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Supply Chain Finance: Exploring the State of Adoption with Small Business Suppliers in U.S. Defense Procurement Contracts

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Innovative supply chain finance (SCF) practices offer alternative approaches to relief of cash flow distress for suppliers in an extended enterprise by enhancing access to and affordability of working capital. Adopting optional SCF instruments can be especially beneficial for small–medium-sized enterprises (SMEs), which are more acutely affected when credit conditions tighten. This explorative research described the state of buyer-led SCF adoption in defense procurement contracts used to produce highly technical weapons systems. A case study research design with embedded units across four groups of intermediaries was employed to compare the state of SCF adoption between a defense and a commercial business environment in the context of alternative working capital finance instruments. The study identified boundary conditions limiting the awareness and use of the buyer-led reverse factoring instrument for SME suppliers performing as subcontractors in the defense business environment. The study found that enterprise orchestration should be considered as a critical mediator for successful SCF adoption in the defense business environment. Contributions include descriptions of evolving motives, key enablers, and challenges of SCF adoption, emphasizing implications for SME manufacturers and suppliers producing vital components for the U.S. Department of Defense and the military services.

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Abstract

Innovative supply chain finance (SCF) practices offer alternative approaches to relief of cash flow distress for suppliers in an extended enterprise by enhancing access to and affordability of working capital. Adopting optional SCF instruments can be especially beneficial for small–medium-sized enterprises (SMEs), which are more acutely affected when credit conditions tighten. This explorative research described the state of buyer-led SCF adoption in defense procurement contracts used to produce highly technical weapons systems. A case study research design with embedded units across four groups of intermediaries was employed to compare the state of SCF adoption between a defense and a commercial business environment in the context of alternative working capital finance instruments. The study identified boundary conditions limiting the awareness and use of the buyer-led reverse factoring instrument for SME suppliers performing as subcontractors in the defense business environment. The study found that enterprise orchestration should be considered as a critical mediator for successful SCF adoption in the defense business environment. Contributions include descriptions of evolving motives, key enablers, and challenges of SCF adoption, emphasizing implications for SME manufacturers and suppliers producing vital components for the U.S. Department of Defense and the military services.

Keywords: supply chain finance, defense procurement, small–medium sized enterprises

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Chapter One: Introduction

This dissertation offers insights and recommendations to address a systemic challenge facing the U.S. Department of Defense (DoD) concerning the distress of extended payment terms and late cash flow payments to small businesses supplying prime vendor contractors in the defense industrial base (DIB). The DoD (2023a) said, "The Federal Government and DoD specifically have taken numerous steps to ensure the cash flow of our prime contractors …however, our attempts to push these benefits to the subcontractor and supplier level appear…neither robust nor effective" (p.67). The DoD has sought to understand systemic barriers and to promote innovative solutions to mitigate "limited access to capital for America's small and medium-size producers has hindered their ability to invest in necessary technologies" for improving readiness and resilience of force capabilities (DoD, 2022a, p. 27).

Small–medium-sized enterprises (SMEs) are more likely to be affected by limited access to capital that constrains growth and limits the ability to exploit profitable investment opportunities fully (Berger & Udell, 2006; Templar et al., 2020). Supply Chain Finance (SCF) is presented as a potential solution for SME supplier firms facing cash flow distress frequently caused by Original Equipment Manufacturer (OEM) buyers extending payment terms and making late payments (Caniato et al., 2016; de Goeij et al., 2021; Martin & Hofmann, 2017). The ultimate objective of SCF is to optimize financial flows at an interorganizational level by improving cash flow management from a supply

chain perspective (Gelsomino et al., 2016; Global SCF Forum, 2016; Hofmann et al., 2021; Pfohl & Gomm, 2009). Buyer-led SCF provides access to working capital at a lower interest rate for SME suppliers via instruments such as reverse factoring, dynamic discounting, inventory financing, and purchase order finance (Martin & Hofmann, 2019). These SCF practices allow a firm to obtain cash based on the value of the assets and the credit standing of a large buying firm (Zhang et al., 2019).

However, a quorum of SME suppliers has yet to reap the benefits of SCF practices because many national and regional midsized corporations need to understand the topic and its potential impact on enterprise value (De Boer et al., 2015; Moretto et al., 2021). SCF practices "rarely reach beyond first-tier suppliers of large corporates" and thus exclude SME suppliers facing difficulty gaining access to capital (Hofmann et al., 2021, p.17). This lack of knowledge has left a considerable proportion of the problem unsolved for SME suppliers and also left the adoption of SCF under-investigated in the literature (Martin & Hofmann, 2019; Moretto & Caniato, 2021; Templar et al., 2020; Van Bergen et al., 2019). Tunca and Zhu (2022) show that buyer-intermediated financing can significantly improve channel performance and benefits supply chain participants simultaneously.

Little is known about how SME suppliers develop awareness and understanding of optional SCF practices with the large prime vendor OEMs in the U.S. defense industry and then proceed with adoption decisions to mitigate cash flow distress. The purpose of this dissertation was to explore the state of SCF adoption in defense procurement contracts to a commercial business environment in the context of organizational intermediation and alternative types of financial instruments used to address the

affordable and timely cash flow needs of SME suppliers competing with global market forces. The nature of the systemic problem set and purpose led to the following research questions:

1. How does intermediation of SCF adoption practices between OEM buyers and SME suppliers differ between defense procurement contracts and a commercial business environment?
2. What are the key enablers and challenges influencing the adoption of buyer-led SCF practices to mitigate financial cash flow distress among SME suppliers?

Background

SME suppliers and subcontractors are estimated to contribute 40 – 60 percent of the value to defense OEMs by producing and delivering essential components (DoD Report, 2022b, p.13). Prime vendor OEM contractors in the DIB are responsible for final assembly, life cycle repair parts, and augmentation of services and repairs of major weapon systems delivered to military forces (DoD Report, 2021). For example, Lockheed Martin has been a prime vendor contractor responsible for delivering a fully ready C-130 cargo aircraft platform to the U.S. Air Force. A typical aerospace manufacturer in the U.S. relies on approximately 200 direct first-tier suppliers and approximately 12,000 subtier suppliers (DoD, 2018). This complex network of firms aligned to the prime vendor must maintain financial liquidity to ensure continuity of inbound supply and final assembly operations. The prime vendor typically has strong commercial credit, lower borrowing costs than its subcontractors, and incentives to minimize exposure to financial cash flow risks with its supplier base.

A range of SCF solutions is available in the business-to-business (B2B) marketplace to improve the working capital position across buyer-supplier relationships. In the literature and practice, many interpretations and connotations of the term supply chain finance remain confusing for stakeholders to articulate a clear value proposition. Stakeholders may hold one or more perspectives in mind for shaping firm objectives, including a purely financial orientation, a buyer-driven orientation, or a broader supply network orientation (Caniato et al., 2016). The scope of SCF solutions, with emphasis on the inbound supply base for the OEM buyer for this dissertation, is depicted in Figure 1 below.

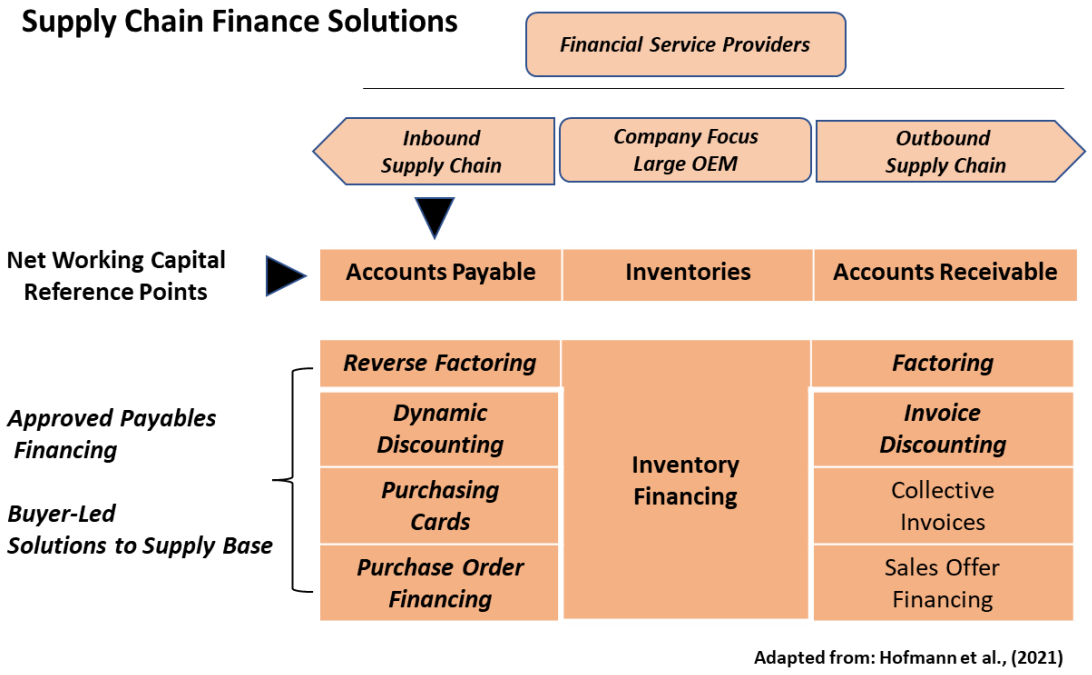

Figure 1: Orientation to SCF solutions offered in the B2B marketplace

The most popular buyer-led SCF solutions aligned under the Accounts Payable reference are the approved payable instruments known as Reverse Factoring and Dynamic Discounting. Other SCF instruments and defense contracting instruments were examined to compare and contrast the value proposition of buyer-led SCF instruments with other options to finance the working capital needs of SME suppliers.

Intermediation involves the brokering and bridging of knowledge exchange between industrial actors in ecosystems and networks (Arnaldi and Neresini, 2019). Intermediary organizations play a crucial role in facilitating collaboration by mobilizing and orchestrating resources within the business ecosystem (Cao and Zhi, 2020). The research explores multiple perspectives and interdependencies in the buyer-supplier relationship including the intermediaries' role in fostering, adopting, and implementing a solution to achieve firm objectives. Adopting SCF requires the multidisciplinary integration of functional roles and exertion of three distinct levers: (a) collaboration, (b) technology, and (c) financing; this process involves actors promoting business value across a complex supply chain ecosystem (Templar et al., 2020). The ideal application of SCF practices promotes a supplier-buyer solution satisfactory to all by locating an optimal point for managing working capital among firms collaborating in a network of supply chain relationships (Hofmann et al., 2021; Seifert & Seifert, 2011, p.38).

According to several case studies, SCF enhances overall trust and commitment between multitier stakeholders by leveraging working capital across a network to protect the liquidity of cash flow and preserve SME solvency (Wetzel & Hofmann, 2019). Fintech firms offering SCF services (e.g., Taulia, Orbian, PrimeRevenue, and Kyriba)

have provided essential information exchange platforms and, in some cases, short-term credit to optimize working capital for buyers and suppliers.

Digital transformation of business-to-business (B2B) practices, such as SCF, often requires investment in new organizational functions and competencies, promoting greater collaboration among stakeholders across multiple tiers of a supply network (Caniato et al., 2016; deGoeij et al., 2021). Scholars and practitioners have sought empirical evidence to understand better, explain better, and communicate better the expected benefits and policy implications for SME firms across an extended enterprise of adopting SCF practices (de Goeij et al., 2021; Dekkers et al., 2020; Hofmann et al., 2021).

Research Methodology

A single case study research design was employed to compare the state of SCF adoption between a defense and a commercial business environment in the context of alternative working capital finance instruments. The case study included four groups with embedded intermediaries. The case study research method (Eisenhardt, 1989; Yin, 2018) is appropriate for exploratory studies focused on the understanding and in-depth description of complex organizational processes involving multiple stakeholder perspectives and simultaneous interactions, including technology-implementation projects in a real-life context (Bhattacherjee, 2012; Simons, 2009). The case study approach included an examination of several SCF theoretical propositions of interest.

Through case study observations, I sought to further extend SCF theory by describing how SCF practices are successfully adopted or constrained among multiple

intermediaries influencing the high-tech manufacturing industry's buyer-supplier base relationships. I also sought to identify and isolate how prevalent externalities of defense procurement contracts influence SCF adoption decisions.

The case study process included the development of an a priori conceptual framework used in the design of the interview protocol from extant SCF literature (Caniato et al., 2016; de Goeij et al., 2021; Martin & Hofmann, 2019; Phraknoi et al., 2022; Wuttke et al., 2013a). The first-order coding produced perspectives, insights, and experiences from the four embedded groups. The second-order analysis generated major findings and themes. The third-order analysis generated aggregate outcomes, including thematic categories that led to assertions and propositions to extend SCF theory.

Major Findings

In the DoD business environment, fostering and intermediation of buyer-led SCF practices between OEMs and SME suppliers was adopted only as a matter of exception. While in the commercial business environment, the reverse factoring instrument is firmly established and proactively intermediated by large OEMs to SME suppliers to deliver early cash flow payments at attractive prices based on an OEM buyer's stronger credit rating.

Secondly, SME suppliers participating as subcontractors to defense OEMs face similar unilateral payment term extensions coupled with late payments that many suppliers absorb in the commercial business environment. This finding was corroborated by a 2023 DoD study in contract financing and is a recognized shortcoming acknowledged by the DoD.

Thirdly, the SCF Fintech respondents in the case study were reluctant to pursue market penetration with defense procurement contracts. This reluctance to pursue SCF business development was due to the perceived effort needed to navigate complex federal acquisition regulations and procedures and little confidence to produce a minimum return on investment.

Finally, proactive intermediation by multiple stakeholders (Intra-Firm, Inter-Firm, and with Financial Service Providers or FinTech) was needed to foster buyer-led adoption of reverse factoring with SME suppliers in the commercial business environment. Achieving a partnership mindset requires consistent advocacy, education, and collaboration with many stakeholders to articulate a clear value proposition and benefits of SCF adoption.

Contributions

This dissertation offers original empirical evidence about the state SCF adoption trends and challenges within the U.S. defense business environment and interface with government contracting regulations. The results of this qualitative dissertation contribute to the SCF literature and management practitioners through descriptions of evolving motives, key enablers, and challenges of SCF adoption among stakeholders in the high-technology manufacturing industries, emphasizing implications for SME manufacturers and suppliers sourcing components to large defense OEMs.

Contributions to the SCF literature include positioning enterprise orchestration as a critical mediator for successful adoption in the defense business environment. Enterprise orchestration promotes a shared understanding of SCF concepts, terminology,

performance conditions, and execution procedures to improve timely and affordable cash flows to subtier SME suppliers (Tate et al., 2019). Orchestration can promote awareness, visibility, and transparency of adopted SCF practices and performance by diverse intermediaries within the defense environment for greater flexibility to position the most appropriate working capital finance solution to SME suppliers in a dynamic ecosystem.

I confirmed five theoretical propositions of interest from SCF case study research reported in existing literature influencing intermediation of adoption decisions between large buying firms, SME supplier firms, and financial service providers. The theoretical propositions confirmed include the relationship between the SCF adoption and interdependencies of the OEM buyer – SME supplier and the moderating effects of OEM strategic objectives, alternative working capital finance instruments, the importance of collaboration across multiple echelons in the SCF ecosystem, and the role of the digital SCF platform as an efficiency enabler for stakeholders.

I also confirmed the role of variables from transaction cost economics to partially explain organizational governance decisions in the OEM buyer-SME supplier relationship. Those first-order concepts include the objective to minimize working capital finance costs and the impact of asset specificity regarding investments required in the buyer-supplier relationship to support awareness training, to clarify features and benefits of SCF adoption, and to enable implementation and interface with the digital SCF platform. The role of uncertainty was confirmed regarding aspects of opportunism and bounded rationality. My observations confirmed use of corporate policy as a form of opportunistic buying power was used to pressure some SME suppliers into joining the commercial OEM SCF program. I also confirmed the role of uncertainty in the form of

bounded rationality acknowledged by SME suppliers regarding a limited understanding of how SCF instruments compared in cost of capital to other financing options. These aspects of buyer-led opportunism and bounded rationality were mitigated through a robust awareness training program offered by the OEM to demonstrate the economic value proposition of participation to SME suppliers.

This research included unique intermediary stakeholder perspectives from DoD policy executives and operational directors responsible for the readiness of legacy weapon system platforms while promoting the financial health of the SME suppliers sourcing vital components to large defense OEMs. This case study research captured keen insights from a commercial OEM managing a mature and successful SCF program across four business units and with an SME supplier. The commercial OEM group provided a baseline perspective to compare and contrast motives, adoption procedures, and degree of participation with the supply base. Five financial service providers – specializing in SCF services provided insights and perspectives on why SCF may be hampered in defense procurement-related contracts with SME suppliers.

Managerial implications of the research include a better understanding of why the buyer-led SCF practice of reverse factoring for defense contracts appears to lag the degree of application and participation with SME suppliers observed in a commercial OEM business environment. The constrained adoption and employment of buyer-led SCF practices in the defense industry are linked to many interdependent barriers, including:

(a) a conservative culture in the defense business environment that embraces more traditional and more straightforward financing mechanisms with an SME supplier's host bank.

(b) limited awareness and promotion of buyer-led SCF instruments between defense OEMs and their SME partners in the supply base.

(c) limited pursuit and penetration by the SCF fintech industry into government contracts due to anticipated burden of understanding and navigating the complex regulatory mandates used in defense acquisition contracts.

(d) minimal visibility of cash flow distress affecting the financial health of SME subcontracted suppliers by the DoD due to the privity of contract.

(e) there needs to be clarity in the terminology used by a fragmented SCF ecosystem to describe similar finance products making it difficult to compare features and costs.

To counter identified barriers to SCF adoption in the defense business environment, respondents in the case study advocated a greater degree of orchestration between DoD policymakers, the defense OEMs, and industry forums contributing to the readiness of the defense industrial base. Case study respondents prompted orchestration to improve overall awareness of alternative buyer-led financing options and to promote consistent use of terms to describe SCF concepts, performance conditions, and execution procedures. SCF financial service providers provide a critical intermediary role and are best positioned to shape how the digital technology platforms can be aligned to improve the visibility and transparency of cash flow payments to supply base SME participants.

Organization of the Remaining Chapters

Chapter 2 reviews the extant SCF literature to identify known gaps and variables and is used to design the conceptual framework for the qualitative case study research approach. Chapter 3 describes the design of the research methodology to explore the state of SCF adoption with four groups of seasoned executives and managers regarding the intermediation and adoption of SCF practices. Chapter 4 summarizes the data collection results, major findings, analysis, and synthesis of the data collected. Chapter 5 provides a comprehensive interpretation of findings and thematic categories characterizing the case study, along with corresponding assertions, propositions, theoretical contributions, managerial implications, and conclusions.

Chapter Two: Review of the Literature

The interface of finance and supply chain management has become a new frontier of research (Caniato et al., 2019). The purpose of this study was to explore the state of SCF adoption in the context of organizational intermediation and alternative financial instruments used to help address the affordable and timely cash flow needs of SME suppliers by comparing adoption between defense procurement contracts and a commercial business environment. Intermediary organizations shape collaboration dynamics in industrial ecosystems (Henandez-Chea et al., 2021).

As discussed in Chapter 1, limited awareness and understanding have been preventing SME suppliers from reaping the benefits of SCF practices (De Boer et al., 2015; Hofmann et al., 2021). Researchers have discovered little about the development of such awareness and understanding to foster SCF adoption with multiple organizational intermediaries (Martin & Hofmann, 2019; Moretto & Caniato, 2021; Templar et al., 2020; Van Bergen et al., 2019). I could find no empirical studies related to adopting SCF with SME suppliers in the context of government procurement contracts within the U.S. defense industry.

This chapter begins with contextual background information on the SCF ecosystem and a brief review of the origins and evolution of SCF practices since 2000. Other topics discussed include working capital management with the supply base, transaction cost economics as theoretic lens for investigating interorganizational

governance of SCF adoption decisions, strategic motives, alternative working capital financing mechanisms, and the role of SCF digital platforms. A conceptual framework for conducting the case study research methodology is built upon my synthesis of the literature review. My synthesis of the literature review supported the design of the conceptual framework for conducting the case study. My literature review continued throughout the data collection, data analysis, and synthesis phases of the case study to further understand and to generate meanings for the field findings.

Defining the true nature of SCF has remained challenging because experts have continued to disagree on whether SCF is a discipline, technique, product, or program (Templar et al., 2012). This study extended existing empirical case study research in which researchers examined a range of factors and criteria relevant to the adoption of SCF practices with SME suppliers:

- Wuttke, Blome, and Henke (2013) investigated the phenomenon of weak working capital positions in the supply chain with eight buyer firms in context with their supply base and factors affecting decisions to employ SCF practices.
- Caniato et al. (2016) explored the relationship between buyer objectives and the adoption of SCF solutions.
- Martin and Hofmann (2019) explored supply-side SCF practices with eight buyer–supplier–financial service provider triads to explain adoption decisions caused by working capital conflicts in the buyer-supplier relationship.

- de Goeij et al. (2021) assessed eight SME supplier responses to SCF reverse factoring offerings using concepts from transaction cost economics.
- Phraknoi et al. (2022) explored barriers to SME suppliers making SCF adoption decisions.

Consensus has yet to emerge regarding a general theory to explain SCF practices and behaviors, and the development of a solid theoretical base for SCF has become a recognized significant gap in the literature (Bals, 2019; Gelsomino et al., 2016). Clear linkage to the transaction cost economics framework offers an initial basis for studying and explaining organizational adoption and governance of SCF practices (de Goeij et al., 2021; Dekkers et al., 2020; Martin & Hofmann, 2019).

