A Study of the Norwegian Defense Ecosystem, Seen from an Organizational Innovation Perspective, to Enhance Product Innovation and Reduce Response Time of Products to Market.

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Abstract

In an increasingly complex security landscape, coupled with rapid technological advancements, the need for heightened awareness, immediate action, and strategic innovation is paramount to maintaining technological superiority and safeguarding Norway's national security and future prosperity. This paper investigates the phenomena of organizational innovation within the Norwegian Defense Ecosystem, aiming to identify potential opportunities – or 'rooms' – for enhancing innovation processes that can accelerate product development and reduce time-to-market.

Given the complexity and 'wicked' nature of this challenge, a transdisciplinary approach was employed, integrating perspectives from various stakeholders to deepen understanding and foster holistic insights, where soft systems methodologies were applied to structure the feedback.

Findings reveal that project complexity often necessitates sharing specialized technical competencies across individuals, where variations in understanding significantly influence effective communication. Human error remains a prominent concern, compounded by a continuous need for confirmation following information dissemination, as well as a noticeable lack of readily available technical leadership and expertise. The findings indicate that the current requirements system is not optimized to enhance product innovation and technical superiority for Norwegian defense products. Additionally, there is significant potential within the ecosystem to leverage private deep-tech companies and small start-ups. Addressing these areas is essential to achieve the overall goal of optimization. The findings also show that integration of lead users into product innovation strategies within the Norwegian defense sector could possibly hold a significant potential for enhancing the development of relevant and effective technologies, in addition to early validation and prototyping. By recognizing the value of these users and addressing the challenges associated with their involvement, defense organizations can drive

innovation that meets the evolving demands of modern warfare.

This paper does not aim to offer definitive solutions but to propose incentives that may positively influence or accelerate transitions towards greater technical excellence and faster product market entry.

Keywords

Defense, Complex Systems, Innovation, SSM, Transdisciplinary research.

Introduction

Ensuring the safety and security of Norwegian citizens has become increasingly important due to the current geopolitical situation, which represents the most serious security environment since World War II (Norwegian National Security Strategy, 2025). In response, Norway has significantly increased defense spending, allocating approximately 180 billion NOK to defense in 2026, including major investments in the defense industry, operational capabilities, and support for Ukraine (Norwegian Defense M. o., 2025; Norwegian Defense M. o., 2023). Furthermore, Norway has committed to in-creasing defense expenditures to 5.5% of GDP following the NATO summit in The Hague in 2025.

To successfully implement this large-scale defense expansion, effective collaboration across the Norwegian defense ecosystem is essential. Due to the uncertainty and severity of the societal problem a transdisciplinary methodology was chosen (Hadorn et al., 2008; Pohl & Hadorn, 2008; Lang et al., 2012).

Research from the Munich Security Conference Innovation Board and Boston Consulting Group (BCG) indicates that innovation efforts within European and NATO defense sectors often struggle because organizations fail to effectively implement cross-boundary and high-impact innovation practices (Giesener et al., 2025). Innovation and organizational innovation are therefore considered critical for long-term survival, competitiveness, and successful strategic implementation (Zahra & Covin, 1994; Bessant et al., 2005).

Initial findings from this research suggest that the Norwegian defense ecosystem faces several organizational challenges related to collaboration, communication, and knowledge sharing. Resource efficiency pressures often limit opportunities for effective knowledge exchange, while variations in understanding and psychological safety can increase the risk of misunderstandings and human error. The current requirements system for Norwegian defense products also appears insufficient for optimizing innovation and technical superiority. In addition, the ecosystem does not fully utilize the innovative potential of deep-tech companies, start-ups, and lead users. A risk-averse culture within public entities, combined with limited early validation and prototyping, may further hinder innovation and reduce the speed of product development.

The primary research question of this study is: “How can the Norwegian defense ecosystem enhance product innovation and reduce the response time of products to market from an organizational innovation perspective?” A secondary question, developed after initial interviews, examines how the ecosystem can reduce misunderstandings and minimize human error during knowledge sharing. The purpose of the study is not to provide definitive solutions, but rather to identify factors and incentives that may strengthen technical excellence and accelerate product development within the Norwegian defense ecosystem.

Background

Norway now faces the most demanding security situation since World War II. The threats from a Russia that is rearming faster than previously assumed are serious. Facing a more dangerous, less predictable, and militarily strengthened Russia, with significant combat experience and new weapons platforms. Great-power rivalry between the United States and China is also intensifying. Security, economy, and technology are becoming closely linked with large global ripple effects. The further development of the strategic partnership between China and Russia, combined with increased tension in Asia, has

significant implications for Norwegian and European security (Meld. St. 33 (2024-2025)).

