System (SIS) of the ACR. The contracting company, AION CS Zlin, played an important role in this event; they managed to transfer the technology from their own application environment into the SIS. This action reaffirmed our correct choice of the partner for the knowledge systems research.

At first, the article introduces the main result of the project MENTAL followed by its implementation into the SIS.

Next, the selection of suitable application areas for other knowledge bases is described, as well as the method of processing the documents from the Lessons Learned based on the experience from military missions abroad.

2. Results of the project MENTAL

The main result of the project MENTAL is the knowledge system for NEC management in the ACR. The knowledge system includes a knowledge base and the ATOM2 software.
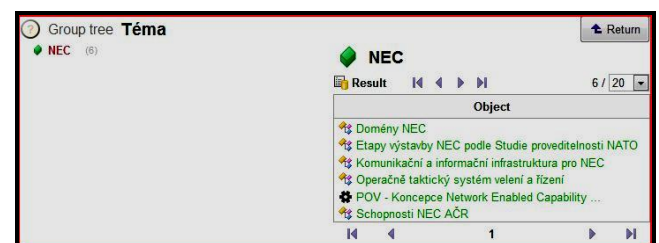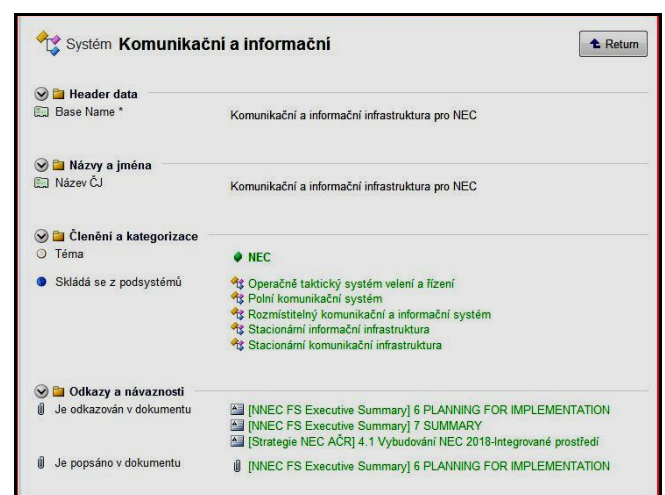

Fig. 1. NEC group-tree

Fig. 2. Communication and information infrastructure of NEC

A key benefit of the knowledge system generated to support activities in the NEC management is the effective organization of information on the NEC, in the form specified by ontology, according to classes, hierarchies and a group-tree. The starting point for the NEC topic is a NEC group-tree, see Fig. 1.
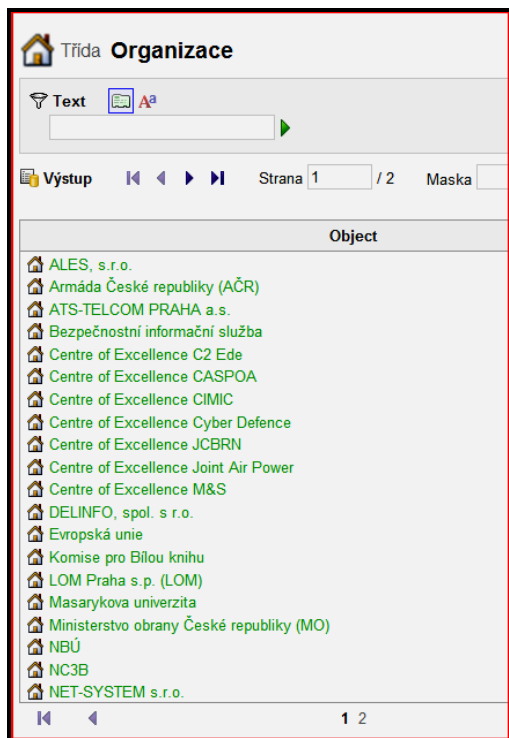

Fig. 3. Occurrences of the class organization

Each item in the NEC group-tree can be viewed or can be chosen as another initial step in browsing information, such as the Communication and Information Infrastructure for NEC (class of a system), see Fig. 2. The reading of the stored information may be still based on classes. The scheme of a selected class displays the survey of all stored occurrences, e.g. the class of organizations, see Fig. 3.