Background

Purchasing components and raw materials is a strategic enterprise function involving diverse stakeholders in a complex ecosystem of supplier networks requiring the collaborative integration of material, information, and financial flows (Johnsen et al., 2018). The increasing availability and adoption of SCF practices have offered an alternative to trade credit funding designed to improve buyers' and suppliers' collective working capital positions (Global Supply Chain Finance Forum, 2016). SCF practices leverage innovative digital technology platforms that, in turn, improve liquidity for participating firms while increasing the velocity, transparency of information, and transactional efficiency of payments and documentation (Rogers et al., 2020).

The DIB is the organizational complex that enables research and development; design, production, delivery, and maintenance of military weapons systems/software

systems, subsystems, and components or parts; and purchasing of services to meet U.S. military requirements (Undersecretary of Defense for Acquisition and Sustainment, 2020). Prime vendor OEM contractors in the DIB are responsible for final assembly, lifecycle repair parts, and augmentation of services and repairs of major weapon systems delivered to military forces. SME suppliers and subcontractors are estimated to contribute 40 – 60 percent of the value to defense OEMs by producing and delivering essential components (DoD Report, 2022b).

The complex network of firms connected to a prime vendor must maintain financial liquidity to ensure continuity of supply operations, and the prime vendor typically has strong commercial credit, lower borrowing costs than its subcontractors, and incentives to minimize exposure to supplier risks (DoD, 2022b). These networks of buyer-supplier stakeholders collaborate to assemble and deliver products to the DoD customer base, consisting of the U.S. military services and the Defense Logistics Agency, by managing information, material, and financial flows.

The DoD has sought to lower barriers to SME participation in the DoD and reverse the decline in the SME supplier base (DoD, 2018). Bresler and Bresler (2022) calculated the overall DIB during 2021 to consist of approximately 52,600 vendors using the Federal Procurement Data System. The number of SME vendors in the DIB shrank by nearly 23% between 2015 and 2021, from approximately 48,300 firms to 37,300 firms, because of consolidations, global competitive forces, and crowding out that favored entrenched firms with knowledge of how to optimize DoD procurement procedures (Bresler & Bresler, 2022, p.124; DoD, 2022b, p.16; National Defense Industrial Association & Govini, 2022, p.33).

One of the factors frequently cited for the growing exodus of SME suppliers providing components to large defense OEMs is related to systemic cash flow distress and its impact on working capital management within the defense business environment (DoD,2018; DoD, 2019). The following section discusses the importance of working capital and factors generating distress.

Working Capital Management with the Supply Base

For production-based firms, the amount of money tied up in working capital can be substantial (DeSmet, 2018; Trent,2016). Cash flow is essential for SME suppliers to cover routine operating expenses. Working capital is the lifeblood of most firms because it represents an investment to keep a business running and provides funding for innovation. The primary components of working capital include cash, receivables, inventories, accounts payables, and short-term bank loans (Chiou et al., 2006; DeSmet, 2018). Managing working capital efficiently during disruptions and inflationary pressures requires keen management of the working capital components within the procurement-to-payment process and order-to-cash process (Templar et al., 2020). It includes negotiation with stakeholders influencing cash flows in the face of uncertain macroeconomic conditions.

The cost of traditional debt financing for working capital needs has been a primary factor contributing to SME suppliers' distress. SME loan rejection rates for traditional debt financing in the U.S. averaged 32% between 2017 and 2020 (Organization for Economic Cooperation and Development, 2022). The finance gap is attributed to credit risk, which prompts a lending institution to charge a higher interest

rate that an SME may be unable to afford (OECD, 2022). In some cases, a bank may decide not to lend at all. For this study, small manufacturing or supply businesses supplying defense OEMs are classified using the Small Business Administration (SBA, 2023) size standards based on the North American Industry Classification System, which relies on a threshold of either annual revenue or the number of employees.

According to PrimeRevenue (2022), an SCF technical platform provider, 49% of supplier respondents cited overdue payments as their most pressing issue concerning prevalent challenges in the B2B payments landscape. PrimeRevenue emphasized the following points:

- Buyer organizations often lack standardized and centralized supplier payment terms and processes, making tracking, managing cash flow and working capital difficult.
- B2B payment processing is resource-intensive and error-prone, requiring interfaces with multiple enterprise requirements planning systems.
- Suppliers often lack visibility and transparency of invoice approval status and incoming payments.
- Overdue payments can inhibit a supplier's ability to invest in its business confidently.

Effectively managing net working capital across a supply network requires substantial planning and cross-functional collaboration at the intrafirm and interorganizational levels (Hofmann et al., 2021).

Pfohl and Gomm (2009) and Gomm (2010) elevated the potential of SCF practices to create financial value by employing supply chain management levers to optimize the duration, volume, and capital cost rate of working capital flows. Their model results found that SCF is more beneficial for companies that are firmly integrated within a supply network and have a high level of collaboration. Gomm demonstrated the linkages between finance theory and economic value drivers of supply chain management levers for invested capital that influence bottom-line financial results for firms, thus generating shareholder value. The weighted average cost of capital is a primary measure used to determine the capital cost rate, which depends on the expected return on investment, risk expectancy of investors, demands of outside creditors, and a company's financial structure (Pfohl & Gomm, 2009). The cash conversion cycle is a composite performance metric to assess how well a company manages its capital (Farris & Hutchison, 2002).

Results of the exploratory research of Wetzel and Hofmann (2019) indicate a profit-maximizing level of working capital and the superior performance of companies adopting working capital management using a network perspective. Furthermore, Wetzel and Hofmann's findings indicate that a progressive buying company may employ an SCF instrument such as reverse factoring, lengthening its payment terms with suppliers while giving the latter the option to receive payment early (Camerinelli, 2009; Wuttke et al., 2016). However, because of cross-company interdependencies, levers to optimize working capital management can positively and negatively impact financial performance concerning affiliated supply chain partners (Hofmann & Kotzab, 2010). Therefore, a

focal company (buyer) should carefully adjust trade credit terms when upstream supply chain partners face working capital constraints to achieve an outcome satisfactory to all.

Mitigating financial risk between OEM buyers and supply base partners infers some awareness of the net working capital position coupled with information regarding the potential of financial distress of the supplier firm (DeSmet, 2018). Most large OEM firms leverage the Altman Z score methodology (Altman et al., 2017) or reports from firms such as Dun and Bradstreet to monitor key suppliers' overall credit rating and financial health.

SCF—Origins, Practices, and Value Mechanisms

Since the financial crisis of 2008, understanding how to optimize the interface of financial flows, physical movement of goods, and information flows of supply chain operations have gained increasing attention in both practice and academic research (Bals, 2019; Caniato et al., 2019; Chakuu et al., 2019; Dekkers et al., 2020; Gelsomino et al., 2016; Huang et al., 2022; Jia et al., 2020). Although the history of SCF traces back to research conducted by Budin and Eapin (1970) into the impact of trade credit and inventory management on cash flows, the SCF domain has experienced an extraordinary period of transition since 2000 directed toward freeing up the working capital position of B2B stakeholders.

Templar et al. (2020) categorized the scope and maturation of evolving SCF activities over four stages: Stage 1, before 2000, included employment of basic SCF functionality, such as letters of credit and factoring. Stage 2, from 2000 to 2010, included the introduction of open account practices, reverse factoring, and seamless documentation

approaches. Stage 3 activities included the rise of integrated SCF platforms, dynamic discounting, reverse securitization, and highly developed trade network communities. Stage 4 activities commenced in 2020 and have included the emerging development and deployment of intelligent solutions, including blockchain-based and tokenized transaction data, smart contracts, and an orientation toward addressing system issues across a deep-tier network.

The 2008 global financial crisis led to a loss of confidence and gave rise to a new financial sector landscape to improve productivity and reduce distribution costs by digitizing processes and transactions (Banque de France, 2016). SCF fintech firms such as PrimeRevenue, Orbian, and Taulia have since disrupted traditional trade credit and financing practices to offer innovative information exchange platforms to enhance working capital positions for buyers and SME suppliers in collaboration with banks. Although a wide range of SCF instruments has become available, the buyer-led accounts payable reverse factoring solution has been the dominant instrument used in the market targeted by larger corporate buyers toward SMEs (De Boer et al., 2015; de Goeij et al., 2016, 2021).

Tanrisever et al. (2015) validated the value of the SCF practice of reverse factoring between a large corporate OEM and SME suppliers working with a bank to optimize financial flows to overcome capital market frictions, such as financial distress costs or information asymmetry. Optimal financial flows are possible when the OEM has a lower short-term cost than its supplier and because the transaction is fully and transparently collateralized by the OEM with no recourse to an SME supplier. In essence, the choice between an SCF practice, such as reverse factoring, and conventional

external finance is a capital structure problem in which secured debt is leveraged to reduce the cost of capital (Tanrisever et al., 2015). Table 1 below describes key features of SCF instruments used for inbound supply chain perspectives pertaining to the scope of this study, as well as asset or inventory financing, an alternative form of inbound SCF practice. SCF abbreviations and terms are thoroughly defined in Appendices A and B.

Table 1: Supply Chain Finance Instruments

Instrument	Description	Key features
	Approved payables	
Reverse Factoring	A bank or other FSP acts as an intermediary and commits to paying a buyer's invoices to suppliers using the buyer's credit rating. The supplier receives early payment from FSP in exchange for a discount. Buyer pays the full invoice on the agreed due date (Lekkakos & Serrano, 2016; Liebl et al., 2016; Tanrisever et al., 2015; Wuttke et al., 2016).	Post shipment financing FSP is an intermediary Buyer-approved invoices Supplier financing using buyer's credit rating Supplier receives payment from funding firm
Dynamic Discounting	Suppliers can trigger early payments at a time of their choice. Buyer and suppliers collaboratively adjust standard payment terms dynamically; the discount is a linear function of the time outstanding (Caniato et al., 2016).	Post shipment financing Supplier can elect advance payment from the buyer in exchange for variable discounts Buyer uses internal funds for financing
Purchase order Financing	Suppliers can gain access to capital from an FSP based on the purchased orders issued by their creditworthy and reputable buyers prior to delivering products (Camerinelli & Bryant, 2014; Wuttke, Blome, Foerstl, & Henke, 2013).	Pre-shipment financing FSP funds supplier based on a purchase order Buyer provides acceptance guarantee
	Asset financing	
Inventory Financing	Suppliers obtain financing from an FSP or extend credit lines from buyers by exploiting the value of assets rather than the credit rating. Inventory financing has recently involved using a third-party logistics provider as a financial service provider to purchase goods from suppliers and resell them to the buyers after a period of time (Elliot et al., 2020; Hofmann, 2009; Hofmann & Wetzel, 2018).	Current assets with inventory used as collateral Buyer may offer funding for inventory

Note. Detailed descriptions of supply chain finance terms and instruments appear in Appendices A and B. FSP = financial service provider.

The adoption of SCF solutions requires a network approach and exertion of three distinct levers: (a) collaboration, (b) an enabling technology platform for digitizing processes and improving the visibility of transactions, and (c) financing from banks or other funding agents (Caniato et al., 2016; Hofmann et al., 2021; Templar et al., 2020). Although the market for SCF has continued to grow, especially between OEMs and first-tier suppliers, few researchers have made empirical investigations of the motivations and challenges involved in attracting and adopting SME suppliers into a network of end-to-end financing options (Caniato et al., 2019; Hofmann et al., 2021). Dekkers et al. (2020) identified four organizational aspects shaping adoption:

- Knowledge of methods for evaluating the value of SCF instruments beyond financial departments—especially for SME firms—has remained limited.
- Successful implementation of SCF requires considerable intrafirm and interorganizational collaboration and communication.
- Interorganizational relationships relate to gaining trust and exerting power.
- National culture may impact the implementation of SCF instruments.

Bals (2019) identified multiple financial aspects shaping adoption: First, optimizing working capital in buyer-supplier relationships across a supply network depends on the business model and the supply chain design configuration. Second, concerning liquidity, the reverse factoring instrument can considerably improve a supplier's operational performance while potentially unlocking more than 10% of the supplier's working capital (Lekkakos & Serrano, 2016, p.367). Third, extended payment terms to suppliers can transfer risk to the supply base and impose higher capital costs on

suppliers with restricted access to short-term financing (Hofmann & Kotzab, 2010). Fourth, management of the cash conversion cycle through optimized capital financing provides value previously ignored (Randall & Farris, 2009). Klapper (2006) found that the reverse factoring practice mitigates the problem of a borrower's informational opacity if only receivables from high-quality buyers are applied.

Conceptual factors influencing SCF Adoption with SME Suppliers

This section introduces conceptual factors from the literature relevant to the adopting SCF in defense and commercial business environments. These conceptual factors include inter-organization governance concepts from transaction cost economics, the financial interdependencies between an OEM and its SME suppliers, the OEM strategic motives used for promoting SCF with the supply base, the options of alternative working capital finance instruments available to SME suppliers, collaboration with multiple stakeholders, and the role of digital technology platforms.

SME suppliers considering the adoption of the RF instrument should assess multiple quantitative elements, including the timing of early payments, discount rates, invoice approval times, supplier opportunity cost, credit insurance, and implementation costs (deGoeij, 2022b). Other qualitative aspects affecting the SME adoption decision space include experience and knowledge with SCF instruments, information exchange, new communication requirements, and the roles of collaboration, power, and trust in buyer-supplier negotiations. (deGoeij, 2022b).

Transaction Cost Economics – A Theoretic Lens for SCF Adoption

Transaction Cost Economics (TCE) is one of the most widely referenced organizational governance theories used in operations and supply chain management research (Ketokivi & Mahoney, 2020). TCE offers a lens and high explanatory power for understanding inter-organizational governance aspects of SCF adoption (Dekkers et al., 2020; Gelsomino et al., 2022; Wuttke et al., 2013a). TCE concepts explain firm behaviors to minimize transaction costs and to reflect the roles of uncertainty, opportunism, and frequency to inform SCF adoption decisions in the buyer-supplier relationship (Dekkers et al., 2020). Economic approaches in the study of organizations tend to focus on efficiencies, including the overall structure of the enterprise, the operating parts of a firm, and how human assets are organized (Williamson, 1981). TCE (Williamson, 1979, 1981, 1996, 2008) offers a useful theoretical lens for assessing how firms negotiate and govern interorganizational buyer-supplier relationships (Handfield & Bechtel, 2002), outsourcing (Ellram et al., 2008), and efficiency (Ketokivi & Mahoney, 2020). The foundational premise of transaction cost economics is that effective management of transactions requires efficient governance, which consists of cooperation and coordination to realize mutual gains and mitigate contractual hazards arising from risks and uncertainties (Ketokivi & Mahoney, 2020; Williamson, 1996).

The TCE conceptual factors of asset specificity, uncertainty, and frequency are sources of differential governance costs (Williamson, 1979). Uncertainty is further delineated by the dimensions of bounded rationality and opportunism (Williamson, 2008). These factors can offer explanatory insights with which to understand relational contracts between large buyers and SME suppliers regarding the assessment of SCF

instruments (de Goeij et al., 2021; Dekkers et al., 2020; Martin, 2017; Martin & Hofmann, 2019; Wuttke et al., 2013a).

Asset specificity relates to durable investments undertaken in support of particular transactions (Williamson, 1985, p.55). In the context of SCF, these transaction-specific investments may entail additional personnel and skilled resources to assess the adoption and subsequently manage the implementation of an SCF practice (de Goeij et al., 2021). De Boer et al. (2015) noted that adopting SCF practices by a supplier may incur additional legal fees or costs for regulatory needs or process changes. Potential investment costs that ought to be considered in the evaluation of SCF adoption include ERP and software interface costs with the SCF platform, legal fees to review contract agreements, and internal project management and staff training required for onboarding (Templar et al., 2020, pp.255 - 256).

Uncertainty regarding an agreement exists when "the contingencies affecting the execution of the agreement are complex and difficult for the trading partners to understand, predict, and articulate" (Pisano, 1990, p.156). Uncertainty manifests as difficulties monitoring transaction partners' behavior and compliance with contracts because of elusive performance evaluation and information asymmetry (Williamson, 1985).

Bounded rationality leads to suboptimal decision-making and results from restrictions in time or cognitive ability to receive and process information (Pisano, 1990; Williamson, 1975) and imperfect information (Simon, 1957). Several researchers studying SCF have reported limited ability among SME firms to accurately understand the financial and organizational impacts of adopting an SCF instrument (Dekkers et al.,

2020; Wuttke et al., 2013a). de Goeij et al. (2021) showed that bounded rationality is attributable to internal factors within an SME supplier firm, such as limited prior experience and intrafirm collaboration with SCF practices and limited ability to assess the total financial impact of SCF adoption accurately.

Opportunism in an organizational context reflects the assumption that humans are driven by self-interest (Williamson, 1975). Opportunism contributes to the uncertainty of a transaction, which can lead to higher transaction costs linked to additional coordination and monitoring activities (Ketokivi & Mahoney, 2020). Opportunism in SCF may occur due to incomplete or inaccurate information sharing (Hobbs, 1996) or lack of trust (Bromiley & Cummings, 1995). In the context of SCF adoption observed in the field, OEM buyers use their bargaining power to unilaterally extend payment terms and then pressure suppliers into reverse factoring practices to offer early payment options for a discount fee (Caniato et al., 2016; Liebl et al., 2016).

Frequency refers to the volume of transactions processed through a specialized governance structure (Williamson, 1985). The frequency of investments in transactional governance can be measured as recurring or occasional (Williamson, 1985). In the context of SCF, the volume of recurring transactions might be a consideration if an increasing scale of B2B transactions results in discounted fees in the buyer-supplier–financial service provider set of relationships (de Goeij et al., 2021). The frequency of SCF transactions did not influence adoption decisions based on the case study findings by de Goeij et al. (2021).

SME Supplier Financial Interdependencies with an OEM Buyer

The visibility of cash flow distress influences interdependency with an SME supplier and the overall financial viability of the SME firm to remain a going concern (Bode et al., 2014). Wuttke, Blome, and Henke (2013) identified an understanding of a buying firm's underlying working capital positions and its critical suppliers in the network as an antecedent for pursuing the adoption of SCF. Martin and Hofmann (2019) identified a buying company's financial strength, intra-firm working capital strategy, and a supplier's financial strength and working capital orientation as critical interdependencies for supply-side SCF adoption.

Bode et al. (2014) identified criteria to monitor and manage financial distress with upstream suppliers. Bals (2019) found that optimizing working capital in buyer-supplier relationships across a supply network depends on the business model and the supply chain design configuration. Concerning liquidity, the reverse factoring instrument can considerably improve a supplier's operational performance while providing the potential to unlock more than 10% of the supplier's working capital (Lekkakos & Serrano, 2016, p.367). Extended payment terms to suppliers can transfer risk to the supply base and impose higher costs of capital to suppliers with restricted access to short-term financing (Hofmann & Kotzab, 2010). Management of the cash-to-cash conversion cycle (CCC) through optimized capital financing provides value previously left on the table (Randall & Farris, 2009).

Caniato et al. (2016) measured the financial attractiveness of the buyer given an investment level credit rating as an important moderating factor for adoption. de Goeij et al. (2021) examined the implications of bounded rationality based on SME suppliers'

prior experience with SCF instruments, the availability of a calculation model to determine the economic value of joining an SCF program, and the range of intrafirm collaboration to achieve consensus for accepting an offer. The researchers measured opportunism via the bargaining power of a buyer, completeness of SCF instrument information from the buyer, and degree of trust an SME supplier has in the buyer.

OEM Buyer Strategic Motives

From a broader supply chain management perspective, several strategic drivers impact the consideration of adopting of SCF practices for a firm and its network of B2B stakeholders (Caniato et al., 2016; De Boer et al., 2015). A compelling framework for assessing the strategic value of adopting and implementing SCF practices consists of three broad dimensions: (a) financial performance, (b) delivery performance, and (c) relational performance (De Boer et al., 2015). Table 2 depicts these dimensions.

Table 2: Strategic Motives for Promoting Adoption of Buyer-Led Supply Chain Finance Practices

Value and feature	Description
Financial performance	
Releases/optimizes working capital	Enables firms to reduce cash conversion cycle
Return on investment	Can reduce the cost of capital by using a better credit rating of a large corporate buyer Can reduce the cost of goods sold with the downstream ripple effect
Delivery performance	
Risk management perspectives	Averts risks of suppliers not being able to source due to lack of funds Continuity of the inbound supply from upstream network Reliable production/final assembly capability at OEM
Responsiveness and innovation perspectives	A focal buying company can leverage supply chain finance practices to ensure suppliers have funds to invest in spare production capacity

	Allows for investment in advanced innovation technology Allows for quick response to demand surges
Relational performance	
Maintenance of enduring relationships	Strong buyer-supplier relationships are essential for high-performing supply chains Enhances trust, commitment, transparency, and flexibility

De Boer et al. (2015) strongly promoted the likelihood of integrated physical, information, and financial collaboration. They contended that companies seek to improve the supply chain with their direct suppliers and sub-tier suppliers further upstream. From a practitioner perspective, De Boer et al. revealed several consistent principles for adopting SCF practices, including the following: (a) Corporate finance strategy must align with supply chain strategy in the design of objectives and boundaries of an SCF program; (b) The integrated strategy should align flows of B2B information, materials, logistics, and corresponding financial information; (c) The SCF solution should prompt interorganizational collaboration to create joint value among stakeholders; (d) Formulation of the SCF program should always occur with the ultimate customer in mind, emphasizing a globally optimal solution rather than local optimization concerning a specific nodal operator; (e) Monitoring effectiveness of an SCF practice requires establishment of relevant and precise performance measurements linked to strategic intent.

