AUTHOR REVIEW TO PhD THESIS

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Author review and official critique to PhD thesis titled

– Possibilities of GIS services developments at the transforming Hungarian Defence Forces –

Budapest
2007

1. FORMULATING THE PROBLEM

One of the most significant factors in modern warfare is the great variety of acquirable data of the three-dimensional space. Provision of this kind of information is considered as one of the most essential tasks in geospatial information supply. Besides technical challenges, application of market mechanisms in information servicing has an expanding role in the 21st century. Translating this theory into practice would give a more efficient and successful service to the military forces, too.

Today, the role and the environment of security matters in the Republic of Hungary are in transition. Having joined the NATO and the European Union new challenges and tasks have been encountered. The coming up of new problems would require solid and scientifically valuable answers be given and directions of services be determined. In order to do so, results of scientific research should be known and be applied in everyday life.

The reform of the armed forces, the transition of the Hungarian Defence Forces is the task of the present. By this transformation the defence forces will turn into a modern, high quality army with a capability to manage emergency situations and provide and use information in a fast and efficient way. The changes in the scope of duties and the appearance of new tasks necessitate higher quality requirements towards the management and management system of the armed forces as well as information and geoinformation services supporting its leaders.

For the efficiency and communication and cooperation with the allies of the Hungarian Defence Forces and in order to provide proper services to the users the creation of a uniform, modern information system has become imperative.

The vast majority of information necessary to the military leaders are or can be bound to a given geographical location. In order to perform a fast and efficient management of such information based on digital databases it should be useful to forward them to the users by the means of geoinformation systems. Geoinformation systems already in existence at the defence forces should be incorporated in future unified geoinformation systems as much as possible and also these new systems should be formulated in a way as to be integral parts of them.

In geoinformation development future applications and status of geoinformation systems shall be taken as starting point. Based on this information, areas requiring geoinformation support the most shall be determined. Right in the beginning of

development, basic characteristics and attributes of geoinformation systems shall be revealed and applicable demands shall be determined.

Data quality, and by this, duration of applicability, of future digital military geoinformation databases and systems are determined first of all by data capture methods applied in the creation and operation of such systems.

The use of geoinformation systems in solving defence tasks in a quick and efficient manner has turned out be indispensable; the revaluation of information has become today's reality. As a consequence of challenges raised by the information revolution, scientifically consolidated answers should be given to be able to meet the new demands claimed to the Hungarian Defence Forces.

The successful implementation of today's reforms at the defence forces would require transformation of the management and information systems on the one hand, as well as it would give an opportunity not to be missed in introducing the equipment and results of modern information systems on the other.

The changes in our international relations, the fulfilment of our duties arising from our NATO and the European Union membership and the necessity of communication have made the development of information systems, especially geoinformation ones, at the Hungarian Defence Forces essential.

In my thesis I have tried to give answers on by what, how and where can we serve our customers in order to complete more efficient and determined planning and implementation, what shall we learn about our environment's information, how should we provide services with marketing principles taking into consideration and, with the help of all this, where should a most professional work be carried out in order to assist the very special tasks of the defence forces.

The Hungarian Defence Forces in transition has had an increasing demand on information gained from 3D mapping of the real world, i.e. the results of geoinformation, geography, meteorology, astrology, oceanography etc. Thanks to the scientific and technological developments and enhancement of opportunities, this area, once called 'geosciences' in Hungarian, is referred rather as 'geoinformation' in these days. Also part of this field is 'military geography', a discipline that deals with the descriptions of the physical terrain on the products of which there is a growing demand, too.

Exploitation of geoinformation opportunities has not been carried out in full yet, neither in Hungary nor in the most developed countries. The development, however, is

continuous and is in acceleration. This idea gives my thesis timeliness by which I would like to contribute to the development of geoinformation services in Hungary.

According to the provisions on the execution of Act LXXVI of 1996 on Surveying and Mapping Activities creating, updating and servicing state topographic maps, both in analogue and digital forms, belong to the responsibility of the Minister of Defence in Hungary. Subsequently, the Geoinformation Service of the Hungarian Defence Forces as well as other organisations providing geoinformation support have to take into consideration not only military needs but civilian requirements as well.

