

PHD TESIS AUTHOR'S REVIEW

NATIONAL UNIVERSITY OF PUBLIC SERVICE
Doctoral Council

Major Szabolcs Jobbágy

**On developing the digital professional knowledge of the
communication and information NCO and warrant officer
operating personnel**

author's review of PhD thesis

Scientific supervisor:
Captain Tibor Farkas, PhD

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DEFINING THE SCIENTIFIC PROBLEM

The global, everything affecting effect of the digital society reaches also such special, more closed fields like the area of defence, law enforcement services, so the Hungarian Defence Forces (HDF) as well. Thus also the info - communication network and its substantial element, the operating personnel have to keep pace with this change and development. This intention and will is drawn in the acquirements and expectations of the political decision making, the military higher leadership, the professional superior and the legislative background as well. The more, also the international involvement of the HDF is putting a significant task on us regarding this field. In the meantime, as a result of the development of military science, the characteristics of the opposing forces on the modern digital-, and information battlefield, and the technologic innovation, the warfare of the modern age has gone through a generation shift. Nowadays we have to talk about fourth generation warfare, age of cyber war, computer network operations (CNO), information operations (INFOOPS), network centric warfare (NCW), and network enabled capability (NEC).

Approaching from the aspect of technology and service, one can see that due to these, albeit a bit in a late fashion, but also within HDF a constant development is present, for example resulting in the realization of the Insular Telecommunication Network for Purpose of Government of the Hungarian Defence Forces (ITNPG of HDF), a state-of-the-art info-communication network, which provides base plate for the stationary and field info - communication system comprising of the analogous and digital system-elements of HDF. ITNPG of HDF combines such technologies meeting the standards of digital age, like for example MPLS TCP/IP based solutions; E1, E3 broadband connections; digital microwave linkage; VSAT based, wire free, long distance transmitting ways, VPN, ISDN PRI, VTC services. All these are provided by technical tools, like digital switch centres, multiplexers, VoIP phone devices, IP cameras, CISCO active network devices. Naturally the routes of the future development are also defined by the standards of digital age.

However, the development defined as an expectation and acquirement from the technological and service side is only a partial aspect of this field. It is inevitable to analyse each segment, all the building stones of the info-communication system. Thus the signals and information, info - communication force cannot be an exception to this either. Since „*the development, running and operating of a state - of - the - art signals*

and information system without professional personnel, in many cases possessing the knowledge of an engineer, and further educated in a course system is impossible.” As a result, in the interest of running the ITNPG of HDF an operating staff possessing digital literacy is requisite. Such experts, who had have to cooperate with soldiers of other nations in an international environment during NATO, UN, EU or OSCE missions. Fulfilling their professional tasks isn't to be imagined without the presence of digital professional knowledge, and the ability to transform it into practice, and utilize it as on a skill level. The education and training of professional experts, the creation of access to knowledge stocks and databases securing gaining of information, has even to be of higher importance in this more closed, more specialized digital social segment. If digital literacy has to be present on an all-society level at the digital age, then this has to be true for the digital abilities of the professional experts at HDF on an exponential level.

Innumerable scientific work has been made already on the stationary and field information systems giving the base of the HDF info - communication network, on its effects on organizing signals service and the order of organizing and operating that, and on the shifting to digital technology from analogous systems. In 1994, András László in his PhD thesis analysed the evolution and development of digital communication, and its evolving and possibilities of utilization within the information system of HDF. Zoltán Rajnai in 2001 set the goal of analysing the field basic information system, and the possibilities of digitalization in his scientific work, in the aspect of communication systems of each NATO member states. In his 2003 thesis, Károly Fekete researched the possibilities of further development in the stationary communication system of HDF. Sándor Szőlősi in 2007 dealt with the development trends and possibilities of technological utilization of converging networks within the frame of HDF info - communication system. In addition, in 2015 Andás Tóth analysed the possibilities of realizing network enabled capabilities in the communication system of HDF. In fact, most of these approached the digital society and the actual effect of digitalization on it from solely one perspective. That of the aspect of technology and service. As an outcome, loads of suggestions come at hand in regard of network infrastructure, tools, transmission capabilities, services provided by the network, interoperability and compatibility and of possibilities of connecting to other nations' networks. At the same time, not much is told about the operating staff, the signals and information, info - communication force. Their digital professional knowledge has to