Caniato et al. (2016) identified three types of strategic objectives that shape buyer adoption of an SCF solution including: (a) improvement of financial cash flow performance at the corporate enterprise level; (b) improvement of supply chain stability by reducing financial risk with the supply base and even accepting a decrease in its own

financial performance to do so; (c) or pursuit of a balanced approach to achieving both objectives (a) and (b) with compromise tradeoffs.

Alternative Working Capital Financing Instruments for SME Suppliers

Adopting SCF practices is only suited for some SME supplier (Elliot et al., 2020). The financial strength of an SME supplier, its credit rating, and relationships with host banks influence the SCF adoption decision. The SME supplier may benefit more from traditional commercial debt instruments, such as a line of credit, depending on the fees charged for the SCF services. In some cases, defense OEMs may offer SME subcontractors alternative defense contract financing through cost-plus predelivery contracts (DoD Report, 2023a).

Berger and Udell (2006) analyzed SME credit availability issues and found that the choice of lending technology for a specific creditworthy SME depends on the sources of information available for that SME and the adaptability and appropriateness of the techniques used for screening, underwriting, contracting, and monitoring transactions. At the time Berger and Udell (2006) conducted their study, the traditional lending technologies in place included (a) financial statement lending, which often depends on future cash flows; (b) small business credit scoring converted into loan performance prediction for loans of up to $250,000; (c) asset-based lending based on the value of inventory held or accounts receivable; (d) factoring applied to accounts receivable in which an underlying asset is sold to a lender, based primarily on the quality of the obliger; (e) fixed-asset lending, in which long-lived collateral such as real estate is pledged; (f) leasing to finance equipment, motor vehicles, or real estate; (g) relationship

lending based on soft information directly gathered from an SME over time; and (h) trade credit as an exchange between buyer and supplier. According to Cusmano and Koreen (2015, p. 32), SMEs tend to employ traditional forms of debt financing to cover working capital expenses.

Table 3 provides a reference point for comparing the buyer-led reverse factoring instrument with other more traditional alternatives available to SMEs to finance working capital needs.

Table 3: Alternatives for Financing Short-Term Working Capital Needs

Finance instrument	Typical features and benefits
Reverse factoring	Cash received based on 100% of the invoice value Interest based on OEM buyer's credit rating Cash received is not considered debt. Cash received upon invoice approval + 10–15 days Low cost of capital—APR at prime + 150–250 basis points
Line of credit loan	On demand cash provided by a host bank Interest based on the supplier's credit rating Medium cost of capital APR at 9%–12%
SBA 7(a) guaranteed loan	Medium cost of capital—APR at 8.25% + 450 basis points Long-term amortization period—up to 10 years
Accounts receivable factoring	Cash received based on 70%–80% of the invoice value Interest based on the supplier's credit rating Cash received is considered debt—affecting credit rating High cost of capital—APR typically 15%–24%
Purchase order financing	Cash received typically covers 15%–30% of purchase order High cost of capital—APR typically 20%–50%

Note. A single basis point is one-hundredth of a percentage point (e.g., 6% is equivalent to 600 basis points). APRs listed are snapshot references taken on April 22, 2023. APR = annual percentage rate; SBA = Small Business Administration.

Typical challenges SMEs face in accessing affordable financing include limited credit history leading to substantially higher interest rates and fees, lengthy processing and onerous documentation requirements, minimum loan amounts, and collateral

requirements (Organization for Economic Cooperation and Development, 2022). When receivable cash flows are deferred, SMEs frequently use their line of credit loans to support working capital requirements. An SME may seek one or more lines of credit loans based on the magnitude of eligible receivables, credit history, other collateral, and personal relationships. SBA 7(a) guaranteed loans have been another viable source of funding for working capital or for production capacity expansion (SBA, n.d.). Such a loan requires a robust personal credit score and reasonable personal equity invested in the business before applying. Accounts receivable factoring is a costly instrument to bridge cash flows from slow-paying clients (U.S. Chamber of Commerce, n.d.). Purchase order financing takes place before goods and services are delivered to an OEM customer, with fees of up to 2% per month.

The U.S. government has promoted relevant initiatives to help SMEs access working capital much more affordable. The most notable of these programs has been the U.S. Supplier Pay Initiative, launched in 2014 in collaboration with private industry (White House, 2014). This initiative aligned with the intent of SCF programs and principles.

Defense Business Environment—Contracts and Financing Mechanisms

Table 4 summarizes of different contracts and instruments available to prime contractors in the DIB. The purpose of the table is to provide a reference point for comparing payment terms of alternative instruments.

Table 4: Defense Contracts and Working Capital Instruments

Instrument	Typical features and benefits
Delivery contracts	Delivery invoices are paid within 30 days (Prompt Payment Act) The average payment in 15 days following invoice approval
Predelivery cost-plus contracts for prime contractors	Consistent cash flows to OEM prime contractors Progress or performance milestone payments within 30 days Available for select acquisition programs; used for production and delivery of complex weapon system platforms Monthly payments based on accrued or forecast costs plus fees Negotiated markup fees range from 5% to 25% OEMs offer flow down of cost-plus contract financing instrument to approximately 30% of subcontract suppliers
Accelerated payments	Payments to OEMs in advance of negotiated terms Applied in extreme conditions or circumstances The intent is to flow down accelerated payments to small business suppliers
Purchase order financing	Cash received typically covers 15%–30% of purchase order High cost of capital—annual percentage rate typically 20%–50%

The government's intent for delivery contracts is to pay approved invoices within 30 days. The average payment to prime contractors is made within 15 days (Defense Finance Contract Study, 2023). Pre-Delivery Cost-Plus contracts provide consistent cash flows to OEM prime contractors based on progress or performance-based milestones. Accelerated payments are made in advance of the normal 30-day payment term under national emergency conditions such as the COVID-19 pandemic or to ramp up for a contingency operation.

Collaboration Culture

Collaboration plays an essential moderating role in increasing awareness of the features and benefits of successful SCF adoption with multiple stakeholders (Caniato et al., 2016; de Goeij et al., 2021; Liebl et al., 2016; Martin & Hoffman, 2019; Wuttke et al., 2013a). Collaboration across functional roles is needed for intra-firm stakeholders, inter-

organizational managers, and financial service providers for the implementation of SCF to achieve a sense of both trust and power balance within the buyer-supplier relationship practices (Bals, 2019; Caniato et al., 2016; Dekkers et al., 2020; Wandfluh et al., 2015). Dekkers et al. (2020) also emphasized the need for supplier training and development to achieve desired benefits of adopting an SCF solution.

Negotiating power and trust within the buyer-supplier relationship influences SCF adoption (Caniato et al., 2016; Dekkers et al., 2020). Successful adoption also requires collaboration with one or more financial service provider intermediaries for funding and establishing discount rates and fees for services (Caniato et al., 2016; de Goeij et al., 2021; Dekkers et al., 2020; Liebl et al., 2016; Martin and Hoffman, 2019).

de Goij et al. (2021) examined the implications of bounded rationality based on the SME supplier's prior experience with SCF instruments, the availability of a calculation model to determine the economic value of joining an SCF program, and the range of intra-firm collaboration to achieve consensus for accepting an offer. Opportunism was measured via buyer bargaining power, completeness of SCF instrument information from the buyer, and the degree of trust the SME supplier has in the buyer. The results of de Goeij et al.'s (2021) case study indicate that employing the SCF instrument of reverse factoring does not always generate an outcome satisfactory to a supplier because of the limited information available about the offer and the high degree of buyer opportunism involved. Alora and Barua (2019) found that disclosure of sensitive financial information was a significant barrier to SCF adoption for SME manufacturing companies.

Phraknoi et al. (2022) found that SMEs rely on relational trust because they need more awareness of the complexity of the various SCF schemes. Many SMEs reported opportunism or controlled manipulation presented as an implied choice between accepting longer payment terms and no longer being a supplier. SMEs were also concerned about signaling financial weakness if they accepted SCF offers using a buyer's banker of choice. These researchers also identified several non-transactional considerations regarding maintenance of relationships, imperative to retain control, and importance of signaling concerns (Phraknoi et al., 2022, p.1460).

Role of an SCF Digitization Platform

A common proposition from the extant literature is that innovative SCF solutions are enabled by a high level of trade process digitization (Wuttke et al., 2013a; Caniato et al., 2016; Martin & Hofmann, 2019). A financial service provider's reputation and IT capabilities of a supporting SCF FinTech are essential capabilities for adopting an SCF solution (Martin & Hofmann, 2019).

Vital features prompting SCF adoption include digitization of the procurement-to-payment process using cloud-based technologies to connect working capital lending with multiple stakeholders, invoicing, approval, and payment (Global Treasurer, 2019). More and Basu (2013) emphasized the importance of digitizing trade credit processes to overcome manually intensive payment procedures; doing so can vastly improve the efficiency and visibility of transactions.

From a digital technology perspective, Caniato et al. (2016) found that the level of digitalization of trade credit processes significantly moderates the adoption of innovative

SCF instruments. Gelsomino et al. (2022) characterized key themes regarding the relationships among technology, transparency, and adoption of SCF schemes as follows:

- Technology provides an increasing degree of transparency.
- Transparency enhances transformation in SCF offerings.
- Transparency implies triadic/tetradic relationships (buyer–supplier–financial service provider–SCF fintech firm) that enable or inhibit SCF provision.
- Fintech and bank partnerships have been transforming SCF adoption and use.

Phraknoi et al. found that many SME firms had to interface with multiple banks or platforms to conduct SCF transactions with various customers.

Conceptual Framework for Case Study

Each concept reflected in Figure 2 below was derived or adopted from the previous case SCF case studies addressed in the literature review.

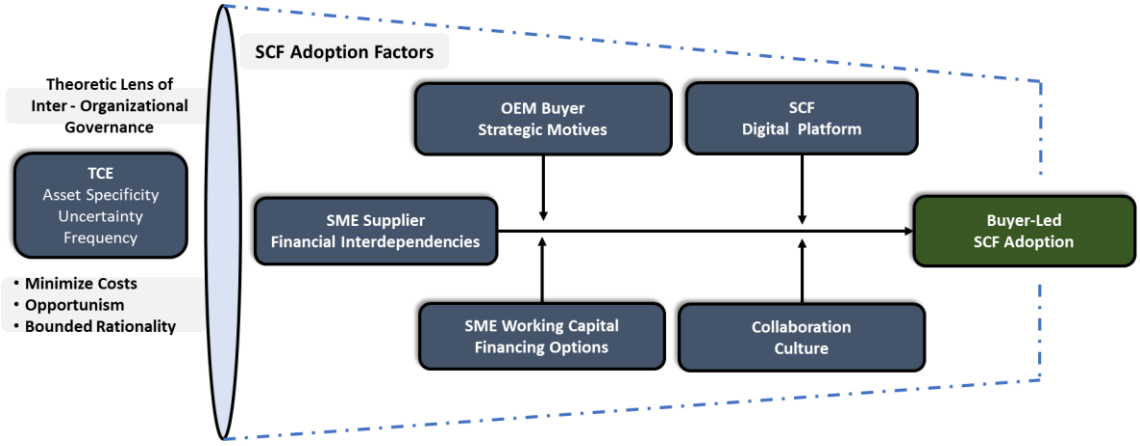

Figure 2: Conceptual Framework for Exploring Buyer-Led SCF Adoption

The dependent variable is the adoption of a buyer-led SCF instrument. The independent variable is the SME supplier's financial interdependency with the OEM

buyer. The other four concepts reflected have a moderating influence in line with propositions from the previous SCF case studies. The table below further describes and operationalizes each conceptual variable for a priori coding.

Table 5: Conceptual Framework – Operationalization for A Priori Coding

Concept variables	**Description and Operationalization**
Buyer-Led SCF Adoption • Intermediation • Governance • Minimize Costs	Dimensions of SCF adoption concept include the type of buyer-led instrument offered including Reverse Factoring, Dynamic Discounting, Purchase Order Finance or Inventory Finance (Hofmann et al., 2021). Adoption of buyer-led instruments by an SME supplier requires assessment of terms, performance trends, affordability in annual percentage rate, and spend volume access. (Caniato et al., 2016; deGoeij et al, 2021; Lekkakos and Serrano, 2016; Martin and Hoffman, 2019; Wuttke et al., 2013a, 2013b)
SME supplier financial interdependencies	Posture and visibility of SME Supplier cash flow; Criticality of material sourced by supplier; spend volume Days Payable Outstanding (Bode et al. 2014; Wetzel and Hofmann, 2019) Magnitude and Frequency of Cash Flow Distress; signals for likelihood of critical supplier bankruptcy (Bode et al., 2014)
OEM strategic motives	Working capital position, reduction of CCC; Stability and resilience of supply chain operations; strengthening of buyer-supplier relationships (Caniato et al., 2016; de Boer et al., 2015).
Other working capital financing options	Adoption of SCF practices depends on the financial strength of an SME supplier, its credit rating, and its relationships with host banks. Sometimes, the SME may benefit more from traditional commercial debt instruments, such as a line of credit supplier (Caniato et al., 2016). In some cases, defense OEMs may offer SME subcontractors alternative defense contract financing in the form of cost-plus predelivery contracts (DoD Report 2023a).
Collaboration Culture • Opportunism • Bounded Rationality	A primary goal of SCF is to minimize transaction costs while addressing issues of uncertainty, and opportunism in the buyer–supplier relationship (Williams, 2008). Collaboration is an essential mechanism for increasing awareness of the features and benefits of adoption for multiple stakeholders. Educating stakeholders across departments within an OEM and with potential SME suppliers requires deliberate investments in time and energy to promote a viable business case. (Liebl et al., 2016; Caniato et al., 2016; Martin and Hoffman, 2019; deGoeij et al., 2021). Successful adoption requires collaboration with one or more financial service provider intermediaries; to understand benefits of digitized procurement-to-payment business processes (Liebl et al., 2016; Caniato et al., 2016; Martin and Hoffman, 2019; de Goeij et al., 2021)
Role of the SCF digital platform	The SCF digital platform provides an essential component to enable efficiencies for making SCF practice attractive via a simple onboarding process, improving transparency of the procurement-to-payment process

Concept variables	Description and Operationalization
	for all transactions, and enabling timely governance of transactions to deliver automated and consistent payments to SME suppliers (Wuttke et al., 2013a; Caniato et al., 2016)

Notes: Acronyms used Original Equipment Manufacturer (OEM); Small Medium Enterprise (SME); Supply Chain Finance (SCF).

The conceptual framework and variables described above provided the basis for the design of the interview protocol used to assess the state of SCF adoption in the defense and commercial business environments. There is no known empirical evidence assessing the adoption of buyer-led SCF practices with SME manufacturers and suppliers in the setting of the U.S. DIB. This gap prompts a better description and understanding of the roles of multiple stakeholders, including DoD Customers, the role of the large defense OEMs, the role of financial service providers, including SCF fintech firms providing a digital information exchange platform and a better understanding of SME supplier cash flow needs in the defense business environment.

My review of the literature continued throughout the interview engagements, data collection, and analysis process of this exploratory research. For example, one key phrase used or inferred by several case study respondents was the need for enterprise-level orchestration to generate a broad and unified approach for mitigating cash flow distress to SME subcontracted suppliers in the DIB (See summary results in Appendix E from Groups 3 and 4).

Bals (2019) explored fragmentation in the SCF ecosystem and implications limiting or hindering more comprehensive adoption of SCF programs. There is a common recognition that SCF providers must agree on standard terminology and

standard processes to further penetrate target markets (Global Supply Chain Finance Forum, 2016; Martin & Hofmann, 2017). For example, the reverse factoring instrument is offered and communicated to the market under a wide variety of naming conventions, including SCF, approved payables financing, an early-payment product, or a true-sale product. Therefore, it becomes difficult for customers to understand products and compare different services' (Martin & Hofmann, 2017, p.54). This is coupled with a wide variety of financial service providers offering SCF products and services with slightly different processes and procedures. To further evolve, the SCF ecosystem depends on common standards and naming conventions for information exchange with multiple stakeholders. Ecosystem research in the SCF literature is missing related to actor and software interactions and technological infrastructure. One important ecosystem role is that of the orchestrator, the actor or set of actors typically responsible for governing and supporting the ecosystem (Manikas, 2016).

Bals and Bals (2019: pp. 217-220) suggest that the SCF ecosystem should be aligned with how the open-source software community is organized, where success is deeply dependent on cooperation around commonly agreed standards. This form of orchestration is decentralized, and process driven. The interdependent principles of standardization and actor diversity form the basis for practical cooperation in the SCF ecosystem to follow the same sets of rules and to facilitate the efficient flow of information between different sets of actors. This approach to orchestration leads to the standardization of concepts, conditions, and regarding execution. From a conceptual perspective, multiple definitions in both practice and academia make it difficult to understand and compare products for similar offerings. From a conditions perspective,

there remains much friction regarding which parameters are relevant to SCF offerings, and how those parameters are measured and disclosed. From an execution perspective, data formats, data exchange requirements, and information security protocols from diverse proprietary systems generate complex barriers with the stakeholder community.

Bals and Bals (2019) prompt the three following propositions to enable orchestration within a fragmented SCF ecosystem. The first proposition is that standardization of concepts, conditions and execution is needed to further develop the SCF ecosystem. This first proposition is clearly linked to the role of SCF digitization elevated by (Caniato et al., 2016; Wuttke et al., 2013a; Wuttke et al., 2013b). Intermediaries in the SCF ecosystem can add value by helping to bridge differences in terms and processes and by elevating transparency on different offerings to enhance the decision-making process of stakeholders. The second proposition prompts a greater diversity of participating actors to further develop the SCF ecosystem. Non-profit organizations like the Global SCF Forum and the SCF Community provide venues and professional development to promote broader diversity and participation. Bals and Bals (2019) recognize there is a gap in research revolving around the orchestration of the SCF ecosystem. In business and in nature, the leader of orchestration is not usually a singular entity, but rather a quorum of leaders that shift over time. The situational context leads to a third proposition prompting the development of a decentralized orchestration mechanism, which is process driven and builds on established standards managed by a diverse community composed of individuals, commercial and non-commercial organizations.

Chapter Three: Research Design and Methods

This chapter characterizes the research design, data collection instruments, and the analytic approach used to converge evidence from multiple sources. The study aimed to explore the state of SCF adoption between defense procurement contracts and a commercial business setting in the context of organizational intermediation and alternatives used for financing SME supplier working capital needs. This chapter describes the rationale for applying a case study research methodology, research setting and scope, approach used to recruit case study participants, data collection methods, coding and data analysis**,** interpretation processes, and the approach used to address trustworthiness.

Research Methodology and Rationale

A single case study research design was employed with embedded units across four groups of intermediaries to explore the state of SCF adoption between business environments. (Yin, 2018). The case study involved the evaluation of SCF adoption in context with alternative types of working capital finance instruments used to help address the affordable and timely cash flow needs of SME suppliers. The case study research method is appropriate for exploratory studies focused on understanding and in-depth description of complex organizational processes involving multiple stakeholder perspectives and simultaneous interactions, including technology implementation projects

in a real-life context (Bhattacherjee, 2012; Eisenhardt, 1989; Simons, 2009; Yin, 2018). The case study approach included an examination of several SCF theoretical propositions of interest.

Given the exploratory nature of the research to better understand organizational intermediation by multiple stakeholders involved in the SCF adoption process, I employed an adaption of the Gioia method (Gioia et al., 2013). The Gioia method consists of three steps to support coding, analysis, and interpretation of outcomes. The first step involves coding and identifying first-order findings from respondents in the four embedded groups. The second step involves identifying consistent patterns and themes reflecting major findings from across groups. The third step involves synthesizing and aggregating findings to generate thematic categories and the overall meaning of the case study. The third-order analysis also prompts the generation of case study assertions and propositions to enable continued research in the defense business environment.

Through the case study methodology just described, I sought to extend SCF theory by describing how SCF practices are successfully adopted or constrained among multiple intermediaries influencing the buyer-supplier base relationships in the high-tech manufacturing industry. I also sought to identify and isolate how prevalent externalities of defense procurement contracts influence SCF adoption decisions. The convergence and analysis of data collected promoted construct definition, validity, and measurability and allowed for comparison with extant literature.

The case study research approach involved drawing inferences through the convergence of several data sources based on my interviews of experts across four groups of embedded intermediaries – two groups aligned with the defense business environment

and two groups aligned with a commercial business environment – and considered in context with relevant source documents, and observation (Bloomberg & Volpe, 2019). Individual interviews are suitable for exploratory research when little is known about the processes and interactions of stakeholders concerning the phenomenon of interest (Yin, 2018). Responses from the four groups were analyzed to compare, contrast, and synthesize perspectives regarding same-construct issues (Stake, 2013). Secondary sources of evidence regarding the adoption and implications of SCF practices with SME suppliers included insights from other public studies, trade journals relevant to SCF adoption, and relevant webinars sponsored by nonprofit organizations such as the Global SCF Forum (http://supplychainfinanceforum.org/), and SCF Community (https://scfcommunity.org/) and my direct personal observations with SCF industry participants. The postpositivist approach I followed rests on the assumption that cultural and social contexts influence theories (Chukwudi et al., 2019).

SCF scholars have conveyed that a consensus has yet to emerge regarding a comprehensive theory of the adoption and governance of SCF (Caniato et al., 2019; Gelsomino et al., 2016. The case study research approach enabled the collection and synthesis of comprehensive viewpoints regarding intrafirm and interorganizational perspectives, adoption boundaries experienced by stakeholders, and decision criteria used by stakeholders to assess the business case, features, and SCF adoption benefits. The state of SCF adoption in the defense OEM sector was then compared to SCF practices firmly implemented and matured in a commercial OEM setting across multiple business units involved in delivering high-tech products and services.

