SUMMARIES

From Integrated Defence via Total Defence to Comprehensive National Defence: On Defining the Nature of Estonia's National Defence in Strategy Documents

Ivo Juurvee

According to the Estonian Constitution passed in 1992, every citizen has a duty to defend the independence of Estonia. However, adopting a similar approach to all state agencies is more recent, dating back to 2010, although sometimes mentioned in earlier documents. This article deals with the challenge of finding an Estonian equivalent to such broad approach, using the textual analysis of strategy documents drafted since 1996 and expert interviews with practitioners involved in drafting such documents. Oddly enough, the above documents use different equivalents for the same concept, thereby creating further confusion. With the word "defence" one can read from the documents the extensions like "broad", "broad-based", "broad-surface", "broad concept" and "broad approach", to use the direct translation from Estonian. As it appears from expert interviews, the meaning behind these terms is the same and can be found in the Estonian National Security Concepts of 2010 and 2017 which both give a list of six pillars of national defence. The advisable term would be – translating it directly from Estonian – "broad approach to defence" (*riigikaitse lai käsitus*), and the English term used for this concept is "comprehensive national defence".

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Term Work is Teamwork: The Shared Concepts and Term System in Comprehensive National Defence?

Reet Hendrikson

In the information era and in the context of hybrid threats, military and more widely comprehensive national defence terminology plays an increasingly important role. Although modern viewpoint on terminology claims the opposite, research in defence and experience in other projects confirms that terminological variability hinders the communication and understanding between specialists. Common understanding and the shared system of symbols are fundamental in a crisis when human lives depend on the speed of message delivery. Thus, it is presumed that the areas contributing to national defence share the same information space, including the system of concepts and terms as one of its fundamental components.

This article aims to shed light on the aspects of terminology as an interdisciplinary and field-based sign system that tends to remain either semi-obscure or unconscious, yet expedient to keep in mind in national defence terminology work. The term work related to the project Manticus Apollo confirmed two main sources of term problems. Firstly, the adherence to source language patterns and term systems, rather than its concept level. Such weaknesses indicate more broadly the lack of knowledge about terminology as a discipline and its logic, as well as about the differences in conceptual hierarchies. Secondly, the field-related and individual differences in the concept level and use of terms. Often people without a sufficient knowledge of the field do not see terminology as a separate field of research. High-quality terminology work and the choice of the optimal form of cooperation require the awareness of the nature of terminology as a highly applied field of research with its challenges. Terminology work should always have two main goals: to reduce differences on the one hand, and raise awareness on the other.

Term work is teamwork. Like effective terminology development, outreach requires a team: other professionals who can have a say in decision-making and disseminate decisions. The broadest possible integration of professionals into terminology work creates a sense of involvement crucial for decision dissemination.

The most important target groups in communication work are lecturers, researchers and journalists. They spread both relevant, reflective terms and inappropriate variants. Unfortunately, even teachers and scientists often lack the knowledge of terminology. This is reflected in textbooks and

teaching materials, including research publications, curricula, etc. The most challenging situation is when the problem is not recognised. In terminology, the initiative must always come from within a field. The key persons here are heads of education and training institutions and (sub)units. Otherwise it would be difficult or even impossible to achieve greater coherence and terminology awareness. The author's doctoral dissertation results unequivocally indicated that terminological harmonization is of crucial importance in teaching and subject teachers.

The most effective way of terminology harmonization is through the education system and routine everyday teaching of subjects. The best results are obtained by integrating the teaching of specialist language with specialty subjects. The keyword in terminology courses and integrated terminology learning should be *practicality*. Due to both the gap in the higher education system and the lack of good practice, sometimes even philologists do not make the best possible term decisions. However, the terminology awareness of specialists has increased year by year, both in national defence and in Estonian society. The same is true of the prestige of terminology as a discipline. Researchers and teachers increasingly realise the need to educate themselves and their students in this field. It is understood that terminology is vital and practical: something that is an inseparable part of good professional knowledge.

