MIKLÓS ZRÍNYI
NATIONAL DEFENSE UNIVERSITY
Doctoral Committee

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Using Expert System in the Military Technology Research and Development

author's review and official critiques of the entitled PhD dissertation

Budapest
2008

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1. THEORETICAL PROBLEM

Besides the several PROS some CONS were also came up due to the effect of the IT revolution in the theoretical and practical word in a parallel way. One of the most significant advantages was changing of the information sources (data, information, knowledge). That means you can store, handle e-information much easier, than before and you can reach these data from the Internet without any obstacles. The mentioned disadvantage is the quantity of the available information and troubles with search technique coming from the information mass.

The military technology research and development (R&D) is an area of the army, which is affected by this previously mentioned problem very directly. The effective searching and finding of the needed information is an essential part of the first phase of the military technology R&D, which can influence the whole process. Hungary joined to NATO as a full member country in 12. March 1999. This fact prescribes other characteristic tasks for the army. In addition the Hungarian Defence Forces has to maintain its full operational capability (FOC). One of the most important new tasks is the R&D, which has to have a significant role in the transformed defence system. Our defence R&D has lost some importance nowadays however there is no doubt this area has to stay alive. The relation between the military technology R&D and the military logistics as well as the defence politics proves the same.

The old military equipments, materials, and the rapidly developing IT establish new tasks for military technology R&D. These new challenges require using modern IT achievements just like Expert Systems which are used in other armies frequently in order to keep the level of the NATO standard. This kind of system using algorithm can support the first phase (planning and analysis) of R&D to find more and more relevant information, data etc. in the information mess on the Internet. To solve this "effective search and find" problem can be useful for not just R&D but it can give a new searching method for the military.

Based on this the theoretical problems are the following:

a) The information source has changed; the e-information is improving in contrast with the printed info. There is still no solution for finding information on the Internet especially searching military technology related things.

b) Expert Systems have been developed due to the IT revolution (see Artificial Intelligence) and their quality as well as quantity is not adequate comparing their possibilities for defence purposes.

c) There is room for improvement for the military technology R&D in the defence system based on the relationship with the defence politics and the military logistics. Moreover it is not able to apply new techniques and procedures just like Expert System.

2. RESEARCH GOALS

Based on the summarised theoretical problems and according to the modernisation of the Hungarian Defence Forces my goals are the following:

a) To analyse the effect of the IT revolution concerning the transformed information source. To describe the current situation of the information source system illustrating the dynamic picture of Internet.

b) To demonstrate importance of Expert System giving colourful examples and historical review. To give short description about Expert System and its general characteristics. To give recommendations using and developing Expert System in the military based on the most important problem types. To show a math correlation method (SORK) example in order to have an objective, independent way to get knowledge from the human experts.

c) To evaluate the relationship between the military technology R&D and Internet (with full info) as well as changed information source. To emphasize the importance of the military technology R&D in the complex defence structure using military logistics and defence politics to prove it. To simulate the possible links between the military technology R&D process and the Expert System applications. To propose possible Expert System solutions and its effectiveness in the defence R&D.

d) To evaluate the possibilities of the Internet, especially the current search methods in order to establish a modern effective searching systems (to give the basic criteria) using Expert System algorithm.

3. RESEARCH METHODS

I used the following general and specific methods, procedures following my goals:

General methods:
- historical method for analyzing information source system, presenting Expert Systems as well as possibilities of Internet search;

Special (partial) methods:
- Analysis: to specify the role and the place of the military technology R&D according to the military logistics and the defence politics;
- Hypothesis-Abstraction: to evaluate the Expert Systems in the military technology R&D, to find the common points in the R&D process;
- Comparison: to prove the effectiveness of the IT based research concerning the military technology R&D nominated phases;
- Induction-Deduction, Experimentations: to establish theoretical criteria of a modern search engine system.

4. WORKS BASED ON CHAPTERS

- Introduction: It contents theoretical problems, current situation, goals, hypothesises, applied methods;
- Chapter 1 ('The Changing of the Research Methodology'): It presents the research methodology current structure and the new transformed information source system;

- Chapter 2 ('Using Expert Systems'): It gives a presentation about the Expert Systems and their first practical use especially in the military;
- Chapter 3 ('Military Technology R&D as an effected area'): It introduces the role of the military technology R&D according to the military logistics and defence politics. Moreover it proposes some examples for supporting R&D with Expert Systems;
- Chapter 4 (Searching and Finding Military Technology Related Info on the Internet'): It describes the current limitations of the Net search and it shows the criteria system of the new searching method.

5. SUMMARISED CONCLUSIONS

The stated theoretical problem is coming from the IT revolution, the increased amount of info, the lack of Expert System applications, the new structure of information source, the unmanageable Internet and the underestimated role of the military technology R&D. To accomplish my mission I used different general and specific methods. To prove my hypotheses I analysed the IT revolution and its comprehensive affection, I introduced the Expert Systems and the aspects of the military logistics as well as defence politics comparing military technology R&D. Finally I established the criteria of a new, modern Internet search method for military technology information.

6. SCIENTIFIC THESIS

I. I presented the Expert Systems by broad cross section of the areas through systematic examples. Based on this examination I stated that the Expert System applications are not sufficient in the Hungarian military.

II. According to my evaluation of the military technology R&D and its two related areas (military logistics and defence politics) I reinforced the place and role of Hungarian military technology R&D in the defence structure.

III. I analysed the military technology R&D methodology in order to increase its effectiveness. I reached the conclusion that there are several common points to meet R&D and Expert Systems but the most effective way to support the planning and analysis phases with this kind of software.

IV. After describing the information source system, and evaluating the R&D methodology as well as the opportunities of Net search I concluded that the effective solution is the IT based research for military technology R&D early phases.

V. Concerning the current limitations of the Internet search I established the criteria of a new, modern, effective military technology information search-engine to support the military technology R&D process.

7. PROPOSALS AND APPLICABLE TO

<u>Thesis are directly applicable:</u>
- to develop R&D procedures;
- to find military related information, data, knowledge etc. on the Internet;
- to give help in order to edit useful homepage in a technical way.

<u>Thesis are indirectly applicable:</u>
- to create further searching methods;
- to develop a modern search-engine or Expert System;
- to support military with different Expert Systems;
- to improve Internet search capability and capacity.

Budapest, 10 Jun 2008.

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