Theoretical sampling guided case selection to replicate similar aspects of previous SCF case studies and test theoretical propositions identified during the literature review. The process included developing the interview questions in the context of a priori concepts from extant SCF literature as a basis for replicating or extending theory. Five prominent SCF studies provided the basis for the conceptual framework. A concept-driven coding approach established the interview instrument protocol based on the conceptual framework developed and described in Chapter 2.

For example, Martin and Hofmann (2019) conducted an exploratory multiple-case study design with eight European buyer-supplier-financial service provider triads to describe the buyer-led circumstances and expected benefits of SCF adoption. The Martin and Hofmann (2019) case study focused on approved payables financing, working capital orientation, aggregate buyer-supplier interdependence, cash flow uncertainty, payment terms, and the contingent decision criteria applied to adopt the most popular SCF instruments employed - Reverse Factoring and Dynamic Discounting. The case study also assessed the explanatory power of transaction cost economics theory. The study generated several propositions to extend SCF theory related to information exchange across the buyer-supplier relationships, sourcing and timing of SCF funding, and other moderating effects such as the role of the digital SCF platform. Their findings underscored the importance of buyer power to pressure suppliers into participation.

Caniato et al. (2014) analyzed SCF adoption using a multiple case study methodology with 14 Italian firms. The Caniato et al. study evaluated various strategic objectives leading to the adoption of SCF. It assessed moderating variables related to collaboration, SCF platform digitalization, and buyer power.

de Goeij et al. (2021) evaluated eight SME supplier responses to SCF reverse factor offers using the theoretic lens of transaction cost economics. This study elevated quantitative and qualitative decision criteria in the adoption decision-making process.

The interview protocol used appears in Appendix C. Pilot tests with experienced professional or academic colleagues involved in procurement, supply chain operations, and SCF practices were used to check the content validity of the semistructured interview protocol. Pre-test participants included two academic colleagues and two SCF practitioners to assess the validity between the interview protocol and the purpose of the a priori conceptual variables. The a priori concept variables used, and the purpose of each for the interview protocol are reflected in Table 6 below.

Table 6: Concept-Driven approach used for Design of Semistructured Interviews

A priori concept variables	**Purpose for Interview Protocol**
SCF adoption • Minimize Cost	To determine and analyze what type, if any, SCF practice was used; and whether there was awareness of the potential benefits of the buyer-led reverse factoring instrument; to identify access boundaries and perspectives on affordability.
SME supplier financial interdependencies	To determine the sequential criteria to foster buyer-led SCF practices with a supply base as a primary antecedent for adoption.
Other working capital financing options	To understand other working capital finance options considered by SME suppliers in making the SCF adoption decision.
OEM strategic motives	To determine the hierarchy of motives prompting fostering and adoption by an OEM buyer with its supply base partners.
Collaboration culture • Uncertainty • Opportunism	To assess at three levels: Intra-firm; Inter-firm, and with Financial Intermediaries; To assess the theoretical role of transaction cost economics as an initial lens for explaining the role of minimizing transaction costs, uncertainty, and opportunism in the buyer-supplier relationship and degree of influence on SCF adoption decisions;
Role of the SCF digital platform	To validate the role of the SCF platform as an essential component for enabling transactional efficiencies, visibility, and timely governance.

The case study approach enabled the assessment of conceptual variables and propositions regarding asset specificity, uncertainty, SME supplier financial interdependencies, the consideration of alternate finance options available to SMEs, strategic motives of the OEM, collaboration, and the role of the SCF digital platform influencing the buyer-led SCF adoption decision-making process.

Research Setting

The focal firm for the case study was an active and recognized OEM (prime vendor contractor) offering final assembly, spare parts, and maintenance services. Figure 3 below depicts the roles of, and relationships among, the case study participants as intermediaries. The unit of analysis was the organizational intermediation perspectives with embedded respondents aligned to a defense business environment and within a commercial business environment.

The four organizational perspectives include a) Group 1 - DoD customers; b) Group 2 - OEM and an SME supplier in a commercial business environment; c) Group 3 - OEM and SME Suppliers in a defense business environment; d) Group 4 - SCF financial service providers including Fintech firms, a large U.S. Bank, and a firm specializing in financing for defense contracts. The level of analysis varied across organizational boundaries to allow exploration of policy and program perspectives, explore working capital finance alternatives relative to SCF practices with field agents, and to gain perspectives from SME suppliers in the field.

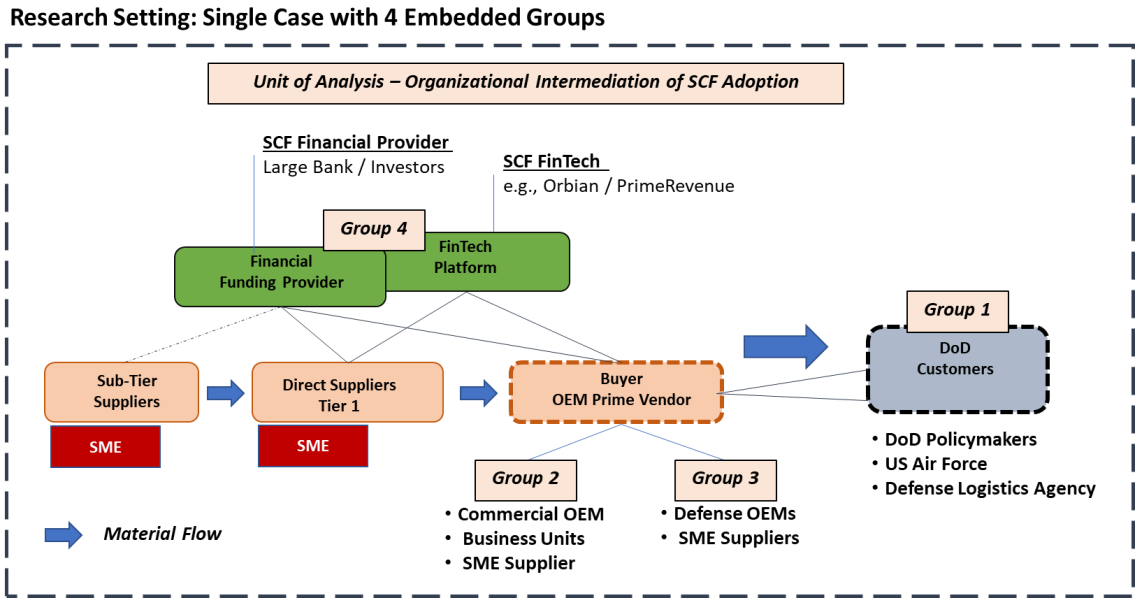

Figure 3: Case Study Research Setting

Note: SCF = supply chain finance; DoD = Department of Defense; SME = small–medium-sized enterprise.

Group 1 respondents were DoD customer executives engaged in industrial policy, contract management, and operational supply chain management activities. The collection of data from Group 1 included interviews and follow-up engagements with seven executives responsible for influencing policy and management related to the readiness of the DIB, possessing an in-depth understanding of financing used for defense contracts, and being responsible for promoting participation and retention of SMEs in the supply base.

Group 2 respondents represent a multinational commercial OEM firm with eight business units offering high-technology products and services. The commercial OEM respondents had deep experience in the intermediation of an SCF program with the firm's Tier 1 supply base across North America, which began in 2008. This group provided a baseline understanding of motives, SCF adoption processes, and detailed procedures for

deriving business cases with SME suppliers. Group 2 included five executives responsible for managing and promoting the SCF program across the enterprise and with SME suppliers. Data collected for this group also included insights from the primary fintech company providing the firm's SCF platform and insights from an SME supplier. The commercial OEM firm selected for the case study is recognized in the SCF community for having one of the most mature SCF programs with robust participation by its supply base and offering access to nearly all SME suppliers. The Commercial OEM firm provided a baseline control for assessing the dimensions of the conceptual framework and understanding the evolution of SCF adoption practices.

Group 3 respondents represented multiple DIB contract OEMs and SME suppliers (subcontracted suppliers). Group 3 included four executives from DIB OEMs and four executives from SME suppliers. Table 7 characterizes the product lines of the defense OEMs and SME suppliers participating in the case study.

Table 7: Defense Business Environment Respondent Profile

DIB respondent	Product line	% defense-oriented sales
OEM 1	Aerospace, missiles, ground combat platforms	
OEM 2	Aerospace platforms	
OEM 3	Aerospace, missiles, communications	
OEM 4	Ground combat platforms	
SME 1	Precision machine shop	~80
SME 2	Mechanical pumps for ground equipment	~75
SME 3	Printed circuit boards	~90
SME 4	Airframe components	~20

Note. Percentage of defense-oriented sales deliberately not reported for OEMs 1–4 to protect confidentiality. DIB = defense industrial base; SME = small–medium-sized enterprise.

Group 4 respondents were executives from the SCF industry offering financing and platform services in the United States. Group 4 consisted of four executives of firms offering SCF solutions, including a vice president responsible for the global SCF program at a large U.S. bank and three executive managers from prominent SCF fintech firms operating in the United States.

Research Population, Sample, and Data Sources

The case study consisted of four embedded groups with a total of 27 respondents who provided alternative perspectives on the state of SCF used in high-technology OEMs with SMEs in their supply bases. Table 8 summarizes the structure of the case study respondents. More detail about respondent roles and experience is in Appendix E.

Table 8: Case Study Respondents with Four Embedded Groups

Respondent type	No. respondents
Group 1: Department of Defense customers	
Defense executive (Office of Secretary of Defense)	4
U.S. Air Force executive	3
Defense Logistics Agency executive	1
Total	8
Group 2: Commercial OEM baseline SCF case	
Corporate Finance Executive - SCF program director	1
OEM Business unit - Supply Chain or Procurement managers	4
OEM SME supplier	1
Total	6
Group 3: Defense Industrial Base - (DIB) OEM and SME suppliers	
OEM Executive (Prime contractor) in procurement, finance, or supply chain [a]	4
DIB SME supplier [a]	4
Total	8

Group 4: SCF Financial Service Providers	
Large U.S. bank SCF executive	1
Fintech executive [a]	3
Working Capital Finance Provider – Specializing in Defense Contracts	1
Total	5
Total Number of Interview Respondents	27

Notes. The data collection period was November 2022 – April 2023. SCF = supply chain finance; SME = small–medium-sized enterprise. [a] Each respondent is from a different organization.

The respondents provided a sample of experts to explore and compare working capital finance practices between defense and commercial oriented contracts. The findings and insights from the semistructured interviews were complemented with evidence from relevant studies, documents, and industry reports.

Recruiting and Permissions

Group 1 - Defense department respondents and Group 3 - defense industry respondents were identified primarily through my existing network of professional contacts and engagements at professional industry events, via outreach through the LinkedIn platform, and then through a series of snowball interactions with interested parties. The Group 2 - commercial OEM firm respondents were identified through academic collaboration with Rutgers University. Group 4 – Financial Service Providers were recruited through the LinkedIn platform and through my professional network.

Recruiting efforts for Group 3 – defense industry respondents - involved sending email and LinkedIn messages to defense industry prime contractors and supporting sub-contractors identified in the Federal Procurement Data System (FPDS). For the large defense OEMs, I targeted my recruiting efforts to experts responsible for supply chain

finance, supply chain operations, and procurement. The first wave of recruiting efforts with defense OEMs consisted of 55 LinkedIn messages to personnel in 10 large defense OEMs to identify where SCF practices had been adopted or considered. The second wave of recruiting efforts on the LinkedIn platform targeted executives of 20 subcontractor firms to the large OEMs.

Unfortunately, the recruiting approach using the LinkedIn platform for Defense OEMs and SME suppliers did not achieve the intent. This approach only converted six responses into follow-up telephone conversations. During those follow-up conversations, two of the six potential respondents stated they could not participate in my research due to OEM firm policies related to legal or proprietary concerns. With two other potential respondents, there was a professional reluctance not to disclose any information about financial policy or practices not already available in public financial reports.

For respondents agreeing to participate in the interviews and follow-up conversations I followed a consistent process of orientation and disclosure permissions. This process began by providing a quick synopsis of the high-level situational context and purpose for conducting the research via email. All respondents agreeing to participate in semi-structured interviews were informed of the intent to protect personal privacy, anonymity of firm participants, and confidential treatment of all data collected.

Data Collection, Coding, and Analysis Methods

Interview data were collected from November 2022 through April 2023. The primary means of data collection centered on the semistructured interviews used to capture insights and perspectives of experts in the field. These interviews lasted 45 to 60

minutes. The interviews were supplemented with content from relevant studies or other secondary sources.

Other source documents and personal observations were used to elaborate on the processes described and to identify and clarify limitations and boundary conditions of the procurement-to-payment process involving supply-base participants.

Select content from the documents described in Table 9 was used to establish background context regarding the problem set and the overall purpose of the research.

Table 9: Key Content Documents and Data Resources

Document or resource	Content
DoD (2022a)	The significant and growing gap in current technology and manufacturing modernization investments between SME firms and large OEM firms
DoD (2022b)	Consolidation and market concentration lead to reduced competition and create sourcing risk
DoD (2018)	Risk archetypes threatening manufacturing include a fragile supplier—a specific supplier that is financially challenged or distressed (pp.24 - 30)
DoD (2023a)	The financial health of the defense industry Financing and payment policy impacts to subcontractors Small business and the importance of cash flow
SCF Community (de Goeij, 2022)	Successful onboarding of SME suppliers in SCF
Global SCF Forum (2016)	Standard market definitions for SCF and related techniques

Note. DoD = Department of Defense; SME = small–medium-sized enterprise; SCF = supply chain finance.

Data Analysis and Interpretation Methods

The goal of the analysis and interpretation phase was to answer each of the research questions. The first-order coding produced perspectives, insights, and experiences from the four embedded groups. The analysis process commenced with the transcribing recorded individual interviews (conducted via Zoom, Microsoft Teams, or by

telephone) and cross-checking the content with field notes. The next step included summary-level validation and clarification of respondent transcripts via participant feedback. Data sets were then coded, categorized, and reordered to explore patterns and corresponding themes, which were converged with content from other documents to tell the stories of participants' contextual experiences and authentic perspectives of the process and value (Simons, 2014).

The second-order analysis generated major findings and themes. Qualitative transcripts were analyzed manually by reducing data collected into distinct themes. The coding was further refined following interviews based on the procedure developed by Strauss and Corbin (1990). After a sufficient number of interviews, I started to integrate data from different sources relating to existing concepts in the SCF literature and the a priori variables and dimensions included in the conceptual framework. Thematic analysis and interpretation of transcript data took place cyclically and iteratively, resulting in themes within each group of the case and then across groups, which delivered contextualized understanding (Bloomberg & Volpe, 2019).

The third-order analysis generated aggregate outcomes, ultimately leading to assertions and propositions for extending SCF theory. These themes reflected overall meanings due to sorting, refining, and refocusing data to derive a sense of applicability to potential analytic propositions or a case theory. (Simons, 2014). Chapter 4 expresses the themes in narrative form with extensive sample quotes from participants, and cross-group interpretations.

Table 10 describes validity and reliability tests for judging the quality of the case study design. The convergence of multiple sources of data and evidence provides construct validity when using the case study research method to identify correct operational measures of concepts under investigation (Ellram, 1996; Yin, 2018). Reliability was achieved by defining and employing a case study protocol, consistently using a case study database, and maintaining a chain of evidence (Yin, 2018, p. 43).

Table 10: Validity and Reliability Measures

Aspect	Definition	Applied measures
Construct validity	Questions derived from SCF literature and the use of adequate measures for examined constructs	Development of a semistructured questionnaire consistent with the related literature (protocol in Appendix C) Data convergence of multiple sources Reviews of transcripts
Internal validity	Framework derived from SCF literature and constructs to corroborate or establish causal relationships and identification of spurious correlation	Research framework based on concepts from transaction cost economics Inclusion of multiple well-informed respondents Open coding and pattern matching among cases
External validity	Comparative design allows for partial generalizability of results to another context	Within-group analyses Theoretical sampling approach Comparative, multiple-case design, including several types of practices and adopters within buying companies
Reliability	Possible repetition of examinations with some findings	Case study protocols (Yin, 2018) Case study database Semistructured questionnaire as the basis for interviews (Appendix C) Redacted transcripts of all interviews

Note. SCF = supply chain finance.

Addressing Issues of Trustworthiness

Bloomberg and Volpe (2019) and Zeithaml et al. (2020, p.44) provided a framework to strengthen the rigor and trustworthiness of the qualitative research related to credibility, dependability, confirmability, and transferability. Credibility measures the

extent to which a new theory's if–then propositions are plausible. The rigor of this measure depends on providing compelling arguments to support new if–then propositions. My actions included probing participants on why they believed in specific constructs or concepts of interest and identifying the high and low extremes of responses through follow-on questions of juxtaposition (Eisenhardt, 1989).

Dependability measures the extent to which the research process is logical, traceable, and documented. Evaluation techniques included peer review and validation of convergence (Bloomberg and Volpe (2019) and Zeithaml et al. (2020, p.44). Confirmability measures the extent to which others can independently certify that theory constructs and if–then propositions emerge from a study's data and examination of its audit trail (Bloomberg and Volpe (2019) and Zeithaml et al. (2020, p.44). I strived to achieve confirmability by asking respondents about propositions aligned with the conceptual framework to verify consistency with their views and to invite comments and remarks. Transferability is analogous to external validity in other specific settings (Bloomberg & Volpe, 2019). I applied theoretical sampling from previous SCF case study designs to help determine in which circumstances, or cultural environments the extant SCF theory held or not.

Before starting the research, I completed ethical training and certification with the Collaborative Institutional Training Initiative; the training for social and behavioral research covered the topics of protecting human research participants, responsible conduct of research, and ethical considerations regarding privacy, confidentiality, and anonymity. The University of Denver determined that this study was exempt from review by the institutional review board because there was minimal risk of disclosure of

identifying information: Disclosure would not put participants at risk of harm, and adequate provisions for privacy and confidentiality were in place.

All respondents acknowledged informed consent before starting interviews. Study participants were made aware of the purpose of the research and expectations during the interview. These consent documents emphasized that participation was voluntary and that individuals could withdraw at any point in the study. The consent documentation explained the process for protecting privacy and confidentiality, including secure data collection and storage. A template of the consent document appears in Appendix D.

Summary

The case study research methodology with embedded units of analysis offered a viable approach to address research purpose questions. The case study research approach allowed for assessing concepts and propositions from the existing SCF literature across alternative business environments and cultures. The level of analysis varied among the echelons of the organizations contributing to the four groups of respondents.

Schematically, the diagram in Figure 4 below depicts the method and processes used to explore SCF adoption in two business environments. The a priori conceptual framework provided a basis for the interview protocol. I followed a deliberate sequence of qualitative data coding, analysis, and interpretation, to generate case study outcomes with thematic categories, assertions, and propositions.

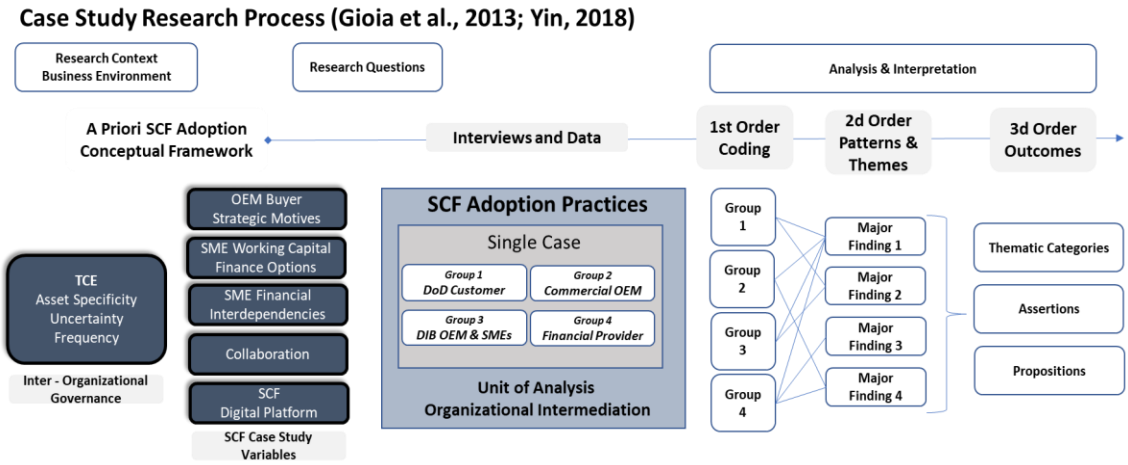

Figure 4: Case Study Research Process

The concepts used for analytic comparison are derived from the extant literature. These concepts included inter-organizational governance variables from TCE; the types of working capital financing practices employed with SME suppliers; financial interdependence between an OEM buyer and an SME supplier; the strategic motives used by an OEM to promote finance practices within its supply base; the role of collaboration across multiple stakeholders to foster and promote adoption of a buyer-led SCF program; the role of an SCF technology platform in enabling adoption, onboarding, and efficiencies; and the influence of other alternative financing options available to meet SME suppliers' working capital needs.

Chapter Four: Results

This chapter discusses the findings and analysis of data collected from the embedded groups of the case study and supplemented with other relevant source documents. The purpose of the case study research was to explore the state of SCF adoption by comparing organizational intermediation between defense procurement contracts and a commercial business environment. I also validated and clarified key enablers, challenges, and boundary conditions influencing SCF adoption in the two business environments and distinct cultures.