Fig. 4. Organizations – DELINFO Company

3. Implementation of MENTAL into the SIS

The Staff Information System of the ACR is a nationwide, distributed information system supporting daily processes and activities in the Command and Control System of the defence sector. It provides functions in the following areas:

- Using e-mail.
- Web portal.
- Safe storage of user files.
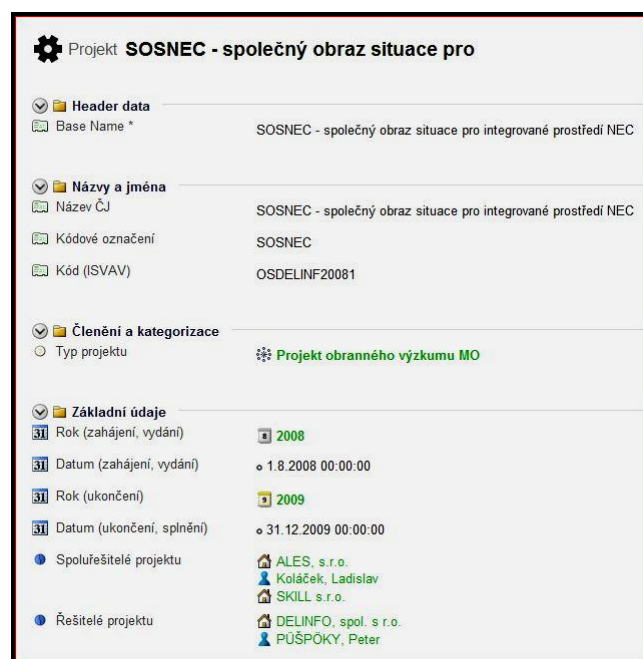- Information security for users.
- Terminal connection of users.

Fig. 5. Project SOSNEC

The SIS of the ACR consists of a central locality at strategic level (Prague, General Staff), sites at operating level (Olomouc, Joint Forces Command; Prague, MoD; Stara Boleslav, Support Forces Command; Tábor and Vyškov). In addition, there are thirteen localities at tactical level and two foreign localities. The SIS is interconnected through an autonomous all-army data network.

Implementing the knowledge system MENTAL into the SIS enables all members of the MoD to familiarize themselves with the project outcomes and to learn what potential the knowledge system offers in information processing. The implementation took place in late 2011, and in the first half of 2012 the MENTAL pages were attended by several hundreds of users and the number of accesses reached nearly 2,5 thousand.

The caption, which became a part of the implementation, stated: *The purpose of creating MENTAL*

is to present the opportunity to get familiar with the knowledge system, which was developed using the commercial software ATOM from AION, Ltd. Zlin. For selected candidates it will also provide the possibility of creating a pattern of their own domain knowledge system. The knowledge system MENTAL is accessible via "Intranet Links / Information Systems" option "Knowledge System MENTAL".

The knowledge system, unlike information systems, associates information in the context; documents of optional format (text, picture, and diagram) are usually used. The context of information is crucial in this case, it means to link one piece of information to another if they are relevant. Imagine that all documents of the Ministry of Defence have been processed in this way; then the user will not have to search constantly in the confusing sets of documents stored in dozens of folders and information systems. With the installed knowledge system other documents are available in the SIS (see Figure 6):

- Guidelines for using the knowledge portal MENTAL.

- Description of the functional model MENTAL.

