Swedish public procurement and the defence industry: obstacles and opportunities

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Abstract

Purpose – A deteriorating security situation and an increased need for defence equipment calls for new forms of collaboration between Armed Forces and the defence industry. This paper aims to investigate the ways in which the accelerating demand for increased security of supply of equipment and supplies to the Armed Forces requires adaptability in the procurement process that is governed by laws on public procurement (PP).

Design/methodology/approach – This paper is based on a review of current literature as well as empirical data obtained through interviews with representatives from the Swedish Defence Materiel Administration and the Swedish defence industry.

Findings – Collaboration with the globalized defence industry requires new approaches, where the PP rules make procurement of a safe supply of defence equipment difficult.

Research limitations/implications – The study's empirical data and findings are based on the Swedish context. In order to draw more general conclusions in a defence context, the study should be expanded to cover more nations.

Practical implications – The findings will enable the defence industry and the procurement authorizations to better understand the requirements of Armed Forces, and how to cooperate under applicable legal and regulatory requirements.

Originality/value – The paper extends the extant body of academic knowledge of the security of supply into the defence sector. It serves as a first step towards articulating a call for new approaches to collaboration in defence supply chains.

Keywords Defence logistics, Defence supply chain, Public procurement in defence industry

Paper type Research paper

1. Introduction

Defence procurement, which is the process by which states acquire the goods and services needed by their Armed Forces, constitutes a significant sub-field within Defence Studies (Sigma, 2011; Uttley, 2018; Calcara, 2020). According to Markowski and Hall (1998), there has been a renewed interest in the economics of defence procurement. A growing body of literature is focusing on the efficiency challenges presented by the acquisition of defence equipment (Glas, 2017; Zsidisin *et al.*, 2020). One aspect of this research delves into purchaser-provider or demander-supplier relationships within contexts where the functioning of market forces is hindered by information deficiencies and asymmetries, economies of scale and scope,

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as well as conditions of monopoly supply and/or monopsony demand (Markowski and Hall, 1998). Another aspect of the research delves into the legal and regulatory aspects surrounding the acquisition of defence equipment (Blauberger and Weiss, 2013; Gombos and Szűcs, 2019; Biermann and Weiss, 2021).

The environment of defence procurement is intricate. It is characterized by uncertainties and significant resource constraints arising from constantly evolving threat perceptions, limited dissemination of information about new technologies and the expenses related to defence (Patil and Bhaduri, 2020). Numerous laws and regulations govern the arms trade, arms and ammunition production and the acquisition of defence materials, all of which the involved actors must consider (Sigma, 2011).

The EU directive on public procurement (PP) encompasses the procurement of defence equipment as government authorities are the entities responsible for the procurement process (European Commission, 2020). The EU Directive 2014/24, 2014 on PP stipulates that national authorities must adhere to the principles of PP, ensuring equal treatment of all applicants and the absence of discrimination (European Commission, 2020). Additionally, the EU directive mandates that interactions and long-term contracts should not distort competition and should follow the principles of non-discrimination and transparency (Calcara, 2020; Holma *et al.*, 2022).

This arms-length approach, dictated by the applied laws, stands in stark contrast to the supply chain literature outside the defence sector. This literature underscores the significance of mutual trust among involved parties, shared goals and objectives, transparent communication, close collaboration, long-term commitment, comprehensive involvement at all levels and the continual nurturing of relationships (Ellram and Edis, 1996; Gules and Burgess, 1996; Dowlatshahi, 2000; Cova and Salle, 2008; Daugherty, 2011; Huang and Wilkinson, 2013; Panahifar *et al.*, 2018).

A recent inquiry by the Swedish government proposed the necessity for both public and private sector entities to establish novel, long-term collaborations to ready Sweden for potential wartime scenarios (SOU, 2019, p. 51). Consequently, an urgent imperative arises to devise supply solutions that fulfil the operational requirements of the Armed Forces. Typically, these supply solutions are achieved through cooperation with industry actors, particularly those in the defence sector (Bryden and Caparini, 2006; Datta and Roy, 2013; Gereffi and Fernandez-Stark, 2016). Nonetheless, strictly adhering to PP laws presents challenges in cultivating enduring relationships with the defence industry, which are essential for establishing a foundation of supply security over time (Manuj and Mentzer, 2008; European Commission, 2016a, b). Emphasizing cost considerations has taken precedence over establishing supply security (Wilhite *et al.*, 2014; Ekström *et al.*, 2021; SOU 2022:24, 2022, p. 24).

Numerous studies have delved into the implementation of the EU's defence material procurement directives (Trybus, 2002; Arrowsmith, 2006; Hall *et al.*, 2009; Piga and Schooner, 2022). As pointed out by Kausal *et al.* (1999) and Schoeni (2020), significant disparities exist between the EU and the US regarding the functioning of the military material market. Several nations opt to interpret the existing procurement directives flexibly, aiming to maximize advantages for their own state (Heuninckx, 2008, 2009; Snider and Rendon, 2008; Smith, 2022). Conversely, certain states adhere more strictly to these regulations with the intention of optimizing benefits from a global defence equipment market (Aguado-Romero *et al.*, 2013). Some procurement regulations, such as the U.S. Federal Acquisition Regulation, establish a continuum between compliance and procurement efficiency (Decarolis *et al.*, 2021). This signifies that there are differences in the procurement laws of various states, or, at the very least, in how these laws are put into practice. Such variations allow for different behaviour in procurement and supply chain management, particularly when circumstances warrant such adaptations (Arrowsmith, 2017, p. 284; Schwartz and Peters, 2019).

While past research has delved into commercial supply chains with the aim of maximizing financial gain, less attention has been directed towards defence supply chains, where the focus is on operational viability (Rutner *et al.*, 2012; Wilhite *et al.*, 2014). Yoho *et al.* (2013) advocate for more research within the domain of defence logistics in general and emphasize the need for additional investigation into the resilience and management of defence supply chain networks. Melnyk *et al.* (2014) call for increased research to identify distinctive features and underlying factors in the design of supply chains within the defence sector. Despite the divergence between civilian and military research, an opportunity exists to harness knowledge and expertise from civilian endeavours to advance the understanding of military logistics and supply chains (Zsidisin *et al.*, 2020).

The explanation provided highlights a clash between the prerequisites outlined in the literature for establishing robust and effective supply chains and the limitations imposed by PP laws on openness, information sharing and sustained collaboration between buyers and suppliers. This situation underscores a knowledge gap at the juncture of PP regulations and the fundamental elements required to build efficient supply chains.

1.1 Purpose

The purpose of this paper is to explore whether a nation that rigorously adheres to the Public Procurement Act can successfully attain the desired cost-effectiveness, availability and supply security of essential defence equipment and resources. The outcomes of this study contribute to a deeper understanding of critical inquiries related to procurement strategies, supply chain operations and the accessibility at the juncture between the defence industry and the Armed Forces.

1.2 Organization of the paper

The paper is organized as follows: Section 1.3 presents the study's frame of reference, while Section 2 illustrates the evolving demands on the Armed Forces' preparedness and the corresponding shifts in supply capability requirements over time. Section 3 describes the state of Sweden as defence procurer. In Section 4, the research methodology is detailed, followed by Sections 5.1 and 5.2, which encompass the empirical evidence expounded upon in Section 5.3. Section 6, concluding section, presents findings and implications.

1.3 Theoretical background

This section covers a range of theoretical domains that are interconnected within the framework of the Public Procurement Act, with the overarching goals of achieving desired cost-effectiveness, ensuring availability and enhancing supply security.

1.3.1 Provision of equipment and essential resources to the Armed Forces. The military defence's capability within the European Union has consistently declined over the past five decades, primarily due to the prevailing security policy landscape at the time, which indicated a low likelihood of armed conflicts in immediate regions. Consequently, the proportion of the defence budget in relation to the GDP has correspondingly diminished. This trend persisted until 2018 when there was a shift towards increased allocation (World Bank, 2022).

A fundamental query revolves around the optimal allocation of the available defence funds across various areas, including personnel, facilities, training, operations, equipment maintenance, contingency storage, supply management and the procurement of new equipment (Hartley, 2013; Brown, 2013; Aben and Malizard, 2018). Military logistics planning should encompass a wide spectrum of potential scenarios to ensure a flexible response to unforeseen circumstances (McGinnis, 1992; Prebilič, 2006). Nevertheless, during periods of

perceived minimal or negligible threat within the security policy framework, defence forces have been downsized and supply provisions have been minimized (Walt, 1985; Department of Defense Report, 2018).

In the present day, the operational effectiveness of the Armed Forces hinges on the availability and preparedness of sophisticated high-tech weaponry. As the military's primary focus often centres on utilizing these systems, the logistics and support aspects are typically outsourced to the industry. This dynamic underscores the growing significance of industrial suppliers in ensuring the accessibility and operational readiness of weapon systems. However, firms primarily seek to maximize profits and allocate their prime resources to the most promising business ventures, which might involve clients other than domestic military customers (Glas, 2017).

The defence industry plays a pivotal role in providing advanced military equipment and solutions, commonly referred to as platforms. These encompass combat aircraft, warships/submarines, combat vehicles and weapon systems. While the Armed Forces require cutting-edge products and services, they also engage in the procurement of bulk commodities like ammunition and essential supplies such as food, water and propellants. However, firms within the defence industry do not typically supply these types of basic provisions.

