

Research Paper

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Innovation and adaptation in public–private partnerships in the military domain under broad-spectrum influencing: Towards a competence-based strategic approach

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Abstract: The purpose of this research is to conduct two instrumental case studies, one from Finland and the other from Israel. These case studies explain ‘why’ and ‘how’ clear and significant differences exist between these two nations in the area of military innovation and adaptation. Research strategy is not to conduct a comparative case study, but results make it possible to find and evaluate operating methods suitable for building and safeguarding Finnish society in cooperation between private and public actors. The operating methods being studied focus on the early stages in the life cycle of developing military capability. This study utilises the inductive approach, in which data guide the research process. As the research progresses, new information is built on top of the acquired data, and the overall picture of the topic is constructed in an iterative manner. Contribution of the research are propositions that the Finnish Defence Forces would benefit from a competence-based strategic approach to partially replace the resource-based approach. A separate sub-strategy with its foundation in competence-based strategy is proposed for innovation activities. Results indicate that the excellence-based approach chosen by Israel that emerged in the case study and literature review has specifically produced results in the area of developing innovation activities.

Keywords: innovation, capability, adaptation, incrementalism, FDF, IDF

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1 Introduction

Finland’s defence is based on the comprehensive defence model. The objective in this model is to respond to disruptions in society at different levels through cross-administrative cooperation between different actors. Some of the actors represent the public administration sector, while others are private companies whose operations are guided by commercial targets in normal conditions. Utilisation of commercial actors has several positive impacts on preparedness and – in the worst-case scenario – readiness plans. Therefore, the term cooperation in this article refers to a comprehensive defence model, which utilises all the resources in the society from the public and private sectors. Research on public–private partnership (PPP) has highlighted these factors, for example, in the work of Doerr et al. (2005), Budina et al. (2007) and Gansler and Lucyshyn (2006).¹

The threats affecting Finland have expanded to areas and methods of hybrid and broad-spectrum influencing (Huusko 2023).² Although the terminology and definitions vary in discussion and research related to this topic, it is clear that the Finnish Defence Forces (FDF) – as one of our most important security authorities – must also be better prepared for broad-spectrum influencing. This readiness will require new operating methods for building

¹ Kenneth Doerr, Ira Lewis, and Donald R. Eaton, “Measurement issues in performance-based logistics,” *Journal of Public Procurement*, 2005; Nina Budina, Hana Polackova Brix, and Timothy Irwin, “Public-private partnerships in the new EU member states: managing fiscal risks,” *World Bank Publications*, 2007; Jacques S. Gansler and William Lucyshyn, “Evaluation of performance based logistics,” Maryland Univ College Park Center for Public Policy and Private Enterprise, 2006.

² Janne Huusko, “Laaja-alaisen vaikuttamiseen on varauduttava”, cited on June 23rd 2023, <https://puolustusvoimat.fi/blogi/-/blogs/laaja-alaisen-vaikuttamiseen-on-varauduttava>.

military capability as well as preparedness and readiness on the part of society. Developing the defence system and national defence in the 2030s are highlighted as the focus of FDF' research and development activities (Tutkimus).³

Evaluating the current defence system and developing operational processes make it possible to create an optimal outcome, also known as the target state. The literature in the field of process development states that this approach is acceptable and even recommended as a development method. Failing to sufficiently consider the impacts that stakeholders have on activities is a risk for the selected actor when creating an optimal environment (Sungau et al. 2013).⁴ One way of avoiding this problem during development work is an iterative approach, in which development progresses in stages and the risks and objectives of each development stage are reviewed and then reassessed (Pasivirta and Kosola 2007).⁵ The iterative development model is also used in the FDF, with planning and building of capability implemented according to the principles of requirement specification (Kosola 2012).⁶ According to the literature and manuals in the field, risk and threat assessments play a key role in both the project planning and reorganisation of processes (Aminbakhsh et al. 2013; Marcelino-Sádaba et al. 2014; Taroun 2014).⁷ However, it must be noted that the first public work to critically examine societal functions as a whole from the perspective of their continuity was only published in 2006 by Lewis (2019).⁸ The author highlighted the vulnerability of a networked society and the mutual dependence of

critical functions in a way that could be described as brutally accurate.

Finland's accession to and ratification of membership in the North Atlantic Treaty Organisation (NATO) on 4 April 2023 increased the complexity of the topic being studied (Valtioneuvosto 2023).⁹ As part of the 31-country coalition, Finland must be able to fulfil its comprehensive defence and security tasks in accordance with NATO requirements. These tasks are divided into four different areas:

- (1) NATO Intelligence and Warning System;
- (2) NATO's Operational Planning System;
- (3) Civil Emergency Planning;
- (4) NATO Crisis Response System.¹⁰

Although the purpose of this research is not to examine cooperation between national defence and NATO, it must be acknowledged as one of the variables affecting activities. However, the authors have left the requirements set by the coalition outside the scope of their research. The reader should also understand that the requirements set by NATO are not binding in the same way as, for example, the legislative guidance handed down by the European Union (EU).

Capability development of the FDF is an integral part of the strategic development process. The strategy should provide clear answers to four questions: (1) Who are we? (2) Where do we want to go? (3) What means and resources do we have at our disposal? (4) How do we utilise our means and resources? Mintzberg's Strategy Safari is widely recognised as a classic publication in the strategic management field. It presents 10 different approaches to the strategy process of commercial companies and analyses how differences in these approaches affect the achievement of strategic objectives (Mintzberg et al. 2020).¹¹

The FDF' hierarchical organisational structure, centralised decision-making and operational steering through political decision-making make it easy to understand why strategic planning complies with the basic 'Design School' or 'Planning School' principles presented in Mintzberg's book. These basic principles make it possible to answer the four basic questions of strategy formation in the FDF' operating environment. Another

3 "Puolustusvoimien tutkimuksen tekijät", Tutkimus, cited on June 27th 2023, <https://puolustusvoimat.fi/web/tutkimus/tutkimuksen-tekijat>.

4 Sungau, Joseph Joseph, Philibert C. Ndunguru & Joseph Kimeme, "Business process re-engineering: the technique to improve delivering speed of service industry in Tanzania," *Independent Journal of Management & Production* V. 4, N 1 (2013): 208–227

5 Pasi Pasivirta & Jyri Kosola, *Vaatimustenhallinnan soveltaminen puolustusvoimissa* (Maanpuolustuskorkeakoulu, sotatekniikan laitos, 2007).

6 Jyri Kosola, "Puolustusvoimien projektiohje", *Julkaisusarja* 5. No 11, 2012.

7 Abdulmaten Taroun, "Towards a better modelling and assessment of construction risk: Insights from a literature review," *International Journal of Project Management*, Volume 32, Issue 1 (2014): 101–115; Saman Aminbakhsh, Murat Gunduz & Rifat Sonmez, "Safety risk assessment using analytic hierarchy process (AHP) during planning and budgeting of construction projects," *Journal of Safety Research*, Volume 46 (2013): 99–105; Sara Marcelino-Sádaba, Amaya Pérez-Ezcurdia, Angel M. Echeverría Lazcano & Pedro Villanueva: "Project risk management methodology for small firms," *International Journal of Project Management*, Volume 32, Issue 2 (2014): 327–340.

8 Ted G. Lewis, *Critical infrastructure protection in homeland security: defending a networked nation* (John Wiley & Sons, 2019).

9 "Suomi liittyy Natoon 4. huhtikuuta", Valtioneuvosto, Cited July 4th 2023, <https://valtioneuvosto.fi/-/suomi-liittyy-natoon-4.-huhtikuuta>.

10 Marszałek, C. M. NATO Crisis management system. In: *Nation State Interdisciplinary Research in Security Studies*, editors Cezary Smuniewski, Agostino Massa, Andrea Zanini (Akademia Sztuki Wojennej, 2021).

11 Henry Mintzberg, Bruce Ahlstrand, & Joseph B. Lampel, *Strategy Safari* (Pearson UK, 2020).

key work in this area is ‘Exploring Strategy’¹² by Johnson et al. (2020), which sheds light on the challenges that the above-mentioned strategic approaches can cause in a rapidly developing business environment. It also provides a good description of the benefits provided by competence-based strategic planning in comparison to resource-based strategic planning.

1.1 Challenges to partnership activities in the FDF

Material management in the FDF and the subsequent planning, building and utilisation of capability comply with the principles of the so-called life cycle model. The main processes in the first stage of the life cycle model are closely linked to Main process 1 of the FDF, which focuses on strategic planning. When building capability based on requirements management and project management, the development work is divided into stages according to the life cycle model (Pasivirta and Kosola 2007).¹³ This article examines how private actors are utilised in the development process for FDF activities in sub-processes 1.1 and 1.2 of Main process 1.

Main process 1 is divided into four sub-processes, of which sub-process 1.1 ‘Compiling a target state for the Finnish Defence Forces’ and sub-process 1.2 ‘Developing the use and operating principles of the defence system’ are closely linked to building future capabilities, as the final outcome of the process is the FDF development programme. This development programme is managed through life cycle management, which is an integral part of requirements management (Hukkanen 2017).¹⁴

The topic has also been studied earlier in the FDF operating environment. General Staff Officer Hukkanen’s (2017) final paper discusses capability building, but does not address the research, development and innovation activities that are an integral part of operational development.¹⁵ It also deals with Service Dominant (SD) logic, touching briefly on value stream mapping as a phenomenon and issue. The work does not use SD logic as a paradigm for guiding research. Instead, the theoretical

framework of the work is process steering and the Lean method in particular.

Finnish military research has dealt with the topic of cooperation with private actors in, for example, Anteroinen’s dissertation articles,¹⁶ Kosola’s publication on project management,¹⁷ and an earlier study performed by Häyhtiö.¹⁸ Anteroinen’s article also refers to previous research on cooperation between a private and public actor. It utilises previous work to highlight the importance of active R&D&I in building military capabilities. The difference in comparison to this research is the target of these studies. Kosola’s work on cooperation between private and public actors refers to the general ‘Commercial off-the-shelf’ system, while Anteroinen’s work focuses on collaboration related to long-term cooperation taking place in development programmes. Rather than being mutually exclusive, these factors represent different approaches to the subject. Häyhtiö (2018), on the contrary, presents the possibility of developing and measuring operations by means of specified requirements. The approach chosen by each of these authors is very logical when examined in the strategic management framework of the FDF.

Niemelä and Nikkarila (2023) also discuss the FDF’s innovation activities and the related cooperation between private and public actors in the *Tiede ja Ase* 2022 Journal. Their article provides a good and comprehensive literature review of previous research and the many concepts associated with the topic, as well as the regulation that governs activities.¹⁹ Liikola’s dissertation in the military sciences field addresses the creativity that is an essential part of the discussion on capability building and innovation.²⁰ Liikola (2019) sees creativity as an issue and phenomenon that drives change and development. This observation is linked to innovation culture, which is discussed as part of this research.

Näkkäläjärvi’s final paper of the General Staff Officer Course sheds light on the challenges of developing capability through innovations from the perspective of the

12 Gerry Johnson et al., *Exploring Strategy* (Pearson UK, 2020).

13 Pasivirta & Kosola, *Vaatimustenhallinnan soveltaminen puolustusvoimissa*.

14 Ville Hukkanen, “Joukkojen ja järjestelmien elinjaksojen hallintaprosessi Puolustusvoimissa” (Helsinki, Maanpuolustuskoulu, 2017), <https://urn.fi/URN:NBN:fi-fe2017111350670>.