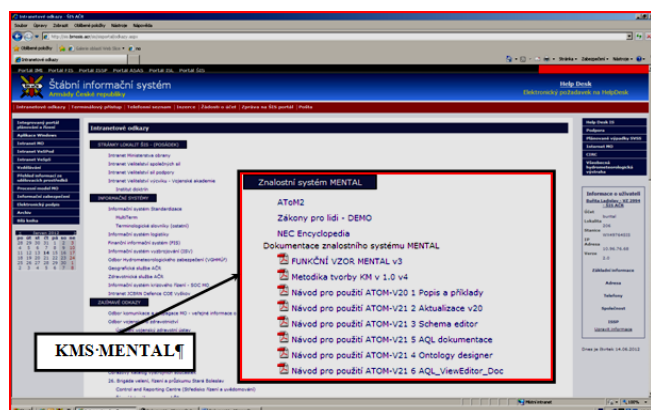- Methodology for creating the knowledge systems within the MoD.

Fig. 6. Intranet links to project MENTAL in SIS

4. Further directions of MENTAL development

While developing the project MENTAL we received suggestions about other prospective areas of the knowledge system processing. One of the appropriate topics became the issue of Lessons Learned (LL) from operations that are drawn up by each NATO's army. LL receives a great deal of attention in NATO, where a database of operations experience is recorded. Presenting the results of work on the project MENTAL MCC-2010 at the conference in Prague, I was addressed by a general from NATO headquarters regarding this topic. Other suitable areas are military rules, particularly because the supplier of technology and the collaborating company AION CS Zlin

have extensive experience of processing laws as a knowledge system.

Most users found the ATOM software options for creating knowledge systems interesting and appropriate, but no one was actively working with the system. Therefore our research team decided to create even further knowledge base and thus to stress our arguments about the appropriateness of the technology for practical use. After several discussions and presentations of the project MENTAL results, the team chose a set of documents from the Department of Doctrines at the Military Academy in Vyškov focused on the LL issues. The working process includes:

1. Analysis of documents and selection of concepts for ontology.

2. Decomposing of documents into parts which describe a complete one topic.

3. Synthesis of candidates for the design of ontology.

4. Design, verification and implementation of ontology.

5. Interconnection of articles and ontology.

The project work has actually completed only activities up to the point No. 3. Thus the experience of the first two activities will be described for the time being.

4.1 Analysis of documents and selection of terms for ontology

Since 2007, the Department of Doctrines at the Military Academy has annually issued several studies focusing on the experience from missions. This represents a total of 31 papers, published in PDF format in the total range up to 2000 pages (one document is from 60 to 100 pages). The treated topics include experience in operations management of their own units (such as "Mission Planning", "100 Days in Operation", "Escalation of Force", "Patrol Activities", "Protection of the Base", "Searching Operations"); description of an enemy and their fight (for example, "Muslim Culture", "Insurgent Tactics", "Taliban") and evaluating information (such as" Experience from LL "," Information Extraction of Resources ").
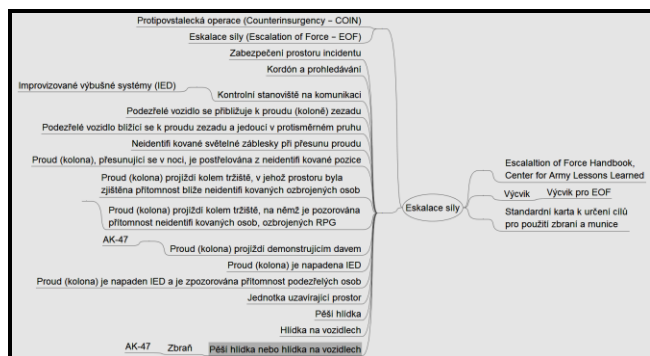
Fig. 7. Resulting analysis of the document called "Escalation of Force"– taxonomic view

The purpose of the document analysis is the selection of concepts for the knowledge layer of the knowledge system - ontology. According to the principle of Topic Maps, ontology includes classes and their attributes, relationships between classes and occurrence of classes. The team split a set of documents and everyone prepared the individually assigned document. The results of the analytical work are shown in Fig. 7 and 8 (they are in Czech; considering the purpose of the article, translation into English would be excessively laborious). The Figure 7 illustrates the activities of units in the escalation of forces in the form of taxonomy; the Figure 8 records the analysis results of the "Searching operations" document; where the classes and their occurrences are in columns (person, organization, location, activity, rule) and the other possibility is to organize row-wise classes and their occurrences.