Achieving greater terminological consistency based on optimal terminology and similar understanding of concepts can take years. However, it all starts with the awareness and realisation of one's responsibility, which requires a conscious and consistent contribution of national defence institutions and higher education institutions to terminology work. One must understand that even the uniform use of terms and the common understanding of concepts and their relations will never give a 100% guarantee of understanding. However, this is one of the essential preconditions to ensure that there will be no omission or misunderstanding in circumstances that require urgent action.

Terminology work needs to be invested in as with national defense or top sports – it must be dealt with on a constant basis, not just when a conflict has broken out, or a competition is about to begin. Maintaining a terminology network and a cooperation culture is an investment in wide-ranging and effective cooperation between the parties in national defence in a crisis.

Crisis, Threat, and Risk

Aarne Ermus, Jaan Murumets

This article elaborates on approaches to crisis and crisis management, and related concepts of threat and risk, as developed within the framework of the Manticus Apollo project commissioned by the Government Office of the Republic of Estonia. The aim of the study is to create a shared conceptual basis and vocabulary to facilitate cooperation between different government agencies operating within the framework of comprehensive defense. The authors define crisis as a situation where the organic resources and capabilities of responsible organizations are insufficient to resolve the situation. Transition to crisis, then, is a matter of political decision to activate reserve components, engage additional resources of other agencies, or apply non-customary doctrines, tactics or procedures. Threat can be any source of potential damage that could cause considerable harm to individuals, systems or the state as a whole. Risk is defined as a combination of probability of an event and severity of its consequences. While crisis is seen as a process with its formation, culmination, and fading stages, crisis management should be seen as a process with prevention, preparation, reaction and recovery phases. Crisis management, from the perspective of a state, is a continuous and uninterrupted process.

The Role of the Learning Experience in Civil-military Cooperation and Information Exchange

Erkki Koort

More than ten years ago the comprehensive defense concept was introduced in Estonia. This article analyses the learning experiences gained from three civil-military cooperation (CIMIC) operations with an emphasis on information exchange. Two out of the three were accidents and the third operation was staged, with all participants well aware of it several years in advance.

The first CIMIC operation was carried out during an accident in Lake Ülemiste, where an aircraft landed on the frozen lake. The lake is right next to the Tallinn Airport and is also a water reservoir of the capital of Estonia. The second crisis situation happened in northeastern Estonia where extreme weather conditions blocked one of the key highways with more than 200 cars

with 600 persons stuck in snow overnight. The third operation took place during the transport of euro banknotes and coins when euro was introduced as an official currency in Estonia.

There were three key questions:
1) How organisations used lessons learned after the crisis, how they documented it and how they shared conclusions?
2) How the learning experience regarding crisis management was shared with partners and how organisations prepared together for future crisis situations?
3) Did civil-military cooperation go well during the three crisis situations?

All three events took place in 2010 when they were the major safety events in Estonia and that is why they were chosen by the author. According to the Estonian legislation, most of the state institutions information that is marked "for internal use only" should be public after 10 years. This fact allowed to analyse relevant documents, e-mails, presentations, protocols and other materials. The three CIMIC cases can be described as follows: we know what we have, yet one does not know what to ask (the 1st case); we do not know what is needed, yet we offer a lot (the 2nd case); and we know what is needed, but we make it complicated (the 3rd case).

According to the analysis of the three cases, the level of civil-military cooperation in Estonia is very good and is even is better in the cases that happen unexpectedly. Since all hybrid warfare cases come unexpectedly and according to the analysis, preparedness for that looks promising.

Manticus Apollo Wargame and its Results

Veiko Dieves

The aim of the Manticus Apollo project was to propose the architecture of a situational awareness system for comprehensive defence. In order to examine the situational awareness support system ability to improve situational awareness, it was first necessary to examine the situational awareness of the parties involved in comprehensive defence in resolving complex situations. To fulfil the sub-goal of the project, a war game application and a war game scenario were created. This article gives an overview of the application of the war game and the results of the war game. It describes the previous use of

war game simulations in the study of command and control approaches, the war game application developed during the Manticus Apollo project, and the theoretical starting points of command and control approaches.

Simulating Situation-aware Behaviour in Support of Decision Making

Merik Meriste, Kalev Rannat, Leo Mõtus, Mare Teichmann, Tõnis Kelder, Jüri Helekivi

This article is a comprehensive overview about common issues in situation-aware modeling to support decision making. The main focus is on implementation of tunable models in agent-based simulations for investigating the behavioral patterns of simulation agents representing real world actors in crisis management or logistics in a dynamic operational environment.