Analyses carried out by geoinformation means and methods will give answer to how and where existing issues, data and processed information in our world could be tied to the spatial reality, how the necessary data can be acquired and how they can be visualised for the user. By investigating geoinformation data abstraction from the real world can be made in order to learn virtual reality. Knowing this virtual portrait it could be made possible to investigate the events taking place in the real world, observe and model spatial processes, create case studies and carry out experiments.

In the past decade the demand on spatial information reached an unexpected level in the various sectors of national economy, such as defence, administration, environmental protection, regional development, transportation, water management, agriculture etc. Databases serving as foundation for national geospatial systems need accurate, up-to-date and reliable information, where defence also puts in claims for special additional data.

Hungary's NATO membership and supplying its partners with information also justifies the necessity the development of geoinformation services and timeliness to review it.

Service marketing has a special role within marketing as it is not profit oriented, i.e. its aim is not to increase the income but lays emphasis on providing information and giving instructions to the users.

The topic, i.e. the area of marketing, I have selected is not abound in technical literature. However, I succeeded to cast light upon some yet unexploited facts that I have examined and documented in my research and, later, published in my thesis for the first time.

Based on my research I am convinced that this topic is timely and reflects the way of thinking of the modern world. I sincerely hope that my conclusions will be useful within and outside the defence forces alike.

2. AIMS OF RESEARCH

1. Define the terms ‘geoinformation’ and ‘geoinformation systems’.
2. Give a comprehensive examination of information forwarding systems and their application at the Hungarian Defence Forces from strategic planning to operative implementation.
3. Analyse the theory and practice of service marketing and its introduction at the Hungarian Defence Forces with the aim of carrying out structuralisation of geoinformation services.
4. Determine the current status of geoinformation services by means of questionnaire survey. Based on the conclusions, assess the possible directions of further developments.

3. METHODS OF RESEARCH

1. Collect and evaluate scientific results based on technical literature on service marketing, clash opinions, verifications. My efforts included to review articles, studies, regulations and scientific works regarded as standard at the libraries of the Zrínyi Miklós National Defence University, Budapest University of Technology and Economics, (former) Mapping Service of the Hungarian Defence Forces and the Internet.
2. Employ classical methods in information acquisition such as conversation, interview, questionnaire etc. with special military aspects taken into consideration. Use the Internet in information acquisition process, analyse and evaluate the observations.
3. Examine the possibilities of information process, getting acquainted with the needs of the users through textual evaluations, tables, diagrams and flowcharts and learn the serviceability of Internet in information distribution.
4. Draw conclusions from the investigations, outline, verify and analyse how these process can be turned into practice. For the purposes of my research I have selected observation, analysis, synthesis, induction, deduction, adaptation and rules of formal logics.

4. A BRIEF DESCRIPTION OF THE ACCOMPLISHED INVESTIGATION BY CHAPTERS

My thesis is divided into four chapters. In chapter one, the subject, concept and development of geoinformation services have been presented. A detailed portrayal of the subject of geoinformation and its appearance in the NATO and European Union technical literature has been given, and also a proposal on a possible new definition of geoinformation systems has been made. After the necessary analyses I have come to the following conclusions:

- Provision of geoinformation services is essential in the life of the defence forces
- I have given a definition on a new geoinformation concept and its system
- Traditional GIS, meteorological and other information and information acquisitioning systems can fit into this new geoinformation system
- The NATO and the EU have formulated ideas on the creation of a unified geoinformation system. Hungary, as a member state of these organisations, assumes active role in the creation of this information system

In Chapter 2, the mediatory elements of the services, the most important of which I consider the Internet, have been discussed. I have given an overview on its origin, development and outstanding potential. Metadata issues have been talked over as well. A summary on the service mediation possibilities in respect of Hungary and NATO as well as the results and simulation systems of information warfare has been provided. A review on the achievements on the flow of information along with some expectations yet to be accomplish have been given as well. Views on some possible new mediatory systems as well as the construction of an internal and protected information network at the Hungarian Defence Forces that military mapping could join have been revealed, through which an opportunity could present itself to find widespread new solutions in geoinformation services. As a summary of all the above I have come to the following determinations and conclusions:

- The mediatory means of the geoinformation services are the information infrastructural systems
- The information infrastructural network has to be expanded countrywide by which an appropriate provision of information could be rendered possible at all levels of the armed forces

- The system of military layers shall be further widened and the opportunities by the Internet and military intranet systems shall be exploited. Also, the supply of proper information shall be assured by these networks
- The future armed forces in Hungary cannot do without geoinformation services. Information shall be supplied to our NATO and EU partners and we shall request and be able to utilize information supported by them
- Opportunities shall be presented to the joint application of information and data. The quality and safety of these information and data shall be assured
- Rules of information exchange shall be elaborated and we shall be prepared to create and use the joint databases and information systems

In Chapter 3, the possible ways of services have been analysed. An overview on the theory and relations of marketing, more specifically, service marketing has been given. Common points in respect of services and geoinformation systems have been determined. Steps of service marketing in order to increase the efficiency of geoinformation support have been analysed and investigations have been executed to find linkages between quality characteristics of service and education. The importance of quality assurance in services has been proved. Having expounded my point of view on the effects of service marketing in the 21st century geoinformation support I have come to the following conclusions:

- The definitions in the theory of marketing can be applied under the special circumstances of the armed forces, too
- It is important and useful to arrange information into metadata and the application of them also in the field of geoinformation services. Having ordered this information in metadata structure the readability and usability of our services will increase
- Geoinformation services can be regarded as special goods the characteristics of which can match the definitions of service marketing
- The most important tasks of our services present themselves in the fields of education and further education
- Elaboration of theoretical and practical knowledge shall be carried out, and an appropriate educational background shall be provided
- The degree of geoinformation knowledge shall be improved at all levels of the armed forces

In Chapter 4, the results of the actual information acquisition, i.e. the theory and practical implementation of the questionnaire survey have been revealed. I have gone into details in the theory of market research, the requirements of primary and secondary information acquisition as well as the steps of the elaboration and analysis. A comprehensive image on the history and the results of the questionnaire surveys has been given; the questionnaires have been processed and analysed and conclusions have been reached. The results have been displayed in the form of diagrams and textual explanations upon which I have come to the following conclusions:

- It has been proved that the questionnaire survey should be carried out more frequently, i.e. 4 to 5 years, more steadily and on a more extensive basis
- In the new organisational structure marketing activities shall be carried out in order to have our results and services presented on a wider basis
- It is reasonable to widen the relationships with other armed and law enforcement organisations as well as other authorities of national competency
- The geoinformation abilities of the troops as well as their already existing scope of knowledge shall be expanded; the possibilities of the geoinformation positions and technical tools shall be exploited
- The international requirements arising from mission activities shall be incorporated in the research
- The relations of geoinformation services shall effectively work together with the allied systems

I have attempted to obtain all accessible information and professional literature about this topic. Having utilised the possibilities of the Internet a great many of usable publications, articles and PowerPoint presentation have been discovered and used during my work. The novelty of my thesis is hidden in the fact that no paper producing such scientific results has ever been published before. Efforts have been made to give a most detailed and unabridged image on service marketing since it was the first time such an exhaustive survey has been carried out. The survey, as for the high level management, has been implemented on my initiation, while, as for the personal and organisational survey, has been carried out on the motion of the Mapping Service of the Hungarian Defence Forces. In elaborating the questionnaires as well as compiling the questions I have assumed an active role myself.

5. SUMMARY OF CONCLUSIONS

In the thesis an introduction on the subject of the geoinformation service, a system describing three-dimensional space with information, has been given. Information acquisition has an important role in geoinformation. Taking into account the great number of definitions in the field of GIS, geo-information and geoinformation systems I have made a proposal on a new phrasing of the terms ‘geoinformation’ and ‘geoinformation systems’ based on individual aspects and with scientific demands.

Taking into consideration the international engagements of geoinformation services I have created links between the NATO and EU geoinformation policies and defined requirements in the field of cooperation. I have arranged the international possibilities and extraordinary importance of geoinformation services in a scientific way and formulated answers and possible answers to the ‘what’ type of questions.