The National Security Strategy (2025) states that this development should be met by making society more resilient while placing higher priority on economic security. Russia's war against Ukraine and the uncertainty about its outcome require substantial resources. Both to safeguard Norway's own interests and as part of a broader binding community, support for Ukraine's legitimate defense is given high priority. In addition, relations between the United States and Europe are characterized by greater unpredictability than in many decades. These trends were highlighted in the long-term plan (Prop. 14 S. (2020-2021), and the negative developments have further intensified in a short time. There are clear expectations and a shared recognition within NATO that Europe must take substantially greater responsibility for its own security. Strengthening the ability for collective defense will demand more from European allies. Burden-sharing in NATO must become fairer, which means that European allies, both individually and collectively, must contribute more to common defense. NATO cooperation is based on member states developing their individual and collective ability and capacity to withstand an armed attack. That means each member must have military forces capable of meeting the challenges and contributing a proportionate share to collective defense. In this situation, it is in Norway's interest to strengthen the European capability for conventional deterrence. For this to happen quickly enough, Europe must further build up its defense industry to increase production capacity and reduce delivery times. An important objective is at the same time to standardize and limit variants of military equipment (Meld. St. 33 (2024-2025)).

In 2023 project F-24 was put forward to reorganize existing structures within the public entities of the Norwegian defense ecosystem in order to make the sector more efficient through faster decision processes and decreased execution time – which was – and still is – expected to positively contribute to achieving the overall objectives of the defense sector. A more comprehensive decision-making foundation based on facts, reduced fragmentation, clearer task allocation and responsibilities and increased governance and control are the main focus areas behind the initiative (Norwegian Defense, 2025). And on October 17th, 2025, the Norwegian defense sector held their first conference on experience-based learning; 'Act now – or wait until it hits?' where trust, situational awareness, collaboration, knowledge sharing, and the psychological environment were among the key elements to battle in order for the sector to innovate, in addition to their ability to change and mobilize, to mention a few (Experience-based learning conference in the Norwegian defense sector, 2025).

The idea of business ecosystems was first introduced by James F. Moore in 1993 and is based on the notion that one single business cannot operate without investors, suppliers, customers, and networks. It is similar to biological ecosystems where one element cannot survive without the other (Iansiti & Levien, 2004). Not only do the businesses depend on its own business model, but it is also rely on its surroundings – the ecosystem – as we like to call it (Zott & Amit, 2008), which connects through different value networks (Zott & Amit, 2010). A business ecosystem corporate and compete in order to develop new products and to create customer value (Moore, 1993).

According to Gleick (1987) 'the 21st Century Innovation Ecosystem is a multi-level, multi-modal, multi-nodal and multi-agent system of systems. The constituent systems consist of innovation meta-networks (networks of innovation networks and knowledge clusters) and knowledge meta-clusters (clusters of innovation networks and knowledge clusters) as building blocks and organized in a self-referential or chaotic fractal (Gleick, 1987) knowledge and innovation architecture, which in turn constitute agglomerations of human, social, intellectual and financial capital stocks and flows as well as cultural and technological artifacts and modalities, continually co-evolving, co-specialising, and co-opeting. These innovation networks and knowledge clusters also form, re-form and dissolve within diverse institutional, political, technological

and socio-economic domains including Government, University, Industry, Non-governmental Organizations and involving Information and Communication Technologies, Biotechnologies, Advanced Materials, Nano-technologies and Next Generation Energy Technologies' (Carayannis & Campell, 2009, p. 206). And according to Rubens et al. (2014) an innovation ecosystem is inter-organizational, political, economic, environmental, and technological systems of innovation through which a milieu conducive to business growth is catalyzed, sustained and supported. A vital innovation ecosystem is characterized by a continual realignment of synergistic relationships that promotes harmonious growth of the system in agile responsiveness to changing internal and external forces.'

There are many definitions of what a business ecosystem and an innovation system is, but they all agree that they are multi-level complex systems that are interdependent on the other 'parts' of the system in order to produce value to the public (Grandstrand & Holgersson, 2020).

Extensive research has been conducted on innovation, mostly technological and product innovation, but organizational innovation continues to receive less attention than others (Birkinshaw et al., 2008; Pauget & Wald, 2018). Crossan and Apaydin (2010) found that less than 3 percent of 1,000 articles published on in-novation dealt with organizational innovation. The closely related concepts of management innovation and administrative innovation have also been relatively neglected (Volberda et al., 2013; Peris-Ortiz & Hervás-Oliver, 2014). However, several studies have demonstrated that organizational innovation can have direct positive effects on firm performance as well as indirect effects via process and product innovations (Armbruster et al., 2008; Mothe & NguyenThi, 2010; Camisón & Villar-López, 2014; Hanedet et al., 2014; Cozzarin et al., 2017; Cozzarin, 2017). Additionally, the configuration of organizations and ecosystems, along with their effect on innovation effectiveness, is a key focus of the Munich Security Conference Innovation Board (MSC) and the Boston Consulting Group (BCG). The concept of the defense innovation readiness gap, developed by BCG, highlights the disconnect between the innovation objectives established by European ministries and their ability to implement these goals effectively (Schlueter et al., 2022; Giesener et al., 2025).