15 Hukkanen, “Joukkojen ja järjestelmien elinjaksojen hallintaprosessi Puolustusvoimissa” (The management process for life cycle periods related to troops and systems in the Finnish Defence Forces), 2017.

16 Jukka Anteroinen, “Enhancement of national collaboration between defence establishment and industry by systems approach”, *Journal of Military Studies* 1, nro 1 (2010): 44–67.

17 Jyri Kosola, “Suorituskyvyn elinjakson hallinta”, 2007.

18 Markus Häyhtiö, “Service development in public private partnerships in the military domain: requirements management as a service performance development and measurement system”, *Series 1: Research Publications* No. 26, 2018.

19 J-P Niemelä, J-P Nikkarila, *Tiede ja Ase 80 Suomen sotatieteellisen seuran vuosijulkaisu* (Annual publication of the Finnish Society of Military Sciences), Vol. 2022 Nro 80 (2022): Published on 2023-06-28.

20 Jani Liikola, “Luovuus arkipäiväisenä jännitteenä—tutkimus kokonaisvaltaisesta ryhmän luovuudesta”, *Julkaisusarja 1: Tutkimuksia* nro 31, 2019.

FDF. The work highlights the recognised need for innovation activities and the possibility of utilising external actors in innovation activities from the perspective of the FDF. Based on the findings, the Scientific Advisory Board for Defence (MATINE) and the Finnish Funding Agency for Technology and Innovation (TEKES, now Business Finland) allocated resources for research work that was utilised by the FDF.²¹ However, Näkkäläjärvi's work does not address cooperation with a commercial or external actor outside the FDF from the starting points of the commercial actor. This study considers the significance of cooperation to be extremely important. The inadequacy of the mechanism for steering cooperation between development initiated from the perspective of a commercial actor and the FDF is illustrated in earlier research conducted by Häyhtiö (2018)²² and in Näkkäläjärvi's work, which examines the topic from inside the FDF.

The FDF's partnership programme and related operating methods were formulated in the early 2000s. The aim was to achieve cost savings and phase-out support functions that were not considered part of military defence, providing support for other authorities, providing international assistance or participating in international military crisis management. These four areas comprise the statutory tasks of the FDF (Kämäri 2010; FINLEX 2023).²³ The outcome of the implemented partnership programme was the creation of new operating methods for catering services, material maintenance, clothing care and administrative support services. The strategic partners are either private companies or companies with majority public ownership. However, the activities can be considered consistent with the PPP model, as the business operations of these companies are guided not only by a public task but also by financial objectives. On the contrary, this is open to interpretation as some of the key principles of the PPP are not followed. Doerr's study 'Measurement Issues in Performance Based Logistics' provides a good description of the impact of this phenomenon and the challenges associated with interpretation (Doerr et al. 2005).²⁴

21 Näkkäläjärvi. (2023). Innovaatiotoiminta Puolustusvoimien Tutkimusorganisaatioissa (Innovation activities in Finnish defence forces' research organisations).

22 Häyhtiö, "Service development in public private partnerships in the military domain".

23 Vesa Kämäri, *Kumppanuusohjelman strateginen johtaminen - Monitapaustutkimus puolustushallinnossa* (Lappeenranta teknillinen yliopisto, 2010), <https://lutpub.lut.fi/handle/10024/66234>; Edita Publishing Oy, "FINLEX® - Ajantasainen lainsäädäntö: Laki puolustusvoimista 551/2007" (Oikeusministeriö, Edita Publishing Oy), cited August 30th 2023, <https://www.finlex.fi/fi/laki/ajantasa/2007/20070551>.

24 Doerr, Lewis, & Eaton, "Measurement issues in performance-based logistics".

The FDF have also gone through several reforms since the creation of the partnership programme. The first structural reform was implemented in 2008 and resulted in the merger or termination of some support activities (Puolustusvoimat 2016).²⁵ The changes in threats that occurred after the FDF reform also caused the Defence Forces to transition from training organisation to readiness organisation (Valtioneuvosto 2023).²⁶ Although NATO and the related obligations are outside the scope of this research, it is quite likely that cooperation between companies with an impact on national defence also affects other NATO countries. This creates a new potential threat to a private company that is important in terms of national defence.

However, it is interesting to note that the conclusion of Källman's (2019) final paper states the following:

... the credibility of Finland's defence has not faced major pressure for change since hybrid threats became a topic in security and defence policy discussions. This is seen as being the result of Finland's strategic culture (Källman 2019)²⁷.

However, Källman's (2019) work does not take a position on the implementation of the PPP in terms of practical examples. The examples provided illustrate the range of instruments that one state actor can use against another state actor and, according to Källman's (2019) study, cooperation between private and public actors has not been an integral part of the security policy discourse addressed in the study since 2014.²⁸ The author believes that there is a clear need to integrate PPP into security policy discussion in the military domain.

The research challenges the existing project steering and strategic steering for three reasons:

- (1) Preparing for broad-spectrum influencing requires a strategy process that is founded on expertise and competence-based strategic planning, as the objectives of broad-spectrum influencing are more extensive than simply affecting material capability;
- (2) Cooperation with private companies in innovation activities differs from the principles used in project activities;

25 "Puolustusvoimauudistuksen loppuraportti valmis -", Puolustusvoimat, 31. lokakuuta 2016, <https://puolustusvoimat.fi/-/puolustusvoimauudistuksen-loppuraportti-valmis>, cited August 30th 2023.

26 "Valmius, rahoitus ja materiaalihankinnat turvaavat uskottavan puolustuksen", Valtioneuvosto, cited June 14th 2023, https://valtioneuvosto.fi/-/valmius-rahoitus-ja-materiaalihankinnat-turvaavat-uskottavan-puolustuksen?languageId=fi_FI.

27 Simo Källman, "Hybridituhut ja Suomen puolustuksen uskottavuus", Yleisesikuntaupseerikurssin opiskelijan diplomityö, 2019, <https://www.doria.fi/handle/10024/172760>.

28 Källman.

- (3) Using and building capability is not a series of separate, parallel processes in the SD logic framework, but a matter of simultaneous functions.

The purpose of the study is drawing conclusions from two separate instrumental case studies and to find and evaluate operating methods suitable for building and safeguarding Finnish society as cooperation between private and public actors. The operating methods being studied focus on the early stages in the life cycle of developing new products and services.

2 Research objectives, questions and methods

Finland's national defence is based on cooperation between private and public actors. In order to find suitable operating methods for building military capability in the early stages of the life cycle, authors have defined following research objectives:

- (1) How PPP is instrumental in the case-study object Israel implemented in the national framework with regard to the development of innovative capability that is part of the FDF' Main process 1 and its sub-processes 1.1 and 1.2?
- (2) What new threats does broad-spectrum influencing bring to cooperation between the FDF and the private actors in Main process 1 and its sub-processes 1.1 and 1.2?

Based on the research objectives, the following research questions were formed according to the principles of case study introduced by Eisenhardt (1989), Rashid et al. (2019) and Yin (1981).²⁹ These principles describe the methodology for an in-depth exploration of varied topics. Our chosen case-study research, according to its principles, often leads to a wide array of questions and challenges being addressed to develop a comprehensive understanding of the subject matter. Each question and challenge presented in our manuscript is directly tied to our research objectives and contributes clearly to our findings:

²⁹ Kathleen M. Eisenhardt, "Building Theories from Case Study Research", *The Academy of Management Review* 14, nro 4 (October 1989): 532, <https://doi.org/10.2307/258557>; Yasir Rashid et al., "Case Study Method: A Step-by-Step Guide for Business Researchers", *International Journal of Qualitative Methods* 18 (January 2019): 160940691986242, <https://doi.org/10.1177/1609406919862424>; Robert K. Yin, "The case study as a serious research strategy", *Knowledge* 3, nro 1 (1981): 97–114.

- (1) How PPP is optimally implemented in Finland's national framework with regard to the development of innovative capability that is part of the FDF's Main process 1 and its sub-processes 1.1 and 1.2?
- (2) What new threats does broad-spectrum influencing bring to cooperation between the FDF and the private actors in Main process 1 and its sub-processes 1.1 and 1.2?
- (3) How does a strategic approach differ in the two case studies and how does it impact the development work in both countries?

This study utilises the inductive approach, in which data guide the research process. As the research progresses, new information is built on top of the acquired data, and the overall picture of the topic is constructed in an iterative manner. The research was conducted according to the principles of hermeneutic research, which means that the authors can question and change their initial views on the topic as the work progresses and they accumulate information and gain a greater understanding of the topic. In line with these principles, good and complementary data collection methods were selected to utilise quantitative and qualitative data. This is consistent with the case-study methodology used to improve the reliability and generalisability of the research. In the case-study method, the same research question is triangulated during and as the work progresses to facilitate reliability of the research and generalisation of its results (Yin 1989).³⁰

The first phase of the authors' research consisted of a critical literature review, which was divided into two parts. The first of these deals with innovation activities in the military domain, in which cooperation takes place between the private and public actors. The second military framework deals with broad-spectrum influencing.

After screening EBSCO or ProQuest databases, 72 sources were selected from the relevant results to provide a theoretical framework for the development and innovation components of the research.

The search words were the following:

- innovation and PPP;
- innovation in military;
- Israel innovation in military;
- military development and SMS companies;
- funding private military innovation in Israel;
- laaja-alainen vaikuttaminen (broad-spectrum influencing in Finnish);
- broad-spectrum influencing;
- Israel innovation culture in defence.

³⁰ Yin, "The case study as a serious research strategy".

The military framework for the research observes the research criteria drawn up by the authors, in which broad-spectrum influencing was recorded as a priority. The work focuses particularly on a systemic analysis of operating models. The aim is to identify generalisable principles and possibilities for application. The literature review in the topic area is based on official reports as well as National Defence University theses and publications. These publications also include official public administration documents and reports, earlier research and other open sources.

3 Broad-spectrum influencing

Along with hybrid warfare, broad-spectrum influencing emerged as a topic of military debate after the Crimean invasion in 2014. Broad-spectrum influencing may involve the use of conventional military preparedness means and/or methods that only have an impact on civilian actors in society. The purpose of the activities is to support and strengthen the achievement of objectives related to unarmed or armed pressure. Direct military influencing is also one method of broad-spectrum influencing, as stated in a blog written by Commodore Huusko, Assistant Chief of Staff Operations (Huusko 2023).³¹

Broad-spectrum influencing provides the military framework for this work. The phenomenon is a continuous background factor, and it is considered to be both the reason for and a driver of the development activities that are being performed. The link to innovation activities is the concretisation of a new and unrecognised issue, preparation for it and consideration of wide-ranging stakeholder cooperation as part of the activities. All of the above play a key role in innovation taking place in networks.

Research on broad-spectrum influencing is challenging for several reasons. Broad-spectrum influencing methods are indirect and target the critical functions of society. Publicising attempts to influence these functions may contribute to the outcome desired by the influencer: weakening the internal security situation in the target country and undermining trust in the authorities' ability to protect their citizens. Public attention would also provide the attacking party with information about the vulnerability of critical targets and the success of an influencing attempt. For this reason, the examination

of broad-spectrum influencing in this work remains at a general level, and the results are discussed in relation to innovation activities in the conclusions.