The provisioning of supplies and equipment essential for the Armed Forces' operations does not necessarily demand them to be physically stored within the military organization itself. Instead, a portion of defence sustainability relies on continuous resupply from the defence industry. This dynamic transforms the interface between the delivery capabilities of the defence industry and the requirements of the Armed Forces into an intricately complex logistical planning challenge (Simon, 2001; Egnell, 2006; Acero *et al.*, 2020; Milenkov *et al.*, 2020). Depending on the lead time for materials, the strategic decision arises regarding whether raw materials, components, semi-finished goods and final products should be maintained within the defence industry's inventory or whether completed products should be procured and held by the Armed Forces. The resilience and capability of the defence industry play a pivotal role in determining the extent to which the Armed Forces must stockpile resources internally versus relying on industry deliveries (FOI, 2022; Antai and Hellberg, 2023). Nonetheless, the stocks of the Armed Forces must be replenished in accordance with consumption rates, which, in times of war, entails significantly higher volumes compared to peacetime (Kovács and Tatham, 2009; Erbel and Kinsey, 2018).

During times of peace, the defence industry plays a role in providing the Armed Forces with equipment needed for training, exercises and other routine activities. However, in times of conflict, the defence industry faces the crucial challenge of rapidly ramping up its delivery capacity and sustaining its capability to provide for the Armed Forces over an extended period (Davids *et al.*, 2013). This means that the defence industry must be adaptable, capable of operating in both peace and wartime modes and able to switch between these modes at short notice (Kovács and Tatham, 2009; Sharma and Kulkarni, 2016). These differing demands on supply chains during peace and war (McGinnis, 1992; Kovács and Tatham, 2009) make it expensive to design a single supply chain that can effectively manage both scenarios. While commercial supply chain designs may suffice for peacetime operations, they often lack the robustness required when the defence forces are on high alert (Ekström *et al.*, 2020).

To fulfil the requirements of the Armed Forces, firms within the defence industry must devise supply chains that can cater to both peace and wartime conditions. Enhancing delivery capacity, security and persistence come with different costs, and the industry continually seeks solutions in collaboration with the Armed Forces that are both cost-effective and resilient over time (Department of Defense Report, 2018; Ekström *et al.*, 2021; SOU 2022:24, 2022, p. 24). Operations during peacetime versus crisis or war necessitate distinct types of relationships between the Armed Forces, national public organizations

providing support, foreign military organizations and a variety of private firms (Ekerholt Sæveraas and Listou, 2018).

Selecting the appropriate supply chain strategy hinges on understanding the characteristics of the product or service, market requirements and management complexities (Mason-Jones *et al.*, 2000). Consequently, supply chain design is context-sensitive (Melnyk *et al.*, 2014). The requirements of the defence sector exemplify the unique design considerations that defence industry firms must account for, especially when the objectives of the supply chain diverge from traditional norms (Melnyk *et al.*, 2014). In summary, while cost efficiency remains a critical factor for defence supply chains in peacetime, the defining attributes for defence supply chains during wartime are agility and effectiveness (Kovács and Tatham, 2009).

1.3.2 Defence industry has undergone privatization and globalization. Leading up to the 21st century, most Western countries' governments exercised direct control over the majority of defence firms' capital. Two exceptions were Germany due to historical factors and the USA because of its economic system (Bishop and Wiseman, 1999; Mampaey, 2001; Lundmark, 2019; Sempere, 2020). Today, the European defence industry, which supplies Armed Forces, has undergone significant privatization, resulting in varied ownership structures and supply chains that extend well beyond national boundaries (Bishop and Wiseman, 1999; Mampaey, 2001; Sempere, 2020; Ikegami, 2013).

In tandem with the increased privatization and globalization of the defence industry, its supply chains have also become notably globalized. This implies that the defence industry relies on imports for its production, thus rendering it more vulnerable to disruptions (Ikegami, 2013; Gansler *et al.*, 2014). As more firms embrace the advantages of globalization, their susceptibility to disruptions and uncertainties intensifies (Stevenson and Spring, 2007; Mackay *et al.*, 2020). During times of conflict or war, supply chains are susceptible to disruptions, particularly those originating beyond national borders. Consequently, the robustness of supply chains, referring to their capability to withstand external and internal disruptions, becomes increasingly crucial (Durach *et al.*, 2015; Monostori, 2018). Effectively managing supply chain risks necessitates coordinating diverse strategies to mitigate risks and address supply and demand uncertainties (Manuj and Mentzer, 2008; Simchi-Levi *et al.*, 2018).

1.3.3 Supply chain disruptions. Supply chains are susceptible to various disruptions, and the broader the global reach of the supply chain, the more diverse disruptions it is likely to encounter (Craighead *et al.*, 2007). Businesses now operate in a progressively intricate and dynamic environment, and scholarly discourse advocates for embracing manufacturing flexibility as an effective countermeasure against these environmental threats (Patel *et al.*, 2012). The COVID-19 pandemic clearly illustrated how swiftly cascading effects accumulate and the adverse consequences these can have on supply chains (Moosavi *et al.*, 2022; Antai and Hellberg, 2023). In response, firms are striving to construct robust supply chains that incorporate redundancy and flexibility (Chopra and Sodhi, 2014; Ivanov and Dolgui, 2019; Ivanov *et al.*, 2019).

To foster resilience in supply chains, common approaches involve introducing flexibility and redundancy, which might encompass securing access to alternative suppliers, flexibility in component usage and the capability to adjust capacities in various manners (Sheffi, 2007; Dabhilkar *et al.*, 2016). Conversely, resilient supply chain frameworks provide an alternative perspective that enables firms to address vulnerabilities and disruptions across a global supply chain (Park, 2011). In contrast to the lean supply chain strategy, the resilient supply chain strategy accentuates a firm's capability to anticipate and respond to anticipated and unforeseen risk factors, recover promptly from actual disruptions and rapidly restore normal or improved business operations. The goal is to enhance business continuity, elevate business performance and ultimately attain sustainable competitive advantages (Park, 2011).

Historically, the limited emphasis on redundancy in supply chains can be attributed to the pursuit of low costs and high inventory turnover, aimed at mitigating the risk of outdated inventory and tying up capital in the flow of goods. The belief was that the market would present alternative solutions during crises, which were not anticipated to be prolonged (Ekström *et al.*, 2021; SOU 2022:24, 2022, p. 24).

1.3.4 Supply chain value creation. In the interaction between the organizations responsible for supplying equipment and supplies and the Armed Forces, value is generated. The value for the Armed Forces lies in the availability and persistence of replenishment capability, while the supply organizations generate income by delivering and charging for readiness stockpiling (Ekström *et al.*, 2021). Value creation is perceived differently on the supplier side compared to the consumer side (in this instance, the Armed Forces).

A crucial aspect of value creation revolves around a firm's relationships with its customers and suppliers (Schenkela *et al.*, 2015). As stated by Corsaro and Snehota (2010), perceptions of value are crucial as they influence the behaviour of the actors involved. From the supplier's perspective, generating value for the customer starts with understanding the customer's processes for creating value (Payne *et al.*, 2008). Grönroos (2011) argues (in Saarijärvi *et al.*, 2013, p. 9) that a firm's customers inherently facilitate value for the firm's development of its offerings. This necessitates direct interactions with customers to comprehend how they utilize the firm's solutions. Value co-creation does not mean the customer becomes a co-creator of value with the supplier; rather, it is the supplier that becomes a co-creator of value with its customers. Collaborative value creation, however, has garnered significant scholarly attention. Numerous researchers credit Prahalad and Ramaswamy, along with Vargo and Lusch, as pioneers in the field of value co-creation, albeit with differing perspectives (Ranjan and Read, 2016). Prahalad and Ramaswamy (2000, 2004) defined value co-creation as a comprehensive collaborative concept involving multiple stakeholders. Vargo and Lusch (2004) further developed this concept by introducing the co-creative service-dominant logic.

The notion of value co-creation rests upon firms and customers jointly creating value through interaction (Galvagno and Dalli, 2014). From the co-creation standpoint, suppliers and customers are no longer opposing entities; instead, they engage with one another to explore new business opportunities. The primary approach to achieving co-creation and an ensuing synergy enhancement in the supply chain is aligning individual customer requirements with corresponding supply chain arrangements (Christopher and Holweg, 2011). To attain the level of flexibility that adds value for customers, supply chain organizations must extend their focus beyond manufacturing flexibility (Kumar *et al.*, 2006).

1.3.5 Public procurement of defence equipment and necessities. As the procurement of defence equipment and essential supplies relies on public funds, it falls under the purview of the Public Procurement Act and the Defence and Security Procurement Act (European Commission, 2020). Article 346 of the Treaty on the Functioning of the European Union (TFEU) permits EU Member States to enact specific exceptions to the EU's procurement regulations in order to safeguard critical national security interests (Blauberger and Weiss, 2013; Weiss and Blauberger, 2016; Terpan and Saurugger, 2019). However, this can sometimes result in the development of national markets, leading to an excessive proliferation of individual defence industries within EU member states. As articulated by the Swedish procurement authority, the application of exceptions under Article 346 of the TFEU should be judiciously employed (Swedish National Agency for Public Procurement, 2022).

Nevertheless, the current implementation of procurement laws imposes restrictions on the extent of collaboration between the defence industry and the Armed Forces, as well as the duration of agreements, particularly during times of peace. The lack of continuity in this collaboration has implications for the defence industry's supplier relationships.

Within defence enterprises, there is a trend towards supplier selection primarily driven by price considerations, based on the unique specifications of each customer order. This approach has faced criticism for not adhering to the strategic sourcing practices commonly employed in the commercial industry. Consequently, long-term collaborative partnerships between defence industry firms and their suppliers have been notably lacking (Cohee *et al.*, 2019). In the strategic interplay between supply chains and supply network decision-making, managers are required to undertake strategic re-evaluation to effectively manage the intricate nature of the supply network, characterized by numerous dependencies (Braziotis *et al.*, 2013).

Furthermore, there is variation in how different states interpret and apply PP laws in the context of defence-related acquisitions. For instance, Finland and France have been observed to interpret and apply these laws differently (Finland Ministry of Defence, 2023; Kausal *et al.*, 1999; Breaking Defence, 2022).