Modeling of situational awareness and analysis of explicit behavior of agents is an essential part of simulation-based decision support. The article consists of the subsections about generic issues of decision support and distributed situation awareness. A special emphasis is placed on reckoning with the real environmental conditions and usage of realistic information for parameterizing the simulation models and agents. The work is illustrated with examples from different projects with practical implementation of agent-based simulations for decision support in crisis management and allocation of resources. All examples are implemented with the same methodology and in the same ProLab simulation environment.

Cross-dependency Analysis of Life-Critical Services

Peeter Laud, Hayretdin Bahşi, Aleksandr Lenin, Kalev Mändmaa, Jaan Priisalu, Reedik Tuuling

Awareness of undesirable events happening in the country, and of their consequences is a major part of the comprehensive national defense approach. Knowing and forecasting the status of life-critical services is part of this awareness. A drop in the supply of one of the services may have far-reaching effects, and so may a surge in demand. This paper reports on our work in formalizing the dependencies between the supply and demand of services in the Estonian context.

Our formalization depends on a suitable metamodel, i.e. a formal language for expressing the dependencies. The language has to be sufficiently expressive to capture the essential types of dependencies, but not overly expressive, as this would hinder the analysis. We have performed a review of the attributes of services and dependencies referred to in relevant literature, and have concluded that despite the richness in their structure, only the level of rendered services (expressed numerically), their changes in time, and their dependencies on the current and past levels of other services should be included in the metamodel. More complex services, e.g. the provision of electrical power, whose level cannot be expressed as a single number, should be characterized by a tuple of numbers (e.g. the availability of power at each substation).

In addition to the characteristics of the services, the metamodel allows the description of environmental events, using the same formalism. The examples of such events are weather conditions, as well as drops in the levels of external services, all characterized by their time of occurrence and duration. Given this ability to model the effects of external events, we can construct scenarios and run simulations to find out how well the infrastructure (according to our model) copes with such events in such sequence.

In our work, we have made use of two metamodels, the second one building on top of the experiences obtained while using the first one. The first metamodel focused on describing the relationships between service levels and resource stocks over time, offering a powerful description language for the supply side of the status of services, similar in the expressiveness to the DMCI model[1], but much lighter in the formalism. Our second metamodel combined the considerations of the supply and demand side, reducing some degrees of freedom available in the first model in order to make this combination tractable both for the analyst and the simulator.

We have used these metamodels to formalize the existing risk analyses that all providers of life-critical services must have[2]. We have found these analyses to be of widely varying quality and granularity, some of them describing the existing situation regarding the available resources, while the others describe the formal requirements on the resources for providing the service. A significant shortcoming of the existing risk analyses is the

[1] **Trucco, P.; Cagno, E.; De Ambroggi, M.** 2012. Dynamic functional modelling of vulnerability and interoperability of Critical Infrastructures. – Reliability Engineering and System Safety, Vol. 105, p. 53.

[2] **Elutähtsa teenuse toimepidevuse riskianalüüsi ja plaani, nende koostamise ning plaani kasutuselevõtmise nõuded ja kord**. – Riigi Teataja I, 28.06.2017, 6.

coverage of geography – the necessary granularity for describing the provision and consumption of services at different locations cannot be derived from the analyses. Additionally, the interviews with the representatives of the service providers revealed that the risk analyses do not cover certain important dependencies, e.g. the possible unconventional replacements for missing resources, or the competition for skilled labor among different providers. Finally, the risk analyses do not specify how simultaneous shortcomings in several inputs to a service provider combine.

In order to capture more details about the dependencies, we devised an application that a specialist at one of the service providers could use to describe the dependencies of his/her organization him-/herself. Through this application, the specialist can identify which dependencies and their combinations are important for the description of the organization. The same application allows to define possible events that either decrease the supply or increase the demand for particular services during certain time intervals. The saved dependencies can be used by a simulator, computing the outcomes of defined scenarios. The validation of the design choices made in the application is an ongoing process.