As a phenomenon, broad-spectrum influencing is very complex and difficult to define. However, it can be stated that this is a way of exerting influence that affects several public or private actors, either directly or indirectly. Consideration of interdependence and the resulting wide-ranging need for protection is a demanding task in all development work and reform. It is very difficult to identify possible deviations in normal operations as being part of external influencing. Hostile influencing can directly target an important process in society, or it may be indirect, for example, by disturbing or even preventing a function that enables the process. A networked society and cross-administrative activities mean that disruptions in critical operating processes may cause an accumulation of multiplier effects.

The networking of society, accumulation of individual impacts and vulnerability of long value chains must be considered when preparing to deal with broad-spectrum influencing. The change in threats and the crises that have already occurred demonstrate that attempts to influence our society on a broad scale may focus on very unusual targets in the traditional military framework. Multiplier effects may increase the potential harm of spillover effects many times over. However, cooperation between different authorities across administrative boundaries allows the FDF and other critical functions of society to operate without disruption even in emergency conditions. The identification, protection and development of functions and value chains that guarantee security of supply as well as Finland's territorial integrity and social harmony are at the core of maintaining the FDF's readiness.

The preparedness method used by public actors (state, wellbeing services county, municipal sector) in the comprehensive security area could also be more extensively applied to private actors. Based on previous research conducted by the authors, the significance of the private sector in maintaining and developing comprehensive security has not been sufficiently recognised in Finland. A larger role for private actors in comprehensive defence – as a partner, subcontractor or individual output acquired by the FDF – greatly increases the number of potential targets for influencing. Every actor, process and function must be subjected to the security and preparedness planning of all parties in the network. Operating in this way makes it possible to specify and create capabilities that serve the organisation's own activities and identify influencing and hostile activities in the ultimate target. Previous research by Häyhtiö and Zaerens (2017)

³¹ Janne Huusko, "Laaja-alaiseen vaikuttamiseen on varauduttava". Preparation for broad-spectrum influencing is essential), Finnish Defence Force, cited on 29 June 2023, <https://puolustusvoimat.fi/blogi/-/blogs/laaja-alaiseen-vaikuttamiseen-on-varauduttava>.

shows that a comprehensive operating model can be constructed by using an approach that covers the entire system and examining the roles of actors participating in measures to counteract broad-spectrum influencing. This facilitates preparations for broad-spectrum influencing and protection against it (Havu and Markus 2023; Häyhtiö and Zaerens 2017).³²

Networked activities also make it possible to identify targets that are critical to those activities while simultaneously providing an opportunity to utilise the expertise and capacity of the entire network to achieve the objectives. The price of this positive feature is its potential risks. The new innovation in the author's approach is networked development, which also creates vulnerabilities. The process of each network actor and its contact points with other network members are potential targets for an attack (Häyhtiö and Zaerens 2017; Lewis 2019).³³ However, a networked operating method is considered the strongest way of responding to the threat of broad-spectrum influencing. The aim is to make comprehensive and flexible use of the expertise and resources of different actors in society as threats change or become reality. Defence Command Chief of C5, Brigadier General Vähätiitto emphasises the importance of this perspective in his blog post, which also highlights the importance of adaptability in changing circumstances (Puolustusvoimat).³⁴

In combination with new partnerships, innovative development, building and use of capabilities are part of a comprehensive approach that includes controlled utilisation of private actors. An understanding of warfare – and its wide-ranging nature – requires clear communication and use of a broad concept of security to ensure that every citizen is aware of the worst threats. From a military point of view, the key question is how potential threats and

broad-spectrum influencing are perceived. This in turn has a substantial impact on how to prepare for wars and crises. Finland's accession to NATO reflects this changing threat field by putting it on our national agenda while also helping us respond to these threats.³⁵

The wide-ranging nature of warfare also forces different authorities in Finland, as well as Finnish society, to seek and identify new operating methods in future state influencing activities, utilisation of private actors and the military domain. Preparedness improves readiness to deal with exceptional conditions – and ultimately even extreme situations, such as war. In Finland, preparedness is based on the principle of comprehensive security, which involves safeguarding the vital functions of society as cooperation between the authorities, business operators, organisations and citizens.³⁶

4 Innovation activities in a military operating environment

The organisation and management of innovation activities has long been recognised as a prerequisite for operations in commercial organisations. Organisations that are capable of renewing their operating methods in a way that safeguards the conditions required for business are able to continue operating in a competitive environment. Business economics recognises several examples of the importance of a successful change in operating method and the competitive advantage resulting from that change. A summary of the topic is provided by a study published by Birkinshaw and Mol (2006), which analysed >100 management innovations over a period of 130 years. One of the conclusions in the article states there is no clear turning point in the detection and implementation of innovation. The change in operating methods and their management took place during iteration and there were differences in the origin of these iterations. In addition, the article stated that subjecting a new innovation to internal and external validation is a prerequisite for success.³⁷

32 Eero Havu and Markus Häyhtiö, "Yksityisten ja julkisten toimijoiden yhteistyö verkostoituneen yhteiskunnan puolustuksessa - laaja-alaisen vaikuttamisen huomioiminen kybertoimintaympäristössä" (Cooperation between private and public actors in the defence of a networked society - consideration of broad-spectrum influencing in a cyber operating environment), in *Sodan usvaa II - Sodankäynnin laaja-alaisuus*, vsk. 2023, National Defence University Series 2: Research Reports 27, no date.; Markus Häyhtiö and Klaus Zaerens, "A comprehensive assessment model for critical infrastructure protection", *Management and Production Engineering Review* 8 (2017).

33 Häyhtiö & Zaerens, "A comprehensive assessment model for critical infrastructure protection"; Lewis, *Critical infrastructure protection in homeland security*.

34 "Globaali kybertoimintaympäristö haastaa, mutta avaa myös uusia näkymiä", Puolustusvoimat, cited August 16th 2023, <https://puolustusvoimat.fi/blogi/-/blogs/globaali-kybertoimintaymparisto-haastaa-mutta-avaa-myo-usia-nakymia>.

35 Palokangas, M. Sodankäynnin laaja-alaisuus (The extent of warfare). In: *Sodan usvaa II - Sodankäynnin laaja-alaisuus*, vsk. 2023, National Defence University Series 2: Research Reports No. 27, 1; Palokangas, M. Synteesi sodankäynnin laaja-alaisista piirteistä (Synthesis of the broad-spectrum features of warfare), In: *Sodan usvaa II - Sodankäynnin laaja-alaisuus*, vsk. 2023, National Defence University Series 2: Research Reports No. 27, pp. 217-218.

36 Ibid.

37 Julian M. Birkinshaw & Michael J. Mol, "How management innovation happens", *MIT Sloan management review* 47, nro 4 (2006): 81-88.

It is also impossible to ignore the role of innovations in defence planning and capability building. Throughout history, a clear power balance advantage has been achieved through materiel capability, activities that have an impact on competences, or an administrative reorganisation. When examining the significance of innovations over a 100-year period, it is easy to find clear examples of the impact that a new operating method has on altering the character of war, changes in battle planning, or a change in the principles how forces are used. During World War I, technology completely changed the battlefield and warfare. The nature of attrition warfare certainly emphasised the importance of technology, but the technical limitations related to, for example, weapons capabilities that the World War set for all sides led the societies involved in the war to move to a large-scale wartime economy and eventually caused total war. World War I can be regarded as a refined 20th century version of absolute war in the post-Napoleonic period. The combined and enormous power of administration, technology, federations of states, a wartime economy and ideology led to total warfare.³⁸ Great Britain brought the armoured vehicle to World War I battlefields, completely changing the way in which wars were fought. The role of the Navy changed in 1914 when a Japanese aircraft support vessel was used in a sea-to-land air strike for the first time (Malkki et al. 2008; Keegan 2011).³⁹

As World War II approached, the volume of technology development increased, and it became more important. This new war was characterised by increasingly advanced weapons technology, manoeuvre warfare and more extensive penetration of war into societies and the home front. Development of armoured units and the air force led to a strong shift from attrition and trench warfare to manoeuvre and blitzkrieg warfare. This war was characterised by mobile warfare, particularly in its early stages. Rigid defence lines and battles linked to the fronts were only a marginal part of total war. The world war also revolutionised maritime and air warfare in significant ways and made the atomic weapon part of the grand strategy.⁴⁰

The role of logistics in the Second World War was very nearly more important than operational skills and tactics. In terms of the Allies, the United States and Canada had to move hundreds of thousands of soldiers, military equipment, and millions of tons of materiel and supplies to Europe before they could join the fight against Germany. If Germany and its allies had been able to prevent or threaten these logistical flows of maritime transport or projection of military power, they would have put successful Allied warfare at risk and forced the interruption of invasions and landings on the European coasts.⁴¹ Many private companies, service providers and actors were utilised to assist with logistics.

The unmanned V-1 and V-2 rockets developed by the Germans and the first jet-powered aircraft greatly modified the role of the airborne weapon. Today, the role that innovations played in the nuclear weapon and its development has a huge impact on humanity as a whole.⁴² The widespread use of helicopter capability for the first time in the Algerian war changed the way in which troops were transported. The impact of precision-guided munitions in the Gulf Wars changed the role of artillery preparation. The war in Afghanistan highlighted the importance of drone operations. The growing role of small, unmanned aircraft in the war in Ukraine is the latest factor shaping the image of a battlefield (Malkki et al. 2008; Keegan 2011).⁴³

Wars are a classic example of how war in itself shapes and develops warfare with regard to technology, skills and doctrines. War is always a product of its era, driven by the deepest manifestations of contemporary culture, prevailing politics, and state interests or superpower aspirations. Generally speaking, the moral, intellectual and technological ability of humankind to test and apply all elements of warfare – from weapons to the economy or from propaganda to mass destruction – was demonstrated in all wars.⁴⁴

Although all of the before-mentioned cases can be considered facts of military history, they always involved use of a new operating method or device to respond to a threat or making the balance of power more advantageous by means of a new innovation. The authors approach the research topic through a study published by

38 Palokangas, M. Toinen maailmansota – sodankäynnin kehityksen globaali laboratorio (World War II – a global laboratory for warfare development), In *Puolustusvoimien kokeilutoiminta sotavuosina 1939–1944; Kokeilutoiminnan historialliset juuret, osa II*, ed. Mikko Karajalainen (National Defence University Series 1: Research Publications 52), p. 17.

39 Janne Malkki, “Malkki”, Janne, Marjomaa, Risto, Raitasalo, Jyri, Karasjärvi, Tero, Sipilä, Joonas, *Sodan historia*. Helsinki: Otava, 2008; John Keegan, *A history of warfare* (Random House, 2011).

40 Palokangas. Toinen maailmansota – sodankäynnin kehityksen globaali laboratorio (World War II – a global laboratory for warfare development).

41 Ibid, pp. 18–19.

42 Spector, R. H. (2001, Cassell). *Eagle against the Sun; The American War with Japan*, pp. 546–550.

43 Malkki, “Malkki”; Keegan, *A history of warfare*.

44 Palokangas. Toinen maailmansota – sodankäynnin kehityksen globaali laboratorio (World War II – a global laboratory for warfare development), p. 21.

Grissom (2006).⁴⁵ This widely cited article divides military innovation activities into four different schools of thought.

4.1 Schools of thought on military innovations

The first school of thought emphasises close cooperation between civil and military actors. Grissom's (2006) work cited the results of Posen (1984), who studied the topic in the 1980s. Those results referred to the innovation activities of Germany, France and the United Kingdom between the first and second World War.⁴⁶

The second school of thought presents a model that examines the internal rivalry inside a military organisation as a driving force for innovation activities while simultaneously building capability. The scarcity of available resources forces actors who have achieved a certain position to develop their activities in order to ensure funding. One of the examples used by Grissom (2006) is Sapolsky's (1972) research on the development of the Polaris submarine system⁴⁷. The principles of this school of thought clearly conflict with the author's service research and are not consistent with the principles of SD logic.