1.3.6 Purchasing portfolio model for defence procurement. Traditional PP has historically played a tactical and administrative role, primarily focused on regulatory requisites (Matthews, 2005; Clauss and Tangpong, 2018; Patrucco *et al.*, 2017). Conflicting priorities within the public sector encompass various aspects that are not entirely reconcilable (Plantinga *et al.*, 2020). Erridge and McIlroy (2002) delineate three categories of these conflicting priorities: commercial (such as cost and quality), regulatory (ensuring compliance with PP legislation) and socioeconomic (encompassing employment, social inclusion and sustainability).

PP is transitioning towards a strategic role, driven in part by the need to attain governmental objectives (Walker, 2015; Clauss and Ritala, 2023). According to Murray (2009), procurement could strategically emphasize short-term leveraging of bargaining power (Cox, 2005) and the achievement of maximal cost reductions (Nollet and Beaulieu, 2005). Alternatively, procurement could recognize that effective supply chain management demands a long-term vision (Tummala *et al.*, 2006).

Strategic procurement necessitates segmentation and differentiation strategies (Dyer *et al.*, 1998; Weinstein, 2013; Formentini *et al.*, 2019). A plethora of purchasing portfolio models (PPMs) have been developed in the literature to categorize resources and opt for suitable suppliers (Hilletofth, 2009). The PPM encompasses a segmentation framework, differentiation approaches and managerial guidance (Hilletofth, 2012). A fundamental requirement of strategic procurement involves establishing distinct relationships with suppliers (Gelderman and Van Weele, 2005), which underscores the need for classification (Lilliecreutz and Ydreskog, 1999). Kraljic (1983) introduced a portfolio model that gained broad recognition and widespread usage (Drake *et al.*, 2013; Formentini *et al.*, 2019), albeit not without criticism. Most dimensions within these models encapsulate diverse factors associated with the purchaser, supplier, market or product.

The segmentation model for defence procurement comprises three dimensions: The operational prerequisites of the Armed Forces, the market's capacity to furnish resources and potential constraints on the Armed Forces' operational capabilities in case the market underperforms (Ekström *et al.*, 2021; SOU 2022:24, 2022, p. 24).

As outlined by Lumineau and Henderson (2012), the concept of supply chain governance has historically been approached from two theoretical standpoints. The initial perspective centres on relational governance, which operates as a mechanism for regulating inter-organizational exchanges through a set of norms that define acceptable conduct among exchange partners. Within the context of relational governance, it is posited that buyers and suppliers engage in satisfactory transactions over time, leading to the establishment of relational norms encompassing flexibility, participation and solidarity. These norms contribute to the maintenance of relationships and the inhibition of behaviours that could undermine the objectives of the involved parties. The second perspective underscores the significance of contractual arrangements between trading partners and their formal rules,

which are designed to ensure compliance and prevent opportunism and conflicts. According to Cao and Lumineau (2015), both of these governance paradigms play a role in inter-organizational relationships (IORs). The governance of IORs extends beyond mere formal contracts. It has been demonstrated that relational governance, particularly trust, constitutes an additional form of governance aimed at mitigating the risks associated with uncertainty and investments specific to transactions. This differentiation between contractual and relational governance delineates two distinct yet interconnected approaches to facilitating and managing IORs (Cao and Lumineau, 2015).

As previously stated, PP is subjected to rigorous oversight through the implementation of procurement laws and regulations. When these legal structures are diligently upheld, the potential for extensive collaboration and protracted contractual arrangements becomes constrained (Calcara, 2020; Holma *et al.*, 2022). Even when purchases have been classified into categories such as strategic, routine and bottleneck products (as exemplified by Kraljic, 1983), the procurement actions within each category remain subject to the regulatory framework governing PP.

1.3.7 Need for more knowledge. As evident from the preceding theoretical compilation, military supply chains operate within a distinct context in comparison to their commercial counterparts. The supply requirements for the Armed Forces have evolved over time, transitioning from the Cold War era characterized by extensive readiness stockpiles, to peacetime where the emphasis shifted to cost optimization for smaller task forces, and now in the present day, focusing on constructing a more extensive defence infrastructure with heightened readiness.

The dynamics of relationships with the defence industry have also undergone a transformation. In the past, there was significant government influence over domestically based defence industries, particularly during the Cold War. This has transitioned to a present scenario of a privatized defence industry with substantial foreign ownership. Moreover, the supply structures within the defence industry have become profoundly globalized, relying heavily on supplies from subcontractors located in different countries.

In most instances, the acquisition of defence equipment and supplies adheres to the parameters of PP regulations. This contemporary approach imposes constraints on the extent and depth of collaboration that the Armed Forces can establish with the defence industry. This highlights the necessity for an enhanced understanding of how the procurement of defence equipment in today's landscape can be effectively achieved, considering factors such as the privatization of the defence industry, the increased susceptibility to disruptions within supply chains and the fundamental adherence to PP laws.

2. 50 years of evolving supply capability and persistent challenges in the Armed Force

This section delineates the preparedness capability of standard European defence organizations, spanning from the 1960s to the present day. It elaborates on the evolving demands placed upon defence logistics, elucidating and analysing the current predicament confronted by both the defence industry and the Swedish Armed Forces. Section 4 provides an explanation for the selection of Sweden as a case study.

2.1 High levels of preparedness characterized the defence logistics during the Cold War

During the Cold War, European governments perceived a substantial military threat from potential adversaries. Consequently, numerous countries maintained Armed Forces in a state of readiness, prepared for potential invasions or conflicts. In Sweden, the logistical contingency plan during this era entailed stockpiling adequate quantities of supplies and

equipment, ensuring the defence forces' prompt and robust operational capability. The defence supply system during the Cold War operated under an agile paradigm and a "Just-in-Case" concept, as described by Naylor *et al.* (1999) and Ekström *et al.* (2020). This "Just-in-Case" approach characterized the preparedness strategies (Cusick and Pipp, 1997; Ekström *et al.*, 2020), while market strategies involved speculation (Pagh and Cooper, 1998), responsiveness (Fisher, 1997) and agility (Lee, 2002; Christopher *et al.*, 2006).

To optimize transport requirements during heightened readiness levels and better meet operational needs, the Swedish Armed Forces strategically distributed and positioned a significant portion of the pre-stored supplies within or near projected operational zones. This tactic aimed to minimize transport needs at higher preparedness tiers, thereby enhancing overall operational readiness. Collaborative ties with private sector defence industry partners were primarily regulated by legislation, complemented by commercial agreements. Under Swedish law, certain critical private suppliers were obligated to maintain the delivery of goods and services to the Swedish Armed Forces during heightened conflict and wartime scenarios (Ekström *et al.*, 2020).

2.2 Readiness for peace preservation action and low costs characterized defence logistics after the Cold War

Following the Cold War, the perceived threat significantly diminished, prompting several European Governments, including Sweden, to redirect previous defence expenditures towards alternative endeavours (Humphries and Wilding, 2001). Consequently, defence forces underwent downsizing and transformation into Armed Task Forces for international deployments (Ekström *et al.*, 2020). Between 1990 and 2010, the provision of supplies to the Armed Forces was increasingly shaped by the principles of New Public Management (NPM). This approach involved heightening supplier competition, integrating private sector management practices to curtail expenses and elevating performance benchmarks (Hood, 1995; Grimsey and Lewis, 2004). The term "NPM" encompasses a range of reforms, spanning administrative and ideological domains. Administrative changes centre on organizing the public sector, entailing augmented evaluation, documentation and measurement of efficiency and performance. Ideological shifts have extended competition to public activities, situating them within a market framework and necessitating responsiveness to customer demands (Mundebo, 2008). In Sweden, NPM was adopted within the defence sector by implementing measures aimed at fostering competition and involving private entities in the process.

The defence supply system transitioned from a "just-in-case" strategy to being characterized by the "just-in-time" or "lean" approach (Basnet and Seuring, 2016; Ekström *et al.*, 2020). Correspondingly, the employed market and logistics strategies included efficiency (Fisher, 1997; Lee, 2002), outsourcing (Dickens Johnson, 2008), postponement (Pagh and Cooper, 1998) and leanness (Christopher *et al.*, 2006). This shift can be interpreted as an adoption of lean management methodologies (Christopher, 2000; Stock *et al.*, 2010).

As a result of NPM, the previously state-controlled Swedish defence industry was privatized. Collaborative ties with private sector suppliers and contractors were predominantly governed by commercial contracts, even though legislation from the Cold War era remained in force and could be invoked in heightened conflict scenarios (Ekström *et al.*, 2020).

The impact of this efficiency-oriented and lean approach was a significant reduction in the size and frequency of orders for supplies and services from the Swedish Armed Forces to the defence industry. A substantial portion of the required supplies, equipment and consumables for the defence forces were procured through open tenders, which meant that priority was not given to the Swedish defence industry. Instead, the primary focus was on cost-effectiveness and capability. The Armed Forces made purchases based on the most economical options

available at the time, considering performance and specification requirements. Exceptions were made for products deemed vital to security interests, and these items were procured through targeted acquisition processes.

2.3 New requirements for the capacity of defence logistics following increased requirements for national defence capability after 2015 and later aggressions

Russia's actions in Georgia, Crimea and Ukraine have given rise to new circumstances that are reshaping the organization of defence logistics. The increasing demand for heightened preparedness and enhanced defence capabilities has become prominent in several nations.