The academic literature on organizational innovation has not agreed on a common definition or unique theoretical framework (Sørensen & Stuart, 2000; Wolfe, 1994; Lam, 2004), and there are several related concepts, such as management innovation (Birkinshaw et al., 2008; Mol & Birkinshaw, 2009; Damanpour and Aravind, 2012; Volberda et al., 2013), administrative innovation (Damanpour, 1987), and process innovation (Boer & During, 2001). Even though organizational innovations are relatively neglected in scientific studies, organizational innovation's number one goal is to increase the company's performance and competitiveness by introducing new ways of doing things. The introduction of Lean manufacturing production is such an example, where simultaneously engineering and just-in-time delivery, are well-known concepts today. Organizational innovation differs from organizational change in the way that organizational innovation introduces a new way of doing things. It could be to increase workplace satisfaction or to reduce supply chain costs, or it could be how the organization (s) interacts with other organizations. It could be new ways of collaborating or communicating with customers, how they are procuring products, or recruiting new people (Birkinshaw & Mol, 2006).

Pauget and Wald (2018) claims that an organization's degree of organizational innovation will depend on the patterns of a social system represented by networks of relationships, professional identities and formal structures, and in a study of in a study in teams of start-up firms in 2002, Ruef found that embeddedness in cultural and social networks determines organizational innovation. His research is part of a stream of innovation research that focuses on networks and the opportunities and constraints they constitute for innovation (Powell & Grodal, 2004). Dubouloz (2014) investigated how organizational innovation can be supported by human

resource practices at the micro-level. She demonstrated that the technological aspects of organizational innovation must be complemented by more social aspects, such as high-involvement human resource practices. Gumusluoglu and Ilsev (2009) showed that transformational leadership behavior enhances the creativity of followers. For a sample of Canadian firms, Yang and Konrad (2011) found that employee involvement, another micro-level factor, promotes organizational innovation; this effect is stronger for culturally diverse minority group members. These studies show that network embeddedness of actors are important elements for understanding organizational innovation.

Numerous studies also acknowledge the beneficial effects of knowledge management strategies, which encompass the skills associated with managing, sharing, coding, and storing knowledge, typically linked to increased flexibility, adaptability, competitive advantage, and enhanced organizational performance (Grant, 1996; Spicer & Sadler-Smith, 2006). However, few studies provide definitive evidence of this relationship (Becerra-Fernandez & Sabherwal, 2001), and some indicate only a weak significance (Chen et al., 2004).

Research Design, Methodologies and Methods

Research Design.

A case study approach is often chosen for investigating complex real-life phenomena because it provides researchers with the appropriate environment to gain a holistic understanding of the issue at hand. This approach integrates multiple sources to capture deeper insights into specific cases and categorizes them into different types, such as exploratory, explanatory, and descriptive. An exploratory case study aims to enrich understanding without preconceived biases or assumptions about the current state of the phenomenon under investigation (Bunkar et al., 2024, p. 67). A case is commonly defined as "a phenomenon of some sort in a bounded context" (Miles et al., 2014), typically occurring within specified boundaries and at a specific time in its natural environment.

Key characteristics of case study research usually include:

1. In-depth Exploration: A thorough examination of one or a limited number of cases.
2. Contextual Analysis: Understanding the issue in real-life contexts, accounting for the complexity and interdependence of various elements.
3. Holistic Perspective: Considering multiple factors and dimensions.

(Bunkar et al., 2024, pp. 70-71)

Qualitative methods are generally employed, including in-depth interviews, observations, and analysis of other relevant materials that may influence the understanding of the phenomenon under study (Bunkar et al., 2024, p. 72).

Research questions may be predefined or developed through preliminary investigations of the selected case study (Noor, 2008). In this research, the primary question – “How can the Norwegian defense ecosystem enhance product innovation and reduce the response time of products to market from an organizational innovation perspective?” – was predefined and the second research question – “How can the Norwegian defense ecosystem effectively reduce misunderstandings and minimize the potential for human errors during knowledge sharing?” – was developed through preliminary findings.

Figure 1 presents a visual outline of the research design for this paper. The background literature review and literature selection were guided by the main research question.

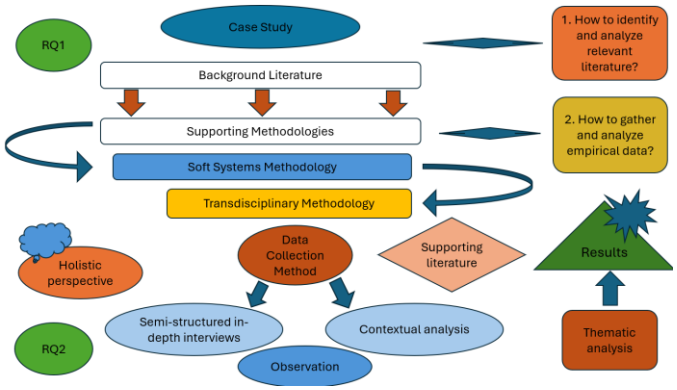

Figure 1. Visual Outline of the Research Design.

The Norwegian defense ecosystem was selected as the case study for this research (see section "System Boundaries"). The primary research question was developed prior to the literature review, followed by a review of relevant background literature and the selection of appropriate methodologies. Initial interviews were then conducted, leading to the development of the second research question that often is the case in these kinds of studies (Noor, 2008).

The research continued with in-depth interviews, observations, and contextual analysis using a holistic approach (Bunkar et al., 2024, pp. 70–71). Finally, the collected data was analyzed through thematic analysis combined with Soft Systems Methodology to support conclusions and provide recommendations for action in line with the selected transdisciplinary methodology (Lang et al., 2012).