This chapter presents four major findings obtained from 27 interviews with respondents distributed among the four embedded groups of the case study. A summary of first-order coding by respondent groups is reflected in Appendix E. Interview responses are complemented with insights from other relevant documents. The second-order analyses reflect the patterns and themes from across all groups are presented as the major findings. The third-order analyses offer case study outcomes with thematic categories, assertions, and propositions.

Major Findings

1) In the DoD business environment, adopting buyer-led SCF practices between OEMs and SME suppliers was pursued only as a matter of exception. While in the commercial business environment, the reverse factoring instrument is firmly

established and proactively intermediated by the OEM to SME suppliers to deliver early cash flow payments at attractive prices based on an OEM buyer's stronger credit rating. Access to the reverse funding instrument to first-tier SME suppliers is available with annual spending volume as low as $20,000. There is a relatively high degree of SCF program participation amongst SME suppliers (30 – 50 percent or more), depending on the unique conditions of a commercial business unit.

2) SME suppliers participating as subcontractors to defense OEMs face similar unilateral payment term extensions coupled with late payments that many suppliers increasingly absorb in the commercial business environment. A DoD study corroborated this finding, and it is a recognized shortcoming acknowledged by the DoD. The disparity is in direct contrast to prime vendor contractors in the defense industry benefitting from very consistent cash flows of 15 – 30 days following invoice receipt by the DoD.

3) The SCF Fintech respondents in the case study stated an overall reluctance to pursue market penetration with defense procurement contracts. This reluctance to pursue SCF business development was due to the perceived effort needed to navigate complex federal acquisition regulations and procedures and needing more confidence to produce a minimum return on investment.

4) Finally, proactive intermediation by multiple stakeholders (Intra-Firm, Inter-Firm, and with Financial Service Providers or FinTech) is needed to foster buyer-led adoption of reverse factoring with SME suppliers in the commercial business environment. Achieving a partnership mindset requires consistent advocacy, education, and collaboration with many stakeholders to articulate a clear value

proposition and benefits of SCF adoption. Enterprise orchestration of SCF adoption enables a shift in the mindset from transactional opportunism to a network partnership that improves timely cash flows to SME suppliers.

Findings 1, 2, and 3 answer the first research question. Table 11 summarizes the findings for Research Question 1.

Table 11: Comparison of SCF Adoption by Business Environment

RQ1: How does intermediation of SCF adoption practices between OEM buyers and SME suppliers differ between defense procurement contracts and a commercial business environment?		
Category	**Defense business environment**	**Commercial business environment**
State of SCF Adoption • Intermediation • Governance • Minimize costs	A low degree of organizational intermediation is observed between OEM Buyers, SCF Fintech firms, and SME suppliers. SCF is available from defense OEMs for the largest suppliers—but only promoted and used by exception with SME suppliers OEMs benefit from favorable payment terms, contract financing, and timely payments from the government The current state may result in a higher cost of capital to SME suppliers and a greater risk of cash flow distress due to extended payment terms, late payments, and the impact of rising inflation	A high degree of organizational intermediation is observed between an OEM Buyer, SCF Fintech firm and SME supplier. Buyer-led SCF for first-tier supply base SMEs is firmly established with RF instrument Participation rates with suppliers range between 30% - 50%, subject to business case conditions SME suppliers are allowed access to the SCF program with annual spending volume as low as $20,000 Buyer-led adoption of the Reverse Factoring instrument results in a lower cost of capital and timely cash flow for SME suppliers
SME Interdependence	Recruitment to SCF Programs likely constrained due to the complexity or interpretation of Federal Acquisition Regulations	Procurement and Supply Chain leads responsible for developing business cases and recruiting suppliers Recruitment based on SME spend volume, shortest DPO, and criticality of supplier
Strategic Motives	DoD - attract and retain small businesses in the supply base OEM - focused on working capital optimization Prime vendor OEM benefits from the Prompt Payment Act	Evolving beyond working capital optimization—from transactional opportunism to extended partnerships SCF program is used to strengthen the stability and resilience of the supply base Promotes SME participation in OEM supplier diversity and sustainability goals

Alternative Working Capital Financing	SME suppliers often rely on self-funding and traditional working capital financing instruments SME suppliers work under firm fixed-price contracts, while OEM buyer benefits from cost-plus contracts	Flexibility embraced for unique SME supplier cash flow needs
Collaboration • Asset Specificity • Opportunism • Uncertainty	DoD and OEMs have minimal visibility of SME supplier cash flows beyond large OEMs	OEM has significant investment to continuously promote awareness and education of the SCF program for all stakeholders and SME supply base OEM leverages buying power to pressure SME suppliers into SCF program
SCF Digital Platform	No feedback	The digital platform enables transactional efficiencies, visibility, and automated governance; it enables the use of AI / ML to support a business case

Note. SME = small–medium-sized enterprise; RF = reverse factoring; DPO = days payable outstanding; DoD = Department of Defense.

Finding 1: Buyer-Led Reverse Factoring practices were only pursued as a matter of exception in the defense business environment

The popular SCF practice of reverse factoring—often used by large OEMs in a commercial business environment to improve cash flow for SME suppliers—appeared to be promoted or offered in defense-oriented OEM contracts only on exceptions. In contrast, reverse factoring is firmly established and proactively intermediated across multiple echelons in the commercial business environment. The convergence of comments from participants in Groups 1, 3, and 4 and insights from the DoD Contract Finance Study (2023a) prompted this finding.

SME suppliers and subcontractors are estimated to contribute 40 – 60 percent of the value to defense OEMs by producing and delivering essential components (DoD Report, 2022b). Given this dependence on SME suppliers, my initial investigations of

SCF adoption in the defense business environment commenced in early 2023 with Group 1 respondents. My engagement with Group 1 included inquiries with officials serving in the Office of the Secretary of Defense (OSD), including Industrial Policy (Defense Executive 1), Strategic Capital (Defense Executive 2), Defense Pricing and Contracting (Defense Executive 3), and Defense Contract Management Agency (Defense Executive 4). These early probes sought to determine if and where there was assigned responsibility to elevate and address the Department's concerns about SME Supplier financial cash flow distress elevated in several official DoD reports. One objective of these initial probes with the DoD customer was to clarify the connotation of the term "supply chain finance" and any indication of application within the defense business environment between OEMs and SME suppliers.

One of the well-documented working capital problems associated with small businesses in defense procurement is characterized as the "valley of death." This problem is commonly associated with an innovative small business that does not have the necessary cash flow to stay in business as the DoD winds through a lengthy budget process. However, the Office of Strategic Capital is focused on increasing the capital available to critical technology companies to help them reach scaled production in contrast to the SME suppliers supporting legacy weapon systems.

> The office of Strategic Capital is aware of the working capital issues regarding SME suppliers in the DIB…but we are not resourced to address this particular aspect of acquisition life cycle management regarding SME financing or intervention with supply chain finance instruments you mentioned (Defense Executive 2).

This comment sheds light on the fragmented nature of responsibility for SME Supplier financial distress in the department with many different stakeholders involved in the lifecycle management of any weapon system.

A series of follow-on referrals led to the engagement with OSD Executive 3 and the subsequent discovery of the DoD Contract Finance Study (2023a) with recommendations for action, which included the following:

- Recognize the role of profit and cash flow in a healthy DIB.
- Improve means to ensure timely payments to subcontractors.
- Assist SMEs on defense contracts with financing.

The critical response from OSD Executive 3 reflects the minimal role of SCF in defense procurement in the context of existing regulations. OSD Executive 3 noted:

> The government does not provide "supply chain financing" in the course of contracting for goods and services under the Federal Acquisition Regulation … because the government lacks privity of contract with subcontractors to our primes … we do provide contract financing to our prime contractors, principally in the form of cost reimbursement payments.

Based on direct feedback from the four defense OEM respondents, reverse factoring is only offered or applied with SME subcontracting suppliers by exception. Although OEM 1 had a publicly available supplier finance portal operated in collaboration with a global bank, the finance manager interviewed from the defense business unit of OEM 1 stated, "The use of reverse factoring in our defense business unit is done on an exception only basis…reverse factoring is much more prevalent in the commercial business unit." Two other defense OEM responses indicated similar

availability of the reverse factoring instrument but only used on an exceptional basis; one defense OEM did not use an SCF program at all.

Three of four SME supplier respondents were unaware of buyer-led reverse factoring practices and benefits. SME Supplier 4 indicated that reverse factoring was applied more to commercial vendor contracts in their product line. The contract terms between OEM prime vendors and SME subcontracting suppliers tended to follow standard commercial invoicing practices, with payment terms ranging from net 30 to net 90 days based on the negotiating power in a buyer-supplier relationship. For the longer extended payment terms, defense-oriented SME supplier respondents used traditional commercial debt financing, such as line of credit instruments, to fund working capital needs and meet monthly operating expenses when cash flow was deficient.

From the perspective of industrial policy, SME suppliers recognized the potential benefit of expanding the intent of the Prompt Payment Act or the value proposition of SCF practices to SME suppliers during pre-award negotiations:

> Pressing OEM prime contractors to offer early payments to subcontractors as a matter of acquisition policy would improve confidence in timely cash flow payments to SME suppliers. This would promote more bids for projects from the subcontract supplier pool. (DIB SME Supplier 2)

The apparent limited understanding and application of SCF practices for subcontracted SME suppliers in the defense industry should be considered in the context of the actual distress of extended and late payments, as observed in Finding 2.

Finding 2: Defense SME Suppliers Face Systemic Cash Flow Distress Challenges

In the DoD business environment, SME suppliers as subcontractors to defense OEMs have not been receiving the same favorable cash flow benefits available to other SMEs operating as prime contractors to the DoD. However, the magnitude of cash flow distress causing financial bankruptcy or the cause for exiting the defense supply base remains inconclusive.

Mirroring commercial market trends, SME suppliers performing as subcontractors attested to the arms-length transactional nature of business in defense procurement contracts and the implications of pushing financial risk to the supply base through the systemic extension of payment terms and late payments. These cash flow issues have often been coupled with challenges for SME suppliers in accessing affordable financing.

All four defense SME supplier respondents acknowledged similar pain points and financial distress issues related to cash flow positions resulting from late payments, extended payment terms, the effects of inflation, and working within firm fixed-price constraints on defense-oriented contracts. However, there was limited awareness of the reverse factoring instrument and the potential benefits of its adoption as a relief mechanism. Direct feedback from the defense SME suppliers characterizes the cash flow issues faced. Defense SME Supplier 1 (representing a precision machine shop) said, "Cash is king! Making payroll is not just a cliché! Prime contractors have forced the cost risk to SME suppliers in an unstable market [due to inflation] and a firm fixed-price environment. Small banks are more supportive of SMEs." DIB SME Supplier 3 (representing a supplier of printed circuit boards) said, "My defense contract payment terms have been stretched from net 90 out to 180 days …while terms with my suppliers

are still on net 30 terms. There is a very arms-length transactional approach with defense OEMs—it's a culture."

SME subcontractors have yet to benefit from the intent of the Prompt Payment Act to promote invoice payment within 30 days (Department of the Treasury, n.d.). A critical reference point for this finding is that DoD prime contractors—such as General Dynamics, Lockheed Martin, Raytheon, and Boeing—have been receiving payments within 30 days in compliance with the act. The systemic nature of financial cash flow distress for SME subcontractors supporting the DIB has remained a credible issue:

> The Federal Government generally and DoD specifically have taken numerous steps to ensure the cash flow of our prime contractors, and these measures go far to make DoD a good customer. However, our attempts to push these cash flow benefits to the subcontractor and supplier level appear, for the most part (with the possible exception of construction contracts) neither robust nor effective. The Department believes there is more to be done to contribute to the financial health of the subcontractor/supplier component of the Defense Industrial Base. (DoD, 2023a, p.67)

Defense Executive 3 said:

> The government abides by the intent of Prompt Payment Act and presses OEMs to do the same …however, the risk of financial distress to small business subcontractors is not readily visible to defense contracting managers due to privity of contract.

The DoD (2023a, pp. 57, 61) expressed a similar sentiment. The DoD (2023a) reported that approximately 20%–30% of cost-plus predelivery contracts flowed down to subcontractors. In this study, three of the four SME supplier respondents had firm fixed-price contracts with OEMs awarded DoD cost-plus contracts. DIB SME Supplier 1 commented:

> Some of the large prime contractors are forcing net 45 to net 60 payment terms to suppliers …even though they have net 30 terms with their government customer. And quite often, payments from OEMs are late. There is very limited visibility and understanding of supply base health beyond direct Tier 1 suppliers. Who is responsible for supply chain orchestration across the DIB?

Finding 2 may be correlated with growing concerns over the accelerating number of SME suppliers exiting the DIB. The number of SMEs doing work for the DoD has been shrinking—by approximately 35% between 2013 and 2022 (DoD, 2023b). OSD Executive 1 said, "The DoD lacks surge capacity due to long lead time for components, contracting time, shrinking of industrial base suppliers." A contributing factor prompting small suppliers to exit the DIB has been the financial duress caused by negative cash flow and limited flexibility to adjust for dynamic economic conditions and inflation. Defense Executive 4 said:

> Small businesses in the defense industrial base are at risk …we are struggling with the impact of inflation in firm fixed price contracts. The wrong incentives are in place to keep large OEMs and small business suppliers aligned. Creative thinking is needed.

Defense Executive 5 said:

> During COVID, we had a couple of SME suppliers go out of business and declare bankruptcy …we had a number of open orders with them …and we started asking ourselves—why didn't we see this coming? So, we started building [a risk management] tool to determine if a supplier needs help or how critical they are to readiness and operations.

And DIB SME Supplier 2 said:

> If a SME supplier's business sales are 80% commercial and 20% defense and the economic benefits continue to decline …this is what prompts exit from the DIB. The exodus can only be reduced if the mindset shifts from transactional to partnerships. The DoD could reduce long-term risk of exodus with more direct contracts to SMEs to gain advantage of prime vendor status. SCF instruments could help …but only if done in concert with DoD acquisition reforms.

An important aspect of Finding 2 requires clarity relating to the distinct advantages of being a prime contractor to the DoD—whether as a large OEM or as a small supplier. The distinction derives from deliberate cash flow practices used in the defense marketplace but not the commercial marketplace. These cash flow practices were meant to compensate for the long lead times attributed to the design, sourcing, and manufacture of defense platforms heavily dependent on integrating sophisticated computer hardware and software: "The stronger cash flow practices for DoD prime contractors correlates to the availability of contract financing, favorable payment terms, and the Government's commitment to pay its bills on time" (DoD, 2023a, p.53).

Table 12 presents for comparison cash flow terms of defense prime contractors and subcontractors, which are often SME suppliers.

Table 12: DoD Cash Flow Terms (Prime Contractor Versus Subcontractor)

Category	Prime contractor	Subcontractor
Working capital cash flow	Generated predictably	Similar to commercial market contracts
Visibility of payments	Actively monitored and measured	Very limited due to privity of contract
Negotiated payment terms	Net 30 days Per Prompt Payment Act (or interest paid)	Net 30–120 days Depends on negotiating position and power
Actual payment performance	12.6 days upon receipt of invoice	Wide variation in performance 33% of payments late for small business

Note. Adapted from *Contract Finance Study Report* (pp. 61-62), by Department of Defense, 2023 (https://www.acq.osd.mil/asda/dpc/pcf/finance-study.html). In the public domain.

Defense OEMs have also benefited from predelivery financing that essentially consists of cost-plus contracts that provide monthly payments based on progress or performance milestones (Acquisition.gov, 2023). These predelivery contract finance instruments have flowed down to approximately 20%–30% of subcontractors of defense OEMs (DoD, 2023a, p. 56).

In contrast to the findings above, the Defense OEMs have publicly promoted awareness and concern with respect to financial cash flow needs within their supply bases and SME suppliers in particular. Defense OEM 1 said:

> Very few of our critical suppliers are distressed to the point of bankruptcy. We are willing to go cash flow negative with some suppliers to keep the network healthy. During COVID, we issued $1,000,000,000 in accelerated payments to our suppliers. Advanced payments for materials are often used for firm fixed-price contracts. We are shifting from a transactional mindset to much more of a

network readiness mindset—and improving business acumen and practices with small suppliers.

The implications of Findings 1 and 2 generate interest in understanding how reverse factoring is successfully adopted and implemented and understanding the key enablers and challenges involved.

Finding 3: Fear of regulatory constraints limit market penetration by SCF Fintechs

Executives from the financial service provider (Group 4) indicated that complex government regulations often dimmed prospects of promoting reverse factoring without a solid economic business case for stakeholders. SCF Fintech 1 said:

> I'm not sure exactly why SCF has not taken hold in the U.S. defense industry …but likely …it is perceived as too much work to achieve a minimum return on the capital hurdle rate. There remains considerable misunderstanding between account receivable factoring and buyer-led supplier financing with the reverse factoring instrument.

SCF Fintech 2 said:

> It's generally not conducive to pursue government contracts because there is often no business case …there is no allowance for extension of payment terms and there is limited room to manage working capital strategy across a network of stakeholders …perhaps because procurement policies and contracts mandate must pay to contractors within say 30 days.

And SCF Fintech 3 said, “We have not cracked this segment [government contracts] …for fear of the unknown …contract bureaucracy …and unknown legal implications if SCF is offered to some SME suppliers and not to others.”

The GOVCON FSP stated:

> Offering working capital finance in the world of government contracts requires a unique understanding of many types of defense contract vehicles and legal implications of the Federal Assignment of Claims Act – defining how lenders or factoring companies can arrange for payments when federal contracts are part of the accounts receivable, or loans made to the contractor. Financing is not the real problem for SMEs in the DIB…the true problem tends to be the Defense procurement process that is subject to long extension of time to adjudicate and commence programs.

Finding 4: Proactive Organizational Intermediation is needed to enable SCF Adoption

In the commercial business environment, fostering and adopting reverse factoring (the dominant form of buyer-led SCF practice employed in OEM contracts) requires consistent advocacy, education, and collaboration with many stakeholders to articulate a clear value proposition and benefits of SCF adoption. The reverse factoring solution generates positive cash flows for SME suppliers through early payments at attractive prices based on an OEM buyer’s stronger credit rating.

Finding 4 addressed the second research question, which was as follows: What are the key enablers and challenges influencing the adoption of buyer-led SCF practices

to mitigate financial cash flow distress among SME suppliers? Table 13 summarizes the findings for Research Question 2.

Table 13: Key Enablers and Challenges of Buyer-Led Reverse Factoring Adoption

RQ2: What are the key enablers and challenges influencing the adoption of buyer-led SCF practices to mitigate financial cash flow distress among SME suppliers?	
Category	**Items**
Key enablers	Collaboration: continuous awareness and education of RF value proposition OEM intrafirm collaboration between finance, procurement, and supply chain Financial service provider/fintech plays equal role in encouraging awareness and training in the field Flexibility: Business case explored for each OEM supplier; SCF is not always the best solution for all SME suppliers Funding: Large banks or investor markets fund SCF program based upon OEM buyer credit profile Digital SCF platform enables transactional efficiencies: automation of procure to pay processes, visibility and governance of timely transactions Technological efficiencies and scaling allow access to SME supplier at just $20,000 annual spend with OEM
Challenges	Limited awareness, understanding, and experience of RF features and benefits in comparison to alternate working capital financing options Identification of appropriate decision maker in SME firms to validate value proposition and make decision to join SCF program SME supplier must understand discount rates, invoice approval times, supplier opportunity cost, credit insurance, and implementation costs Increasing degree of transparency called for by market investors and Financial Accounting Standards Board guidance Although RF is not regulated in United States, there remain many compliance checks that take time to adjudicate: SME supplier–host bank approval, knowing the customer, and anticorruption

Note. RF = reverse factoring; SCF = supply chain finance; SME = small–medium-sized business.

Common responses supporting Finding 3 centered around the lower cost of capital made available to SME suppliers relative to traditional debt funding and consistent early payments made to improve cash flow for the supply base. SCF Banker stated, “One of the basic economic goals of SCF is to help SME suppliers confidently bid on future orders with expected cash flow streams in place.”

Another concept frequently emphasized was the degree of collaboration needed to promote awareness and education of an SCF program within a corporate firm, with potential suppliers, and with financial service providers and the platform provider to onboard suppliers efficiently and govern automation and visibility of transactions. Although there have been some recurring challenges to SCF program adoption, such programs have continued to grow rapidly to the supply base of large and medium-sized OEM buyers with good (BBB +) credit ratings.