The present Swedish political assessment acknowledges a tangible military threat against Sweden once more, prompting the government to undertake a transformation of its defence forces. The primary focus of the current Swedish Defence Bill is to bolster the defence capabilities of the Armed Forces and reinforce the Swedish Total Defence, as highlighted by the Swedish Ministry of Defence (2015, p. 1). This shift significantly affects the supply system. Consequently, the Swedish Armed Forces must reconfigure their supply solutions to support the increased defence capabilities while meeting operational requirements for availability, preparedness and sustainability. The Armed Forces are undergoing another transformation due to renewed political interest in homeland defence (Ekström *et al.*, 2020).

The imperative of an appropriately tailored supply chain strategy is widely recognized (Perez-Franco *et al.*, 2016). The successful execution of the chosen supply chain strategy holds pivotal importance for a firm's competitive success (Narasimhan *et al.*, 2008). Firms typically manage supply chains catering to diverse products and services for varied markets and customers with distinct demands. It is evident that a universal approach does not suit all scenarios (Christopher *et al.*, 2006). Instead, firms customize their supply chain design to align with specific market requirements (Aitken *et al.*, 2003) and adopt an adaptive supply chain dynamics capacity approach (Cannella *et al.*, 2018).

The modern supply chain demands heightened responsiveness (Gunasekaran *et al.*, 2008) and increased resilience (Christopher and Peck, 2004). Some firms adopt a blend of agility and cost efficiency, often referred to as lean-agile or hybrid solutions (Yang *et al.*, 2004). Researchers have conducted extensive studies to explore suitable supply chain strategies across diverse industries (Nag *et al.*, 2014), revealing that industry-specific solutions are contingent on unique business models (Basnet and Seuring, 2016).

In the contemporary landscape, supply chains are progressively global, intricate and lengthy, functioning under a just-in-time ethos (Purvis *et al.*, 2016). However, this setup amplifies vulnerability (Christopher and Peck, 2004). Firms have achieved supply chain efficiency by reducing inventory and resorting to global sourcing, inadvertently heightening susceptibility to fluctuations in demand, accidents, conflicts, terrorism and natural disasters (Purvis *et al.*, 2016). Disruptions have underscored how this vulnerability directly affects a firm's operational continuity and its capability to deliver products/services to customers (Jüttner *et al.*, 2003). This vulnerability was starkly evident during the Suez Canal shipping incident in 2021 and the subsequent COVID-19 pandemic, which brought about restrictions on national border crossings to contain the disease (Antai and Hellberg, 2023).

The susceptibility to disruptions in global supply chains, coupled with the political uncertainty related to outsourcing to low-cost countries, has compelled firms to repatriate previously outsourced production and shift operations to politically more predictable nations (Blackhurst *et al.*, 2011; Stentoft *et al.*, 2015; Hartman *et al.*, 2017; Loska and Higa, 2020; Gao *et al.*, 2022). The Department of Defense (DoD) is actively engaged in efforts to enhance competition and establish domestic defence supply capacity, particularly through small businesses. Additionally, there is a drive to address gaps in the national security and technology industrial base (Department of Defense Report, 2022).

3. State of Sweden as procurer of defence equipment

In Sweden, the procurement of defence equipment is overseen by the Swedish Defence Materiel Administration (FMV), acting on behalf of the Armed Forces. FMV serves as the governmental procurement agency under the Ministry of Defence. The Armed Forces articulate their desired defence capabilities and allocate the available budget, which FMV then translates into specifications and releases as a public tender.

Given that both the Swedish Armed Forces and FMV are governmental entities, their procurement of materials and services adheres to the principles of PP. These principles stem from EU directives and aim to introduce competition among suppliers, enabling the procuring entity (in this case, FMV) to select the product or service that best aligns with its objectives. The core principles governing PP encompass non-discrimination, equitable treatment, transparency, mutual recognition and proportionality (Försvarsexport, 2022). Successful procurement occurs when involved parties act independently, engage in free negotiation and maintain no external affiliations beyond the transaction. Furthermore, all parties must have equal access to information regarding one another and the transaction itself.

However, based on Article 346, specific to Sweden, four domains have been categorized as "essential security interests": the underwater realm, the realm of fighter aircraft, specialized aspects of the command domain like cryptography and sensors (Försvarsexport, 2022). Due to this classification, FMV is granted the authority to choose suppliers for products and services within these specific areas without necessitating the complete procurement procedure.

The PP legislation entails that domestic industry cannot be given preferential treatment. Instead, contracts should be awarded to the bid that best aligns with the established criteria in the tender request, irrespective of its origin. In the context of Sweden, this principle has been fully implemented for all product and service domains not categorized as essential security interests. Moreover, the objective has been to secure contracts at the lowest possible cost. The result of this approach, which places a strong emphasis on minimizing purchase expenses, is that the Swedish defence industry lacks certainty about the prospect of receiving new orders. Consequently, the industry tends to prioritize other clients.

The implementation of the PP regulations in Sweden has led to a stance where the relationship between the defence industry and authorities should be "characterized by arm's length". Presently, the interpretation of PP laws in Sweden places significant constraints on the extent and duration of cooperation agreements that can be established under contract. This, in turn, presents challenges for the defence industry in justifying investments aimed at augmenting supply capacity and security.

The defence industry in Sweden is predominantly under the ownership of foreign firms, and commercial interests take precedence over domestic defence considerations (SOU 2021:87, 2021, p. 87; FOI, 2007). In the contemporary landscape, the primary objective for a firm is to generate profits for its shareholders. Consequently, there exists limited room for any form of allegiance to Sweden as a nation or to Swedish defence interests, except in cases where an underlying contract ensures the firm's emergency preparedness costs are covered (SOU 2021:87, 2021, p. 87).

The Swedish government has clearly articulated the necessity to enhance the capabilities of the Armed Forces (Regeringens proposition 2020/21:30, 2014). This implies upgrading existing equipment and procuring additional equipment. Furthermore, augmenting preparedness stocks within the Armed Forces and establishing resilient logistical supply solutions are deemed imperative. Given the insights gleaned from experiences like the ongoing conflict in Ukraine and the challenges posed by the pandemic, the significance of supply security has amplified. Consequently, a re-evaluation of the current approach to defence-related procurement becomes essential.

4. Method

As outlined in Section 1.1, the objective of this paper is to investigate whether a nation that diligently adheres to the Public Procurement Act can effectively achieve the desired goals of cost-effectiveness, availability and supply security for essential defence equipment and resources.

Sweden has been selected as the subject of the case study due to its substantial procurement of defence materials and its strict adherence to both the EU and Swedish PP regulations. The state of Sweden as a procurement entity for defence equipment is expounded upon in Section 3.

The current research is a constituent of a broader research initiative titled "Enhancing Defence Capabilities to Bolster Industry Competitiveness". This overarching project is a collaborative effort involving four defence equipment manufacturers based in Sweden and two public authorities, the Swedish Defence Materiel Administration (FMV) and the Swedish Armed Forces. The data used in this paper is derived from the broader research project.

The research presented in this paper employs an abductive research approach. As this study does not revolve around hypothesis testing, is not solely anchored in empirical explanations and is grounded in existing supply chain theory while analysing collected empirical data to elucidate observed phenomena, it assumes an abductive approach (Saunders *et al.*, 2012; Bryman and Bell, 2015; Alvesson and Sköldberg, 2008). The abductive approach is well-established in applied sciences like logistics research, which seeks to describe and explain novel phenomena using existing theories as a foundation, even when these theories require further development to enhance their explanatory capacity (Kovács and Spens, 2005; Dubois and Gadde, 2002).

In order to attain a more profound understanding of supply chain strategies, supply chain resilience and robustness, conditions in PP, as well as security of supply and the collaborative creation of logistics value, a strategic literature review was carried out, following the approach outlined by Thelwall (2005). A comprehensive array of distinct yet interconnected keywords and keyword combinations were employed during the process of selecting relevant literature. Examples of keyword combinations include defence procurement, security of supply, defence industry privatization, supply chain resilience, value-added logistics and defence procurement strategies. Given that the chosen search terms generated a wide spectrum of articles encompassing diverse content, a discerning approach was adopted to isolate articles directly pertinent to the focused area. Notably, numerous research contributions within the realm of supply chain dynamics emphasized the evolution of third-party logistics, a fact that lies beyond the scope of this research endeavour and was thus systematically filtered out. Similarly, there exists relevant research concerning performance-based logistics; however, since these studies lack a comprehensive consideration of the Swedish context within the framework of PP limitations, they were not integrated into this review.

In addition to an extensive literature review, this research project is founded upon empirical insights derived from interviews conducted with key representatives from both the FMV and four defence firms located in Sweden. Notably, the FMV functions as the governmental procurement agency operating under the purview of the Ministry of Defence. Consequently, the FMV is entrusted with executing procurements on behalf of the Swedish Armed Forces, hence prompting interviews with FMV representatives. A total of 26 distinguished individuals occupying various roles within four defence firms in Sweden (comprising 20 interviews) and the FMV (comprising 6 interviews) were interviewed during the first and second quarters of 2022, which means that there are approximately the same number of interviews per participating firms and the authority.

Selection of interview subjects was undertaken in collaboration with the respective firms and FMV, ensuring that the chosen participants were reflective of top-level management

positions such as CEOs and Business Area Managers. Additionally, individuals responsible for pivotal areas like contracting, customer relations, legal affairs, strategic procurement, production management and product management were included in the interview pool. The majority of industry interviewees possessed over a decade of professional experience, while FMV interviewees had between 2 and 15 years of experience (with an average of about 5 years).

The interview process revolved around open-ended questions designed to comprehensively explore both the limiting factors and facilitators influencing the industry's capacity to meet current and future demands. The inquiries encompassed both internal and external circumstances. In parallel, FMV representatives were engaged in a similar manner, providing insights into the functionality of the existing delivery processes and avenues for potential enhancements. A uniform interview guide was employed across interviews, although adaptations were made to tailor questions to each interviewee's specific area of expertise.