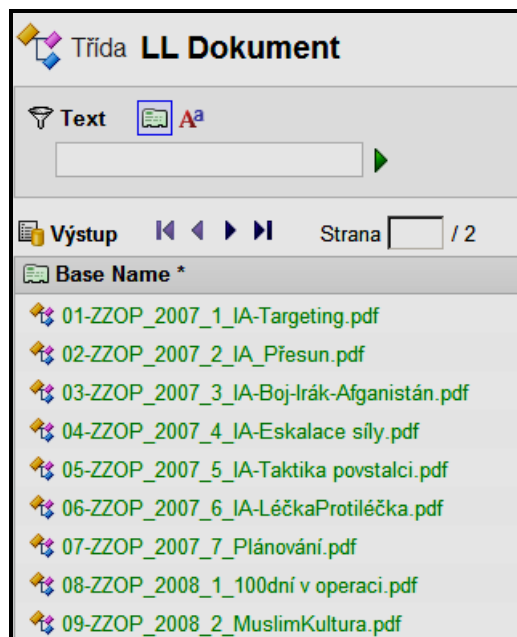**Fig. 8.** Resulting analysis of the document "Searching Operations"

Fig. 9. Decomposing of documents into parts – overview

4.2 Dividing documents into parts

One LL document usually describes not only a single topic, but it includes a series of partial, often unrelated, parts. These parts (called articles in the LL documents) should be separated which enables individual connection with the knowledge layer. This is a fairly laborious process, when the document is converted into XML format, while the significant parts are automatically identified. Nevertheless, the final processing requires the assistance of human eyes and experience. The results of documents decomposition are represented by Figures 9 and 10. The Figure 9 shows a set of documents that were divided into parts and the Figure 10 shows a document in the Knowledge Base.

Fig. 10. Decomposing of documents into parts – document structure

5. Conclusion

The paper describes the stage of development of the project MENTAL [1] research results, both the implementation and the process of seeking other topics for the creation of knowledge bases. It presents the implementation of MENTAL into the SIS, and also the state of development of the knowledge base obtained from the Lessons Learned documents is explained. In the upcoming period, the research team has to devote a lot of efforts to complete this task.

Acknowledgement

References

[1] Documentation of the Research Defence Project the ACR NEC Knowledge Management-MENTAL. Prague: Ministry of Defence, 2008-2011, 32 pp.

About Author

Ladislav BUŘITA was born in Kutná Hora in 1945; studied at Military College in Vyškov; since 1970 has been holding command positions; 1970-1975 graduated from the Military Academy in Brno in the field of computer science; in 1975-1980 worked at the General Staff Computer Centre in Prague and in 1980-1987 at the Research Institute of the Military Topography Survey in Prague. Since 1987 has been working at the CIS Department at the Faculty of Military Technology (FMT) University of Defense (UoD) in Brno as an assistant professor, head of section, head of department, and academic worker (pensioner). Since 2007 has been a member of Thomas Bata University in Zlín, Faculty of Management and Economics. Finished his academic studies (for CSc. degree) in 1985; became an associate professor in 1991 and a professor in 2003. A member of the UoD and FMT Academic Board, a member of the MoD Board for Defense Research; has been in charge for the FMT Research Program and Defense Research Project MENTAL; has published several university textbooks and books in the fields of informatics, interoperability and project management; publishes papers and gives presentations at national and international conferences.