System Boundaries

In figure 2 below you will see an outline of the stakeholders within the Norwegian defense ecosystem.

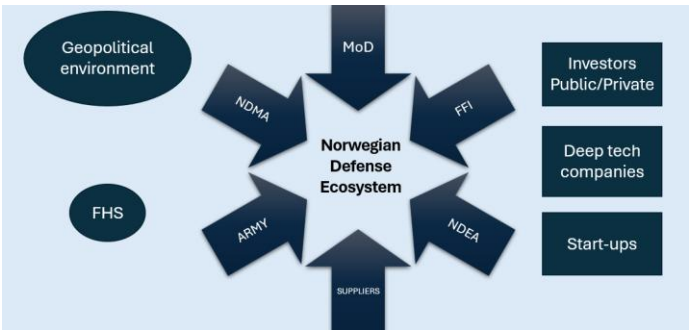

Figure 2. Norwegian Defense Ecosystem – Stakeholder Map.

Stakeholder Analysis is a method used to identify and describe the stakeholders relevant to the selected system (Matikainen, 1994). This method is based on the understanding that networks, such as individual actors or groups of actors, are connected to each other (Prell, 2003).

The actors within the Norwegian defense sector, as you can see from the stakeholder map, are; the ARMY, MoD, NDMA, FFI (NDRE) and NDEA, the Norwegian Defense College (FHS) (Norwegian defense.no), main suppliers, sub-suppliers, start-ups and deep-tech companies, and investors – in addition to the overall geopolitical environment.

Muller (2025) differentiate between actors operating in a business ecosystem and their perspectives, shown in figure 3. Muller's classification system is a generalization of all technical industries and has been used to show systems of interest for different actors within a technical industry. The model has been reconstructed to include the Norwegian defense industry actors added to the right.

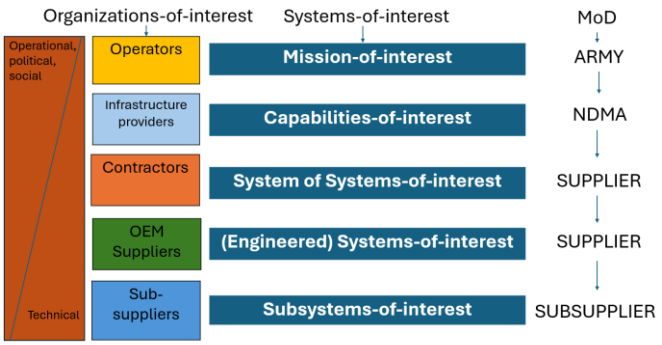

Figure 3. *Perspective Changes from Layer to Layer*. From System to Ecosystem. Recreated from Muller, 2025.

The ecosystem classification includes several interconnected actors. Operators are represented by the Army, while infrastructure providers include the Norwegian Defence Materiel Agency. Contractors, such as Kongsberg Defence & Aerospace, operate both as contractors and OEM suppliers, giving them multiple systems of interest (SoS and SoSs). Sub-suppliers contribute through specialized sub-systems. The model also considers the balance between operational, political, social, and technical perspectives within the ecosystem.

To narrow down the research the Norwegian Defense Material Agency, and their main supplier (s) and sub-suppliers were investigated more thoroughly, as seen in figure 4.

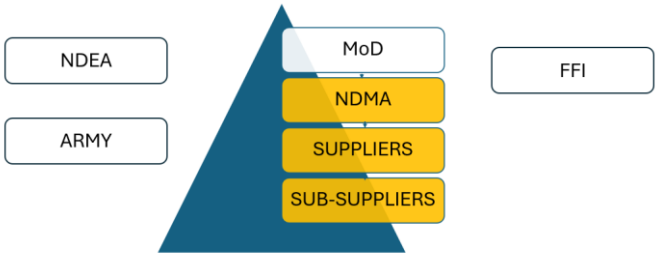

Figure 4. Main Focus Areas for This Paper Highlighted in Orange.

The acquisition process of Norwegian defense products was highlighted as one area for improvement throughout the research in order enhance product innovation and reduce time-to market for Norwegian defense product, especially the current requirement system, therefore a model of the acquisition process for Norwegian defense products seemed appropriate, shown in figure 5.

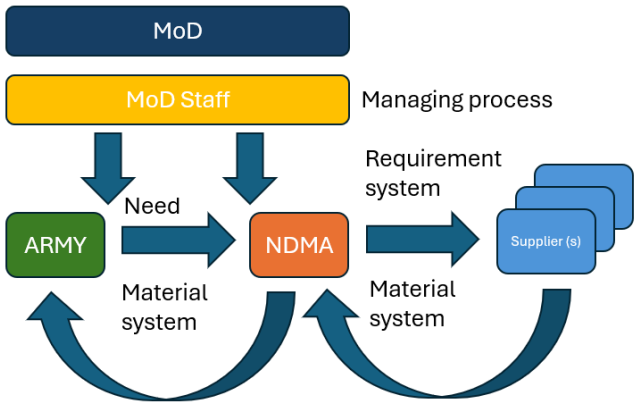

Figure 5. Actors In the Acquisition Process. Recreated from Lunke & Kokkula, 2025.