I have reviewed the role of geoinformation on the World Wide Web, summarised the necessary utilisation of military layers and applications and analysed the role of GIS in respect of simulation systems established at the Hungarian and allied armed forces. I have elaborated some possible aspects of acquisition and protection of information in the operational planning and management period with a great stress laid on the issues of data quality and safety. I have examined, evaluated and elaborated theories of information structures, the way of turning them into practice in the present and the future, and a system of networks that could be developed. I have examined the information channels available in Hungary with special regard to geoinformation services.

My thesis gives a thorough image on the theory of marketing and service marketing and gives rise to thoughts and demands on the topic. Attention has been called on the reasons for existence and the possible ways of development of this discipline. For the first time, I have created arrangements and drawn conclusions that are unique in the examined topic.

And last, but not least I have tried to find answers on the ‘why’s, i.e. why service marketing should be examined and why the opinions of the users shall be learned. I have presented earlier surveys and followed some theoretical questions, especially regarding the method of direct, i.e. primary, data acquisition of market research. A detailed discussion on the theory, steps and evaluation methods of the questionnaire survey has been given. I have completed a three-level (organisation-persons-management) questionnaire survey on our services and the evaluation of it and created reports and

diagrams in order to show the results in a lively way. Textual analyses have been made and conclusions have been drawn from the results gained. I have elaborated proposals in order to have the work made more productive and to provide more effective, user-friendly services. I have carried out a unique market research task the results of which will have effects on the future of our profession.

I think, what is more, am convinced that my research has reached its goals. According to the challenges of our era a new sphere of concept has been determined that may constitute the subject of the GIS services in the future; this is geoinformation. The implementation of services has been transferred to on market bases to which I have used the theoretical bases of service marketing. I have shown the way to the mediatory elements of our services, which should be quick, effective and accessible to everyone. Finally, I have investigated and analysed the requirements and demands of the users, their opinion about our trade and the military GIS support, the main statements of which are to be found in the theses below.

6. NEW SCIENTIFIC RESULTS

The new scientific results of my research work as presented in this paper can be summarised in the following theses:

Thesis No. 1: I have processed and analysed the earlier definitions of the words ’GIS’ and ’geoinformation’, and based on them, according to the challenges by our era and the requirements by the Alliance, I have made a proposal on a new terminology, more accurate then before, on the terms ’geoinformation’ and ’eoinformation systems’ (D.S.4, I.S.1, L.S.1, Sz.S.1, K.S.1, K.S.2, K.S.4, K.S.6, K.S.7, K.S.9, K.S10).

Thesis No. 2: Besides the possibilities of the developed information infrastructures used at present I have processed the solutions applied and planned at the Hungarian Defence Forces, completed a comprehensive analysis of the information forwarding systems and, with some anticipated expectations taking into consideration, made a proposal on the future use of them at the Hungarian Defence Forces from the management level to the executing subunits or the combatants (I.S.2, Sz.S.2, K.S.3, K.S.8, K.S.9).

Thesis No. 3: After investigations in marketing and service marketing carried out in an identical way connections have been determined and also it has been demonstrated that marketing, as a science, has the same characteristics in military environments as under market circumstances. I have published the results of the process and analysis in professional literature for the first time, which will serve the interest of the profession and may serve as a basis of further research (I.S.3, D.S.3, L.S.2, K.S.5, K.S.6, K.S.10).

Thesis No. 4: Using one of the solutions of market research system of service marketing I have carried out a questionnaire survey at the various levels of management of the Hungarian Defence Forces aided by the Mapping Service HDF. The results of the survey have been processed and analysed and, based on them, I have defined requirements for the geoinformation services (D.S.3, K.S.9, K.S.10, K.S.11, K.S.12).

7. USABILITY OF THE RESULTS OF RESEARCH IN THE PRACTICE

In my thesis the phrases ‘geoinformation’ and ‘geoinformation system’ have been defined. By this, an opportunity presented itself to make further clarifications of these terms and preparation the geoinformation doctrine. Also, it can serve as a basis for the experts in their efforts to define the services of geoinformation systems.