Each face-to-face interview was conducted in a deep-engagement format, lasting between 90 and 140 min. Thorough records of all interviews were maintained through audio recordings. For confidentiality purposes, neither the entities nor the individuals participating in the interviews are identified by name. The principal products and services under examination within this study pertain to major defence weapon systems and their associated consumables.

The conducted interviews comprehensively explored a broad spectrum of factors with the potential to impact delivery capabilities, delivery capacity, resilience in delivery, security of supply and the enabling or hindering conditions for achieving enhanced supply capabilities for the Swedish Armed Forces. The selection of interviewees was meticulously executed to ensure the inclusion of influential factors that currently shape delivery capabilities and persistence. The focal areas of these interviews encompassed legal considerations, business and contract models, customer relationships, information exchange, upstream procurement and production-related challenges including capacity planning and order prioritization, component and finished product storage, finished goods distribution, supply system robustness, among others.

The analysis of the empirical data adhered to a qualitative methodology, specifically adopting a simplified targeted thematic content analysis approach. Qualitative content analysis entails identifying, coding and categorizing underlying patterns or themes present in the empirical material (Patton, 1990; Bryman, 2011; Bergström and Boréus, 2018). In the thematic analysis, efforts are directed towards identifying common elements to comprehend diverse statements and observations (Braun and Clarke, 2006; Mayring, 2023). This qualitative content analysis involves the process of recognizing, categorizing and organizing fundamental patterns or themes inherent in the empirical data.

An abductive coding approach, drawing inspiration from Graneheim *et al.* (2017) and Humble and Mozelius (2022), was employed in a series of steps involving a blend of inductive and deductive methods. The content analysis process in this study encompassed four sequential steps, guided by the framework proposed by Erlingsson and Brysiewicz (2017):

(1) Familiarization with the data: A comprehensive understanding of the collected data was established.

(2) Selection of themes: Themes were identified to encapsulate the essence of the research area.

(3) Division into units of meaning: The data was segmented into units that carried distinct meaning.

(4) Allocation of units to themes: The categorized units were subsequently associated with the identified themes.

The responses garnered from the interviews underwent a systematic categorization process, leading to the formation of three central themes. These themes closely correlate with the central theme underpinning the research objectives:

(1) The capacity to deliver both in terms of timing and quantity.

(2) The resilience of delivery and assurance of supply security.

(3) The factors that either foster or hinder the attainment of an enhanced supply capacity.

The insights garnered from the interviews are detailed in Section 5 of this study. Ultimately, the findings and implications are presented in Section 6.

5. Empirical findings and discussion

In this section, a curated representation of the interview responses is presented. The insights shared in this section do not stem from isolated individual responses, but rather from a comprehensive synthesis of numerous interviews, achieved through the applied targeted thematic content analysis. The identities of individual interviewees and firms are intentionally withheld to maintain confidentiality. Selected anonymous quotes (directly translated from Swedish) have been incorporated to substantiate various aspects of both the defence industry and FMV perspectives.

The responses are subdivided into two sections: Section 5.1 provides insights from the perspective of the four participating defence firms in Sweden (suppliers), while Section 5.2 offers the viewpoint of FMV (the procurement authority). Both perspectives elaborate on the current factors influencing delivery capabilities and potential avenues for enhancement. Section 5.3 compares the empirical findings to the existing literature detailed in Sections 1.3 and 2.1–2.3.

An intriguing observation is that, in the early part of 2022 when the initial interviews took place, neither FMV nor the Armed Forces had a pronounced emphasis on supply security and requirements for redundancy. However, as the interviews progressed, there emerged an escalating focus on these aspects.

5.1 Defence industry's view on delivery ability

Within this particular defence industry sector, the production process does not involve a constant output of products destined for the general market. Instead, all manufacturing activities are carried out on a per-order basis, with each order representing a specific quantity of products tailored to meet the individual specifications of the purchaser. These items are then supplied within a mutually agreed timeframe.

The defence industry in Sweden typically serves multiple clients beyond the Swedish Armed Forces, each with their own contractual commitments that must be fulfilled. Among the four firms partaking in the study, the Swedish Armed Forces contribute to a smaller proportion of the overall sales volume for two of them. The defence industry in Sweden is not legally obligated to prioritize orders from FMV or the Swedish Armed Forces, unless stipulated otherwise by legislation (Försvarsdepartementet, 1978).

5.1.1 The ability to deliver in terms of both timing and quantity. The ability of a firm to deliver a unique order, in terms of both timing and quantity, is established during the quotation phase. Once FMV issues a request for a quotation, the functional specifications, desired quantity and delivery timeline are thoroughly examined. If a firm assesses that its solution aligns with the requested criteria at an acceptable cost, it initiates preliminary discussions with subcontractors concerning purchase costs of needed inputs and delivery schedules. This preliminary phase also involves a broad outline of production capacity to

create a production timetable. Following this preparatory groundwork, a decision is made on whether to submit a formal quote.

In cases involving the upgrade of existing products or the introduction of new systems, the order typically encompasses new components that necessitate system integration, testing and approval from the buyer before production can commence. In this context, the capacity for system integration, system testing and access to testing facilities poses a bottleneck, leading to competition among numerous orders for these resources.

The business model adhered to by FMV implies that firms do not maintain stocks of essential raw materials and components. Procurement generally occurs once FMV (or any other customer) has approved a quote. Given the current high demand for defence materials, sub-suppliers experience extended lead times, and firms themselves contend with multiple orders in the production pipeline. In light of these factors, firms do not accord preferential treatment to FMV compared to other clients.

To augment their production capacity, firms employ a range of strategies including various shift arrangements and subcontractor collaborations. Despite FMV's tendency to incorporate options for additional orders within their quotation requests, suppliers refrain from procuring materials for these potential orders until they are officially initiated.

> As we do not keep any stock of raw materials, components, or finished products, there is little opportunity to produce fast or larger volumes in a short time. The delivery time of material and components from our suppliers largely determines when we can produce.

Firms avoid maintaining stocks of finished products, raw materials or components due to the inherent variations in functional requirements across different orders, which carries the risk of holding unused materials. Additionally, ITAR (International Traffic in Arms Regulations) requirements restrict the interchangeability of components between various orders and products. The crux of a firm's capacity to deliver, in terms of both timing and quantity, hinges entirely on the moment FMV (or any other customer) provides acceptance. This marks the point at which the firm can begin acquiring raw materials and components.

> It is not easy to use components from other customers' deliveries, as there must be certificates of end users and the handling of ITAR-classified products is highly regulated, which places great demands on documentation, certificates etc. However, it is in our advantage if we do not have to use ITAR classified components.

Presently, extended delivery times from subcontractors, coupled with the eventual need for system integration and potential testing, rarely pose a bottleneck to the availability of in-house production capacity. The time required for transportation from the production site in Sweden to FMV (the Armed Forces) is usually negligible within the broader delivery timeline.

While FMV does not mandate it, firms typically store common consumables and spare parts in limited quantities. This practice stems from the requirements of other customers rather than FMV's stipulation.

> In order to be an attractive supplier or as we wish to express it, cooperation partner, we have chosen to stock the 100 most requested spare parts. This means that we can make quick deliveries.

Regarding export orders, the capacity scenario might diverge. For intricate products, it is customary for the buying nation to stipulate specific tasks to be conducted within its borders. Additionally, the purchasing nation may designate certain system suppliers to be engaged. In certain instances, this arrangement entails conducting portions of assembly and testing in the recipient country, alleviating the direct impact on the production capacity of the selling firm.

In summary, the ability of this firm to deliver relies on factors such as access to production capacity not yet allocated to agreed orders, the potential to enhance production capacity and the delivery timelines of subcontractors.

5.1.2 Resilience of delivery and assurance of supply security. The firm's ability to uphold its promises over time is constrained by the absence of demands from FMV for a continuous supply of services and products. Consequently, the firms have not invested in building such capabilities. Rather, they have developed their own contingency plans and strategies to safeguard the delivery of contracted obligations. These contingency measures are primarily aimed at addressing internal factors under the firm's control, given that modern business models often incorporate force majeure clauses.

FMV has refrained from mandating redundancy solutions that could establish resilience in the supply chain. These solutions could include initiatives like identifying alternative suppliers, stockpiling components, materials and spare parts within Sweden, establishing alternative production and storage facilities within Sweden, ensuring access to specialized skills, or deploying military personnel when necessary. The firms, mirroring FMV's focus on cost-efficiency, have also not developed such robust supply chain arrangements.

> As a privately owned company, we do not take extra measures to ensure delivery capacity and endurance, unless it is contractually agreed on with the customer. Of course, we have our own contingency plans and backup solutions to deal with disruptions. In dialogue with the customer, redundancy in the supply chain can of course be created, but then the customer must bear the additional cost.

The endurance of delivery is largely contingent upon the firms' access to raw materials and components rather than their in-house production capacity. Notably, a substantial proportion of essential raw materials and components originate from suppliers outside the Nordics, often exceeding 50%. In numerous instances, certain materials and services lack competitive local suppliers, compelling firms to depend on foreign providers. This reliance on external suppliers can render supply resilience vulnerable, as illustrated by the disruptions during the pandemic due to closed borders and national prioritization.

> Although we have approximately 50% of our suppliers in the immediate region, we completely depend on foreign suppliers.

In summary, these firms lack the capacity to ensure a consistent supply, i.e. security of supply. Presently, production is exclusively driven by finalized contracts specifying a particular unit count, for which materials and components are subsequently procured. Any additional production hinges on the acquisition of further materials and components, contingent upon production capacity. Given the current subcontractors' lead times of 1.5–2 years, new orders must be commissioned approximately 3 years prior to delivery. Moreover, the supply chain is exceptionally vulnerable to disruptions, chiefly due to the majority of sub-suppliers operating beyond the Nordic region.