be developed as well. They have to be armed with digital literacy. *However, HDF isn't really possessing the ability nowadays either to adopt or convert the professional knowledge meeting the task and function system of the leading NATO and EU forces as a whole to its training of NCO -s and warrant officers. As a result, the professional signals and information education of the HDF NCO Academy isn't able to meet the challenges of the recent time of digitalization without a residue. The obtainable digital professional knowledge cannot be compared in all means to the utilized technologies and services within HDF -s info-ommunication network.* Within the frames of developing the digital literacy of the human resource, the operating staff can be armed with up - to - date digital professional knowledge and abilities. With it, we can educate also for the organisation a professional, but at the same time an expert with a value for the civilian IT segment, competitive, and possessing appreciated knowledge. As an effect, in the case of their leaving of the organisation because of the changed carrier and lifespan model, we can support their employment in the public service or on the market of the civilian IT sphere.

According to the defined scientific problem I decided to narrow my field of research, which originally covered the shifting to digital field communication systems and its effects on organising field communication, and on the organisational and activity order of signals forces. Instead I put the stress during my research on the development of the digital literacy, abilities and professional knowledge of the signals and information, info-communications force, the operating personnel, in regard to the discrepancies of professional signals- and information NCO and warrant officer training. Moreover I held it necessary to change the title of my thesis for this very same reason as well. The original title was „The effect of digitalization on the modernisation of field communication” which was changed to „On developing the digital professional knowledge of the signals and information NCO and warrant officer operating personel”.

DEFINITION OF RESEARCH HYPOTHESES

During my PhD research I defined the following hypotheses:

- as an outcome of the effects of the incredibly fast pace technologic and service revolution of the digital society on the info - communication network of HDF, the digital literacy of the operating personnel has to be developed by up-to-date professional knowledge. Though, HDF won't be able even nowadays to adopt and convert the knowledge meeting the task- and function system within NATO and EU armed forces fully into its professional NCO and warrant officer training;
- the knowledge provided by recent education isn't meeting the challenges of the digital age, the task of running the technologies of and providing services within HDF info - communication network. Thus the revising of the professional signals and information education system at HDF NCO Academy is necessary;
- there is a probability of developing the professional digital knowledge and digital literacy of the named operating staff with the introduction of knowledge material provided by NetAcad Program into the professional education;
- the revised professional education system provides possibility to train experts both useful and outstanding for the organization, and valuable, competing and appreciated in the civilian IT market. Possessing all this digital literacy can make the occurent secession because of changing career and lifespan model, and the helping to reemploy in the civilian IT sector or public service easier.

DEFINITION OF RESEARCH GOALS

During the work I regarded as essential goal settings:

- *to study, analyse and estimate* the outcomes of the effect of digital society on HDF info-communication network and its technologic and service aspects in regard of acquirements to the digital knowledge of operating staff;
- *to collect, analyse and interpret* the notions, definitions and terms strongly connected to my field of research;
- *to study and analyse* ITNPG of HDF affected by the digital society;
- *to study, analyse and estimate* the system of CISCO Networking Academy (NetAcad) and the connecting program (NetAcad Program);

- *to study, analyse and estimate* the professional signals and information education system of the HDF NCO Academy;
- *to make proposal* on the revision and completion affecting the named fields of professional signals and information education system at HDF NCO Academy in view of NetAcad Program.

UTILIZED RESEARCH METHODOLOGY

During my PhD research I used the following research methods:

- I realized research, study and processing of specialized literature;
- I studied and analysed the digital society, and drew conclusions on its effect on the info - communication network of HDF;
- I collected, analysed and interpreted the notions, definitions and terms connected to my field of research;
- I studied the ITNPG of the HDF, studied the relevant legislative background, and estimated the acquisitions and expectations to it. I processed the publications of international and national professional conferences, and signals and information courses;
- I studied, and analysed the system of NetAcad, studied, compared and estimated the accessible courses and their qualification on each level of NetAcad Program, with special awareness to IT Essentials PC Hardware and Software (ITE), and CCNA Routing & Switching (CCNA R&S) courses. I compared each course to the system of professional education in national professional training system and IT field;
- I involved questionnaire survey about the practical usefulness of knowledge material gained in the courses of NetAcad Program, and about the success of the education. With the gained feedbacks I made some conclusions, based on which I triaged if it is reasonable, and possible to insert these materials into the professional signals and information education at HDF NCO Academy;
- I processed my own experiences about the international professional trainings and about the CISCO CCNA Routing & Switching (CCNA R&S) information network building and operating course as well;
- I studied the characteristics of competency - based, modular type professional education, and drew conclusions on it. I analysed the relevant legislative

background, and the professional education system of the HDF NCO Academy. I analysed, estimated and compared the basic professional NCO training, the signals and information system operating specialization, and the warrant officer signals and information professional training system based on the others;

- I consulted the competent experts at HDF NCO Academy's professional training system, collecting their views about the courses of NetAcad Program;
- I defined the possibility of inserting the knowledge material provided by the relevant courses of NetAcad Program into the professional signals and information education system at HDF NCO Academy.

SHORT DESCRIPTION OF THE RESEARCH IN POINTS

My thesis comprises of three main chapters, which are all closed with summarizing and conclusions.

In the introductory part, I refer on the essence of the digital society, on its effects reaching everything, after which I draw the scientific problem. Afterwards I describe my goal of research, define the hypotheses, sort out what did and didn't the subject of my research include, and I draw up my methodology on research. As a closure of the introduction, I define the basis of my research and shape the formal considerations.

In the first chapter, I study, analyse and estimate the most important features of the digital society. After a short historical panorama I inspect the prelude of its evolving, analyse and estimate its peculiarities, study its periodization. Then I study, analyse and estimate its effects on the armed forces, and organize all the conditions, which were inevitable for its coming to life. Beyond that, I study and clarify all the terms and definitions connecting closely to my topic. Closing the chapter I also study and analyse the ITNPG of HDF in general, its structure, goal, professional leadership, control and the future and planned main lines of development.

The next chapter is one of the most important pillars of my scientific research. In its frame, I analyse the system of NetAcad, the NetAcad Program, and estimate and compare the accessible courses and classifications on each training level. Most stress is put among these on ITE and CCNA R&S courses, and the assigned exams and classifications. Parallel I study their equivalency to the national professional training system and the professional education on IT field.

In the third and last chapter, I study and compare the system of competence based modular basic NCO training and the professional warrant officer training based on that

at HDF NCO Academy. In the first case, emphasis is put on the signals branch, and the military information system - operating branch and its sub - branches, while in regard of the latter stress is put on the signals and information branch. I analyse the expectation of the customer and professional superior, the international situation, acquisitions and the legislative background. Based on the work of the second and third chapters I draw conclusions about the possibility to integrate the named NetAcad courses into the professional education system of HDF NCO Academy, thus making suggestions on the approach of that.

In the closing chapter, I make a general summary about the outcome of my research and analyzation, and draw some final conclusions. Supported by these I define my scientific results, and make suggestions on their practical utilization.

The thesis is closed with list of figures, list of abbreviations, appendix, bibliography, and list of my publications.

SUMMARY, FINAL CONCLUSIONS

Based on my research on the society of the 21st century and the ITNPG of HDF, in accordance with my hypotheses I drew the following conclusions. The digitalization of recent days doesn't only have effect on the technology and service aspect, but also on the principles of organizing and planning in the case of up-to-date info-communication network of HDF. The developing of the professional knowledge and digital literacy of the personnel responsible for operating the digital systems and up - to - date signals and information networks, and for provision of certain converged services is inevitable. Thus, the completion of the professional literacy of NCO and warrant officer signals and information experts with such kind of knowledge, within the frame of professional education system of NCO basic professional training and warrant officers' specialization, and outside of it in trainings based on courses is inevitable as well.