The third school of thought proposes the implementation of a new theory from the top down as a source of innovation. Middle management actors with strong practical experience and a vision of the capability being developed play a key role in implementing the innovation. Grissom's (2006) work expands on the operating method in this school of thought for Rosen's (1991) research.⁴⁸ This approach is partly inconsistent with incremental development, although its success does depend on the strong competence of experts in daily tasks.

Grissom's (2006) last research target is an organisational culture that favours military innovation. According to this school of thought, the driving force behind innovation can be the opinion of senior management concerning the need for a development target, disruptions outside the organisation that force change, or a collision between the

operating methods of different military organisations and Services. Grissom's (2006) own research relies on data collected from the armed forces of different countries, starting in the period between the world wars and continuing until today.⁴⁹ The following sections strive to describe the factors that guide innovation activities when building capability.

4.2 Adaptation and the significance of culture to defence innovation

The literature puts adaptation and culture at the heart of defence innovation.⁵⁰ Concepts are described as modifying the ways in which organisations react to changes, develop new solutions and utilise the opportunities provided by technology. One characteristic of adaptive development in the military domain is the production of gradual changes in areas such as tactics, techniques, structures and equipment in order to improve capability.⁵¹ Adaptation refers to the process in which defence organisations and companies adapt to significant changes in funding, research priorities and innovation capabilities. The process is a bottom-up innovation style that is by nature more inductive and reactive.⁵² This means that adaptation is more flexible and reacts quickly to changing circumstances. For example, French defence companies have had to adapt to changes in public defence research and development funding and research priorities by developing new innovation capabilities.⁵³ In particular, Thales – the third largest defence industry operator in France – has responded to these changes by opening up its innovation model, thus increasing internal and external information exchange at the local and international level.⁵⁴

⁴⁹ Grissom, "The future of military innovation studies".

⁵⁰ Ilisaacson, J. A., Layne, C., & Arquilla, J. (1999). *Predicting Military Innovation*; Miller, J. H. (2014). Strategic culture as the basis for military adaptive capacity: Overcoming battlefield technological surprises; Berman, L. (2012). Capturing contemporary innovation: Studying IDF innovation against Hamas and Hizballah. *Journal of Strategic Studies*, 35, pp. 121-147.

⁵¹ As stated by Kivimaa & Saarnio in the publication series Puolustutkimuksen vuosikirja 2019 – Puolustutkimus 100 vuotta: Innovaatio ja adaptaatio puolustusjärjestelmän kehittämisen ajureina (Innovation and adaptation as drivers of defence system development), p. 22.

⁵² Adamsky & Bjerga. (2017). Contemporary military innovation: Between anticipation and adaption, p. 400.

⁵³ Belin, J., Guille, M., Lazaric, N., & Méridol, V. (2019). Defense firms adapting to major changes in the French R&D funding system. *Defence and Peace Economics*, 30, pp. 142-158.

⁵⁴ Ibid, p. 13.

⁴⁵ Adam Grissom, "The future of military innovation studies", *Journal of Strategic Studies* 29, nro 5 (1. lokakuuta 2006): 905–34, <https://doi.org/10.1080/01402390600901067>.

⁴⁶ Barry Posen, *The sources of military doctrine: France, Britain, and Germany between the world wars* (Cornell University Press, 1984).

⁴⁷ H. Harvey M. Sapolsky, *The Polaris system development: Bureaucratic and programmatic success in government* (Harvard University Press, 1972).

⁴⁸ Stephen Peter Rosen, *Winning the next war: Innovation and the modern military* (Cornell University Press, 1991).

The literature⁵⁵ also highlights the ability of private actors to significantly further the adaptation of public defence by using direct and indirect methods in which national practices can encourage the formation of such activities.

4.3 The relationship between adaptation and innovation

Examination of defence innovation expands significantly when the scope is extended to the operating environments of armed forces and the defence industry in different countries and their response to technological and political change. Christensen's⁵⁶ innovation theory provides a framework for understanding these recent development directions in the United States defence industry. The framework is useful when evaluating innovations and selecting suitable business strategies in the face of technological change. It also provides further insight into the relationship between adaptation and innovation. Christensen divides the innovation process into two categories: disruptive and sustaining. The categorical breakdown is mainly based on whether or not the capability of the developed product is measured using new performance indicators.⁵⁷ However, it should be noted that application of this theory leaves less room for a more detailed examination of incremental innovation in the case study of Israel. When considering optimal development of innovation capability in the FDF, it is still possible to ask whether an innovation improves capability according to traditional or new performance indicators. A categorical review is appropriate regardless of whether the innovation is a new device, organisational format, or some other improvement derived from incremental innovation. In terms of incremental innovation, the key question involves asking if the development of innovative capability leads to new performance indicators while

simultaneously decreasing capability measured using traditional methods.

Military innovation, on the other hand, can be defined as a change in capability that increases efficiency as measured by the results of military performance Grissom (2006).⁵⁸ This review sees innovation as a new process with significant impact that changes military activities in the field and increases military efficiency. More precisely, innovation 'refers to the development of new military technologies, tactics, strategies and structures',⁵⁹ while adaptation 'includes the adaptation of existing military means and methods'.⁶⁰ However, adaptation of conceptual and meaningful content should not be considered any less significant than innovation. In fact, many adaptations can accumulate into innovation over time and result in new capability. For this reason, it may not be feasible or fruitful to make too fine a distinction between adaptation and innovation in the defence industry. Farrell's research suggests that it would be more helpful to think of incremental development and adaptation as 'two points on a sliding scale'.⁶¹ Ultimately, innovation or adaptation can take place at the strategic, operational or tactical level in the military domain – and each of these can trigger inter-related changes at both lower and higher levels.

4.4 Culture

Culture plays a multidimensional role in innovation activities taking place between the FDF and private actors. This can affect how collaborating organisations view innovation and adaptation. It can also influence how innovation is understood, integrated into the organisation's processes and strategies, and how it affects relations with other actors. For example, the culture of the Israel Defense Forces (IDF) has contributed to the creation of innovative ideas from the bottom up. This forms an interface with SD-logic.

55 Hartley, K. (2013). Europe's Defence Industry: An economic perspective. In: Masson, H. (ed.), *Defining the European Defence Technological and Industrial Base: Debates and Dilemmas*, (Fondation pour la Recherche Stratégique, Paris), Note 23/13. 4.

56 Christensen, C. M. (1997). *The Innovator's Dilemma: When New Technologies Cause Great Firms to Fail*. Harvard Business School Press, Boston; Christensen, C. M., & Raynor, M. E. (2003). *The Innovator's Solution: Creating and Sustaining Successful Growth*. Harvard Business School Press, Boston.

57 Dombrowski, P. (2009, Spring). Identifying disruptive innovation: Innovation theory and the defense industry. *Innovations: Technology, Governance, Globalization*, 4(2).

58 Adam Grissom "The Future of Military Innovation Studies," *Journal of Strategic Studies* 29, no. 5, (October 2006): 905-34.

59 Farrell, T., & Terriff, T. (2002). *Sources of military change, the sources of military change: Culture, politics, technology*. Lynne Rienner, Boulder, CO, p. 6.

60 Farrell, T. (2003). Military adaptation in Afghanistan "Simultaneous innovation in Technology, Doctrine, and Organizational Structure," Farrell, T. (2008). The dynamics of British military transformation.

61 King, A. et al. Military adaptation in Afghanistan by Theo Farrell, Frans Osinga and James A Russell. *International Politics Reviews*, 1, p. 104. doi: 10.1057/ipr.2013.19.

Literature has highlighted the fact that culture is at the heart of military innovation and fundamentally shapes the ways in which organisations react to technological and strategic opportunities.⁶² Grissom's (2006) reference to Farrell's research provides a multifaceted perspective on how culture can be a resource and a barrier to promoting innovation. Farrell emphasises the role of leadership, the influence of external factors and the importance of international connections in shaping and promoting innovation.⁶³

As a result, there are several options with regard to preparing for broad-spectrum influencing and implementing the related innovation. In the first option, each individual FDF actor is responsible for innovation activities in their own competence area. The results are adapted to the predetermined readiness requirements for broad-spectrum influencing in accordance with the Defence Forces' project steering principles. In the second option, development is carried out as co-development between all FDF actors. In the third option, the development also involves actors from outside the organisations. The fourth option puts development work in the hands of selected external actors, while the last option completely opens up development and innovation activities.

In terms of the R&D&I activities described before, private actors have the opportunity to participate in comprehensive development in all but the first option. In an article describing open innovation activities, Elmquist et al. (2009) used four variables to illustrate different models of innovation.⁶⁴ These variables are the number of partners (few–many) and the location of the innovation process (inside the organisation–outside the organisation). Figure 1 illustrates these variables in a four-field chart, where the vertical axis represents the number of partners, and the horizontal axis shows the number of internal actors versus external actors. Leskinen's (2013) master's thesis published in 2013 continues the research on the challenges associated with open innovation.⁶⁵

Authors emphasise the fact that there is an obvious trade-off for increased development capacity. Increasing touchpoints between development actors open attack vectors for a broad range of influencing. Ecosystem wide system protection and protection of all the information nodes in any service chain can become extremely expensive. As examples illustrated by Häyhtiö and Zaerens (2017) and Havu and Markus (2023) show, the indirect

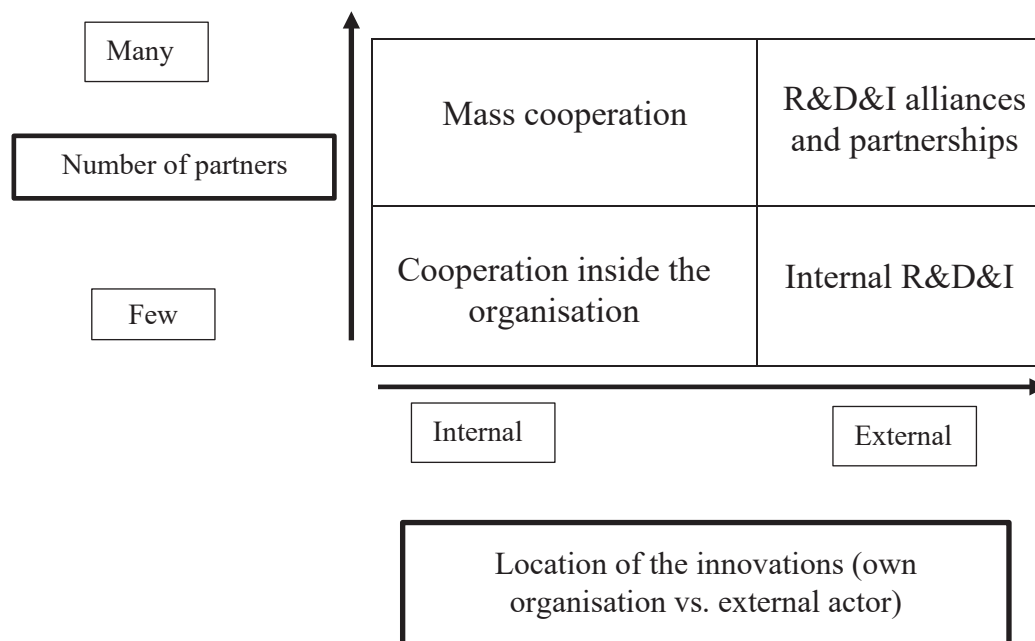


Fig. 1: Organisation of innovation activities (Elmquist et al. 2009).⁶⁶

⁶² Grissom, A. p. 916.