5.1.3 Factors that foster or hinder the attainment of enhanced supply. The firms within the defence industry advocate for longer contracts and advanced planning with FMV to facilitate material provisioning and adjustment of production capacity. However, the present actions taken by FMV and the prevalent business and contract models do not align with such a collaborative relationship. Firms also express a need for heightened information exchange with the Armed Forces, particularly concerning the Armed Forces' requirements and consumption patterns. This would enable them to forecast the demand for consumables and spare parts more effectively. However, due to confidentiality concerns, the Swedish Armed Forces are reluctant to share such information.

> As a supplier, we have little idea of how much replacement units and spare parts are out there with the Armed Forces, and the dialogue about the Armed Forces' consumption patterns is vague. Here, we would have liked a much closer cooperation in order to be able to prepare the production of both replacement units and spare parts.

FMV organizes periodic "industry days" to communicate forthcoming needs and procurement plans. Nonetheless, the industry seeks more specific information, such as precise timelines for modifications and upgrades of existing products.

> There is little communication about future concrete needs of the Swedish customer, but of course, there is an ongoing dialogue about current contracts and deliveries to Swedish customers.

> While FMV does indicate upcoming needs, the specific company selection and order placements remain uncertain. Consequently, we refrain from undertaking preparatory measures [because of these vague indications].

The existing PP regulations limit firms' willingness to engage in discussions about alternative solutions to a quotation request. This is due to the requirement that information provided by FMV to a particular supplier must also be shared with other stakeholders, thereby inhibiting open dialogue.

> We do not wish to ask the customer in a tender round if we can replace any component (for the better) in order to achieve certain requirements in the tender specification, because then all the suppliers we compete with will know about this. Therefore, when we assess whether we want to participate and make an offer, we do it without dialogue with the customer.

To ensure heightened delivery capacity, delivery security and persistence during crisis or wartime scenarios, establishing a "contract" with FMV in peacetime is deemed necessary. Ideally, this contract should be initiated 3–5 years ahead of any potential activation for the production of new equipment.

The absence of effective information exchange between the Armed Forces and manufacturing firms hinders the firms' ability to prepare for forthcoming deliveries. The decision by FMV to refrain from entering into long-term contracts and maintaining a consistent flow of information concerning future requirements with chosen suppliers has a detrimental impact on the mutual trust between the entities. An alternative approach to information sharing, encompassing insights into impending needs and contract structures that enable more extensive and enduring collaboration with selected suppliers could enable a secure supply on a more comprehensive scale.

5.2 FMV's view on delivery ability

The interviews with FMV representatives conveyed an overarching sentiment that FMV does not seek to establish extensive collaborative ties with suppliers, apart from areas falling within essential national security interests (as described in Section 3). Instead, FMV aims for a professional and objective distance to maintain the freedom to select any supplier that fulfils the requirements outlined in the quotation request. FMV places high importance on adhering to the principles of the PP law, aiming to avoid any legal complications arising from unauthorized practices. They prioritize maintaining a neutral stance and treating all suppliers equitably to prevent any allegations of bias.

> All procurement must be done formally and correctly and suppliers other than the original supplier (OEM) must be given the chance to carry out work on updating products, even if in practice it is difficult to find such suppliers.

The decision on whether an order will be placed by the Armed Forces with the defence industry is contingent upon the allocation of the state budget and the subsequent prioritization carried out by the Armed Forces. While budgets are often set on an annual basis, certain systems with significant costs necessitate a long-term perspective in budget allocation. The budget primarily supports the upkeep and enhancement of existing equipment, with provisions in place to accommodate new acquisitions.

5.2.1 Ability to deliver in terms of both timing and quantity. FMV asserts that the responsibility lies with the supplier to evaluate its capacity and capabilities when responding to a request for tender. While FMV possesses historical knowledge regarding the typical capabilities and delivery performance of most suppliers, they do not factor this information into their assessment of tender responses.

> It is up to the supplier to assess whether a request for tender is realistic. Although we know about the supplier's ability in the past, we do not consider it in our evaluation of the tender responses.

FMV acknowledges that they possess an imperfect understanding of the standard delivery capacities of most suppliers. Consequently, they actively seek alternative suppliers who align with their requirement specifications at the most economical cost. In fact, FMV's standpoint is clear: "*No supplier should assume guaranteed orders*". FMV's intention is to motivate suppliers to remain proactive and diligent in securing orders. They are determined not to foster an environment where a specific firm perceives itself as having a standing guarantee for orders, as this approach could potentially lead to compressed profit margins.

> No supplier should feel confident that they will get an order; we want suppliers to be on their toes and work for an order.

FMV underlines their commitment to an ongoing and rigorous contract follow-up, focusing on deliveries and quality matters associated with ongoing contracts. This active contract monitoring reinforces a close and collaborative relationship with the selected suppliers.

In summary, FMV has adopted a short-term approach and anticipates the market to fulfil its requirements in terms of timing and quantity. They seem to lack a sense of responsibility in terms of prioritizing the defence industry in Sweden.

5.2.2 Factors that foster or hinder enhanced supply. So far, there has been no focus on the security of supply from FMV (or the Armed Forces), and each purchase order intends to cover a given need. The next time the need arises, a new request for quotation is made to see which supplier meets the requirements at the lowest cost.

FMV's strategy involves collaborating with other procurement entities, such as Finnish and Norwegian equivalents, to enhance collective purchasing power. This approach aims to increase FMV's appeal as a customer and consequently negotiate prices that are favourable.

FMV points out that they cannot require the supplier to have production in Sweden in their requests for quotations, as this would mean special treatment. On the other hand, they can require that they have a service point on Swedish soil.

> Due to the law on public procurement, we cannot direct tender requests that require production to take place in Sweden, but we can require a service point in Sweden.

FMV expect their suppliers to be flexible and to step up when needed.

> We expect our suppliers to be flexible and to step up when needed.

FMV believes that, as a purchasing authority, they have little opportunity to influence an individual company's delivery times or opportunity to vary the desired delivery quantity. In order to achieve higher priority with suppliers, FMV seeks cooperation with other purchasing authorities to become a larger and more attractive customer. FMV has formulated its procurement strategy with the assumption that there are suppliers in the global market capable of meeting the specified requirements regarding delivery times and quantities.

5.2.3 Conditions that contribute to or prevent the achievement of an increased capability to supply. Even in cases where FMV acquires a weapon system with an anticipated need for upgrades, FMV lacks precise timing for when a budget allocation for such upgrades will be specified. FMV's rationale for this approach is to prevent leading suppliers into false expectations of assignments that might not materialize. Furthermore, FMV emphasizes that

every procurement process must adhere to proper protocols, allowing all potential suppliers an equal opportunity to undertake upgrade work, even if identifying a suitable supplier presents challenges.

> Our procurement activities are guided by the overarching defence budget set by the government and the specific priorities outlined by the Armed Forces. Distinct budget allocations are designated for acquiring new equipment and sustaining existing assets. However, it is worth noting that the exact timing of when individual budget allocations are released, such as for upgrades, remains uncertain to us at FMV. Consequently, we lack the ability to disseminate information to the supplier market or take proactive actions until the budget is confirmed and released.

FMV actively endeavours to keep the supplier market informed about their forthcoming acquisitions through events like industry days and meetings. While these interactions do not divulge specific details, they provide a broad outline of the organization's future requirements. Additionally, FMV's website offers information about their procurement processes and the legal framework governing these processes. FMV is unwavering in its commitment to provide identical information to all bidders within a competitive round, maintaining an equitable stance that does not favour Swedish suppliers over foreign counterparts.

> We communicate our wishes and future requirements for deliveries on different industries and supplier days. Our website also contains information about how our procurements are carried out and which legislation is the basis.

As per FMV's understanding and implementation of the regulations governing PP, it restrains them from engaging in extended contractual agreements and expanding the scope of information sharing beyond what is pertinent to an already finalized contract. However, it is important to note that FMV lacks the legal authority or mandate from the state to sustain the domestic defence industry in Sweden. Consequently, FMV is unable to prioritize a Swedish supplier over a foreign one if the former proves more costly, with the exception of suppliers from sensitive regions like China and Russia.

In a broader context, FMV underscores that any alteration in their procurement approach and cost-centric orientation would necessitate a directive from the Swedish Armed Forces to incorporate supply security into the procurement process. Furthermore, FMV would require a mandate to extend the application within the confines of the regulatory framework.

5.3 Discussion regarding the empirical evidence provided by this study in relation to the theory

In the preceding two subsections, the perspectives of the four participating defence industry firms and the procurement authority FMV on the defence firms' capacity to meet stipulated delivery times and quantities as described. In addition, factors that either bolster or impede the realization of supply security were identified. As well, the circumstances that foster or obstruct the potential to enhance delivery security were pinpointed.

In the following section, a comparison is made between empirical findings and the identified literature. Empirical observations that are inadequately explained in the frame of reference are elucidated.

5.3.1 Provision of equipment and essential resources to the Armed Forces. Up until the mid-2010s, the activity within the Swedish Armed Forces remained notably low, and the supply system was marked by its efficiency and cost-effectiveness. As highlighted by Hartley (2013), Brown (2013) and Aben and Malizard (2018), defence supply during peacetime revolves around the continual consumption of provisions for permanent Armed Forces personnel, trainee soldiers, maintenance operations and exercises. The acquisitions of supplies, services and equipment by the Armed Forces are strictly governed by budget constraints. During

peacetime, stockpiles are maintained at levels just sufficient for near-future consumption, as elucidated by Walt (1985) and the Department of Defense Report (2018). In these scenarios, Armed Forces requirements are reasonably foreseeable both in terms of quantity and timing, with delivery schedules from the defence industry being relatively well-known, barring cases of new equipment procurement.

