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Military utility: A proposed concept to support decision-making

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ABSTRACT

A concept called Military Utility is proposed for the study of the use of technology in military operations. The proposed concept includes a three-level structure representing key features and their detailed components. On basic level the Military Utility of a technical system, to a military actor, in a specific context, is a compound measure of the military effectiveness, of the assessed technical system's suitability to the military capability system and of the affordability. The concept is derived through conceptual analysis and is based on related concepts used in social sciences, the military domain and Systems Engineering. It is argued that the concept has qualitative explanatory powers and can support military decision-making regarding technology in forecasts, defense planning, development, utilization and the lessons learned process. The suggested concept is expected to contribute to the development of the science of Military-Technology and to be found useful to actors related to defense.

1. Introduction

> *For Clausewitz, in his masterly analysis of the mental and physical spheres of war, neglected the material–man's tools. If he thereby ensured to his work an enduring permanence, he also, if unwittingly, ensured permanent injury to subsequent generations who allowed themselves to forget that the spirit cannot win battles when the body has been killed through failure to provide it with up-to-date weapons* [1,p.158].

New requirements and challenges are born from strained military budgets and a rapidly changing world, as well as from the fact that the time when the military industry was in the forefront of technological development has passed in most areas. In Sweden, and probably in most other democratic states, the question of how limited resources should be put to best use is more relevant than ever before. In general, a military system is complex and already its early life cycle stages, from R&D to initial operation, span over several years and often a decade. After that a typical platform on land, at sea or in the air has an operational lifetime of perhaps thirty years or more. Hence, decisions today may influence warfighting capacity for decades.

Our first case of a decision situation is *the technology forecast*. Even before the technical system is born as a concept, armed forces have to make decisions about what technologies to invest their limited R&D budget in. This means there is a need to forecast and predict the utility of technologies as part of a potential technical system in some far away uncertain future.

The second case is *defense planning*. In short to midterm defense planning, i.e. the next ten-year period, decision makers are faced with the question of when and with what technical systems to replace those currently in operation, while keeping within budget restraints. Furthermore it has to be done taking requirements from interdependent capabilities and foreseen doctrinal, tactical and organizational development into account—optimizing the whole capability system.

The third case is *development*. Once in the concept, development and production life cycle stages of a technical system, the question of how to build a technical system of maximum utility to the customer, the armed forces, within a limited time frame and budget, is addressed using requirement management within the systems engineering process.

The fourth case is *use*. In the utilization and support stage of a materiel system, military commanders and their staffs plan the best use of their limited resources in order to maximize the probability

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of mission success. Concretely, during planning, a staff is typically required to assess what capability systems, i.e. units and technology, the opponent is likely to use based on their strengths and vulnerabilities. Assessing own strengths and weaknesses in the situation the staff is likewise asked to recommend the best use of own available capabilities, not least based on expected technical performance.

The fifth case regards *lessons learned*. This is the long-term review of systems and capabilities throughout all stages from technology forecast, development, defense planning and use. The lessons learned process must be executed in close collaboration with the system stakeholder in order to be accurate in validation of system performance and capability but also to be accurate in the time domain helping decision makers get near-real time information regarding the utility development of the system-in-focus.

In light of the above illustrated incentives for competence in decision making, *Military-technology* is developing as an academic subject at the Swedish National Defence University, SEDU, defined as:

> “Military- Technology is the science which describes and explains how technology influences military activity at all levels and how the profession of an officer affects and is affected by technology” [2].

It seems, though, that in every project similar analytic constructs have to be defined over and over with moderate adjustments to application. And evidently there are similarities between central questions in all the presented use cases from decision situations above. But, is it then possible to form a common theory, to support decision-making regarding use of technology in military affairs, from R&D investments to military operational planning? A more complete Military Technology conceptual apparatus would make it easier to relate to theories across academia, e.g. to economics or management sciences. It would certainly aid effective communication across disciplines within the defense community, i.e. between actors within military research agencies, the armed forces, procurement agencies and industry.