The primary SCF instrument offered by the commercial OEM in this case study was reverse factoring. The corporate finance director for the SCF program offered this view on benefits of adoption:

> The SCF program has improved the corporate working capital position and freed up cash for other investments. Flexibility is a key tenet of our SCF program—each application must be fit for conditions and purpose. Awareness, education, and a clear business case is paramount with all stakeholders. Once a clear value proposition is recognized …we have achieved a high level of participation [50% or better depending on business unit] with Tier 1 suppliers, and we have a low attrition rate [around 3%] after adoption. (Corporate OEM Finance Executive)

The same respondent also said:

> The role of the SCF digital platform is essential for automating the visibility and governance of SCF transactions. The platform invokes speed, trust, and efficiency of transactional governance between multiple stakeholders. Due to the improved efficiencies of the SCF platform we use, the boundary for access to our SCF program for SME suppliers has been reduced to $20,000 in annual spend volume

> …making the SCF program open to virtually any small business. (Corporate OEM Finance Executive)

Another respondent offered, “Program fees for suppliers are based upon their spend volume with us, interest rates are linked to our credit rating, and 30-day average of SOFR [secured overnight financing rate]” (Corporate OEM Finance—SCF Program Manager; see also Federal Reserve Bank of New York, 2023.). And “OEM business unit leaders and the supporting procurement or supply chain managers are responsible for knowing how to recruit and deploy the SCF program to their dynamic supply base partners” (Corporate OEM Finance Executive). Another respondent explained:

> Procurement has the lead in the field to collaborate with and to convince our suppliers of the SCF value proposition …while corporate finance offers training webinars and spreadsheet models to show the financial impact of modified terms and fees for joining the program. Average DPO [days payable outstanding] is part of our quarterly performance reports. …Doing well in this metric gets procurement a seat at the table with our CFO [chief financial officer]. Each business unit must understand the carrying cost of DPO at different time points …at 60 days, at 90 days, etc. …and we must also understand the legal and regulatory limitations of SCF adoption at federal and state levels. (Commercial OEM—Business Unit 2)

The view from another business unit was as follows:

> Strengthening the working capital position in my business is a top priority … we are currently at a negative cash flow position due to long payment timelines for federal projects. My DPO [days payable outstanding] targets are determined by

> spend volume and lowest payment terms. One of my most consistent challenges is identifying the right decision maker at an SME supplier firm. It's also often difficult to gain permission from the SME supplier's host bank—they often hold up the onboarding process. If a supplier is profitable and cash rich, there is less of an incentive to join the SCF program. However, the consistent payment of 10–15 days following invoice approval remains a consistent draw. In some cases, with our most dependable long-term suppliers—we have moved to payments upon purchase order approval. (Commercial OEM—Business Unit 1)

And another respondent said:

> The SCF program has been a fantastic enabler for me to do my part with our function to improve cash flow. Over the past four years, I've gained about 40 days in the average DPO [days payable outstanding] metric. I now have about 80 percent of my suppliers on the program. I think the program helped us develop a robust and stable supply chain that worked to our advantage leading up to COVID and we gained ground. And the SCF program is also providing an avenue to improve supplier diversity. (Commercial OEM—Business Unit 4)

The financial service provider (bank or SCF fintech) plays a critical intermediary role in promoting success for OEM buyers through education and interaction with the buyer's supply base:

> Very simply, the reverse factoring program is an early payment program. It is a cash only transaction for a small fee and affordable interest rate. Reverse factoring is not regulated in U.S. because it is an off-balance-sheet transaction. Our staff is experienced to efficiently onboard new suppliers within 30 days … it

> requires the integration of finance providers, mission critical financial services—and a technology platform. We provide critical onboarding checks such as know your customer political exposure, and anti-money laundering; we also file for UCC [Uniform Commercial Code] house bank consent. (SCF Fintech 1; see also Securities and Exchange Commission, 2023.)

Investors have been increasing scrutiny to improve the level of disclosure in public financial statements regarding the magnitude of SCF because of recent bankruptcies such as Greensill Capital (De Paoli, L. & Rocks, D. (2021). The Financial Accounting Standards Board (2022) issued guidance to enhance transparency.

For SME suppliers, the unilateral extension of payment terms by large buyers has often been a challenging cash flow reality:

> Honestly, I really had no choice but to join the SCF program if I wanted to retain this major customer …that said, my mindset changed from reluctance to a happy partner due to the reduced cost of capital and consistent early payments. …The program saves me 3–4 percent in capital costs compared to my line of credit rates. Joining the program gives me a much more consistent CCC [cash conversion cycle], and the automation helped simplify visibility and management of my receivables. Sticking with the [SCF] program helped me grow my sales to this customer. One of my challenges is I have to monitor multiple SCF programs on different platforms from different customers. (Commercial OEM SME Supplier)

Counterarguments to buyer-led SCF programs recognized that not all suppliers or SME suppliers find SCF attractive. For example, if an SME is cash rich and has developed a

solid credit rating, it simply may have no need to enroll in an SCF program. These observations from the commercial OEM respondents offer a glimpse into the key enablers of and challenges to successful adoption. As SCF practices have become better understood by buyers and suppliers, new strategic motives have been emerging to strengthen incentives for joining buyer-led programs.

The motives for adopting SCF practices in commercial industries have been evolving from transactional opportunism toward broader supply chain partnerships to promote stability and resiliency across the supplier base and to incentivize greater awareness of, and participation in, OEM sustainability goals. The recent COVID-19 pandemic has extended the motivational purpose for adopting SCF beyond financial optimization of working capital between commercial OEM buyers and suppliers:

> The COVID-19 pandemic was a catalyst for changing incentives …the pandemic changed the mindset of limiting the SCF program from top-tier suppliers to extend services to the middle tail of buyer supply chain networks as an enabler for resiliency and to contribute to sustainability goals of large corporates. However, the supply chain finance ecosystem remains very fragmented. (SCF Banker)

Defense SME Supplier 4 said, “Shifting from transactional mindset to a partnership mindset—adopting SCF practices can improve overall stability and resilience of the supply base network.” And Defense OEM 3 said, “The central principles of SCF should be leveraged to help design out supplier financial fragility.”

Validation of the Conceptual Framework and Extant SCF Theory

The relationships portrayed in the conceptual framework, and the dimensions used for a priori coding were validated during my engagements with the Commercial OEM group providing a baseline understanding of current practices employed to foster and adopt buyer-led SCF instruments. For example, in the relationship between the dependent variable (DV) and the independent variable (IV), Buyer-Led SCF adoption decisions were consistently influenced by the SME supplier's posture as a direct and critical supplier coupled with the criteria of the annual spending volume and the length of days payable outstanding. Terms, access, and affordability were all components of a unique business case developed by the buyer to prompt recruiting and adoption negotiations. However, the magnitude and frequency of cash flow distress amongst SME suppliers was still an area with limited visibility by the OEM buyer. Credit ratings provided by various service providers offer a relative marker of SME financial viability. The diagram in Figure 5 below reflects my confirmation of the positive relationship between the dependent and independent variable and the moderating effects of OEM strategic motives, alternative working capital finance options, the role of collaborative intermediation with multiple stakeholders, and the impact of the SCF digital platform to enable several efficiencies in transactional governance.

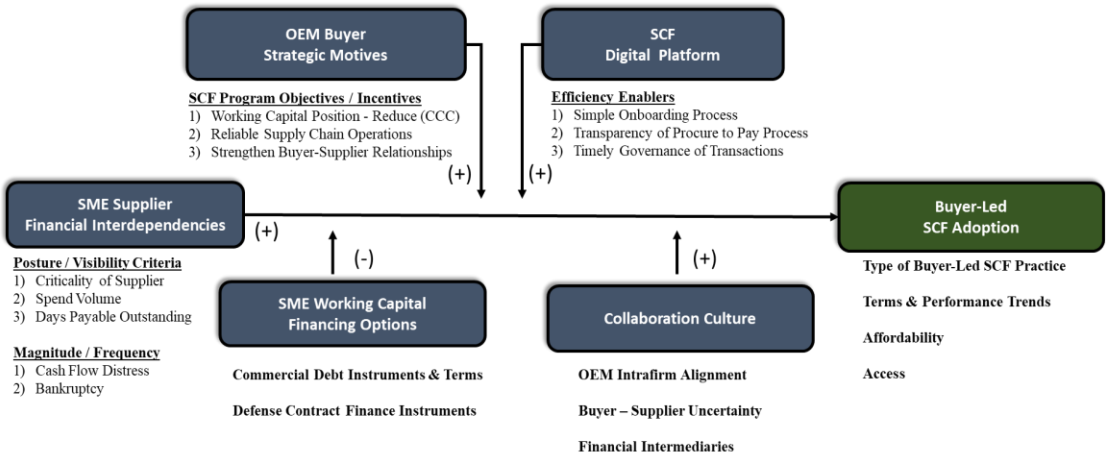

Figure 5: Validation of Buyer-Led SCF Theoretical Propositions

The TCE factors of asset specificity and uncertainty partially explain management decisions to maximize the efficiency of transaction costs by adopting the SCF RF instrument. The buyer-supplier relationship requires investments on both sides to generate a successful contract. The OEM Corporate Finance department makes a substantial investment in the capabilities to promote the SCF program. SME suppliers also had to invest time and energy to facilitate the interface requirements with their ERP systems and local bank to assign receivables. While OEM buyer power strongly influenced opportunism, the eventual adoption of the RF instrument achieved mutual gains across the buyer-supplier relationship. It mitigated contract hazards of supplier risk by reducing uncertainty through awareness and education of intra-firm stakeholders and SME suppliers. There were no indications that the frequency of RF transactions managed during any time horizon had any bearing on fees or discount rates for joining the SCF program.

For the moderating effect of OEM Buyer Strategic Motives on SCF adoption, a definite sequence of importance applied. The first priority was to demonstrate the impact

on the buyer capital position measured by increasing DPO for high-volume suppliers. The second priority focused on how SCF adoption could improve the overall stability and reliability of supply chain operations for delivering products and services to the end customer. The third option seen with more advanced and mature SCF programs was to promote greater supplier diversity and or alignment with other OEM sustainability goals.

The adoption of an SCF instrument is negatively moderated by more attractive working capital finance options available to the SME supplier. In some cases, where the SME supplier is in a strong working capital position and has good credit, a simple line of credit can suffice to meet any short-term capital needs at or below the price offered with the SCF program. When defense contract finance instruments such as cost-plus contracts flow down to the SME supplier – this option can provide optimal pre-delivery cash flow payments.

Collaboration positively moderated the fostering and SCF adoption at many echelons of responsibility, given the unique circumstances in the buyer-supplier relationship. The intermediary role switches depending on stakeholder responsibilities. At the enterprise OEM level, the Corporate Finance department had overall responsibility for promoting, fostering, and educating intra-firm participants on the SCF program intent and desired performance outcomes, explaining processes and procedures, and simple techniques for communicating the value proposition to potential SME suppliers.

While many SME Suppliers are skeptical when first introduced to the SCF program due to extended payments, the awareness and training sessions mitigate uncertainty about the implications of adoption and implementation costs. Buyer negotiating power can be leveraged toward a more trustworthy buyer-supplier

relationship, often resulting in expanded sales for the supplier and two-way loyalty in times of distress.

The SCF digital platform provided by the fintech firm delivered an efficient tool to manage and govern transactions between the buyer-supplier relationship. In most cases, between the Commercial OEM business units and their suppliers joining the SCF program, the onboarding process was simple and timely, within 10 to 30 days. The platform also improved the visibility of all transactions and elevated awareness of planned invoice approval or delayed payments. One area of concern noted by the commercial SME supplier is that they may have to operate with multiple SCF program platforms simultaneously, depending on the number of customers the supplier sources to.

Confirmation of theoretical propositions used in the conceptual framework supports construct validity and reliability of the findings based on extant SCF literature. The following section further examines the patterns across groups with second-order analysis.

Cross-Group Analysis and Emergent Thematic Categories

The second-order analysis effort aimed to establish broader meaning and transferability of the data collected by comparing and contrasting the employment of optional working capital financing practices for SME suppliers in the two business environments. This process required the interpretation of a large amount of data from each group into themes that encapsulate the overarching meaning of the data by sorting and refining the information until it makes sense (Simons, 2014)

The second-order analysis led to three emergent and interconnected themes relevant for leaders and stakeholders in the defense industry: (a) the need for orchestration across a fragmented SCF ecosystem, (b) the need to further enhance visibility and transparency of how SCF practices generate tangible benefits for stakeholders while disclosing any financial risks for funders and investors, (c) the need for flexibility in selecting the most appropriate instrument to finance working capital needs given unique business case conditions. Table 14 reflects a synthesis of participant perspectives regarding the state of SCF in both business environments.

Table 14: Thematic Categories Emerging from Cross-Group Analysis

Theme	Participant Perspectives	Attribution
Enterprise Orchestration	The SCF ecosystem remains fragmented and misunderstood.	SCF Banker OEM Executive 3
	Modifications to public policy, regulations and processes can be the glue for generating a demand signal for change to improve parity in cash flow benefits to subcontracted SME Suppliers.	DIB SME Supplier 1
	Orchestration is needed to shift the mindset from transactions to partnerships.	DIB SME Supplier 4
	DoD, OEMs, and Financial Service Providers play critical intermediary roles in designing out the financial cash flow fragility of critical suppliers in the supply base.	OEM Exec 3
Visibility and Transparency	Awareness and education regarding the tangible benefits of SCF can generate action toward creative solutions.	Commercial OEM Exec
	SCF Digital Platform offers controlled access to performance metrics and trends with AI / ML technology.	Fintech 2, 3
	Improved disclosure regarding use of SCF in financial reports improves trust in use of instruments.	Commercial OEM Exec
Flexibility	A unique business case exists for the most appropriate working capital finance instrument needed for SME suppliers.	Commercial OEM Exec
	Stakeholders are seeking creative solutions in procurement processes to improve the financial health of SME suppliers.	Defense Executive 4

Note. AI / ML = Artificial Intelligence / Machine Learning

The thematic categories of enterprise orchestration, visibility and transparency, and flexibility are further explained below given cross-group participant perspectives.

Enterprise Orchestration – Thematic Category 1

Several seasoned experts from the respondent groups used the term "orchestration" to prompt greater awareness and engagement between DoD Executives and OEM Executives to reduce the degree of cash flow financial risk pushed out to the supply base. For example, OEM 3 stated, "We need to design out financial fragility for our critical SME suppliers."

A common topic of discussion occurring during my interviews revolved around clarifying the responsible agents for SCF orchestration across multiple echelons of the DIB supply chain. The consolidation of the defense industry since 1995 often infers that the large OEMs should take a more prominent role in orchestration to meet the intent of DoD policy. Defense Executive 5 said, "The DoD military services and Defense Logistics Agency have become more reliant on the OEMs to protect the stability of the SME supplier base given the shift to performance-based logistics programs." Professional industrial forums like the National Defense Industrial Association also lean in to orchestrate and influence policy and programs to protect SME suppliers' financial health.

Academics and SCF practitioners widely acknowledge that the SCF ecosystem is fragmented and remains misunderstood by many stakeholders. The Group 4 - Financial Service Provider respondents also verified a limited appetite to pursue SCF in government contracting due to the complexity of regulations and unknown legal

ramifications. The SCF Banker responded to this conundrum by saying, “Modifications to public policy, regulations, and processes can be the glue for generating a demand signal for changes to improve parity in cash flow benefits to subcontracted SME suppliers.”

Recall that Bals and Bals (2019) suggest that the SCF ecosystem should be orchestrated and organized so that adoption success is deeply dependent on cooperation around commonly agreed standards and processes. Orchestration leads to standardization of concepts and definition of terms; standardization of conditions to measure, monitor and disclose SCF performance parameters for effective governance; and standardization enables effective execution related to data exchange formats and system infrastructure requirements to protect the security of information exchange. Intermediaries in the SCF ecosystem contribute to orchestration by helping to bridge differences in terms and processes and by elevating transparency on different offerings to enhance the decision-making process of stakeholders.

Orchestration in the commercial business environment was seen to promote strategic motives beyond working capital optimization to recognize the SCF program could be leveraged as an incentive to strengthen the reliability and resilience of supply chain operations. Limited orchestration of SCF for SME suppliers in the defense business environment was seen as a prominent barrier. DIB SME Supplier 4 responded to the state of SCF in the DIB by stating, “Orchestration is needed to shift the mindset from transactions to partnerships.” Another SME supplier shared concerns regarding the need for enterprise level orchestration in support of the DIB with several rhetorical questions:

> "Who owns the DoD Industrial Base supply chain and how do we want it to perform? Who is responsible for supply chain orchestration? Whose job is it to make sure the industrial base is healthy? (DIB SME Supplier 1)

Orchestration of SCF concepts, conditions, and execution procedures can be further enabled through enhanced visibility and transparency of existing practices and outcomes.

Visibility and Transparency – Thematic Category 2

In several ways, enhanced visibility and transparency of SCF practices and processes can benefit many stakeholders by promoting awareness, trust, and confidence in alternative financing instruments for working capital needs. One way is "generated through training on how to calculate financial outcomes in a clear business case" (Commercial OEM Finance Executive).

Another avenue is "increasing the visibility of DPO terms and performance across the supplier base, using the SCF digital platform" (Fintech 2). Fintech 3 added, "we are using AI / ML algorithms to generate a business case and cash flow performance parameters with our supply base".

Another aspect of visibility and transparency applies to improved disclosure of SCF instruments used in financial accounting reports mandated by the FASB to improve overall confidence in the SCF ecosystem with investors and suppliers (Commercial OEM Finance Executive). The GOVCON Financial Service Provider said, "Assessing and explaining the regulatory boundaries in government contracts, including transfer assignment, is needed to expand awareness and potential adoption".

Gelsomino et al. (2022) assessed the relationship between transparency and SCF schemes using TCE as a theoretical lens to explain the governance structure and understand conceptual implications related to asset specificity, uncertainty, and frequency. These researchers found the use of SCF requires investments in the form of fees paid to the digital platform provider. These investments in the SCF digital platform increase transparency of cash flows across networks echelons, reduce behavioral and environmental uncertainty and offer insights to supply chain operations. These researchers also found that Fintech-bank partnerships have complementary roles that transform the adoption and use of SCF.

Flexibility – Thematic Category 3

Flexibility was another thematic category prompted by case study respondents. Commercial OEM Executive 1 emphasized understanding the limitations in promoting the SCF program to its supply base, given the unique business case conditions. SCF adoption must be considered in context with many alternative working capital options available to SME suppliers.

Flexibility was also emphasized by Defense Executive 4 when speaking to the need to align incentives between the defense OEMs and the supply base related to dynamic economic conditions and financial boundaries of firm fixed price contracts. USAF Executive 3 prompted “greater flexibility in the interpretation of defense procurement processes to rapidly identify and pay SME suppliers with unique manufacturing capabilities for sub-components”. USAF Executive 3 also emphasized that “more flexibility and resources should be aimed at financing options across the full

life cycle of system platforms by proactively creating alternatives to mitigate cash flow distress among SME suppliers providing critical components and intellectual capital to service legacy systems".

From the SCF literature, Grueter and Wuttke (2017) examined how SCF adoption expanded flexibility to suppliers by reducing a supplier's working capital financing costs. Their analysis showed that when suppliers can select specific invoices for application in the SCF program, this, in turn, offers a real-option value. Lekkakos and Serrano (2016) found that participation in an SCF program can potentially release more than 10 percent of SME suppliers working capital by getting paid early.

Inclusion of Thematic Categories into the Conceptual Framework

A comprehensive analysis of the a priori conceptual factors and thematic categories leading to successful SCF prompted an extended abstraction of the conceptual framework depicted in Figure 6 below. This extension of the conceptual framework helps account for the state of the SCF ecosystem of a select industry (defense business environment) and the role of enterprise orchestration as a mediator needed to promote a common understanding of SCF concepts, performance conditions, and execution procedures. Enterprise orchestration extends beyond the Buyer-Supplier-Financial Service Provider triad typically involved in the discreet processes of fostering, adoption, and implementation.

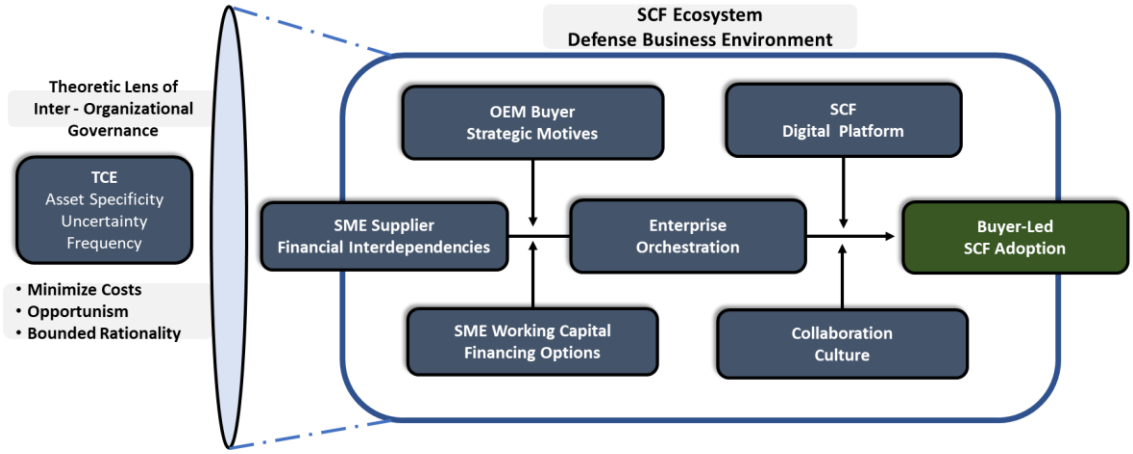

Figure 6: Extended Conceptual Framework

This extended view captures a broader enterprise perspective for understanding how SCF practices are applied within a specific industry, such as the defense business environment. The state of SCF within the government contracting business environment has unique attributes and working capital financing options that must be considered that affect an adoption decision. Enterprise orchestration prompts greater awareness and understanding of the SCF ecosystem applicable to a business environment.

Process-oriented and de-centralized orchestration can lead to rapid evolution of best practices, improved visibility and transparency of SCF opportunities and performance trends, and improved degree of flexibility for SME suppliers to understand the most appropriate and combination of financing options available to optimize working capital. This in turn provides an opportunity for SME suppliers to invest in alternative production capacity and or investment in skill needed to keep pace in competitive global markets.

Summary

The findings in this chapter were derived from respondent interviews and insights from key documents shaping the context for the inquiry regarding the state of SCF adoption in the defense business environment. The key lesson learned from the results is that enterprise orchestration has been missing within the Defense Business Environment. No single centralized entity is responsible for orchestration – but it requires leadership – and greater awareness of the importance of alternative mechanisms available to mitigate cash flow distress to SME suppliers in many industries.