The relationship of supply between FMV (inclusive of the Armed Forces) and the defence industry is typified by an economical, streamlined strategy. Production aligns closely with consumption, and warehousing is minimized. This aligns with the phrases "just-in-time" or "lean" as described by Basnet and Seuring (2016) and Ekström *et al.* (2020). Within the defence industry, procurement activities and production planning are driven by orders. The market and logistics strategies emphasize efficiency (Fisher, 1997; Lee, 2002) and postponement (Pagh and Cooper, 1998). These strategies are characteristic of lean management approaches (Christopher, 2000; Christopher *et al.*, 2006; Stock *et al.*, 2010).

Historically, the activity within the Swedish Armed Forces remained notably subdued until the mid-2010s, with the supply system being very efficient and cost-effective. However, following changes in Europe's security policy landscape, the Swedish government decided to bolster the Armed Forces' operations. Yet, the existing supply system was ill-equipped for this expansion, necessitating FMV to seek novel supply solutions. Traditionally, such supply solutions are achieved through collaboration with defence industry stakeholders (Bryden and Caparini, 2006; Datta and Roy, 2013; Gereffi and Fernandez-Stark, 2016). However, this approach does not align with FMV's tendency to maintain an arms-length and short-term relationship with its suppliers.

Existing literature suggests that a defence supply system should be designed to accommodate two distinct modes: one that's cost-effective during peacetime and another that is robust and agile during conflict (McGinnis, 1992; Kovács and Tatham, 2009; Davids *et al.*, 2013; Sharma and Kulkarni, 2016). In the Swedish context, the latter mode has not been a priority due to the perception that the risk of threat is minimal. FMV's emphasis on cost-efficiency has taken precedence over establishing the security of supply, aligning with the perspectives of Wilhite *et al.* (2014), Ekström *et al.* (2021) and SOU 2022:24, 2022, p. 24).

The Swedish Armed Forces have received a heightened allocation of budget funds. This allocation aims to bolster their operations and replenish preparedness stocks, including an emphasis on enhancing the security of supply. However, due to the state's historical budget focus on cost-efficiency and market exploitation, there are no established relationships with individual entities in the defence industry, except where essential security interests are concerned. Moreover, there are no prerequisites for the defence industry to maintain a readily activatable conflict mode. As the FMV seeks to procure more resources promptly, it encounters certain challenges. For numerous advanced products, the Swedish Armed Forces could anticipate delivery only within 3–5 years from the point of placing an order. They are now exploring options to rearrange past orders and engaging in discussions with other clients to identify potential solutions. Hindsight often offers clarity, yet the alternative approach would likely entail escalated costs.

During a crisis, the Swedish government has the authority to activate the disposal law. In practice, this entails the state assuming control of a firm's resources. However, given that there is no surplus material available within the factory beyond what is required for ongoing production, production ceases thereafter. In the event of such a crisis, it is probable that neighbouring countries face similar challenges.

While the literature promotes the adoption of two supply chain modes – one for peacetime and another for crisis/war situations – few post-Cold War firms and their customers are willing to incur the associated costs of this. However, the Swedish Armed Forces possess the potential to initiate additional supply chains for specific material categories beyond the one currently employed.

5.3.2 Defence industry has undergone privatization and globalization. The defence industry in Sweden is predominantly under foreign ownership, a trend also observed in numerous other nations, consistent with findings by Bishop and Wiseman (1999), Mampaey (2001), Sempere (2020) and Ikegami (2013).

The Swedish government has expressed significant interest in domains deemed crucial for security interests. As a result, specific procurement orders are directed towards defence industry firms within Sweden. It is intriguing to observe that firms not owned by foreign entities predominantly provide products and services in areas classified as essential security interests by the Swedish government. However, these firms export their products and services to other Armed Forces.

The defence industry in Sweden heavily relies on foreign suppliers, with over half of the suppliers located outside the Nordic countries. This global reach is evident in the supply chains of the defence industry, regardless of ownership.

5.3.3 Supply chain disruptions. The procurement strategy of the Swedish state has historically relied on the belief that the market could provide alternative supply solutions in times of crises, presuming that such crises would be short-lived (Hood, 1995; Grimsey and Lewis, 2004; Ekström *et al.*, 2021; SOU 2022:24, 2022, p. 24). However, the COVID-19 pandemic underscored how swiftly cascading effects can accumulate and how detrimental these consequences might become for supply solutions (Moosavi *et al.*, 2022; Antai and Hellberg, 2023). Additionally, the crisis in Ukraine has extended the time required to acquire new military equipment due to heightened demand from other nations for the same suppliers.

The literature indicates that many firms are now revisiting their supply chains (Chopra and Sodhi, 2014; Ivanov and Dolgui, 2019; Ivanov *et al.*, 2019), but this perspective contrasts with the stance of the defence industry. While firms may take measures to ensure deliveries of contracted agreements, incorporating force majeure clauses where necessary, the defence industry's position remains distinct. As long as the buyer FMV does not include robustness and security of supply as requisites in its procurement mandates, there is little incentive, from both the buyer and the supplier, to invest in redundancy and flexibility.

Globalized supply chains introduce heightened vulnerability for both manufacturers, affecting their production capacity, and for buyers, potentially leading to delays in order fulfilment. The literature proposes diverse approaches to enhance the resilience of supply chains. However, unless customers explicitly demand heightened robustness and supply security, firms have not proactively undertaken such initiatives. The pursuit of enhanced security of supply has prompted both Swedish manufacturers and FMV to explore the feasibility of sourcing purchases from closer-located suppliers, preferably within the Nordic region. This strategic shift necessitates accounting for a certain increase in costs.

5.3.4 Supply chain value creation. According to Galvagno and Dalli (2014), value is generated through interaction. Achieving value through collaborative efforts, as indicated by the literature on interdependencies, requires information sharing, cooperation, trust and enduring relationships (Håkansson and Snehota, 1989; Prahalad and Ramaswamy, 2000; Ekerholt Sæveraas and Listou, 2018). In this regard, there is considerable room for progress within the defence industry and FMV.

The anticipated value creation described in the literature, stemming from a relationship of understanding and cooperation between buyers and suppliers (Payne *et al.*, 2008; Grönroos, 2011; Prahalad and Ramaswamy, 2000, 2004; Schenkela *et al.*, 2015), is not perceived as valuable by FMV. FMV acknowledges the importance of maintaining close relationships when dealing with existing contracts and addressing emerging issues. However, FMV's primary objective is to uphold an arm's length distance and engage in short-term contracts. This approach ensures that FMV is not bound to a single supplier but retains the flexibility to select suppliers as needed.

Within the Swedish Armed Forces, there is an inherent hesitance to reveal their capabilities, leading to limited exchange of information with supplier firms. Generally, the Armed Forces are guarded about their requirements. This lack of information exchange between suppliers and the Armed Forces hampers the potential for closer and enduring collaboration, especially concerning robust supply solutions.

A shared interest between the supplier and the buyer benefits the partnership. Firms are understandably reluctant to invest in redundancy measures that result in cost escalation without corresponding compensation. This underscores the significance of having enduring contractual commitments to account for such expenses. Implementing the literature's recommendation for fostering close relationships within the supply chain to achieve efficiency and sustainability proves challenging under the current application of PP legislation.

5.3.5 Public procurement of defence equipment and necessities. FMV has strategically utilized the concept of PP to maximize the value derived from their purchasing budget, often employing contracts with a maximum duration of five years. This has resulted in a lack of long-term collaborative relationships with their suppliers, aligning with Cohee *et al.*'s findings (2019). Nonetheless, FMV seeks a professional distance from their suppliers, allowing them the flexibility to choose any supplier that meets the requirements for a given quotation. This perspective resonates with the EU directive, which underscores that interactions and long-term contracts should adhere to principles of non-discrimination and transparency without distorting competition (Calcara, 2020; Holma *et al.*, 2022).

However, this arms-length approach, rooted in historical practices, contrasts sharply with the supply chain literature. A stringent adherence to PP regulations presents challenges in establishing enduring relationships with the defence industry, which are essential for supply security over time (Manuj and Mentzer, 2008; European Commission, 2016a, b). This highlights the significance of mutual trust among stakeholders, shared objectives, transparent communication, close collaboration and long-term commitments, as emphasized by Ellram and Edis (1996), Gules and Burgess (1996), Dowlatshahi (2000), Cova and Salle (2008), Daugherty (2011), Huang and Wilkinson (2013) and Panahifar *et al.* (2018).

To disrupt FMV's entrenched procurement practices, it is imperative for FMV to garner backing from Swedish authorities to question the conventional PP approach. This entails reconsidering the weighing of evaluation criteria in requests for quotations. Given that other countries adhere to the same EU regulations, albeit with subtle variations, there is an opportunity for Sweden to adapt within these boundaries.

5.3.6 Purchasing portfolio model for defence procurement. The Swedish Armed Forces operate under a segmentation model reminiscent of Kraljic (1983), and this is reflected in the Material Supply Strategy (SOU 2022:24, 2022, p. 24) that is built upon this kind of segmentation. However, there appears to be a disconnect between the aspirations outlined in this strategy and the practical constraints faced by FMV due to the current application of PP laws. This situation resonates with the findings of Plantinga *et al.* (2020) and Erridge and McIlroy (2002), who highlight the existence of barriers that hinder the realization of opportunities. The regulatory framework applied in Sweden leads to a procurement approach that leans heavily towards contractual obligations, at the expense of cultivating relationship-driven behaviours, as explored by Lumineau and Henderson (2012) and Cao and Lumineau (2015).

5.3.7 Summation. The current situation's root cause does not stem from the inadequacy of the Swedish Armed Forces or FMV. Instead, four distinct underlying factors have been identified:

(1) The state's budgeting process.