Assessment of Situational Awareness for System of Systems by Trusting in Capability-based Models of its Components

Leo Mõtus, Mare Teichmann, Merik Meriste, Kalev Rannat, Jaan Priisalu, Jaanus Kaugerand

In real life we sometimes stumble on a problem of assessing situational awareness (SA) of holistic system of systems that is composed of many interoperating heterogeneous organisations – e.g. country's comprehensive (all-embracing) defence system that comprises military organisations, law enforcement organisations (including rescue agencies), critical infrastructure organisations, and others. For managing and controlling the behaviour of any system of systems we need near real-time decision-making ability that stems from the measurements taken via models of constituent systems.

This paper suggests using near real-time measurements taken from capability-based models for estimating SA in constituent system. It is true that capability-based models provide only partial and approximate information

about the situation awareness of system of systems. At the same time, capability-based models, due to their near real-time and (verifiable) trustworthy data improves the decision-making quality, as compared with potential decisions stemming from the conventionally provided statistical data.

Capability-based models come from the DoDAF (Department of Defence Architecture Framework) methodology and are identified as Capability Viewpoint models (class CV-2) that are built on capability taxonomy. Capability taxonomy is an important simplifying factor, since quite often assessment of status of only some taxonomy elements is sufficient for estimating the health condition of the particular capability.

Capability-based models are simpler in comparison to the models that capture the details of functional operation (usually applied in systems of automatic control, and in simulation of system's behaviour). We can economise in the development time of models, and in the competence requirements of developers. An additional benefit is that the modifications of several aspects of the functional model have (almost) no impact on the required capabilities and capability taxonomies.

The major research centre of capability-based models in Estonia is the Estonian Military Academy, they focus on capability-based planning and execution systems design, leaving research on near real-time estimation of capability (and its taxonomy) status in the background. However, this topic has become significant due to the necessity to reduce efforts spent on the near real-time quantitative assessment of situational awareness.

This paper and accessory experimental work have confirmed the utility of concept applying estimation of capability-based models, and capability taxonomy in order to form a stream of values of near real-time current estimates of a particular capability. The analysis of this stream can reveal potential anomalies that later may develop into crisis and thus remarkably unburden crisis management.

However, there is a long way from the proof of concept to full-size practical application of the concept.

Enterprise Architecture and Capability-based Planning – Tools for an Efficient State

Ivo Peets

The second law of thermodynamics, which in essence is universal, exists in the universe. A simple version of it explains that everything in the world moves involuntarily towards greater chaos and disorder, i.e. entropy keeps increasing. In order to reduce disorder or entropy it is essential to work not only to create material and intellectual values, but also to plan activities. We need to find and make use of the right "tools" to make the process of reducing the growth of entropy more effective. The present article elaborates on some of such tools from a vast variety.

The research topic of the article emerged from the practical professional experience that cooperation between the state's different areas of responsibility could be improved, as shortcomings in planning and common situational awareness became evident at the stage of drafting plans. This, in turn pointed to drawbacks in the accepted planning methods and also to possibilities to improve cross-sector exchange of information and cooperation by implementing uniform planning methods across sectors. Over some time, the defence domain has successfully implemented capability-based planning principles, which led to the question whether the method of capability-based planning could work for other domains as well and how this could assist in improving their cooperation. The study confirmed that capability-based planning methods could be applied together with the high-potential enterprise architecture method.

The objective of the article was to confirm the above stated standpoints. The comparative analysis of planning methods, together with tracing possible faults that may emerge in their interaction, indicated that capability planning methods may be applied jointly with enterprise architecture methods. This kind of approach has the potential to improve the cooperation of state institutions and raise the general knowledge of situational awareness. To reach this objective, the mentioned methods were analysed in order to discover possible weaknesses and faults in their comparison and interaction, as well as their desired positive effects.

How problems may be targeted with enterprise architecture methods?
The article first discussed architecture framework, concentrating first and foremost on the problems that could be solved with the methods based

on enterprise architecture. In order to understand the complete picture, the reasons for developing the methods were studied and an overview was presented about the methods that are currently in use. It was instantly evident that the Estonian translation for the term "enterprise architecture" (*ettevõtte-arhitektuur*) was too narrow, since the term "enterprise" refers in Estonian mostly to business-related organisations. To avoid misinterpretations, the study uses a more general term in Estonian – "organization architecure", although other alternatives remain, the scope of this article was too narrow to elaborate more in depth about the terminology.