The insights and findings from the within-group analysis and the thematic categories identified in the cross-group analysis prompted the assertions and propositions offered in Chapter 5.

Chapter Five: Discussion

This chapter discusses my interpretation of the major findings and emerging themes identified during the case study research. A brief overview of the research is followed by a summary of the major findings and identification of thematic categories used as the premise for generating assertions and propositions. The chapter includes contributions and implications for the SCF literature and managers, followed by a discussion of limitations and future research directions.

Overview of Research

While the importance of the research is clear to the DoD and a wide range of constituents serving in the DIB, access to data is highly challenging due to the topic's sensitive nature and concerns about exposing any competitive advantage. This case study research reflects a frontier in generating more empirical evidence for exploring the intermediation of SCF adoption practices in a government contracting environment. The research seeks to elevate alternatives for improving the affordable and timely cash flow needs of SME suppliers in a defense business environment by comparing adoption practices observed in a commercial business environment.

I explored alternative working capital finance instruments for subcontracted SME suppliers in two business environments delivering high-tech products and services. The unit of analysis for the research is organizational intermediation observed between four

embedded groups of seasoned executives offering insights about SCF adoption practices between the defense business and commercial business environment. I also sought to clarify critical enablers, challenges, and boundary conditions influencing the adoption of reverse factoring, the dominant form of SCF practice seen in a commercial business environment. Two research questions guided the study:

1. How does intermediation of SCF adoption practices between OEM buyers and SME suppliers differ between defense procurement contracts and a commercial business environment?
2. What are the key enablers and challenges influencing the adoption of buyer-led SCF practices to mitigate financial cash flow distress among SME suppliers?

This research relied on a qualitative inquiry process to collect data via semistructured interviews and other source documents that helped to characterize the problem set and the state of SCF adoption practices. Interview data were coded, analyzed, and organized according to the research questions and a priori variables derived from extant literature, corresponding theory, and the conceptual framework described earlier in Chapter 2. Within-group analysis sought to identify patterns and emerging insights to form the initial findings. Cross-group analysis supported the second-order analysis and the major findings. The third-order analysis and interpretation led to the thematic categories, case study assertions, and propositions.

Summary of Research Findings and Thematic Analysis

During the within-group analysis phase, prominent patterns and relationships led to the emergence of four major findings. First, in the DoD business environment, the SCF practice of reverse factoring appeared to be offered by exception only. Secondly, SME suppliers, as subcontractors to defense OEMs, have not been receiving the same favorable cash flow benefits available to other SMEs operating as prime contractors to the DoD. Thirdly, SCF Fintech firms are reluctant to pursue penetration into the defense procurement contract market due to a limited understanding of acquisition regulations and mandates that decrease confidence in achieving a required return on investment. Finally, in the commercial business environment, proactive intermediation by multiple stakeholders is needed to foster the adoption of reverse factoring with SME suppliers. Enterprise orchestration of SCF adoption enables a shift in the mindset from transactional opportunism to a network partnership that improves timely cash flows to SME suppliers. Achieving this partnership mindset requires consistent advocacy, education, and collaboration with many stakeholders to articulate a clear value proposition and benefits of SCF adoption across a supply network.

These findings were exploratory and based on limited engagement with experts among the four embedded stakeholder groups. The second-order analysis led to three thematic categories reflecting the need for (a) enterprise-level orchestration, (b) improved visibility and transparency of SCF program performance metrics, and (c) flexibility in applying effective and efficient working capital solutions in the SCF ecosystem to benefit multiple enterprise level stakeholders. These thematic categories advocate improving the overall awareness and training with the defense industry OEM and SME supplier

audience. Reflection upon the findings and thematic analysis leads to several assertions and two propositions to generate new conversations and actions to mitigate cash flow distress to subtier SME suppliers.

Assertions and Propositions

The collective assessment, analysis, synthesis, and interpretation of the case study interview responses combined with content analysis from relevant reports and SCF industry journals prompted the following assertions and propositions. The assertions reflect the temporal nature of the case study findings and serve to begin a new conversation with relevant stakeholders. The propositions presented speak to adjustments to the conceptual framework.

Assertion 1: The state of buyer-led SCF adoption for high-tech manufacturing within the U.S. defense business environment lags behind adoption in comparison to similar high-tech manufacturing firms in the commercial business sector for several reasons:

(a) ***Simplicity:*** For many SME suppliers sourcing to Defense OEMs responsible for delivery and services to legacy military weapon systems – a line of credit with the SME's local banking institution is the traditional and more straightforward process to meet short-term working capital needs. As long as there is evidence of future account receivable payments from the government contract associated with the defense OEM – the SME supplier's local banker is likely to provide working capital funding based on the supplier's credit rating, collateral offered, and personal banking relationships at a reasonable marginal cost.

(b) Defense procurement processes are first-order constraints for SME Suppliers: While all the SME suppliers I engaged with in this case study agreed that parity in cash flow benefits for subcontracted suppliers to the large defense OEMs is a systemic issue – the higher order enterprise problem is related to procurement budget and funding cycles and long delays in getting approved programs started. The undulating budget cycle process hampers cash flow to the SME supply base.

(c) ***Confusion in terminology***: Accounts Receivable (AR) factoring with government contracts is a niche industry. The AR factoring instrument is a recognized practice used by niche finance providers in the defense industry to fund short-term working capital needs to SME suppliers when self-financing or a traditional line of credit will not provide sufficient funds. However, the AR factoring instrument tends to be substantially more expensive subject to the fees and APR rates offered with the buyer-led Reverse Factoring or Supplier Financing instruments with discount pricing based upon the Buyers credit rating.

(d) ***Limited promotion, awareness, and understanding of buyer-led SCF practices***: The perceived complexity of implementing buyer-led SCF instruments is challenging to DoD customer stakeholders in the DIB. The overall complexity of government contracting or federal acquisition regulations hampers SCF adoption. The relatively easy adoption of dynamic discounting is likely available to many SME suppliers from defense OEM buyers. However, all three SCF Fintech firms responding to this case study noted they had not pursued penetration of the reverse factoring instrument into the Government Contract (GOVCON) market due to fear of the unknown implications related to mandated payment terms and

limited understanding of the potential impact on minimum return on investment hurdles with financial service providers.

(e) Inconclusive understanding of payment term extensions applied to SME subcontract suppliers in the DIB: The number of SME suppliers participating in this case study and the number of SME subcontract suppliers in the manufacturing industry responding to the Defense Contract Finance Study does not provide enough data points for a representative sample to generalize the state of payment term extensions or late payments from defense OEMs. More quantitative research is required to characterize the magnitude of cash flow distress to SME manufacturing firms supplying materials, components, and services to defense OEMs.

(f) The magnitude of cash flow distress to SME suppliers causing financial bankruptcy appears to occur by exception only: According to case study respondents, the bankruptcy of an SME Supplier happens infrequently. However, the impact of cash flow distress on SME Suppliers exiting the DIB remains inconclusive. Respondents indicated that defense procurement processes, the unstable definition of program start times, and limited visibility of demand signals from defense programs and defense OEMs were much more problematic than access to affordable working capital. More quantitative research is required to correlate the relationship between cash flow distress and SME suppliers exiting the DIB.

Assertion 2. The culture of the Defense Business Environment is rooted in opportunistic traditions with the subcontracted SME supply base. There is little incentive or policy mechanism for promoting cash flow parity to subcontracted SME suppliers in the Defense Business Environment. The defense OEMs hold extreme buying power over their respective supply base partners, allowing for unilateral control and retention of cash flow benefits. The prime contract defense OEMs benefit from the intent of the Prompt Payment Act and the substantial cash flow benefits of cost-plus projects. Meanwhile, defense OEMs tend to employ firm-fixed price contracts with their SME supply base for sourcing components. This culture creates a culture of conflicting incentives where:

(a) ***A prevalent arm's-length and transaction-based culture pervades the defense business environment:*** The plight of cash flow distress among SME suppliers subcontracted to OEMs follows prevailing market forces regarding payment term extensions and late payments.

(b) ***A survival-of-the-fittest mindset persists:*** subcontracted SME suppliers provide commodity-level sourcing of easily substitutable components.

(c) ***No DoD capability to monitor payment term extensions to meet the intent of the Prompt Payment Act.*** There are operational break-even points for each business case in the buyer-supplier relationship.

Multiple respondents acknowledge a disconnect in the incentives between DIB stakeholders and a need for creative solutions to address the cash flow distress the SME supply base absorbs. The diagram in Figure 7 below reflects a spectrum of characteristics to shift from an opportunistic culture towards a cooperative culture, and then to a collaborative culture where mutual benefits are achieved.

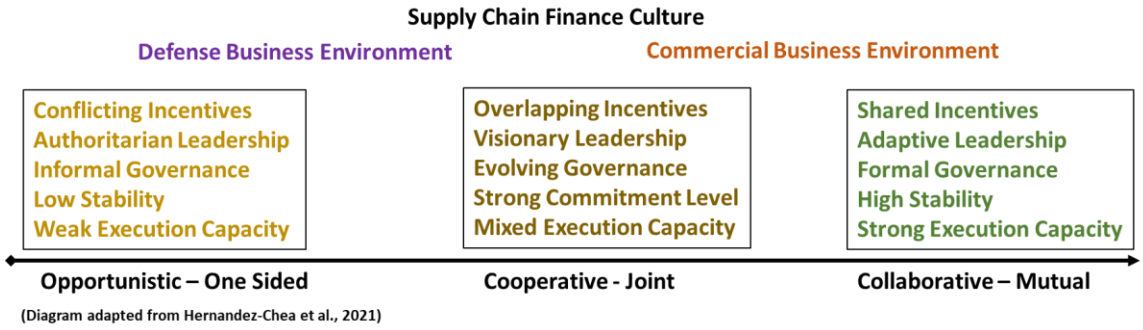

Figure 7: Supply Chain Finance Culture

Ultimately, there needs to be more visibility of subtier SME suppliers' financial health by the DoD to extend the intent of prompt payment. Increasing the overall visibility of SME Suppliers' financial health may mitigate the number of small businesses exiting the DIB because of declining economic outcomes or financial cash flow prospects.

Assertion 3. The core features and benefits of buyer-led SCF instruments - and specifically the adoption of the reverse factoring instrument -appear to be logical candidates for the DoD stakeholders to consider for improving working capital position and timely cash flow for SME suppliers. The portfolio of SCF practices ought to be elevated in terms of awareness and consideration for SME suppliers sourcing critical materials and services as subcontractors to large OEMs within the DIB. The strategic motives and objectives for greater awareness are logical and relevant for improving the working capital position across the buyer-supplier relationships, especially for critical SME suppliers sourcing to multiple OEMs.

The SCF digital platforms available in the market offer improved access to, and transparency of, timely payments made to supply base participants and may offer a way to gain insights into cash conversion cycles of private SME suppliers as a success metric. As information transparency regarding cash flows improves, more fintech firms will likely pursue a broad market opportunity with thousands of SME suppliers in the defense supply base.

Proposition. Enterprise Orchestration is a critical mediator to promote awareness and adoption of buyer-led SCF practices with SME suppliers within the defense business environment. Intermediaries at many echelons play a crucial role in advocating an understanding of available SCF instruments and the mutual benefits of adoption. Orchestration is necessary to transition beyond a transactional mindset to financial partnerships with subtier SME suppliers in the defense business environment. Greater awareness of the principles of buyer-Led SCF practices offers a mechanism for extending the intent of the Prompt Payment Act to a broader set of constituents in the DIB supply base.

Enterprise orchestration involves a set of actors governing and supporting the SCF ecosystem. DoD policymakers are one of many actors responsible for the intermediation of SCF concepts, performance conditions, and operational execution procedures. DoD policymakers should prompt orchestration in conjunction with the large defense OEMs and with forums such as the NDIA to develop a roadmap to improve the visibility and transparency of cash flow payments to SME suppliers in collaboration with other departments to adjust policy and interpretation of Federal Acquisition Regulations.

Contributions

This research offers empirical evidence regarding SCF adoption trends for SME suppliers and challenges considering several externalities of U.S. defense procurement contracts. The study validated extant SCF concepts and propositions within a commercial OEM business environment. The results of this dissertation contribute to the literature and management practitioners through descriptions of evolving motives, key enablers, and adoption challenges among stakeholders in the high-technology manufacturing industries, emphasizing implications for SME manufacturers and suppliers sourcing components to large defense OEMs.

Theoretical Implications

This dissertation reflects a combination and extension of previous SCF case study propositions. It generates a robust conceptual framework for quantitative analysis with the dimensions employed for this exploratory assessment. Key concepts and variables from transaction cost economics partially explain interorganizational governance decisions related to SCF adoption in the OEM buyer-SME supplier relationship. Those first-order TCE concepts applied to the overall objective to free up working capital for alternative investments for firm capabilities while minimizing finance costs.

Mutual investments were required in the buyer-supplier relationship to support awareness training, clarify features and benefits of SCF adoption, and enable implementation and interface with the digital SCF platform. Investments on both sides of the buyer-supplier relationship influenced the SCF adoption decision to generate a successful long-term contract. The OEM Corporate Finance department makes a

substantial investment in the capabilities to promote the SCF program. SME suppliers also had to invest time and energy to facilitate the interface requirements with their ERP systems and local bank to assign receivables.

My observations confirmed the use of corporate policy as a form of opportunistic buying power used to pressure some SME suppliers into joining the commercial OEM SCF program. Opportunism plays a leading role in buyers pressing for a unilateral extension of payment terms on the supply base to improve OEMs' working capital positions. In exchange for joining an SCF program, the reverse factoring instrument reduces the cost of capital for an SME supplier, reduces the uncertainty of cash flow timing, and increases the efficiency of visibility and governance of transactions. While OEM buyer power strongly influenced opportunism, the eventual adoption of the RF instrument achieved mutual gains across the buyer-supplier relationship. SCF adoption mitigated contract hazards of supplier risk by reducing uncertainty through awareness and education of intra-firm stakeholders and SME suppliers.

Bounded rationality plays a critical role in how SME suppliers grapple with a limited understanding of how to compare the annual costs of SCF instruments to other working capital financing options. These aspects of buyer-led opportunism and bounded rationality were mitigated through a robust awareness training program offered by the OEM to demonstrate the economic value proposition of participation to SME suppliers.

Within the SCF domain, understanding how to foster and employ SCF instruments in quasi-government contracts effectively remains very limited. Theoretical implications of the research include positioning enterprise orchestration as a critical mediator for successful adoption. Other theoretical implications of the research include

corroboration of conceptual SCF propositions harnessed from previous case study research focused on buyer-SME supplier relationships. The research also contributes insights into existing boundary conditions for adopting SCF instruments in quasi-governmental contracts in the massive U.S. defense industry largely dependent upon SME suppliers competing in a global supply network.

A definite sequence of importance was applied concerning the moderating effect of OEM Buyer Strategic Motives on SCF adoption. The first priority was demonstrating the impact on the buyer capital position measured by increasing DPO for high-volume suppliers. The second priority focused on improving supply chain operations' overall stability and reliability. In contrast, the third priority promoted greater supplier diversity and alignment with other OEM sustainability goals.

The adoption of an SCF instrument is negatively moderated by more attractive working capital finance options available to the SME supplier. Given the unique circumstances in the buyer-supplier relationship, collaborative intermediation across multiple echelons of responsibility positively moderated the fostering and SCF adoption at many echelons of responsibility. The intermediary role switches depending on stakeholder responsibilities. Employment of the SCF digital platform positively moderates adoption by offering an efficient tool to manage and govern transactions between the buyer-supplier relationship.

Managerial Implications

The findings and lessons learned contribute insights for managers and practitioners to investigate how SCF practices and instruments might improve the

working capital position of their firm and, more broadly, with supply network partners. This research exploring the state of SCF adoption in the U.S. defense business environment included unique stakeholder perspectives, including DoD policy executives and operational directors responsible for the readiness of legacy weapon system platforms and to prompt financial health of the SME suppliers sourcing to large defense OEMs. This research also captured insights from multiple financial service providers, specifically from successful fintech firms operating in North America, as to why SCF may be hampered within the public sector and perceived constraints with government acquisition regulations related to mandated payment terms for subcontracted SME suppliers. The SCF financial service providers provide a critical intermediary role and our best positioned to shape how the digital technology platforms can be aligned to improve the visibility and transparency of cash flow payments to supply base SME participants.

Unique contributions include a better understanding of why the buyer-led SCF practice of reverse factoring for defense contracts appears to lag the degree of application and participation with SME suppliers observed in a commercial OEM business environment. The constrained adoption and employment of buyer-led SCF practices in the defense industry is linked to many interdepended barriers, including:

(a) a conservative culture in the defense business environment that embraces more traditional financing mechanisms with an SME supplier's host bank.

(b) limited awareness and promotion of buyer-led SCF instruments between defense OEMs and their SME partners in the supply base as a viable alternative to finance short-term working capital needs.

(c) limited pursuit and penetration by the SCF industry into government contracts due to the anticipated burden of understanding and navigating the complex regulatory mandates used in defense acquisition contracts and potential mandates on payment terms.

(d) minimal visibility of cash flow distress affecting the financial health of SME subcontracted suppliers by the DoD due to the privity of contract.

(e) There needs to be clarity in the terminology used by a fragmented SCF ecosystem to describe similar finance products making it difficult to compare features and costs.

To counter identified barriers to SCF adoption in the defense business environment, respondents in the case study advocated a more significant degree of orchestration between DoD policymakers, the defense OEMs, and industry forums contributing to the readiness of the defense industrial base. Case study respondents prompted orchestration to improve overall awareness of alternative buyer-led financing options and to promote consistent use of terms to describe SCF concepts, performance conditions, and execution procedures.

SCF financial service providers provide a critical intermediary role. They are best positioned to shape how digital technology platforms can be aligned to improve the visibility and transparency of cash flow payments to supply-based SME participants. The finding helps clarify the actual or perceived hard constraints of adoption resulting from emerging regulations and costs of onboarding. I intended this dissertation to provide decision-makers with potential recommendations for policy considerations and advocacy, if warranted, directed at the DoD and military services. Practitioners can leverage this study's findings and conclusions to assess further quantitative and

qualitative factors influencing a business case for promoting increased SCF adoption in the defense industry.

Limitations and Future Research

The most significant limitation was the overall reluctance by stakeholders in the Defense OEMs to share perspectives on SCF adoption due to legal policy or the proprietary nature of financial contracts. Although this exploratory research offers perspectives across two business environments using four embedded units of analysis within a single case, more quantitative research is needed to clarify potential implications to a broader population of SME suppliers supporting the DIB.

Secondly, the external validity of the conclusions offered is limited because of the scope and sample size of respondents representing defense OEM manufacturers and SME suppliers. While the baseline commercial OEM provided keen insights as to strategic intent for adopting SCF and corresponding processes, procedures, and collaboration requirements, the examination was limited to viewpoints of a single multinational enterprise.

A third limitation is a potential bias arising from one successful SCF program's reliance on a large commercial OEM buying firm as a baseline for understanding strategic intent, processes, and adoption outcomes. Limited access to representatives of other OEM firms with requisite experience may have skewed responses regarding organizational intermediation of collaboration and information sharing.

Future Research

Future research efforts should continue the exploration of situations in which SCF adoption has positively impacted strategic enterprise objectives within a defense business ecosystem or quasi-government contract environment. Evaluating the prototype application of the reverse factoring instrument within an OEM's network of subcontractors could lead to the elaboration of how the adoption of SCF generates favorable working capital positions for multiple stakeholders and provides cash for alternative investments aligned with production capacity or for enhancement of the skills of SME suppliers' workforces.

Future research should focus on a more thorough comparison of where SCF has worked successfully in various clusters of the defense business environment and where it needs to further clarify enablers and known challenges. More insights are needed regarding the impact of the SME lifecycle on working capital needs. For example, the difference in buyer-led SCF needs between start-up SMEs and seasoned firms should be investigated. Including perspectives from the financial service provider, viewpoints can further illuminate the explanations for the success or failure of adoption and the role of acquisition regulations constraining buyer-led SCF practices.

Other SCF instruments in the B2B market should be explored, including much more emphasis on middle-tier and deep-tier inventory management. Other areas of future research include a deeper examination of inventory financing with third-party logistics providers.

Other organizational governance theories must be empirically assessed in the SCF adoption literature, including:

- Principle Agent Theory – to further explore the relationship between DoD policymakers and the large defense OEMs to expand intermediation of SCF capabilities
- Social Exchange Theory – as a mechanism to reinvest in the SME manufacturing base
- Resource Dependency Theory – as an explanatory mechanism for expanding intermediation and enterprise orchestration

From an evolving technology perspective, an emerging area gaining traction is embedded finance with SME Suppliers providing quick and efficient access to SCF options. SCF adoption research efforts should also continue monitoring the development of blockchain technologies as a potential mechanism to expand SCF capabilities to an extended supply network.

Conclusions

More empirical research is needed to understand the evolving interactions between organizational intermediation, evolving technology capabilities, and expanding options to offer more access to affordable financing for SME suppliers. The SME suppliers in the defense industrial base produce a critical portion of the value and intellectual capability needed to deliver and sustain extremely sophisticated weapon system platforms that position the United States as the dominant global military force. Investigating and understanding the concepts, conditions, and execution of successful buyer-led SCF instruments supporting SME subcontract suppliers sourcing to defense

procurement contracts can help the DoD address a fundamental problem of cash flow benefits flowing to small businesses contributing to the industrial base.