Methodologies.

Given the complexity and 'wicked' nature of this challenge, a transdisciplinary approach was employed, integrating perspectives from different actors to deepen understanding and foster holistic insights, where soft systems methodologies were applied to structure the feedback.

Transdisciplinary Methodology.

Transdisciplinary research design is an integrative approach that goes beyond traditional academic boundaries by incorporating knowledge from various disciplines, stakeholders, and community perspectives to address complex societal challenges, (Lang et al., 2012) and gives the researcher the tools he or she needs when the nature of a societal relevant problem is uncertain, and where there is a lot at stake for those who are affected by the problem. (Hadorn et al., 2008 p. 34)

This methodology is increasingly recognized for its potential to foster innovation and create actionable solutions that are relevant and applicable in real-world contexts (Lang et al., 2012). At its core, transdisciplinary research seeks to break down silos between disciplines, encouraging collaboration among researchers, practitioners, policymakers, and the community. This collaborative effort is essential for addressing multifaceted issues which

cannot be effectively tackled through a single-discipline lens (Pohl & Hadorn, 2007). Societal challenges require a holistic understanding that considers social, economic, and environmental dimensions, thereby reflecting the interconnected nature of these issues. The transdisciplinary research process typically involves several key stages. First, it begins with the identification of a societal problem that requires a comprehensive approach (Bammer, 2013). Researchers and stakeholders collaboratively define the problem, ensuring that diverse perspectives are incorporated. This stage is critical, as it lays the groundwork for a shared understanding and ownership of the research objectives. Next, the design of the research involves integrating methodologies and frameworks from various disciplines. This phase often includes qualitative and quantitative approaches, allowing for a more robust analysis of the problem (Max-Neef, 2005).

Furthermore, transdisciplinary research emphasizes the importance of stakeholder engagement throughout the research process. Engaging stakeholders not only ensure that the research addresses real-world needs but also facilitates the co-creation of knowledge, fostering a sense of shared responsibility and commitment to the outcomes. Effective communication and collaboration among participants are essential to overcoming potential conflicts and integrating diverse viewpoints. Finally, transdisciplinary research places a strong emphasis on the dissemination and application of findings. The goal is not merely to produce knowledge but to translate that knowledge into practical solutions that can be implemented by communities and policymakers (Hadorn et al., 2008).

Transdisciplinary research design is a powerful approach that fosters collaboration across disciplines and stakeholders, enabling the effective tackling of complex societal issues. By integrating diverse perspectives and methodologies, transdisciplinary research not only enhances the depth and applicability of findings but also promotes a more inclusive and participatory approach to knowledge production (Meer et al., 2023).

Soft Systems Methodology.

In the 1970s the systems engineering view on systems changed from being just a so-called hard system methodology to including softer elements, such as human social complexity and different worldviews into a so-called soft systems methodology (SSM). These so-called soft systems methodologies are telling us that learning happens through an organized process where the individual will explore the situation, using intellectual tools to provide structure to the issue at hand, to try to come up with a solution to the problem and how he or she should proceed and which action that would be most appropriate to take. The different cognitive processes will most likely happen simultaneously (Sandvold et al., 2025).

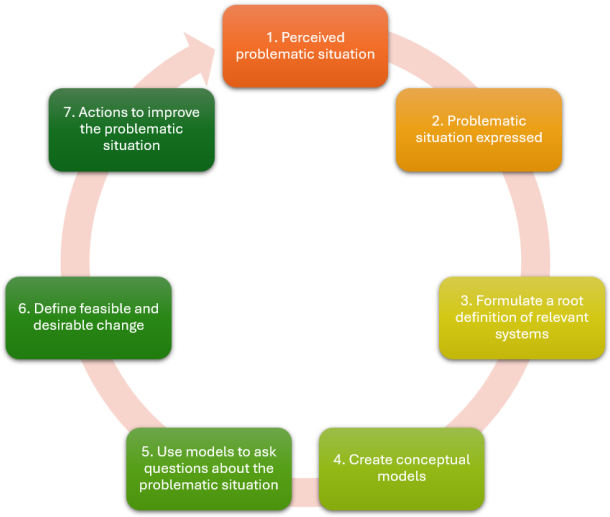

Figure 6. Soft Systems Methodology. Recreated from Sandvold et al., 2025.

Gharajedaghi (2011) sees human beings as systemic in nature and that complex living systems should be viewed in a holistic perspective. This is aligned with both a case study approach (Bunkar et al., 2024) to research and transdisciplinary research (Bammer, 2013). Suggesting that when viewing and understanding a living system, such as a business ecosystem, one should view the system as a whole, rather than just focusing on its individual parts. He emphasizes the interconnectedness and interactions between different components, recognizing that the behavior of the whole system cannot be fully understood by examining parts in isolation. In-stead, it

considers the larger context, relationships, patterns, and dynamics that influence and shape the system. This approach helps to identify underlying causes, promote integrated solutions, and appreciate the complexity of real-world systems (Gharajedaghi, 2011).