⁶³ Farrell, T. G. (2005). *The Norms of War: Cultural Beliefs and Modern Conflict*. Lynne Rienner, Boulder, CO, pp. 176–177. Available at https://www.academia.edu/301125/World_Culture_and_Military_Power

⁶⁴ Maria Elmquist, Tobias Fredberg, & Susanne Ollila, "Exploring the field of open innovation", *European Journal of Innovation Management* 12, no. 3 (2009): 326–45.

⁶⁵ Sampsa Leskinen, "Avoimen innovaation aktiviteetit korkean teknologian pienyrityksissä" (Master's Thesis, Itä-Suomen yliopisto, 2013).

⁶⁶ Elmquist, Fredberg, & Ollila, "Exploring the field of open innovation".

attack using development partners or subsidiaries can increase the overall cost of the development ecosystem to the unprofitable level.⁶⁷ But, paradoxically, as stated earlier, a networked operating method is considered the strongest way of responding to the threat of broad-spectrum influencing.

Also, the cultural aspect of multifunctional and interdisciplinary development is significant. A vast amount of academic research indicates the significance of organisational culture as a part of the successful innovation culture. It is safe to argue that increasing the participating organisations increases the amount of different cultural aspects. This can jeopardise the development environment (Steele and Murray 2004; Birkinshaw and Mol 2006; Kaasa and Vadi 2010; Efrat 2014; Hill 2015; Abdul-Halim et al. 2018).⁶⁸

Cultural differences categorised by Hofstede (2011) differ between two case-study nations.⁶⁹ Factors affecting our research like power distance and individualism are in Israel's favour in the R&D&I environment according to Hofstede's (2011) culture factor group study. Power distance factor explains low hierarchy, respect to hands-on expertise and overall informality. Also, results of the individuality factor are leaning more to the teamwork (Country Comparison Tool).⁷⁰ These factors can explain some findings on our research, and they should not be neglected. Having said that, there is a need to further research before conclusions can be drawn.

⁶⁷ Havu, Eero & Häyhtiö, Markus, "Yksityisten ja julkisten toimijoiden yhteistyö verkostoituneen yhteiskunnan puolustuksessa - laaja-alaisen vaikuttamisen huomioiminen kybertoimintaympäristössä"; Häyhtiö & Zaerens, "A comprehensive assessment model for critical infrastructure protection".

⁶⁸ Hasliza Abdul-Halim et al., "Innovation Culture in SMEs: The Importance of Organizational Culture, Organizational Learning and Market Orientation", *Entrepreneurship Research Journal* 9, nro 3 (24. huhtikuuta 2019): 20170014, <https://doi.org/10.1515/erj-2017-0014>; Birkinshaw & Mol, "How management innovation happens"; Kalanit Efrat, "The direct and indirect impact of culture on innovation", *Technovation* 34, nro 1 (2014): 12–20; Andrew Hill, "Military innovation and military culture", *The US Army War College Quarterly: Parameters* 45, nro 1 (2015): 9; Anneli Kaasa & Maaja Vadi, "How does culture contribute to innovation? Evidence from European countries", *Economics of Innovation and New Technology* 19, nro 7 (2010): 583–604; John Steele & Mike Murray, "Creating, supporting and sustaining a culture of innovation", *Engineering, Construction and Architectural Management* 11, nro 5 (2004): 316–22.

⁶⁹ Geert Hofstede, "Dimensionalizing cultures: The Hofstede model in context", *Online Readings in Psychology and Culture* 2, nro 1 (2011): 8.

⁷⁰ "Country Comparison Tool", viitattu 10. kesäkuuta 2024, <https://www.hofstede-insights.com/country-comparison-tool>.

5 Case FDF

The valid instructions issued by the FDF allow utilisation of private actors when building material capability. However, the role of private actors has only been loosely specified in connection with project activities, and there is no definition for the management of cooperation with private actors. Although cooperation between private and public actors is much more than a way of managing cooperation, governance is an integral part of the phenomenon. As a concept, innovation also includes a change and/or improvement in the existing operating or administration method (Hodge and Greve 2017).⁷¹ As a result, innovation can also encompass a new, more efficient or more economically viable way of dealing with the target of an innovation. This research would like to specifically highlight the fact that – in many cases – cooperation between a public and a private actor means transferring the responsibilities of a public actor to a private, commercial actor. It is important to note that the basic principles of these actors may differ from each other (Hoppe and Schmitz 2013).⁷²

According to FDF Document PAK 06-03, HD 314, it is possible to utilise the competence of a private operator at every stage of a project if that partner meets the specifications governing the quality of FDF operations and other boundary conditions. The specifications contain requirements concerning certification of the partner's activities, security requirements and any more detailed agreements. Document PAK 06-03, HD 314 designates and divides the tasks, responsibilities and required products for different stages of the life cycle model in accordance with the principles of good project management (Mikko 2007).⁷³

It also contains a very interesting phrase that guides the activities:

The owner of the development programme, the person responsible for capability or a designated person presents the joint capability of the Service or the Finnish Defence Forces (development programme) to the Technology Council and to separately invited representatives of potential suppliers.

⁷¹ Graeme A. Hodge & Carsten Greve, "On public-private partnership performance: A contemporary review", *Public Works Management & Policy* 22, nro 1 (2017): 55–78.

⁷² Eva I. Hoppe & Patrick W. Schmitz, "Public-private partnerships versus traditional procurement: Innovation incentives and information gathering", *The RAND Journal of Economics* 44, nro 1 (2013): 56–74.

⁷³ Mikko Kari, "PAK 06-03, Teollisuus ja tutkimusyhteistyö, HD 314", (PEMATOS, June 4th, 2007).

Although justification for activities in line with the above-mentioned guideline exists in the FDF, the guideline leaves very little room for incremental development. However, according to Kim et al. (2012), incremental development accounts for up to 90% of all innovation activities. The authors also find that – outside project work – the document does not provide grounds for private actors to engage in active development work in which the FDF would serve a test platform for the product being developed or a partner in co-development. Furthermore, Defence Command Directive PAK 06-03, HD314 specifies very precise boundary conditions for the resource planning and quality assurance work of companies participating in development work. Companies participating in Integrated Project Team (IPT) activities are required to have ISO 9001 and AQP 2110 or AQAP 2120 certification (Mikko 2007; Guide 2001).⁷⁴

In terms of quality management, there is good justification for this requirement. However, research results on the link between quality systems and innovation activities are not unambiguous. An extensive literature review by Manders et al. (2016)⁷⁵ is unable to draw conclusions concerning an impact that supports or hinders with innovation activities. On the contrary, research by Kim et al. (2012)⁷⁶ suggests that quality systems support incremental, radical and administrative innovation. The same research refers to previous studies that produced more ambiguous results, and neither study can demonstrate the role of an audited quality system as the only positive factor affecting innovation activity. However, Kim et al. (2012) are able to illustrate the impact of a quality system on different parts of the innovation process.

Quality systems enable systematic auditing with selected partners. These audits allow the FDF to check the activities of IPT members and evaluate their processes in comparison to potential broad-spectrum influencing threats in a manner based on Defence Forces starting points. As mentioned in the introduction to this article, influencing may be indirect rather than focusing directly on the actual target. General Timo Kivinen, retired Commander of the FDF, also commented on this matter in an interview with the Finnish Officers' Union in March 2021 by stating:

⁷⁴ Mikko Kari; A. Guide, "Project management body of knowledge (pmbok® guide)", teoksessa *Project Management Institute*, vsk. 11, 2001, 7–8.

⁷⁵ Basak Manders, Henk J. de Vries, & Knut Blind, "ISO 9001 and product innovation: A literature review and research framework", *Technovation* 48 (2016): 41–55.

⁷⁶ Kim, Kumar, and Kumar, "Relationship between quality management practices and innovation".

... We strive to work with other actors to better prepare for broad-spectrum influencing. As a whole, the concept of comprehensive security must be developed so that it corresponds to the changed situation. Kivinen also states the following in the interview: 'In addition to cyber defence, the area of information defence must be developed – from the perspective of the Finnish Defence Forces and also society as a whole' (Upseeriliitto 2021)⁷⁷.

According to the above statement, capability development corresponding to Main process 1 of the FDF cannot only be an internal issue for the Defence Forces. It will be necessary to utilise the entire potential of society, including private actors, in order to achieve the required capability. Reconciling the competence and processes of private actors as part of public service provided by society is extremely challenging. These challenges have been identified, and there is wide-ranging research on the discussion related to the general challenges of PPP. The areas mentioned include legal, economic, political, ideological and cultural challenges (Jeffares et al. 2013; Reeves 2013; Busch and Givens 2013).⁷⁸ The public duty of the FDF means that it naturally has a special position as a public service provider. The statutory task of the Defence Forces, the societal importance of its activities and the security factors that are an integral part of its operating conditions set special requirements for the success of PPP. Ensuring the security of several cross-administrative processes is also extremely challenging. This aspect has been addressed in earlier research performed by, for example, Havu and Markus (2023). They approached the topic from the cyber sector standpoint.⁷⁹

The planning, management, monitoring and utilisation of national development work represent a challenge when research that supports development work is divided between several actors. The FDF currently conducts its own research in seven different organisations: the National Defence University, the Finnish

⁷⁷ "Kenraali Timo Kivisen haastattelu", Upseeriliitto, August 30, 2021, <https://upseeriliitto.fi/verkkolehti/kenraali-timo-kivisen-haastattelu/>, cited September 25th.

⁷⁸ Stephen Jeffares, Helen Sullivan, & Tony Bovaird, "Beyond the contract: The challenge of evaluating the performance (s) of public-private partnerships", teoksessa *Rethinking Public-Private Partnerships* (Routledge, 2013), 166–87; Eoin Reeves, "The not so good, the bad and the ugly: Over twelve years of PPP in Ireland", *Local Government Studies* 39, nro 3 (2013): 375–95; Nathan E. Busch & Austen D. Givens, "Achieving resilience in disaster management: The role of public-private partnerships", *Journal of Strategic Security* 6, nro 2 (2013): 1–19.

⁷⁹ Havu, Eero & Häyhtiö, Markus, "Yksityisten ja julkisten toimijoiden yhteistyö verkostoituneen yhteiskunnan puolustuksessa - laaja-alaisen vaikuttamisen huomioiminen kybertoimintaympäristössä".