Through the introduction and analysing of NetAcad System and NetAcad Program, I made the conclusion, that the knowledge material of the network academy courses is applicable to develop digital professional knowledge and digital literacy. This is also supported by the expediency survey made during my research, which was meant to verify the success and usability of the BSc level and course system education of network knowledge ran by the National University of Public Service, Faculty of Military Science and Officer Training, Institute of Military Maintenance (NUPS

FoMSOT IMM) Signals Department CA. Moreover, for this reason did I make an international outlook on the IT education portfolio of armed forces, defence organisations and educational institutes of other nations. Based on these I made the conclusion that knowledge accessible within NetAcad Program is part of all of those in one or another form.

At the same time, while studying the recent professional education system at HDF NCO Academy I made the conclusion that in its recent form it doesn't meet the requirements of the digital age. The gainable knowledge within the frame of the education doesn't entirely meet the requirements of operating the state-of-the-art technology and providing services at ITNPG of HDF. The more, even that provided isn't in accordance with the level of sufficient professional knowledge to meet the professional requirements of the digital age and for the task and function system of other allied nations. Thus the revising of professional signals and information NCO and warrant officer is all the way necessary. The more I drew the conclusion that the NetAcad Program can be inserted into basic professional signals and information training and also the professional warrant officer educating based on it at HDF NCO Academy. However, against my goal beforehand, I had to get to the conclusion, that the same isn't necessary and not even possible in the case of military information systems operating branch.

After studying the relevant courses, themes and topics of the professional education framework curricula and program, I made the conclusion that they cannot be changed all in all with the knowledge provided by the network academy's courses. As a result, I think it is necessary to work out new independent courses. For this reason I processed a particular course description and program of „Information technology essentials (PC hardware and software)” equivalent to the knowledge material of the ITE course, to be integrated to the signals branch, radio station operating sub - branch and transmission- and connection technology operating sub-branch of the NCO basic professional training, and the signals and information warrant officer professional education, based on the former. On the other hand, I processed also particular course description and program for „Network essentials” and „Networks I.” courses, which are equivalent to the knowledge material of the ITN module of CCNA R&S course, and its second RSE module, and can be integrated to the professional education on transmission- and connection technology operating sub-branch. Parallel I made the conclusion that it is necessary to revise the relevant legislative background, the

framework curricula of the professional education and the training program as well. As a result, I defined all the affected areas, where a change is necessary, and I also made suggestions on the means to do it. All this I pictured in a matrix table form as well.

After analysing and estimating the information from the competent experts and teachers from HDF NCO Academy, I came to the conclusion that there is a need of creating a CA within the frames of the institution. For this reason, I held it to be necessary to define the organisational, personal and technical conditions of the creation of a new academy. Beyond this, creating symphony and a kind of a hierarchic build up I made suggestions on the possibility of integrating some courses of NetAcad Program into the educational system of the newly created CA on HDF NCO Academy and also into the already existing one at NUPS FoMSOT IMM Signals Department, with attention to the need of cooperation. All these suggestions I pictured in a complex procedure figure and a matrix table form as well. Beyond that, I held it necessary to work out a particular training program for IT Essentials PC Hardware and Software course, with the suggestion to integrate it into the course type education portfolio of Signals Department's CA.

By introducing, analysing the NetAcad Program, estimating the accessible qualifications, and connecting exams I drew the following conclusions. What the courses and abilities accessible through the network academy type education, we can train the personnel to operate digital systems, state-of-the-art info-communication networks, and the ITNPG of HDF as professional staff for the HDF, parallel we can also introduce them on the civilian market as competing actors with great value. During this we can arm them with up-to-date, practice-oriented, ability level professional digital knowledge and literacy, and assuring them qualifications which can ease their departure from the organisation because of changed carrier and lifespan model, and their reemployment in the civilian IT sector or connecting fields of public service.