Research Method (s).

For this research a qualitative approach was chosen in the form of semi-structured in-dept interviews with 25 different actors from the defined stakeholders within the ecosystem, in addition to observation and contextual analysis, as recommended by Bunkar et al., 2024 and Hadorn et al., 2008, to get a better understanding of the situation at hand.

Triangulation of methods was used, in addition to interviews with actors at different levels of the organizations to validate the findings (Torrance, 2012).

Data Collection.

The in-dept interviews were conducted in Teams using the automatic transcribing tool to transcribe the interviews. The participants were selected based on their background, knowledge, expertise and placement within the ecosystem. Part of the respondents interviewed have conducted research within the defense sector previously and their findings were highlighted in the interview. All participants were informed about the transcribing tool being used and GDPR was briefly discussed.

Observation was also used, when feasible, in order to get a deeper understanding of the ecosystem environment.

Contextual analysis was continuously gathered throughout the research, due to the complexity of the societal problem and the rapidly changing geopolitical environment.

Data Analysis.

For data analysis, thematic analysis (TA) was applied. Thematic analysis is a widely used qualitative method for identifying and analyzing patterns or themes within datasets (Ahmed et al., 2025). Because TA is not tied to a specific theoretical framework, it offers flexibility for both deductive and inductive approaches (Majumdar, 2022). Braun and Clarke's framework (2024) was used to ensure a systematic and transparent analysis process through structured stages such as familiarization with data, coding, theme development, and interpretation. This framework enhances reliability and supports the reproducibility of qualitative analysis.

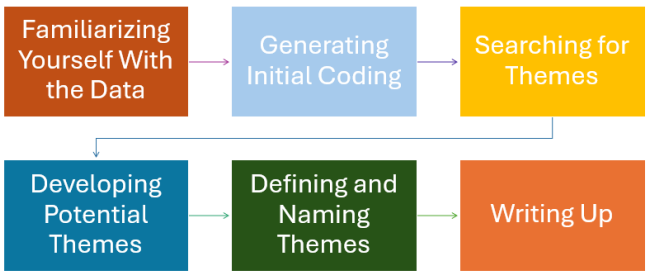

Figure 7. Steps of Thematic Analysis. Recreated from Ahmed et al., 2025.

Each step of thematic analysis provided by Braun and Clark (2024) is developed to provide a systematic approach to analysis qualitative data and to make them reliable and recallable, as seen in figure 7.

Findings

The overall aim of this research was to get a better understanding of the phenomena of organizational innovation and possibly identify 'rooms' for organizational innovation within the Norwegian Defense Ecosystem to enhance product innovation and reduce response time of products to market. After the preliminary interviews were conducted it became evident that misunderstanding during knowledge sharing is perceived to be a problem throughout the ecosystem, so therefore strategies for minimizing those risks became of interest.

The goal was never to provide definitive solutions to the complex issues at hand, but to propose incentives that may positively influence or accelerate transitions towards enhanced technical superiority and reduce the time required for products to reach the market.

Early Validation, Prototyping and Testing

One of the respondents' research projects highlights a significant gap in the early validation processes of product development, with 57% of respondents unfamiliar with these processes. The reliance on customer specifications as the primary source of information leads to limited interaction with customers during design and development, resulting in potential misalignment between the products developed and customer needs. The findings were verified by multiple respondents in the following interviews and occur as a problem followed by the acquisition process between NDMA and main supplier (s). Due to a system where there is limited interaction between customer and supplier (s), prototyping is not used and there is little verification (testing) against customer.

Systems Requirement Challenges

Several of the respondents provided a critical perspective on the regulatory landscape governing defense projects, arguing that the multi-layered approval processes stifle innovation, as demonstrated by the rigid systems requirements set by customer. Complexities in incorporating user feedback in the design and development of defense systems were also mentioned. Main supplier (s) innovation happens in projects after contract is signed, so projects with fewer constraints, such as those projects delivered outside of Norway, allow for greater flexibility and risk-taking. Another respondent emphasizes the complexity of translating stakeholder requirements into actionable systems requirements, a skill lacking in the industry due to resource constraints. The respondent notes that misunderstandings often arise between what customers believe they need, and the solutions developed, illustrating the need for better communication tools.

Lead User Knowledge in Product Development

The emphasize on the importance of lead user knowledge in product development was mentioned by several of the respondents and has become even more evident now than ever where technical companies yearn for Ukrainian military knowledge. Taking advantage of lead user knowledge could provide valuable insights into new untapped technologies.

Onboarding and Knowledge Sharing

Integration of new employees into project teams within a highly technical context was mentioned as one element of importance, and concern, of one of the respondents. The respondents' findings (respondents prior work) suggest that traditional onboarding practices can be insufficient, leading to difficulties for new hires in navigating their roles. The respondent advocates for enhanced training structures, including shadowing experienced colleagues and fostering closer physical proximity among team members to facilitate knowledge exchange. There have been improvements to the company's training protocols, with structured programs and mentorship initiatives that are now in place. However, greater emphasis on the softer aspects of the work environment and increased employee involvement in projects are crucial for fostering a collaborative culture, according to the respondent.