Defence Research Agency, the different services (Army, Navy and Air Force), Logistics Command and the Centre for Military Medicine. Research work is directed from Defence Command Finland. The National Defence University uses research to produce information that supports decision-making in the FDF and, above all, helps the Defence Forces respond to future threats via research. The Finnish Defence Research Agency is divided into five departments, which operate in four different locations. The division of activities between several actors requires clear coordination. If successful, this is implemented according to the principles of the directive presented earlier and via Defence Command Finland steering. This also supports use of the existing strategic planning method. However, the division of limited resources between several different parties may lead to organisational silos and reduce the exchange of ideas that is vital to innovation activities. In addition, decentralised research activities involve the risk of isolating competence-related communication, administration and management from daily activities (Hales 1999; Cano-Kollmann et al. 2016).⁸⁰

The FDF currently invests EUR 48 million in research and development, which is 1.95% of the total military defence expenditure. It is worth comparing that sum to national and international benchmarks. On a national scale, investments in scientific research and development totalled EUR 421 million in 2021 (Yritysten tutkimus- ja kehittämistoiminnan menot muuttujina Toimiala, Rahoituslähde, Vuosi ja Tiedot).⁸¹ Funding for research and development is comprehensive across the EU. In 2022, the European Defence Fund (EDF) provided EUR 317 million in funding for military research and EUR 514 million for military development. The combined sum of EUR 832 million supports 41 projects, 39% of which involve small and medium-sized enterprises. These enterprises received 20% of that funding. Seven projects within the scope of EDF funding targeted small and medium-sized enterprises. Finland is not involved in any of these projects. The results are similar when

Finland's share of the total funding is compared with Sweden and Estonia. Sweden takes part in 25 projects, with the participants divided between 14 private and public actors. The largest recipients are Saab (8 projects) and the Swedish Defence Research Agency (5 projects). In Estonia, 15 actors receive funding, and 11 of these are commercial operators (Result of the EDF 2022 Calls for Proposals 2022).⁸²

In terms of funding, Israel provides a very good international benchmark for research. Funding to the country's start-up companies provided by risk investors is the largest per capita in the world (Katz 2018).⁸³ Research funding for the defence industry in 2017 amounted to ILS 6.7 billion, which is equivalent to approximately EUR 1.7 billion. This phenomenon also has multiplier effects on the national economy. It has even been claimed that Israel's economic growth is driven by its active R&D&I, which is partly driven by the defence industry (Bernanke 2011⁸⁴; Bodnarchuk 2022⁸⁵). The Israeli defence industry and innovation activities are discussed in Section 5.

5.1 Conclusions – Case FDF

The author has highlighted the challenges facing Main process 1 and its sub-processes 1.1 and 1.2 as well as the strengths of the current operating method when building capability. However, when taking broad-spectrum influencing into account, it can justifiably be argued that there is a need to develop capability between private actors and the FDF. Table 1 describes the strengths and weaknesses of the current approach. The strengths and weaknesses presented in the table should be examined in the framework of broad-spectrum influencing.

⁸⁰ Marcelo Cano-Kollmann et al., "Knowledge Connectivity: An Agenda for Innovation Research in International Business", *Journal of International Business Studies* 47, nro 3 (March 1st 2016): 255–62, <https://doi.org/10.1057/jibs.2016.8>; Colin Hales, "Why do managers do what they do? Reconciling evidence and theory in accounts of managerial work", *British Journal of Management* 10, nro 4 (1999): 335–50.

⁸¹ "Yritysten tutkimus- ja kehittämistoiminnan menot muuttujina Toimiala, Rahoituslähde, Vuosi ja Tiedot. PxWeb", Cited July 31 2023, https://pxdata.stat.fi/PxWeb/pxweb/fi/StatFin/StatFin__tkke/statfin__tkke_pxt_11sa.px/table/tableViewLayout1/.

⁸² "Result of the EDF 2022 Calls for Proposals", June 21st 2022, https://defence-industry-space.ec.europa.eu/funding-and-grants/calls-proposals/result-edf-2022-calls-proposals_en.

⁸³ Y. Yaron Katz, "Technology and Innovation in Israel: Advancing Competitive Position in a Global Environment", *Open Journal of Political Science* 8, nro 4 (16. elokuuta 2018): 536–46, <https://doi.org/10.4236/ojps.2018.84033>.

⁸⁴ "Speech by Chairman Ben S. Bernanke on Promoting Research and Development: The Government's Role", Board of Governors of the Federal Reserve System, viitattu 29. kesäkuuta 2023, <https://www.federalreserve.gov/newsevents/speech/bernanke20110516a.htm>.

⁸⁵ T. Tetiana Bodnarchuk, "Policy of the transition from agricultural to high-tech export in conditions of permanent military threat: Israeli experience for Ukraine", *Economy and Forecasting*, nro 2 (2022): 82–107.

Tab. 1: Strengths and weaknesses of the Finnish Defence Forces' R&D&I activities

Issue	Manifestation	Strength/Weakness
The undefined role of a private actor in early-stage capability development outside the scope of project work	Not defined in project steering, lack of steering for development outside project work	- Weakness: risk of failure to notice innovations - Strength: allocation of limited resources
Commitment to certification	Requirement for existing quality certification recorded in Document PAK 06-03, HD 314	- Weakness: the cost of certification for a start-up company - Weakness: time required for certification - Strength: opportunity for audits - Strength: continuous systematic evaluation of processes
Centralised administration	A Finnish Defence Forces development programme led by Defence Command Finland	- Weakness: binds the activities to funding periods - Strength: helps to systematically consolidate limited resources
Fragmentation of R&D&I activities	Activities divided into seven different organisations	- Weakness: complicates communication between different actors - Weakness: fragments financial resources - Increases the number of impact points for broad-spectrum influencing - Strength: units focus on their own area of expertise
Limited financial resources for research and development	- Total share is <2% of defence expenditure - Non-utilisation of international financial instruments	- Weakness: limits research and development work - Weakness: forces consolidation of resources and prioritisation of projects - Strength: forces consolidation of resources and prioritisation of projects

6 Case Israel

Discussion about Israel cannot exclude what is described as 'Military capital'. This phenomenon gives value (capital) to one's competences in particular context, in our case military domain. As Grassiani (2018) describes in his article:

Israel is an example of a country where the military is very important in providing capital to citizens and where serving in (combat) units is regarded as preparing one for life itself. and '...security professionals flaunted their former military experience as a "unique selling point and many technologies were sold carrying a combat proven" stamp – namely, that they had been successfully used by the IDF in real combat. Here the reputation of the materials is at stake, and their "military experience" is used to demonstrate their worth' (Grassiani 2018)⁸⁶.

Military capital can be described as being a specific mentality, which is achieved through mandatory military service or a career in IDF and showing commitment to the values of the state of Israel. Military capital is undoubtedly

a significant factor affecting positively the relationships between public and private entities and helping reduce power distance between these two entities and increasing respect to hands-on expertise and overall informality, as described earlier (Bitzinger 2022).⁸⁷

Israel can justifiably be considered a model country of commercial research and development in the military framework. The country's large defence budget (5.17% of GDP; Statista),⁸⁸ the instability of its operating environment and the role of the defence forces as a societal actor emphasise the continuous nature of development opportunities and needs. This research does not take any stand on the political or geopolitical impacts or drivers of development work. Instead, it focuses on innovation activities in a military operating environment as the target of continuous broad-spectrum influencing. The threat from neighbouring countries that are

⁸⁶ Erella Grassiani, "Between Security and Military Identities: The Case of Israeli Security Experts", *Security Dialogue* 49, nro 1–2 (helmikuuta 2018): 83–95, <https://doi.org/10.1177/0967010617747202>.

⁸⁷ Richard A. Bitzinger, "Military-technological innovation in small states: The cases of Israel and Singapore", teoksessa *Comparing Defense Innovation Around the World* (Routledge, 2022), 151–78.

⁸⁸ "Israel - Ratio of Military Expenditure to Gross Domestic Product (GDP) 2011-2021", Statista, cited August 2nd 2023, <https://www.statista.com/statistics/810433/ratio-of-military-expenditure-to-gross-domestic-product-gdp-israel/>.

hostile to Israel can be considered the starting point for innovation activities by the IDF. The threat posed by an actor that is quantitatively larger has been met by creating a 'Qualitative military edge' (QME). A qualitative edge based on material and competence has allowed Israel to create a military deterrent and respond to escalated conflicts. The capability of the country's defence forces relies on general conscription, close PPP cooperation, strong competence, technological superiority against threats and incremental development based on practical experiences (Marcus 2015; Adamsky 2018; Katz 2018; Bitzinger 2022).⁸⁹ Authors use the term R&D&I, which is a Finnish national and EU-wide term to refer to the term IMOD DOD-R&D used in Israel.

The case study examines the following topics:

- (1) How innovation activities are organised in cooperation between private and public actors in the military domain (internal or external development work, number of partners);
- (2) How development work is steered and managed;
- (3) What are the funding mechanisms for the activities.

The results obtained from the case study are examined in relation to the research questions. The results also allow reflection and a preliminary assessment of whether creating common innovation activities and capability for dual-use products based on civilian technology are possible or economically viable in Finland. In light of the results, a preliminary assessment can also be made concerning whether the implementation and use of joint testing areas, test facilities and other functions or centres intended for collective use by the FDF and private actors is possible and economically viable. The theory of the case study is based on Grissom's (2006) study 'The future of military innovations', which examined innovation policies in the military domain.⁹⁰ That work highlighted the approaches of four different schools of thought in relation to innovation activities. From these four schools of thought, the author selected those approaches that can be used to explain the

special features of Israel's innovation policy and answer the research questions of the entire study.

The innovation activities of the IDI are organised in accordance with the principles of close cooperation between a private and public actor. The development of close cooperation between private and public actors in Israel began in 1958, when the development units under the Ministry of Defence were incorporated as a commercial enterprise under Rafael Advanced Defense Systems Ltd. The country's military industrial alliance currently comprises approximately 150 companies. These companies are divided into three categories based on the size of the company and its role in the defence industry. The companies can also offer their products or services to civilian operators and consumers (Broude et al. 2013).⁹¹ The development curve for unmanned drones can be considered to be a very good example of cooperation between the above-mentioned capabilities and private actors. By 1973, Israeli developers Alvin Ellis and Yehuda Manor had already developed a prototype for an unmanned aircraft, which Israel Aircraft Industries used as the basis for continuing their product development in cooperation with the United States (Sanders 2002).⁹²

Funding for Israel's R&D&I is a very important – perhaps even the most important – factor in creating the conditions required for the activities. The country's high-tech companies received US\$25 billion in external commercial funding in 2021 (The Jerusalem Post | JPost.com).⁹³ The State of Israel invests 4.5% of its GDP in R&D&I activities. Up to 30% of this total sum is allocated to defence industry innovations. For example, the corresponding share in Germany is only 2% and the defence industry accounts for 17% of R&D&I expenditure in the United States, which is the world's largest arms exporter (Top Military Weapons Exporters 2021; Katz and Bohbot 2017).⁹⁴ Approximately 8% of the IDF budget has been allocated to continuous R&D&I activities, and approximately 2% of this amount is channelled to basic and applied research.⁹⁵

⁸⁹ Dmitry Adamsky, "The Israeli approach to defense innovation", *SITC Research Briefs*, nro 2018–7 (2018); Richard A. Bitzinger, "Military-technological innovation in small states: The cases of Israel and Singapore", in *Comparing Defense Innovation Around the World* (Routledge, 2022), 151–78; Katz, "Technology and Innovation in Israel"; Raphael D. Marcus, "Military Innovation and Tactical Adaptation in the Israel–Hizballah Conflict: The Institutionalization of Lesson-Learning in the IDF", *Journal of Strategic Studies* 38, nro 4 (June 7th, 2015): 500–528, <https://doi.org/10.1080/01402390.2014.923767>.

⁹⁰ Grissom, "The future of military innovation studies".

⁹¹ Mark Broude, Saadet Deger, & Somnath Sen, "Defence, innovation and development: the case of Israel", *Journal of Innovation Economics & Management*, nro 2 (2013): 37–57.

⁹² Ralph Sanders, "An Israeli military innovation: Uavs", 2003.