SCIENTIFIC RESULTS

- Based on the studying, analysing and estimating of the digital society, the relevant terminology background and the ITNPG of HDF, I verified that as a result of the effect of digitalization on the info - communication network of HDF and its technology and service aspect, the developing of the digital knowledge and literacy of the signals and information operating NCO and warrant officer staff is necessary as well;
- With studying and analysing the NetAcad Program and the professional education system at HDF NCO Academy, I verified that the revision of the education is necessary. I also verified that the network academy education is sufficient for this purpose, its courses are possible to insert into the professional education system of signals branch and sub-branches at NCO basic professional training and signals and information branch of warrant officer specialized education. In addition I verified that in the case of military information system operating branch there is no need, nor possibility to do that;
- Through studying and analysing the professional framework curricula and the courses of the training program, I verified that they cannot be changed with the courses of the network academy education without modification. Based on this I made suggestions on creating new courses. I defined the parts of the relevant legislative background, the framework curricula, and the education program, and suggested the way to do it. All this I pictured in a matrix table format;
- In a complex progress figure and in matrix table I worked out the possibilities of inserting the courses of the NetAcad Program into the education system of the newly formed CA at HDF NCO Academy, and that of the already existing one at NUPS FoMSOT IMM Signals Department.
- I made suggestion on the organizational, personal and technical substantial for the creation of the new academy;
- Based on the studying and analysing of the NetAcad Program, I verified that by inserting it into the professional education, we are able to give the operating personnel such up - to - date digital knowledge on their profession, by which they can be professional and competing experts as well within HDF just as on the civilian IT market. By estimating these digital abilities, I verified that in possession of them

the possible departure and reemployment in the civilian IT sector or public service field can be made easier.

RECOMMENDATIONS FOR PRACTICAL USAGE

- I recommend to utilize and integrate the scientific outcomes defined in my thesis into the professional education system of signals branch and sub - branches at NCO basic professional training and signals and information branch of warrant officer specialized education at HDF NCO Academy, thus making it ready to be revised and reworked;
- Beyond that I recommend to realize and utilize it to complement the training based education portfolio of network knowledge at the CA of NUPS FoMSOT IMM Signals Department;
- I suggest to study the possibility of utilize and integrate the courses of the NetAcad Program into the portfolio of the NUPS FoMSOT IMM Information Department's Military Operating Basic Education, Military Information Specialization, BSc level, in the interest of rethinking and complementing it;
- The fields mentioned during the analyzation and estimating of my PhD work can create a basis and work as kick-starters for further research of the topic, publications, theses and other scientific work.

LIST OF PUBLICATIONS

LECTURE NOTES

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WORK IN STUDENTS' SCIENTIFIC WORKSHOP

- JOBBÁGY Szabolcs hallgató, SEREGE Gábor hallgató KMKA-1: *A harmadik generációs rádiótelefon-rendszerek alkalmazásának lehetőségei kiegészítve a WLAN hálózati megoldásokkal a Magyar Honvédség keretein belül.* - 2003. - Konzulens Fekete Károly alezredes egyetemi adjunktus - ZMNE Híradó Tanszék, Bp. - 51 p.

PRESENTATIONS

- JOBBÁGY Szabolcs: *CISCO Certified Networking Academy Training, CCNA Routing & Switching.* - Kommunikáció 2015 Nemzetközi szakmai tudományos konferencia, Bp., 2015. november 11.
- SEREGE Gábor, JOBBÁGY Szabolcs: *GPRS: Út a mobil Internet felé.* - Kommunikáció 2003 Nemzetközi szakmai tudományos konferencia, Bp., 2003. október 15.

- **JOBÁGY Szabolcs, SEREGE Gábor:** Az egységes készenléti digitális trónkólt rádiórendszer, TETRA és TETRAPOL jellemzői, sajátosságai. - Kommunikáció 2003 Nemzetközi szakmai tudományos konferencia, Bp., 2003. október 15.

PROFESSIONAL - SCIENTIFIC CURRICULUM VITAE

Personal data:

Name and rank: Szabolcs Jobbágy, major

Date and place of birth: Sátoraljaújhely, 24.03.1981.

Family status: married, father of one child

Constant/postal address: 2120 Dunakeszi, Huszka Jenő Street 11. Ground 1.