Turning information infrastructures into practice it can also be of assistance to the developers to define the requested demands. The support of geoinformation services assumes huge hardware capacity as the large size of the files shall be taken into consideration in data transmission on the one hand and the special software needs for working in a network on the other. The Hungarian Defence Forces shall create its individual network with the allied prescriptions taken into consideration. It can be said that it is precisely geoinformation data servicing that could be one of the ‘narrow’ cross sections in the building up this network.

Getting acquainted with the theory of marketing may not only be advantageous in the field of geoinformation servicing but could be used for formulating definitions applicable in practice at the whole of the defence forces as well. As for geoinformation services, this definition is valid to a greater extent since with our services we make steps beyond our borders as we wish to make these supports available to our military and civilian

partners. Practical application of marketing and service marketing will be effective to a highly increased degree.

Questionnaire survey is one of the primary data sources of market research. A survey examining the demands on the geoinformation services implemented at the Hungarian Defence Forces has given answers to a great many of practical questions. A useful advantage of the survey is that it has been executed in three different levels simultaneously providing abundant information on the demands, requirements and existing deficiencies at the three levels (persons, organisations, high level managements). Based on the evaluation, answers and raisings of the survey, experts dealing with geoinformation services can make real proposals on the future development of the services. They can have answers on the preparedness of the users as well as their requirements and experiences regarding geoinformation services. This knowledge is indispensable when future creation, building up and modernisation of our services are concerned. Solving problems, building up services in a user-friendly manner are essential parts of the development of an organisation as well as the satisfactory of the users. Through the results, conclusions and suggestions of my thesis I wish to add some theoretical and practical recommendations to these tasks.

8. RECOMMENDATIONS

TO THE HUNGARIAN DEFENCE FORCES AND THE GEOINFORMATION SERVICE HDF:

1. I find the results of my research usable to aid the elaboration of military geoinformation support, new concept of services, geoinformation doctrine, various technical instructions, educational materials and scientific papers and proposals.
2. My thesis can be a useful subsidiary material for the decision preparation experts and decision makers responsible for the geoinformation development of the Hungarian Defence Forces. Also, it can give them a successful support to establish and make decisions.
3. Geoinformation officer and non-commissioning officer positions shall be created in the organisation tables within the Hungarian Defence Forces in order to the successful implementation of geoinformation support.

4. The capabilities of the existing geoinformation workstations and databases shall be utilised as well as organisations using geoinformation systems should develop their own databases and systems.
5. In support of geoinformation systems the intranet network of the Hungarian Defence Forces, now under development, shall be used. During the formation of the network, proposals on the technical parameters of the system shall be made; by which fast and efficient data flow can be assured within the system. However, it shall be noted that our services go beyond the bounds of the Hungarian Defence Forces as we intend to provide our services to other law enforcement organisations and agencies with national authorities as well.
6. A website of the Geoinformation Service HDF shall be established.

WITH REGARDS TO TRAINING, EDUCATIONAL AND FURTHER EDUCATION:

1. The whole of the thesis and its chapters one by one can be used in education and further education of geoinformation and other experts dealing with this topic.
2. Officers and NCOs working in standard positions shall, in the frame of locally organised staff training days and with their own devices, present the results and possibilities of their geoinformation services along with how these services can be requested and put in practical use.
3. The efficiency of geoinformation preparedness of the executing staffs in missions shall be ensured by supplying up-to-date and maintained information, sustaining continuous relations with the executives and the lead nations responsible for geoinformation support of the given area.

In the field of service marketing:

1. Service marketing used in the field of geoinformation services will open new territories for the organisations providing such services, speed up data acquisition and stimulate the display and application of such information.
2. Service providers should take into account real user demands and requirements. For this purpose, survey of the requirements on a regular basis can be used as a tool.
3. Results of the questionnaire survey will show the directions of development of geoinformation services and unveil user requirements. Fulfilment of these

requirements, however, will promote the further improvement of our profession but will also raise questions regarding the development of the trade.

Others:

I would like to dedicate my PhD thesis and its results to those who show interest in the new direction of MC&G and GIS, officers, tutors, organisations dealing with map production, military leaders and Hungary's NATO partners.