⁹³ "How Israel's Military Tech Innovators Are Preparing for War", The Jerusalem Post | JPost.com, cited September 1st 2023, <https://www.jpost.com/business-and-innovation/tech-and-start-ups/article-699211>.

⁹⁴ "Top Military Weapons Exporters 2021", cited August 7th 2023, <https://www.worldstopexports.com/military-weapons-exporters/>; Yaakov Katz & Amir Bohbot, *The weapon wizards: How Israel became a high-tech military superpower* (St. Martin's Press, 2017).

⁹⁵ Israel Ministry of Defense: The committee for reviewing the defense budget, priorities and streamlining (2012).

Israel strongly emphasises the importance of maintaining R&D&I capabilities in the independent defence industry. Research and development in the defence industry is led using a triangle, the tips of which are formed by the Ministry of Defence's DOD-R&D Department (Mafaat), the technology and combat units of the country's IDF and Israeli defence companies (Tishler and Pinchas).⁹⁶ The first group consists of three large state-owned defence organisations: Israel Aerospace Industries (IAI), Rafael and Israel Military Industries (IMI), which became separate organisations in 2018. IMI Systems was sold to Elbit Systems,⁹⁷ while Tomer remained government-owned, thus ensuring that part of Israel's essential and indispensable security interests remain in Israeli hands (Tishler and Pinchas).⁹⁸ The second group consists of Elbit Systems, a large privately owned defence company that focuses almost exclusively on the development and production of defence products and services. The third group comprises a large number of medium-sized and small privately owned companies that produce some defence products and services in addition to civilian products. IDF also maintains several large refurbishment and service centres, which are part of its technology and logistics division. These centres service, develop and produce tanks, armoured vehicles, aircraft, communication equipment and other military support systems.⁹⁹

The research and development activities of the Israeli defence industry are directed by the 'Military Research and Development Unit', which is under the Ministry of Defence and led by a soldier with the rank of Brigadier General. The activities are divided into eight departments, each focusing on a different area of the defence industry. One of the departments focuses solely on developing new innovations and integrating the activities of the various Ministry departments, academic researchers, commercial actors and the IDI (DDR&D-Directorate of Defense Research & Development).¹⁰⁰

The State of Israel has also invested in launching and supporting the operations of start-up companies through various funding programmes. One very good example is the Yozma funding programme established in the early 1990s, in which financing decisions for start-up companies were made by local officials from the Ministry of Trade and Industry. The available financial assets were distributed among 10 smaller subsidiaries managed in cooperation with national and international actors (USA or EU). The programme led to the establishment of 800 new companies between 1991 and 2000, with the investment of US\$1.6 billion producing a return of US\$12.5 billion (Bodnarchuk 2022).¹⁰¹

However, the change has not been easy. The country's innovation policy has also been guided by its geopolitical location, constant threats and the subsequent escalated crises. Conscious efforts to increase the country's economic independence already began in the 1950s. The aim was to ensure security of supply and self-sufficiency in the defence industry and primary production through wide-ranging public measures. The country's economic policy decisions, which supported growth in primary production and the defence industry, included tax-related legislative changes, direct state support and strong investment in education that supports these activities (Bodnarchuk 2022).¹⁰² The system developed to support Israel's primary production, which involved close cooperation between industry actors, public authorities and the scientific community, provided a good foundation for collaboration between private and public actors. At this time, the cooperation between academic research and the defence forces includes two key programmes: the Talpiot and Psagot programmes. These programmes enable the best possible development of the participating individual and the development of new world-class products (Nurturing Future Generations).¹⁰³

6.1 Israel's innovation culture

The Israeli defence industry exports >70% of its weapons system production.¹⁰⁴ This allows its defence technology to face international competition, which promotes

⁹⁶ G. Pinchas & A. Tishler, 356.

⁹⁷ Elbit Systems. (2018, November 1). Elbit Systems Completes the Acquisition of IMI Systems, Available at <https://elbitsystems.com/pr-new/elbit-systems-completes-the-acquisition-of-imi-systems/>

⁹⁸ Gil Pinchas & Asher Tishler, Challenges of the Israeli Defense Industry in the Global Security Market, 38.

⁹⁹ Dvir, D., & Tishler, A. (1999). The changing role of the defence industry in Israel's industrial and technological development. Working Paper No. 1/99. Available at <https://tad.colman.ac.il/paper-all/8370.pdf>.

¹⁰⁰ "DDR&D- Directorate of Defense Research & Development", Cited March 18th, 2024, https://english.mod.gov.il:443/About/Innovative_Strength/Pages/Directorate_of_Defense_Research_Development.aspx.

¹⁰¹ T. Bodnarchuk, "Policy of the transition from agricultural to high-tech export in conditions of permanent military threat". 2013.

¹⁰² Ibid.

¹⁰³ "Nurturing Future Generations", cited August 14, 2023, https://english.mod.gov.il:443/About/Innovative_Strength/Pages/Nurturing_Future_Generations.aspx.

¹⁰⁴ Pinchas. (2018). SIPRI yearbooks, 2009–2017, the Israeli defense firms' financial reports and websites.

innovation while also enabling domestic technology to interact through adaptation of international technology or learning by copying (Broude et al. 2013).¹⁰⁵ The IDF has been described in the literature as an efficient defence innovation ‘bureau’, which utilises a strong mix of innovation and entrepreneurship.¹⁰⁶ However, the literature also suggests that Israel’s innovation culture has an impact on the military technology innovation process, mainly through two key factors: strategic necessity and the so-called ‘culture of improvisation’.¹⁰⁷ A culture of improvisation is visible in innovation activities as a low level of strategic planning. In contrast, the focus is placed on problem-solving and an anti-intellectual approach.¹⁰⁸ Strategic necessity, on the contrary, is based on a conflicted environment. Previous research has described this innovation activity as an ancillary part of the wider ‘Israeli way of war’ phenomenon.¹⁰⁹ More broadly, the IDF’s vision for innovation has evolved into creating long-term continuous superiority in comparison to its enemies through faster, more accurate and more systematic mechanisms of change and learning.¹¹⁰ This vision is complemented by the IDI’ LTG Aviv Kohavi conference statement ‘Innovation is not about ideas. Innovation is always tied to the ability to perform, execute and deploy’.¹¹¹

6.2 Conclusions – Israel

While the importance of incremental development and user-oriented innovation has never been disputed, the scientific research on this issue is not extensive even in the case of Israel. Although activities are managed from the top down, examples show that innovation activities led in this manner do not exclude bottom-up innovation and development activities. Innovation activities in Israel are characterised by a strong incremental approach, practicality and huge economic investments in comparison

to Finland. Israel has also succeeded in reconciling the objectives and operating methods of commercial activities with the targets of the country’s defence forces. Examples show that start-ups backed by public funding have been successful in terms of their financial result.

Strong international support has facilitated the operations of start-up companies. The USA alone has provided Israel with US\$38 billion in direct financial support for defence spending during the 2019–2028 period (Sharp 2023).¹¹² However, this sum must be seen in proportion to export revenues in the defence industry. In 2022, the ratio between direct financial support and export revenue was 1/3, with export revenue from defence technology standing at US\$12.54 billion. The country’s total export revenue totalled US\$165 billion in 2022. The largest export product groups in the defence industry have been unmanned aircraft and drone systems (25%), rockets and air defence systems (19%), and electronic warfare and radar technology products (13%) (Genish 2023).¹¹³ The main export products all represent high-technology and high-competence products. The country has not wanted to rely only on its previous achievements. Strong investment in education and the continuity that it provides is a factor that should be taken into account. Education enables the production of new, researched information and the subsequent creation of potential new innovations.

Despite all the positive results and financial success, Israel’s defence innovation and PPPs have met with difficulties. The military has been in favour of off-the shelf products due to possibly costly and high-risk projects funded from the defence budget. Also, strategic decision to move from major platforms to dual-use and advanced technology products became extremely expensive. It is estimated that the overall cost of this shift, which started in 1992, was as high as \$5 billion. Privately owned companies were also able to win contracts more than state-owned companies, which threatened their existence (Sadeh 2004).¹¹⁴

There are also global challenges that Israel’s defence industry is facing. The concentration of defence

¹⁰⁵ Referred to as “learning by copying” in M. Broude, S. Deger & S. Sen, (2013) “Defence, innovation and development: the case of Israel,” *Journal of Innovation, Economics & Management*, No. 12, (2013): 37-57. <https://doi.org/10.3917/jie.012.0037>

¹⁰⁶ Budden, P., & Murray, F. (2019). Working paper. Defense innovation report: Applying MIT’s innovation ecosystem & stakeholder approach to innovation in defense on a country-by-country basis.

¹⁰⁷ Bitzinger, R. (2021). Military-technological innovation in small states: The cases of Israel and Singapore. *Journal of Strategic Studies*, 44(6), p. 881. doi: 10.1080/01402390.2021.1947252 2018.

¹⁰⁸ Adamsky, p. 119.

¹⁰⁹ Watts & Murray. (1996).

¹¹⁰ Bodnarchuk. (2022). “The IDF Innovation Strategy,” 1st International Military Innovation Conference, pp. 82-107.

¹¹¹ Ibid, 10.

¹¹² Jeremy M. Sharp, “U.S. Foreign Aid to Israel” (Congressional Research Service, October 1st, 2023), <https://sgp.fas.org/crs/mideast/RL33222.pdf>.

¹¹³ Shai Genish, “Israel Sets New Record in Defense Exports: Over \$12.5 Billion in 2022”, 14. kesäkuuta 2023, <https://jewishbusinessnews.com/2023/06/14/israel-sets-new-record-in-defense-exports-over-12-5-billion-in-2022/>.

¹¹⁴ Sharon Sadeh, “Israel’s defense industry in the 21st century: challenges and opportunities”, *Strategic Assessment* 7, nro 3 (2004), https://www.inss.org.il/wp-content/uploads/sites/2/systemfiles/SystemFiles/adkanEng7_3_Sadeh.pdf.

industry globally has increased overall competition. According to Tishler and Pinchas, nine largest defence industry companies created already in 2017 half of the global revenues. Simultaneously, prices of weapon systems have increased significantly and dual-use of the military products increases civilian demand. Privatisation and civilisation of the operations steers demand to the civil sector, changing the competitive environment and markets.¹¹⁵

Despite the differences, there are also similarities between Finland and Israel. These similarities do not make these countries alike and differing occurrence can explain the different approach to the R&D&I. First, constant broad-spectrum influencing activities create a threat, which needs to be considered in both nations. On the contrary, a significant difference between Finland and Israel is that offensive, covert operations against broad-spectrum influencing are not allowed in Finland and there is existing evidence on operations conducted by Israel (Kapusňak 2013).¹¹⁶ Second, both countries rely on mandatory military service, but Finland has not been under direct, kinetic attack after World War II, unlike Israel. Due to these national experiences, Israeli society is much better prepared and resilient to the conflict situation than Finland, but not without distressing consequences as (Hobfoll et al. 2009; Greene et al. 2018) studies indicate.¹¹⁷ Also, the strong collaboration between USA and Israel affects Israel's geopolitical leverage and enables capability development by significant financial aid, as described earlier (Holt 2014).¹¹⁸

7 Results and discussion

The following research objectives were set for this work:

- (1) How PPP is instrumental in the case-study object Israel implemented in the national framework with regard to the development of innovative capability that is part of the FDF's Main process 1 and its sub-processes 1.1 and 1.2?
- (2) What new threats does broad-spectrum influencing bring to cooperation between the FDF and private actors in Main process 1 and its sub-processes 1.1 and 1.2?