Phone: 06-20/919-6942 (02-2-29192)

E-mail: jobbagy.szabolcs@uni-nke.hu

Lectures:

2009-2012 Miklós Zrínyi National Defence University, Doctoral School of Military Science (PhD), correspondence education

1999-2004 Miklós Zrínyi National Defence University, Faculty of Leadership and Organisation Science, Military Technology Manager Department, Military Communication System Organiser Specialization, licensed military technology manager, university graduation

1995-1999 Lenkey János Honvéd Secondary School and College, matriculation

Language knowledge:

2012 English STANAG 6001 2.2.2.2.

2009 French STANAG 6001 3.3.3.3.

Courses, professional knowledge:

2016 „Botnet mitigation” NATO CCD COE course

2014 Network knowledge - Education methodology of network informatics ASC Workshop and advanced training (FAT)

2013 Network knowledge - Network troubleshooting ASC Workshop and advanced training (FAT)

- 2013** Switching in local networks and large company environment ASC Workshop and advanced training (FAT)
- 2013** Routing and long distance networks ASC Workshop and advanced training (FAT)
- 2013** CISCO IT Essentials PC Hardware and Software (Instructor) course
- 2013** CISCO CCNA D4 Designing and Supporting Computer Networks (Instructor) course
- 2013** CISCO CCNA D4 Designing and Supporting Computer Networks (Student) course
- 2012** STANAG 6001 2.2.2.2. course for English language exam
- 2012** CISCO CCNA D3 Introducing Routing and Switching in the Enterprise (Instructor) course
- 2011** STANAG 6001 1.1.1.1. course for English language exam
- 2011** CISCO CCNA D2 Working at a Small-to-Medium Business or ISP (Instructor) course
- 2011** CISCO CCNA D1 Networking for Home and Small Businesses (Instructor) course
- 2011** CISCO CCNA D3 Introducing Routing and Switching in the Enterprise (Student) course
- 2011** CISCO CCNA D2 Working at a Small-to-Medium Business or ISP (Student) course
- 2010** CISCO CCNA D1 Networking for Home and Small Businesses (Student) course
- 2009** French CMLF-2 level (STANAG 3.3.3.3.) exam
- 2007** Signals level holding training
- 2007** General military and leadership progression course for promotion to captain
- 2007** Signals company commander professional progression course
- 2006** European Computer Driving Licence course (ECDL 7 module)
- 2006** Digital switching technology (operator) professional course (HICOM)
- 2006** Digital switching technology (programming) professional course (HICOM)

- 2006** General military and leadership progression course for promotion to first lieutenant
- 2005** French STANAG 3.3.3.3. language course Canada
- 2003** French advanced level military complex „C” type language exam (ARMA)
- 2003** French CMLF-1 level (STANAG 2.2.2.2.) language exam
- 2002** Training trip combined with language course („Stage récompense”) France (École Gendarmerie De Rochefort, Rochefort)
- 2002** French medium level military complex „C” type language exam (ARMA)
- 1998** State verified French medium level complex „C” type language exam

Professional experience, assignments:

- 2014** Field Training, France - Luneville - Exercise FERRIE
- 2012-** National University for Public Service, Faculty of Military Science and Officers Training, Institute of Military Maintenance, Signals Department, assistant lecturer
- 2011** Field Training, France - Sissone - Exercise SIRANO
- 2010** Field Training, France - Sissone - Exercise SIRANO
- 2009-2012** Miklós Zrínyi National Defence University, János Bolyai Faculty of Military Engineering, Institute of Information and Telecommunication, Signals Department, assistant lecturer
- 2007-2009** HDF 43. Nagysándor József Signals and Command Support Regiment, Processing Sub - units, Alföld Signals and Information Main Center Szolnok, Signals and Information Department Debrecen, department leader
- 2006-2007** HDF Signals and Information Command, Processing Sub-units, Alföld Signals and Information Main Center Szolnok, Signals and Information Department Debrecen, department leader
- 2004-2006** HDF 5. Bocskai István Light Infantry Brigade, Combat support Sub - units, Signals company, Signals platoon, platoon leader

- 2003** Field training HDF 43. Nagysándor József Signals Battalion
(Székesfehérvár)
- 2002** Field training HDF 5. Bocskai István Mechanized Infantry Brigade
(Debrecen)
- 2001** Field training HDF Savaria Training Centre (Szombathely)
- 2000** Field training HDF Tapolca Training Centre (Tapolca)

Others:

- Member of Puskás Tivadar Signals Fellowship
- Former president and honorary member of Puskás Tivadar Engineer
Advanced College

Budapest, 01 September 2017.

Major Szabolcs Jobbágy