(2) FMV's strong emphasis on cost reduction, leading to orders being distributed among various suppliers, thereby hindering the development of trust between parties.

(3) The interpretation of PP laws, which hampers collaboration and the development of long-term contracts.

(4) The post-Cold War era, during which maintaining readiness capacity in supply and production lines for transitioning to wartime mode was not prioritized.

6. Conclusion

The objective of this research was to explore the outcomes when a state rigorously adheres to the rules of PP for defence materials to determine if this approach can effectively achieve the desired equipment availability, costs and supply security.

The findings of this research indicate that FMV's focus on cost reduction, enforced through a strict application of PP principles, has achieved the desired outcomes. This strategy has demonstrated effectiveness as long as the procurement approach has prioritized cost savings over availability and supply security. However, when the focus shifts towards prioritizing the availability and security of supply, the approach proves less effective. To achieve better results in this aspect, FMV needs to consider sourcing suppliers in closer proximity to Sweden (to improve availability) and with the capacity for consistent delivery (to enhance supply security).

An implication of FMV's prior procurement strategy is the absence of well-developed contract structures that account for these factors in conjunction with functional requirements and price, which have been the predominant considerations thus far. Due to FMV's limited prioritization of the domestic defence industry as suppliers, except in areas vital to security interests, these suppliers are often engaged in fulfilling orders for other foreign Armed Forces, leading to lengthy delivery timelines.

The arm's-length relationship that FMV has maintained with the domestic defence industry needs to be re-evaluated and transformed into a more collaborative and trusting partnership, even if this poses challenges within the realm of PP regulations. Several avenues are available for addressing this issue. One approach involves broadening the definition of essential security interests, thus enabling targeted requests for quotations. Another strategy involves interpreting and applying the legal framework more flexibly, while still operating within its confines. We can learn from countries similar to Sweden regarding the ways in which they implemented PP laws concerning defence-related materials and services.

Conversely, the defence industry has embraced lean principles alongside a postponement strategy, wherein materials and components are acquired only after receiving signed orders from FMV (as from other customers). Aligned with FMV's cost-centric focus, the industry has streamlined operations by eliminating unnecessary expenses and avoiding tying up capital in inventory. Due to the customized nature of each order, with specifications aligned to the particular nation's requirements, the interchangeability of product components between different orders is limited. However, the industry does maintain stocks of commonly used consumables and spare parts.

The emphasis on cost efficiency to secure orders, coupled with the absence of explicit demands from the buyer for delivery reliability, has led the industry to incorporate redundancy in their supply chains to a limited extent.

It is evident that current formal agreement structures and short-term collaborations contribute to limited comprehension and insight into what truly benefits the customer and supplier. Additionally, due to the reluctance of the Armed Forces to disclose their needs or consumption forecasts, often driven by competition or confidentiality concerns, establishing collaborative relationships for mutual value creation becomes challenging. The industry, in particular, desires this type of information exchange.

The absence of some form of demand forecast and a long-term perspective from the buyer, in this case, the Armed Forces, makes it difficult for firms to plan their operations effectively compared to what could be achieved with improved collaboration. Enhanced planning, especially for processes requiring specialized skills and component procurement, could lead to reduced delivery times and lower costs, as expressed by the firms.

In summary, the research underscores how FMV's historical approach has effectively prioritized cost but now needs adaptation to accommodate a heightened focus on availability and supply security, requiring adjustments in supplier selection and contract frameworks. To enhance availability and ensure consistent deliveries, FMV must devise new business models that comply with PP laws. However, closer and longer relationships are impeded by the current application of the Swedish Public Procurement Act and the freedom to choose new suppliers. Consequently, achieving close collaboration becomes intricate when maintaining an arms-length approach, while the Armed Forces' reluctance to share consumption patterns complicates matters. Addressing this challenge necessitates devising methods of producing needs forecasts that do not divulge the Armed Forces' capabilities.

To better assess risks, ensure availability and guarantee supply security in the globalized defence industry and its intricate supply chains, there is a need for more extended and comprehensive forms of agreements that incorporate clauses related to supply system redundancy.

As depicted in Figure 1, the PP framework demonstrates effectiveness when acquiring standard goods or readily available services. The region in Figure 1 that is shaded in light blue. In such procurement scenarios, multiple alternative suppliers are typically accessible. However, during crises, securing deliveries from foreign suppliers can pose challenges, as demonstrated during events like the pandemic.

When the procurement pertains to more customized equipment or services tailored to specific customer needs (the region that is shaded in light red), a closer and more extended collaboration becomes preferable, particularly due to the longevity of the solution and the ongoing maintenance and upgrades required (spanning up to 30 years). Unfortunately, current legislation does not permit such extended collaborations. According to PP laws, contracts are limited to a maximum of five years (or seven years for specific call-off contracts), which is notably short from a defence equipment perspective.

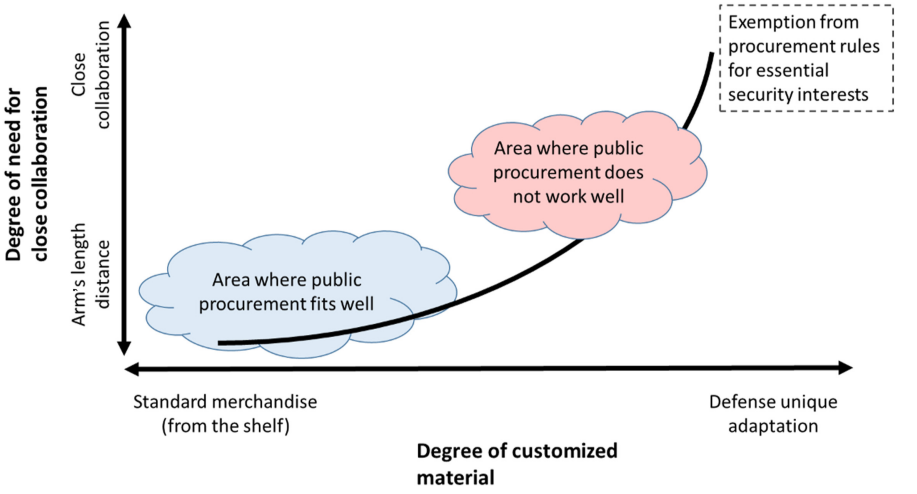

Figure 1.
Need for close cooperation in peacetime is due to the complexity of procured product and the need for predictability in delivery volumes

Source(s): Figure by author

In the context of procuring services and products originating from essential security interests, current procurement laws permit exceptions that enable specific order requests to be directed to chosen suppliers. For products and services falling within the realm of essential security interests, there is greater leeway within the legal framework for shaping purchasing strategies and entering into more extended contracts. In Figure 1, this refers as the white area.

In areas where the present purchasing procedures face limitations, the development of new business models is essential. The necessity for developing new business models and contracts becomes particularly apparent in cases of customer-adapted solutions requiring long product lifespans. These new models should be built upon heightened long-term focus and increased information exchange compared to existing practices. Such a process mandates mutual understanding between agreement parties and clear clauses outlining the handling of sensitive information among involved partners. Furthermore, it prompts a review of how the application of the PP law can be adapted.

In addition to addressing the existing challenges within the procurement process and the implementation of legislation, the government needs to present a more transparent budget allocation that assures the availability of funds for the maintenance and enhancement of the acquired material systems. This would enable FMV to selectively inform firms that are directly relevant to these tasks. While the state naturally aims to prevent excessive profit mark-ups by these firms, a forward-looking and transparent approach (potentially including open price calculations) fosters trust and allows firms to plan for upcoming assignments. In addition, close cooperation between involved parties requires that sensitive information is handled with strict confidentiality.

The current situation's root cause is neither a lack of planning by the Swedish Armed Forces nor FMV. Instead, there are four identified factors contributing to the issue: the state's budgeting process, FMV's cost-focused approach, limitations imposed by PP laws and the post-Cold War era's impact on readiness capacity.

The key contribution of this research to the literature is highlighting the requirement for a more nuanced application of PP laws and contract models, especially for sectors encompassing products and services characterized by extended lifespans and consequent maintenance and upgrades. In essence, this means being able to progressively distinguish and apply varied procurement methods across different categories of products and services.

6.1 Research limitations

This study is subject to several limitations that should be considered when assessing its findings.

Firstly, the conclusions drawn in this study are constrained by the fact that it focuses on a single nation and the specific interpretation and application of the PP law by the authorities in that nation. As a result, the potential for generalizing the results to other contexts is limited.

Additionally, while the four participating firms are significant players within Sweden, they might not represent the entire spectrum of defence equipment procurement. The inclusion of a larger sample of firms could potentially yield different insights into the procurement process. However, it is worth noting that the viewpoint of the only purchasing authority in the country, FMV, is considered to be representative.

Moreover, the interpretation and analysis of interview responses may be subject to theoretical bias, and another researcher might have interpreted and processed the information differently, possibly leading to alternate conclusions.

6.2 Further research

To gain a more comprehensive understanding of how Armed Forces in various countries establish collaborations with the defence industry and prioritize suppliers to ensure secure delivery capabilities, a more in-depth research is necessary. Future studies should aim to

provide more robust and dependable results by incorporating defence procurement practices from multiple nations. This broader scope would encompass various types of defence-related materials, offering a more comprehensive picture.

Conducting a study similar to the one performed by Kausal *et al.* (1999) could also be intriguing. Such a study could provide valuable insights by comparing the procurement strategies and collaborative approaches of different countries over time, shedding light on the evolving dynamics between defence authorities and suppliers.

In summary, future research should expand its scope to encompass a wider range of nations, materials and types of collaborations within the defence industry, potentially including a comparative study akin to Kausal *et al.* (1999). This would contribute to a more nuanced understanding of defence procurement practices and their implications on the security of supply.

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