Based on the research objectives the following research questions were formed according to the principles of case study introduced by Yin (1981), Eisenhardt (1989) and Rashid et al. (2019).¹¹⁹

- (1) How PPP is optimally implemented in Finland's national framework with regard to the development of innovative capability that is part of the FDF's main process 1 and its sub-processes 1.1 and 1.2?
- (2) What new threats does broad-spectrum influencing bring to cooperation between the FDF and private actors in Main process 1 and its sub-processes 1.1 and 1.2?
- (3) How does strategic approach differ in the two case studies and how it affects the development work in both countries?

In order to achieve the research objectives, the authors had to solve an epistemological challenge related to the research framework as the work progressed.

Discussion of the relationship between adaptation and innovation highlighted the epistemological challenge: how to define and distinguish between the different stages of incremental and adaptive development and their combined effects. In terms of FDF capability, these two forms of development are not separate entities, but often overlap and interact with each other. For example, can a small incremental improvement at some stage of development accumulate into a change large enough to be classified as an innovation? If this is possible, what criteria and indicators should be used to assess it in relation to adaptive development? The literature reviewed in the study provides different perspectives on this epistemological challenge. Ian Roxborough's research emphasises the importance of organisational

¹¹⁵ Asher Tishler & Gil Pinchas, "Challenges of the Israeli Defense Industry in the Global Security Market", viitattu 10. kesäkuuta 2024, https://www.inss.org.il/wp-content/uploads/2020/08/Memo202_e-35-49.pdf.

¹¹⁶ Ján Kapusňak, "Covert Operations Attributed to Israel's Intelligence Services against Iran's Nuclear Program", *Panorama of Global Security Environment*, 2013, 375–86.

¹¹⁷ Stevan E. Hobfoll et al., "Trajectories of resilience, resistance, and distress during ongoing terrorism: the case of Jews and Arabs in Israel.", *Journal of Consulting and Clinical Psychology* 77, nro 1 (2009): 138; Talya Greene et al., "Psychopathology, risk, and resilience under exposure to continuous traumatic stress: A systematic review of studies among adults living in southern Israel.", *Traumatology* 24, nro 2 (2018): 83.

¹¹⁸ Blaine D. Holt, "The Gold Standard: U.S.–Israel Military Relations", *American Foreign Policy Interests* 36, nro 2 (1. maaliskuuta 2014): 111–18, <https://doi.org/10.1080/10803920.2014.905366>.

¹¹⁹ Kathleen M. Eisenhardt, "Building Theories from Case Study Research", *The Academy of Management Review* 14, nro 4 (October 1989): 532, <https://doi.org/10.2307/258557>; Yasir Rashid et al., "Case Study Method: A Step-by-Step Guide for Business Researchers", *International Journal of Qualitative Methods* 18 (January 2019): 160940691986242, <https://doi.org/10.1177/1609406919862424>; Robert K. Yin, "The case study as a serious research strategy", *Knowledge* 3, nro 1 (1981): 97–114.

culture in the production of innovation and organisational adaptation.¹²⁰ Based on that study, internal organisational factors, such as characteristics of the culture and degree of autonomy, should be taken into account during assessment. On the contrary, Kollars' research focuses on the challenges of technological change and its impacts on military innovation.¹²¹ It suggests that the definition of incremental and adaptive development should consider the level of technology development and also its impacts on the capability of the FDF.

The epistemological challenge is also partly related to the fact that incremental development and adaptation can both affect different levels of the organisation – from strategic to tactical. This further complicates the process of assessing and differentiating between the impacts of these concepts. The Marcus (2015) study¹²² presented in our literature review focuses on tactical adaptation and innovation in the IDF. This research suggests that, regardless of whether the case involves adaptation or incremental development, impact assessment should be carried out on a multi-level basis with consideration to both strategic and tactical viewpoints. Based on our review, the development of differentiating assessment criteria for the stages of adaptation and incremental development is a complex and context-bound task. As a result, the starting point for the research evolved into a paradigm in which incremental and adaptive development are not perceived as separate phenomena. Instead, they are recognised as factors that mutually influence and interact with each other during capability development.

In order to solve the epistemological challenge and achieve the research objectives, the authors performed an extensive critical literature review that enabled a comparison between Finland and Israel. Israel was selected for comparison purposes because the country has extensive cooperation between private and public actors, and its results are outstanding from the standpoint of the country's defence forces.

The challenge in terms of cooperation and development that involves private and public actors is to reconcile the two different objectives that guide activities. This reconciliation must take place in all areas of business. The R&D&I paradigm that guided the study was SD logic launched by Vargo and Lusch, which has been widely

utilised in commercial activities. One of the key principles of the theory is that the user determines the benefit of a service. Observing this principle creates an operating environment in which the end user of the service benefits from the end result of the entire supply/service chain's competence if each member of that chain is able to produce the required added value. In line with the paradigm, development and creation of something new takes place in a bottom-up manner.

The first conclusion of the study is that the operating methods of Finland and the case-study country Israel clearly differ in relation to the above. In Finland, capability development between private and public actors is not specified in the early stages of development work and, based on this study, the FDF does not have an operating method for making optimal use of innovations developed outside project work. In addition, the administrative requirements for project work raise the threshold for utilising new, innovative companies. For example, the procurement process for the new executive system (SAP S/4HANA D&S)¹²³ related to updating the FDF's SAP system is strongly guided by the savings targets set for the Defence Forces in relation to renewing and streamlining digitalisation, processes and operating methods. For private actors, the requirement for commitment to quality systems slows operations and increases costs.

On the contrary, development activities in Israel are characterised by an anarchistic-style operating method that encourages improvisation and utilisation of all opportunities. The authors consider the reason for these different operating methods to be the differing security situations in the two countries. Israel faces a constant, existential threat. However, it can also be argued that Finland and the FDF are also facing a constant threat due to the range of methods used for broad-spectrum influencing. The continuing threat to Israel has shaped its activities in two ways: the country puts continuous development efforts into ensuring the maintenance of long- and medium-term capability. However, utilisation of risk financing according to the commercial model has simultaneously enabled rapid developments related to building new products and operating methods. According to the project steering model, the FDF's model for building capability is more in line with the operating method described first.

¹²⁰ Roxborough, I. (2000). Organizational innovation: Lessons from military organizations. *Journal of Organizational Studies*.

¹²¹ Kollars, N. (2014). Military innovation's dialectic: Gun trucks and rapid acquisition. *Journal of Military Technology*.

¹²² D. Marcus, "Military Innovation and Tactical Adaptation in the Israel-Hizballah Conflict: The Institutionalization of Lesson-Learning in the IDF," *Journal of Strategic Studies*, 2015.

¹²³ Procurement decision PLM/2022/84. (2022, November 30). Puolustusvoimien SAP-toiminnanohjausjärjestelmän ohjelmistolisenssien, niiden ylläpidon sekä tarvittavien palveluiden hankinta (Procurement of software licenses, their maintenance and the required services for the Finnish Defence Forces' SAP enterprise resource planning system), Ministry of Defence.

The second conclusion of the study is that a risk-financed model provides very good results, and the possibilities for utilising this model in Finland should be investigated and possibly developed. There are huge differences between the two countries in terms of financial investment in development work carried out by the defence forces. The research budget of the FDF is clearly smaller than that of Israel.

The third conclusion of the study deals with the necessity of investigating the possibility of using new domestic and international financial instruments. Making better use of the opportunities offered by the EU alone would significantly increase research resources.

The fourth conclusion is that – in light of this research – the FDF’s method of developing capability through projects cannot be considered wrong in any respect. This method enables good allocation, monitoring and anticipation of limited resources. However, it can be stated that – as the only development method – it does not respond to the threats of a changed security environment and broad-spectrum influencing.

The fifth conclusion of the study is related to competence management. As an actor with limited human resources, Israel has responded to the capability gap by focusing on skills development and the engagement of competent personnel, both with personal incentives (financial factors, academic education) and by creating an operating culture in which new development is considered a resource. Based on the definition, the objects of broad-based influencing are not military targets.

The sixth conclusion drawn by the authors is that preparedness for broad-spectrum influencing should be extended to apply more comprehensively to partners. Prevention is undoubtedly one of the most important means of preparing for wide-ranging threats and achieving readiness, or even preparedness for war. In Finland, this means even stronger concrete cooperation and closer collaboration with authorities across administrative branches, private actors and partners. The key elements in this work are a knowledge of regional and local actors, functional cooperation relationships and standardised, tested and practised operating methods. Rather than being left at the planning or document level, regular exercises with different authorities and partners should also be put into practice. Cooperation between public and private actors must be implemented in accordance with the operating models for cooperation between authorities. Individual audits or operational evaluations carried out during a long-term project are not sufficient to maintain the required level of security and detect possible deviations. The FDF must develop an operating model that is independent of

project steering and enables rapid response to observed deviations and possible influencing attempts.

The study also examined the question of whether creating joint innovation activities and capability for dual-use products on the basis of civilian technology makes economic sense in Finland. In the current situation – without external funding – the FDF has difficulty developing dual-use products within the framework of its own resources. The opportunities for cooperation with civilian actors are also limited, because there is no innovation and development mechanism outside project activities. However, the examples from Israel demonstrate that investing in defence industry innovation can be economically viable.

Based only on examples from Israel, it is not possible to determine whether the implementation of joint testing areas, test facilities and other functions or centres intended for collective use by the FDF and private actors would be economically viable. It is very difficult to estimate the costs of the infrastructure required for the activities without a concrete development project. International examples in the research carried out by Havu and Häyhtiö (2023)¹²⁴ show that the economic benefits provided by activities in the development environment also spill over to companies in the local environment. On the contrary – as stated earlier – the opportunities for broad-spectrum influencing increase as the number of companies involved in the activities rises.

The research challenged the strategic perspective on innovation activities. Based on the literature review and case studies, the researchers consider that the FDF would benefit from a competence-based strategic approach to partially replace the resource-based approach. A separate sub-strategy with its foundation in competence-based strategy work is proposed for innovation activities. According to the researchers, the excellence-based approach chosen by Israel that emerged in the case study and literature review has specifically produced results in the area of developing innovation activities.

The authors recommend further research on the topic, with a focus on preparing a sub-strategy for innovation activities. One possibility is to examine the topic through capability or functionality developed for the FDF. Competence, development of material capability, and the

¹²⁴ Eero Havu and Markus Häyhtiö, “Yksityisten ja julkisten toimijoiden yhteistyö verkostoituneen yhteiskunnan puolustuksessa - laaja-alaisen vaikuttamisen huomioiminen kybertoimintaympäristössä” (Cooperation between private and public actors in the defence of a networked society - consideration of broad-spectrum influencing in a cyber operating environment).

evolution of functional processes and services must be taken into account when developing activities. In terms of developing the FDF's material capability, the shared responsibility model (development of materiel capability and competence) is not necessarily the most flexible way of developing capability. The study already takes a stand on this topic in the form of the research question presented above.

The need to examine or even change the highlighted operating method can be considered a practical application of the research. Based on the research, the authors conclude that the FDF has a need to utilise more agile development and funding models. One way of meeting that need is to expand development work into the area of incremental development. The opportunities provided by external funding require a change in innovation culture. The turnaround time for capability building based on project work differs significantly from that of incremental development and innovation activities.

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