The method, which was developed in the 1970s and received its contemporary form in the 1980s, is successfully used in both private and public sectors for over thirty years. Even though the content and application range of methods and tools, based on the architectural framework, may vary, their internal logic remains the same. They all allow to handle complicated organisations and their components as systematically organised elements in a way that important information and data are accessible to those concerned, being logically connected. This safeguards constant overview of the organisation and its components, systematic administration of information and data, which enables to carry out transitions, manage change and lead the organisation to achieve its goals.

Why did capability-based planning become the main approach to defence planning?

After the Cold War the uniformly defined and measurable threat disappeared and forced the majority of NATO member states to seek new approaches to restructure their defence forces and justify expenses. Since a single high impact threat was replaced by countless smaller threats, it became increasingly difficult to prove their danger and justify the necessity to work out and acquire new deterrents.

The western block countries found themselves unexpectedly in a new multifaceted hazardous environment, which forced them to develop a contemporary defence planning method. The best suited for the developed situation proved to be the capability-based planning method that focuses on the capability requirement and does not tie planners to specific solutions in the beginning of the planning process. This approach enables to avoid existing limitations and patterns and not to get trapped by them, fosters the development of alternative solutions, stimulates innovation and creates conditions for inter-sector cooperation.

How problems can be solved using capability-based planning methods? For this, the application of capability-based planning methods was analysed in compiling action plans in the defence field. This works in situations where it is necessary to guarantee the required competence to repel various modern threats, while considering the limitations of available resources (incl. budgetary). This literally means "planning in the indeterminacy". In the article it is explained that the best suited method to solve a task under such conditions is the capability-based planning method. This is the method that allows for great generalisation when applied throughout the entire organisation. The planners must have the same understanding about the essence of the capabilities in order to understand which are essential to implement for a particular strategy. It is important to understand which changes must be carried out so that the chosen capabilities may offer the best results for all parties concerned.

In order to establish the possibility of using the method outside the defence area, it was compared with the capability-based planning method that is part of the TOGAF framework. It turned out that the planning method principles are similar in both public and private sectors, the differences are mostly due to the different demands presented by the main activity environments.

The author examined the possibilities of how to implement the capability-based planning method and architecture framework together, whether and how the interaction would manifest itself in the results. The analysis demonstrated that in the case of implementing the method in conjunction with each other the effect is greater than implementing each method separately. The focus of each method is on establishing or maintaining the organisation, which corresponds to the vision and set objectives. Due to their differences, the emphasis of the methods showed that the methods rather contribute to than duplicate each other.

The capability-based planning method creates solutions for the optimal use of existing resources, and requires cooperation in the cross-usage of capabilities. By including the enterprise architecture method, the solutions are made more comprehensively understandable for a wider range of users, also the capability-based solution architectures will have a more general usage in both public and private sectors. The hypothesis that the enterprise architecture is a suitable method for implementing capability-based planning method was confirmed.

The overall implementation of the capability-based planning method allows to estimate the amount of capabilities in different domains, whose fields of application reach across sectors and which can be implemented to

guarantee cost-effectiveness in performing various tasks. Hence it is possible to simultaneously ascertain and compare the capabilities that are needed to perform the task with currently available capabilities and if necessary, make amendments. By implementing the capability-based planning method across sectors gives us a general understanding of the situation regarding all existing and required capabilities. This creates a general knowledge of capabilities that can be shared with others or, to avoid unreasonable duplication, to cross-use. By inserting the outcomes into the architecture framework it becomes possible to create the architecture of an organisation or domain that helps clearly define interrelations. In addition, architecture can assist to get an overview of the current situation and to draw an implementation plan for future transitions and change.

Therefore, it is vital for the Republic of Estonia to work hard in the globalising and changing world to maintain and increase its success. Our efficiency in planning and realising planned activities enables our country to apply its potential energy for keeping the standard and achieving success.

The methods discussed in this article are one option that could be considered as a uniform approach – to reduce entropy on state level.