Furthermore, lack of systematic knowledge capturing and succession strategies within the ecosystem could pose a risk for future project continuity and innovation. All the respondents have expressed concerns involving knowledge capturing processes within the sector.

Traditional Resource Efficiency Perspective and Lack of Technical Leadership/Support

The lack of technical leadership and support has been highlighted as a concern and a bottleneck in the industry. Due to the complexity of the industry, the lack of available technical support functions is perceived to be a problem way up in the organizational hierarchy. Not only for new hires, but for experienced employees as well.

It seems to be rooted in the traditional resource efficiency perspective that is detected throughout the sector, where experienced resources are working at full capacity with little available time to support.

Fear of Making Mistakes

The psychological environment has been highlighted as an environment where fear of making mistakes is high. There have been mentioned several reasons for this, such as a risk-averse organizational culture in the public entities of the ecosystem, where risk-taking initiatives could be viewed as unsafe and are not rewarded. The lack of technical leadership/support in the private entities is also increasing the fear of making mistakes and lack of sufficient validation processes towards customer, and large investments.

Trust Within the Sector

There seems to be an issue with trust among entities in the ecosystem where the industry perceived to be fragmented where trust-barriers are evident. The reasons for this have been mentioned to be the large investments in the sector, the fear of making mistakes, media exposure, and current set up of the eco system.

Taking Advantage of Start-ups

There has been mentioned that partnering up with start-ups with technical innovations is difficult in a Norwegian setting due to their lack of scalability and the current ecosystem set up, eve n though this has been emphasized as a crucial factor to achieve technical superior products by supporting literature. The start-ups have to grow into a certain size before the main supplier (s) can agree to a collaboration, due to the same reasons.

Dual use of Products Developed in the Sector

Dual use of products developed in the defense industry is highlighted as potential for growth and independence for the companies in the industry. The companies in the industry should rely on multiple costumers and not depend on the Norwegian state for funding. A company's ability to thrive without governmental support is highlighted in supporting literature.

Logistics and Estate Capabilities

To make the industry more self-efficient, not relying solely on the Norwegian government for investments, estate capabilities and how this could be solved. Mapping out available storage capabilities in Norway and making a logistics plan for military equipment in case of war has been mentioned as something that should be looked further into.

Taking advantage of deep-tech companies

Supporting literature highlights the need to take advantage of both start-ups and deep-tech companies when developing new, disruptive innovative solutions for the industry.

Discussions

Soft Systems Methodology (SSM) was applied to structure feedback and analyze the Norwegian defense ecosystem following the seven-step process recreated from Sandvold et al. (2025). The methodology emphasizes understanding ecosystems holistically by focusing on the interconnected relationships, patterns, and dynamics between actors rather than viewing components in isolation (Gharajedaghi, 2011).

The central problematic situation identified in this research was how the Norwegian defense ecosystem can enhance product innovation and reduce time-to-market for defense products from an organizational innovation perspective. To address this, system boundaries were predefined using the Norwegian defense sector's own framework combined with Muller's (2025) ecosystem classification model. Initial literature reviews and preliminary interviews confirmed the relevance of the research problem while also identifying additional organizational factors affecting ecosystem efficiency.

As the research progressed, focus was directed towards specific parts of the ecosystem to gain deeper understanding of emerging issues (Lunke & Kokkula, 2025). Conceptual maps were developed continuously throughout the study, and findings were validated during the research process to strengthen reliability and understanding.

Figure 8. Findings Research Question 1.

The findings indicate a need to strengthen an organizational culture that encourages creativity, innovation, and "outside-the-box" thinking within the Norwegian defense ecosystem. Public entities in particular appear influenced by hierarchical traditions that contribute to a risk-averse culture where individuals may fear making mistakes. Creating a psychologically safe work environment that rewards experimentation and learning could therefore improve innovation efforts.

The research also highlights the importance of building a more unified ecosystem based on trust and collaboration between both public and private actors, supporting the objectives introduced through the F-24/F-25 initiatives (Norwegian Defense, 2025). In addition, better integration of deep-tech companies and support for start-ups are considered essential for strengthening product innovation and technological superiority (European Commission, 2025). Scalability remains a challenge in collaborations between start-ups and larger defense organizations, particularly due to investment requirements. To address this, the Norwegian government has increased financial support for expanding production capacity within the defense industry (Norwegian Defense M. o., 2024).

Taking advantage of Lead user knowledge in product development has also been highlighted as shown in figure 9.

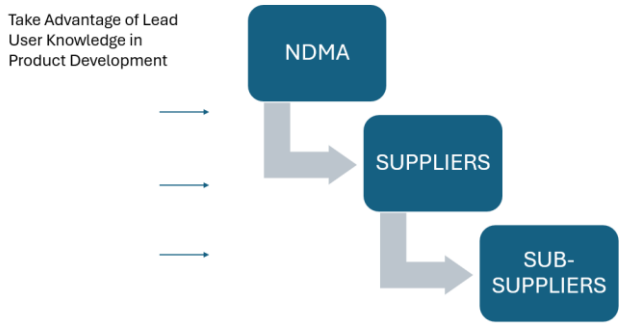

Figure 9. Take advantage of Lead User Knowledge in Product Development.