With this paper we intend to propose a concept with potential for both qualitative and quantitative analysis to support decision-making in military technology. The concept is named *Military Utility*. The starting point is a presentation of the postulates of Military Technology and the theory of concept analysis. After that an applied method for concept analysis is presented followed by a description of the resulting concept. The center of gravity is the following discussion on the concept dimensions and indicators. The paper ends with an example, final conclusions and proposed future work.

2. Military-technology

The technology the military profession chooses, and how it uses that technology, will affect the outcome on the battlefield and the sustainment of capabilities over time. This phenomenon is at the centre of interest here. Our viewpoint originates from postulates in military-technology [3]: the character of war change in pace with the development of technology, technology has influence on all military command levels, and a lack of understanding of technology causes diminishing military opportunities. Consequently, for an analyst in military-technology it is essential to understand what is important to the military decision-maker—i.e. what constitutes military utility?

In an article on the military-technological perspective on Geographical Information Systems, Åke Sivertun finds that maximizing military utility, (translated from Swedish “Militär nytta”) of the technology, is the core question. He stipulates a definition of the concept—how to in an effective way and at a minimum cost, in human life as well as materiel, reach the military mission objectives [4]. This definition is here regarded as a first iteration of the concept.

Military-technology is cross-disciplinary covering engineering as well as both natural and social sciences. The terminology used originates from these and the aim is to propose a concept in harmony with the use of related concepts within these disciplines. Coming from a Systems Engineering tradition viewing problem phenomena as *Systems* is fundamental. A System should be understood as “an integrated set of elements, subsystems, or assemblies that accomplish a defined objective. These elements include products (hardware, software, firmware), processes, people, information, techniques, facilities, services, and other support elements” [5]. In the military domain, *Capability* is a key concept. Our understanding of capability is that it is being able to do something and being able to do it well [3]. With *Military capability* an actor can solve military tasks and thereby achieve desired effects. Using a systemic approach military capability can be viewed as a system composed of interacting elements, as thoroughly discussed by Jukka Anteroinen [6]. We can choose to sort these elements into categories of Personnel, Organization, Methods and Technology (POMT) or into Doctrine, Organization, Training, Personnel, Materiel, Facilities, Leadership and Interoperability (DOTPMLFI), as in NATO publications. Regardless of categorization we realize that any component in a system, e.g. the technology element, has dependencies to other elements. Hence, a component has military utility only if it is viewed as a contributing element in a *Capability system*.

The prefix *Technical* system is used to label the technical element in an operational military capability system when it is beneficial to view the element in itself as a system. In this paper the object for the assessment is an element in the capability system and it is labeled the *Element of Interest (EoI)*, following the Systems Engineering tradition.

3. Concepts development and concept analysis

The above identified need for a concept is based on the view of them fulfilling several important functions within the scientific community. Frankfort-Nachmias and Nachmias states that a concept: provides a common language; provides a perspective to understand the phenomena; allows classification and categorization of different phenomena and; finally, it is the fundamental building block of theories [7,p.28]. Goertz submits that concepts are essential theories about ontology [8,p.5]. Govanni Sartori even claims that “*concepts are not only elements of a theoretical system but equally tools for fact-gathering, data containers*” [9]. A conclusion is that how a concept is designed constitutes not only the building blocks of theories, but also affects how the phenomena are measured and examined. Concept analysis is a process where the characteristics as well as the relations to other relevant concepts are made clear. It can be argued that in fields directly connected to a profession the need of concept analysis increases. A comparison can be made to nursing science where concepts analysis has a given role and where several methods have been developed [10].

There is a lack of lexical definition of the phenomena indicating that the concept is underdeveloped. Two approaches can be used in support of concept development. One is traditional Concept Analysis where the aim is to capture how the concept is used. The other approach is to focus on the phenomena, developing the concept, sometimes referred to as Concept Formation. Which approach is used is primarily dependent on the purpose of the concept in question. The difference between developing a concept for broader