The BCG (2025) report on defense and security highlights the importance of utilizing knowledge gained from previous and ongoing conflicts to strengthen in-novation and defense capabilities (Giesener et al., 2025). Saab, for example, has established dedicated task force groups working directly with the Ukrainian military to provide support while simultaneously gathering valuable operational experience for future product development (Experience-based learning conference in the Norwegian defense sec-tor, 2025).

The findings suggest that incorporating greater Lead user knowledge into Norwegian defense products could significantly improve product innovation and relevance. Such collaboration would benefit customers, suppliers, and sub-suppliers across the Norwegian defense ecosystem.

Adjustment to the current requirement system, as shown in figure 10, have also been highligheted as a potenial problem to enhance product innovation and should be investigated further.

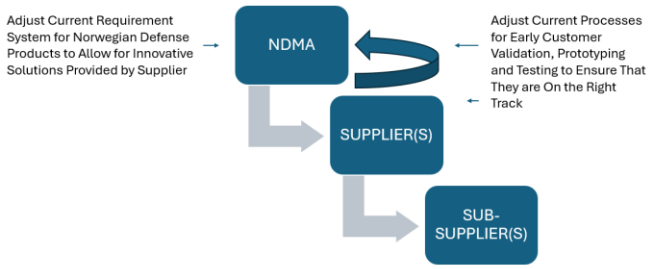

Figure 10. Improvement Areas Related to the Aqusition Process of Norwegian Defense Products.

The current Norwegian defense acquisition process primarily operates between the Ministry of Defense (MoD), the Norwegian Defence Materiel Agency (NDMA), and main suppliers. The Army communicates operational needs to NDMA, which acts as the customer in relation to suppliers and sub-suppliers during procurement process (Lunke & Kokkula, 2025). NDMA defines the system requirements, while suppliers are responsible for developing and producing the systems. The systems of interest vary depending on the actors' position within the ecosystem (Muller, 2025).

The findings indicate that the existing requirement system provides limited flexibility for suppliers to introduce innovative solutions unless these are explicitly requested by NDMA. Since innovation often emerges during project execution after contracts have been established, suppliers have little opportunity to adjust or improve the system of interest throughout the development process.

Key findings to Research Question 2

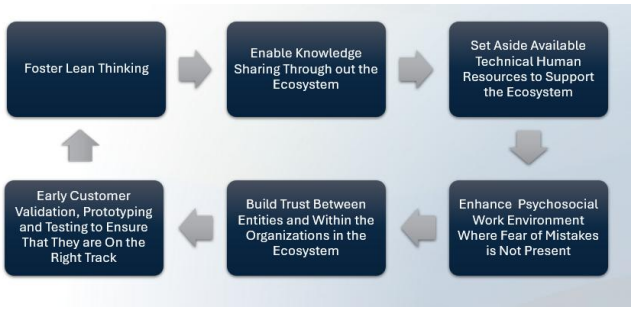

Figure 11. Findings Research Question 2.

As figure 11 shows, the current validation system towards customers (including prototyping and testing) should be adjusted according to the changes suggested to the current requirement system, allowing for changes by supplier (s).

Further on, the findings to research question two show that there is a need to re-evaluate the current resource efficiency perspective in the sector towards a more Lean-oriented approach. In today's system's (ecosystem) there appears to be bottlenecks due to resource constraints within technical leadership/support functions. This is most evident in the supplier (s) organizations but stretches upwards in the organizations.

Coupling this with obvious need for knowledge management strategies throughout the system increases the time it takes to get products to market. Clear knowledge sharing strategies both within and between entities, in addition to absorptive capabilities could decrease misunderstandings, reduce time-to-market and enhance product innovation for defense products.

Building a culture throughout the ecosystem that fosters trust, cooperation, and teamwork will only enhance the factors above according to the findings.

Conclusion

The research shows that to enhance product innovation and reduce time-to-market for Norwegian defense products – viewed from an organizational innovation perspective – the industry could benefit from the findings presented in this paper.

To achieve these goals, the industry should have a continued focus on orchestrating an ecosystem that takes full advantage of deep-tech and start-ups and utilizes lead user knowledge in product development, emphasizes on dual-use products and adjusts the current requirements system for Norwegian defense products to accommodate innovative solutions presented by supplier(s). Cultivating an organizational culture that encourages creative initiatives and innovative thinking could further enhance the factors above.

Furthermore, the ecosystem should prioritize building trust among its entities with clear and effective

communication strategies. Cultivating a psychosocial work environment free from fear of making mistakes could only benefit the system. Enabling knowledge sharing throughout the ecosystem, along with early customer validation, prototyping, and testing, will help reduce human errors, in addition to continued focus on onboarding and succession strategies. Lastly, promoting Lean thinking, ensuring that technical human resources are readily available could prevent bottlenecks and further reduce the likelihood of misunderstandings.

Recommendations

Investigating the ecosystem more thoroughly may produce valuable insights into enhancing technical superiority and reduced product time-to-market for Norwegian defense products. Therefore, additional research is strongly recommended.

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