Access to data about the state of SCF in the defense industrial base will remain challenging without prompting the need for enterprise orchestration with DIB stakeholders. No unilateral SCF practice or solution will resolve the complex nature of cash flow distress concerns affecting some proportion of SME subcontracted suppliers in the DIB. Moving from a culture of transactional opportunism to partnerships in the SCF domain across the U.S. defense industry requires a transformational mindset, policymaker champions, and investments.

Promoting SCF offers many collateral benefits for generating a much more robust understanding of the overall health of subtier supplier readiness. Multiple business and financial intermediaries must collaborate and agree to familiar concepts, performance conditions, and execution procedures to improve cash flow benefits to subtier SME suppliers sourcing to large OEMs in the defense industrial base.

This dissertation offers a framework for conducting a deeper assessment of cash flow distress and working capital finance options available for relief. More research is needed to quantify and qualify the problem set clearly and to foster an increasing degree of visibility and transparency of cash flow conditions between defense department policymakers and defense OEMs to design out SME financial fragility where warranted.

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Appendix A

Table A1: List of Abbreviations

Abbreviation	Term	Definition
B2B	Business to business	Transactions or business conducted between firms
OEM	Original Equipment Manufacturer	An organization that makes devices from component parts bought from other organizations (Oxford dictionary, 2022).
SCF	Supply chain finance	Practices enhancing access to financing options along with risk mitigation practices and techniques to optimize the management of the working capital and liquidity invested in supply chain processes and transactions (Pfohl and Gomm, 2009)
SCM	Supply chain management	The systemic, strategic coordination of the traditional business functions and the tactics across these business functions within a particular company and across businesses within the supply chain, for the purposes of improving the long-term performance of the individual companies and the supply chain as a whole
SME	Small–medium-sized enterprise	Defined in the U.S. defense industry in accordance with the North American Industry Code System; in general, a business that employs fewer than 500 employees or produces annual revenue under $30,000,000.
WCM	Working capital management	A firm's ability to meet short-term obligations to pay bills and to improve operational efficiency, which is normally qualified as the excess of current assets over current liabilities

Appendix B

List of Definitions

Buyer financial strength stems from low costs and easy access to external funding and sufficient liquidity (Brealey et al., 2011).

Cash conversion cycle* or *cash-to-cash cycle is the average days required to turn a dollar invested in raw materials into a dollar collected from a customer (G. Stewart, 1995, see also Farris & Hutchison, 2002); the cycle consists of three components: days of sales outstanding (accounts receivable collection period) plus days of inventory held (considering both work in progress and finished products) minus days of payable outstanding (accounts payable settlement period).

Cash flow uncertainty increases with extension of length of payment terms and level of variance for incoming payments (Ng et al., 1999; Van der Vliet et al., 2015).

Collaboration actions of working with someone to produce or create something as a joint intellectual endeavor (retrieved from Collaboration - Oxford Reference (oclc.org) on 22 May 2023)

Dynamic discounting is a practice in which a buyer and supplier collaboratively adjust standard payment terms dynamically (Templar et al., 2020); the discount is often a linear function of the time outstanding. A nuance of this practice is that suppliers may usually trigger early payment at a time of their choosing. The buyer provides funding (Caniato et al., 2016).

Financial intermediary is an entity that acts as the middleman between two parties in a financial transaction, such as a commercial bank, investment bank, mutual fund, or pension fund. Financial intermediaries offer a number of benefits to the average

consumer, including safety, liquidity, and economies of scale involved in banking and asset management. Although in certain areas, such as investing, advances in technology threaten to eliminate the financial intermediary, disintermediation is much less of a threat in other areas of finance, including banking and insurance (Investopedia, retrieved on 22 May 2022 from Financial Intermediary: What It Means, How It Works, Examples (investopedia.com).

Financial strategy alignment describes common intrafirm financial objectives for finance and operations departments (Wandfluh et al., 2016).

Information technology capabilities are SCF platform features, including the ability to interface with existing enterprise requirements planning systems and information technology knowledge and technology advancements within a platform (Lacity et al., 2009).

Intermediation – the brokering and bridging of knowledge exchange between industrial actors in ecosystems and networks (Arnaldi and Neresini, 2019).

Intermediaries are individuals or companies that behave as middlemen between parties for investment deals, business deals, negotiations, insurances, etc. They are commonly known as consultants or brokers and are specialized in a specific area. "a person who actively participates in the facilitation of the contract or negotiating the contract, including a broker, adviser, attorney, or representative of or agent for the business entity". Retrieved from Intermediary Definition | Law Insider on 22 May 2023.

Intermediary Organizations play a crucial role in facilitating collaboration by mobilizing and orchestrating resources from resource-provider organizations to recipients

in ecosystems (Cao and Shi, 2021). ***Interdependency Relationships*** are opportunistic (one-sided); cooperative (joint) or collaborative (mutual) (Hernandez-Chea et al., 2021).

Inventory financing requires a firm to use its current assets (e.g., account receivables and inventory) as collateral to obtain financing from a financial service provider or to extend credit lines from buyers by exploiting the value of its assets rather than its credit rating (Berger & Udell, 2006; Gelsomino et al., 2019; Yan & Sun, 2013). Inventory financing has recently involved using a third-party logistics provider in the role of financial service provider to purchase goods from suppliers and resell them to buyers after a period of time. Before reselling to buyers, the third-party logistics provider retains ownership of the goods (Chen & Hu, 2011; Gelsomino et al., 2019; Hofmann, 2009).

Net working capital represents a firm's ability to meet short-term obligations, pay bills, and improve operational efficiency and is normally quantified as the excess of current assets over current liabilities (Brealey et al., 2011; Templar et al., 2020).

Orchestration is an important ecosystem role led by an actor or set of actors typically responsible for governing and supporting the ecosystem (Manikas, 2016). Bal and Bal (2019: pp. 217 - 220) suggest that the SCF ecosystem success is deeply dependent on cooperation around commonly agreed standards. This form of orchestration leads to standardization of concepts, of conditions and regarding execution procedures. Arrange or direct the elements of (a situation) to produce a desired effect (Retrieved from: Orchestrate - Oxford Reference (oclc.org) on 22 May 2023).

Purchase order financing is a type of reshipment financing in which suppliers can gain access to capital provided by a financial service provider based on purchase orders issued by creditworthy and reputable buyers before delivery of products. Differing

from asset-based financing (e.g., inventory financing), which involves pledging tangible assets, purchase order financing conditions repayment of loans on the successful delivery of products meeting the requirements of buyers (Reindorp et al., 2018; Tang et al., 2018). The major risk of purchase order financing therefore relates to the supplier's production and delivery performance (Huang et al., 2022; Tang et al., 2018).

Reverse factoring is a common SCF practice in which a bank or other financial service provider commits to pay a buyer's invoices to the buyer's suppliers using the buyer's credit rating. Reverse factoring targets accounts receivable for the supplier and accounts payable for the buyer (Wuttke et al., 2019). Within reverse factoring, the buyer approves invoices and sends the invoice information to the financial service provider for confirmation, upon which the supplier delivers products; the supplier then sells the accounts receivable to the financial service provider to obtain immediate financing with a discount. The financial service provider determines the discount rate based on the creditworthiness of the buyer, then the buyer repays the financial service provider the invoice amount after an agreed payment term granted by the supplier (Grüter & Wuttke, 2017; Liebl et al., 2016; Van der Vliet et al., 2015; Wuttke, Blome, & Henke, 2013; Wuttke et al., 2019). The financial service provider offers financing for the supplier based on the buyer's credit rating rather than the supplier's. Hence this mechanism can lower the transaction risk of the lender (i.e., the financial service provider; Lekkakos & Serrano, 2016; Liebl et al., 2016).

Supply Chain Finance aims to optimize financial flows at an interorganizational level through solutions implemented by financial institutions or technology providers [Fintechs]. The ultimate objective is to align financial flows with product and information

flows with the supply chain, improving cash-flow management from a supply chain perspective (Gelsomino et al., 2016, p. 348).

Supplier financial strength places emphasis on distressed suppliers for which the benefits of SCF practices increase strength (Brealey et al., 2011; Martin & Hofmann, 2019).

Trade credit is a short-term loan for a buying firm's purchase from a supplier, which appears as accounts payable in the buyer's balance sheet and accounts receivable in the supplier's balance sheet. Trade credit is the predominant internal financing method for firms allowing buyers to extend payment terms to sellers without interest charges over prescribed time ranges (Caniato et al., 2016; Seifert & Seifert, 2011; Wetzel & Hofmann, 2019; Yoo et al., 2021).

Appendix C

Protocol Used for Semistructured Interviews

This appendix summarizes the guidelines for conducting the semistructured protocol. The interview questions derived from previous case study research in SCF practices conducted by Caniato et al., (2016); Wuttke, Blome, and Henke (2013), Martin and Hofmann (2019), de Goeij et al. (2021), and Phraknoi et al. (2022).

The aim of the protocol is to capture interpretation regarding differences in fostering, adoption, and governance of SCF practices between prime OEM contractors and SME suppliers in collaboration with financial service providers and SCF fintech firms. The interview questions are primarily based on the conceptual framework and address the thematic categories of SCF adoption, SME supplier financial interdependencies, OEM strategic motives, collaboration culture, role of SCF digital platform, and SME working capital financing options.

During interviews, modifications to the primary set of questions and addition of topics related to the specific role of the group a respondent belonged to. Group 1 consisted of DoD customer respondents. Group 2 consisted of a commercial OEM and SME supplier. Group 3 consisted of defense industry OEMs and SME suppliers. Group 4 consisted of SCF financial service providers and SCF fintechs.

General Introduction

Thank You for your participation in a research study conducted by Jim Phelps, a PhD candidate at the University of Denver, regarding the adoption of supply chain finance practices for SME suppliers sourcing to OEM prime vendors within the Defense Industrial Base. Supply Chain Finance practices enhance access to alternative financing options for working capital needs. The purpose of this study is to develop a better understanding of how large OEM manufacturers are collaborating with their network of inbound SME suppliers to improve affordable access to working capital.

Your responses are confidential and no direct attribution to you or your firm will be published in the research report. The Expected time to complete interview discussion is 30 – 45 minutes.

Demographics

Please provide a brief description of your role in the firm, your business unit function, and your role in participation with finance for supply chain partners.

Prompts:

a) Role & key tasks within your organization

b) Business Unit responsibilities – Size – Revenue – Number of Employees – Geographic Range of responsibility

c) Proportion of Business Commercial / Defense or Federal Government Contracting

d) General degree of participation (Program, Policy, Implementation) of supply chain financing in collaboration with other functional divisions in your firm

e) Where does the topic of SCF fit in context with other priorities or concerns?

f) Any other unique attributes of business related to the subject of SCF?

1. SCF Practice Adoption

a) What type of financing is typically used to finance working capital needs of SMEs in OEM Supply Base?

- Commercial Debt or Self-Finance
- SCF
- Defense Contract

b) Has your enterprise fostered or adopted buyer-led SCF practices? If so, what type of practices?

- Types may include - - If there is more than one – what is most dominant or popular?
  - Reverse Factoring
  - Dynamic Discounting
  - Inventory Financing
  - Purchase Order Financing
  - Other

c) Please speak to affordability and any access limitations of the working capital financing needs of SME suppliers

- Working Capital Affordability
  - Components used for pricing
  - Discount Rate – Credit Rating – Fees
- Aware of any Working Capital Access Limitations
  - Host Bank
  - Regulatory Constraints / Accounting Compliance

2. SME Supplier – Financial Interdependencies

What are the criteria used to extend a SCF program with SME suppliers?

Prompts:

- Posture or Visibility criteria may include:
    - Criticality of SME Supplier
    - Spend Volume
    - Days Payable Outstanding
- Magnitude / Frequency of Distress with SME Suppliers
    - Cash Flow Distress
    - Financial Viability (Potential of Bankruptcy)
- To what depth do you map suppliers in your inbound network?
    - Beyond Direct – Tier 1 Suppliers – does your firm identify and isolate critical suppliers?
    - Role of Supply Chain Risk Management / Supplier Relationship Management
    - What tools or initiatives are you using to extend visibility of supply network?

3. OEM Strategic Motives

What are the working capital financing program objectives for the OEM supply base?

Prompts:

- Objectives may include:
    - Working Capital Position – Reduce CCC
    - Reliable Supply Chain Operations (Stable – Resiliency)
    - Improve Buyer-Supplier Relationships (Diversity / Sustainability Goals)
    - Are there other motives and objectives from any stakeholder?

4. Collaboration Culture – for improving Cash Flow and SCF Adoption

Please describe typical actions taken for collaboration within your firm, with your supply base, and with financial service providers for improving cash flow and working capital positions to adopt and govern SCF instruments?

Prompts:

- Identify collaboration at three levels:
    - Intra-Firm – Who Leads the effort?
    - How is Buyer-Supplier Uncertainty addressed?
    - What investment is needed to promote SCF Awareness?
    - What investment needed to education stakeholders on SCF value proposition?
    - Impact of Buyer-Supplier Power / Negotiating Power / Opportunism
    - What role do your FSP intermediaries have in Collaboration?
    - What are the prevalent issues or challenges you experience on this topic?

5. SCF Digital Platform

How does the platform improve adoption and implementation?

Prompts:

- Identify efficiency enablers:
    - Simple Onboarding Process
    - Transparency in B2B Procure to Pay processes
    - Timely governance of Transactions – Visibility and Approval of e-invoice
    - Integration with ERP Systems
    - SME Supplier on multiple SCF Platforms?
    - Any issues or challenges?

6. SME Working Capital Financing – Alternate Options

What financing is typically used for working capital needs?

Prompts:

- Identify alternate options at two levels:
    - Commercial Debt Instruments – Line of Credit or SBA Loan or Other
    - Defense Contract Finance Instruments – Cost Plus Contract

7. Are there other insights or emerging trends I should be aware of given your experience in finance for SME suppliers?

Prompts:

- Corporate Policy
- Operational Impacts
- Legal or Regulatory Concerns

Other related topics for Group 1: DoD Customers

- OSD A&S Concerns
- OSD Industrial Base Policy on financing SMEs
- OSD Defense Contract Financing & DCS Study Findings
- OSD Strategic Capital Program –
- OSD DCMA Perspective of Small business issues
- USAF Sustainment Command – SCM Perspectives
- DLA Perspectives – SCM Perspectives

Other related topics for Group 2: Commercial OEM

- SCF Industry Trends & Issues
- FASB Disclosure and Accounting
- State of Multi-Tier Supply Chain Finance
- Perspectives on use of Block Chain Technology
- Issues with Supplier Rebates for joining SCF Program
- Multiple SCF Platform Issues for SME Suppliers
- Regulatory Topics: KYC / Political Corruption / UCC House Bank Consent

Other related topics for Group 3: Defense Industrial Base OEMs & SME Suppliers

- Reasons for Exiting / Non-Entry as SME Supplier
- Acquisition Reform must be parallel with Financing Reform
- No visibility of demand / Unstable demand profiles
- DoD Budgeting – Continuing Resolution
- More direct contracts to SME Supply Base with DoD

Other related topics for Group 4: Financial Service Provider / FinTech

- SCF Industry Trends & Issues
- FASB Disclosure and Accounting
- State of Multi-Tier Supply Chain Finance
- Perspectives on use of Block Chain Technology

Appendix D

Ethics Statement and Consent Form for Institutional Review Board Requirements

You are invited to participate in a research study regarding adoption of supply chain finance practices for suppliers sourcing to prime vendors in the Defense Industrial Base. The purpose of this study is to better understand the factors for exploring and adopting innovative supply chain finance practices and the impact on expected performance outcomes for your firm. You were selected as a possible participant in this study because of your professional role and experience related to corporate finance, supply chain management, and or procurement.

If you decide to participate, please understand your participation is voluntary and you have the right to withdraw and discontinue participation at any time. If you decide to participate, please complete the following survey. Your completion of this questionnaire indicates your consent to participate in this research study. The questionnaire is designed to capture and understand multiple perspectives regarding collaboration, information exchange, market drivers and ultimately the perceived or realized impact on firm performance and overall performance of a supply chain network.

The questionnaire will take approximately one hour to complete. Data will be collected using the Internet; no guarantees can be made regarding the interception of data sent via the Internet by any third party. Confidentiality will be maintained to the degree permitted by the technology used. Please feel free to ask questions regarding this study. You may contact me if you have additional questions via email at jim.phelps@du.edu , or by mobile phone at 618-670-7894.

If you are not satisfied with how this study is being conducted, or if you have any concerns, complaints, or broad questions about the research or your rights as a participant, please contact the University of Denver (DU) Institutional Review Board to speak to someone independent of the research team at (303) 871-2121, or email at IRBAdmin@du.edu.

De-identified data from this study may be shared with the research community to advance understanding of how supply chain finance solutions affect business-to-business relationships. We will remove or code any personal information that could identify you before files are shared with other researchers to ensure that, by current scientific standards and known methods, no one will be able to identify you from the information we share. Despite these measures, we cannot guarantee anonymity of your personal data. Thank you for your time.

By clicking the link below, I confirm that I have read this form and decided that I will participate in the project described above. Its general purposes, the particulars of involvement, and possible risks and inconveniences have been explained to my satisfaction. I understand that I can discontinue participation at any time. My consent also indicates that I am at least 18 years of age.

Please feel free to print a copy of this consent form.

Appendix E

Data Summary (Within-Group Analysis)

This appendix provides respondent profiles and summary-level data collected from each of the respondent groups to identify emerging themes and evidence leading to the key findings. Group 1 (DoD executives) offered their professional perspectives on financing SME suppliers in the DIB and related cash flow issues for the supply base. Table E1 summarizes roles, positions and experience of respondents. Table E2 reflects patterns of responses for each of the contextual variables used for exploration of SME supplier financing.

Table E1: Defense Department Customer Respondent Profiles

Respondent	Roles and Experience
Defense Executive 1	Senior Executive for Industrial Policy – PhD
Defense Executive 2	Senior Executive for Strategic Capital Program – Strategic Plans
Defense Executive 3	Deputy Director for Contract Policy
Defense Executive 4	Senior General Officer – Defense Contract Management
USAF Executive 1	Executive Director – Responsible for readiness and supply chain operations for 15 major platforms
USAF Executive 2	Director for Finance – USAF Command
USAF Executive 3	Senior Executive - Director Supply Chain Operations Wing
Defense Executive 5	Senior Executive - Director for Defense Logistics Agency Aviation

Table E2: Defense Department Customer Responses (From Policy and Operations Executives)

Concepts	Summary of responses and emerging themes
Financing practices for defense prime contractors (OEM or small business)	Defense contract predelivery finance instruments: cost-plus projects with markup fee (5%–15%), advance payment for materials, and performance-based payments or progress payments Delivery invoices paid by DoD within 30 days Accelerated payments from DoD (used for conditional situations) in advance of payment term to support supply base
Financing practices for defense subcontractors (large or small suppliers)	Best commercial terms negotiated between OEM prime and suppliers: Payment terms Net 30–90 days (majority) Flow down of defense cost-plus contracts (20%–30%) offered to OEM subcontractors Accelerated payments—flow down from prime (conditional) Reverse factoring is not often offered or applied
Strategic motives	Provide consistent cash flows to OEM prime contractor Attract and retain small businesses in the supply base
Supplier interdependency in supply base	Defense customers dependent on OEM primes Constrained due to privity of contract
Collaboration culture	Transactional—Best value Advocacy for small business opportunity and retention
Role of SCF technology platform	Not applicable
Other emerging insights	Parallel reform of regulations for defense contract finance and defense procurement processes is needed to slow the exit of small business subcontractors sourcing to the DIB (Infers orchestration by the DoD)

Note. DoD = Department of Defense; SCF = supply chain finance.

Operational perspectives came from executives of the U.S. Air Force Sustainment Command and an executive of the Defense Logistics Agency and focused on readiness of aviation and missile platforms. The operational respondents worked in direct coordination with OEM prime contractors and with SME suppliers to manage overall readiness of platforms and inventory management of spare parts for maintenance and repair operations.

Respondent feedback from Group 2 (commercial OEM baseline group) provided insights from multiple perspectives into adoption of the reverse factoring instrument. Table E3 summarizes roles, positions and experience of respondents. Table E4 reflects patterns of responses for each of the conceptual variables and emerging insights used for exploration of SME supplier financing.

Table E3: Commercial OEM SCF Program Respondent Profiles

Respondent	Roles and Experience
Commercial OEM Finance Executive	Corporate Enterprise SCF Program Director
Business Unit 1	Manager for Supply Chain
Business Unit 2	Director for Procurement
Business Unit 3	Director for Procurement
Business Unit 4	Director for Supply Chain
SME Supplier	CEO – SME Supplier – HVAC Industry

Table E4: Commercial Contract OEM and Small–Medium-Sized Enterprise Suppliers (Baseline Case—Successful Adoption of Reverse Factoring)

Contextual a priori variable	Summary of responses and emerging themes
Financing practice for suppliers using reverse factoring	Economic business case is required for each supplier Access to suppliers open at $20,000 annual spend volume Extended payment terms average net 90–120 days SCF fee paid by supplier Fintech spread based on buyer's credit rating and annual spend volume (150–250 basis points) Secured overnight financing rate interest at invoice approval (e.g., 500 basis points) Supplier paid 10–15 days after invoice approval Buyer pays fintech at payment term date
Strategic motives	Free up cash for supply chain partners Generate improved economic working capital position for OEM buyer and suppliers Provide suppliers with consistent early payments
Supplier interdependency	Dun and Bradstreet/credit ratings Supplier relationship management program
Collaboration culture	Awareness and education of SCF program is paramount Flexibility needed for dynamic and diverse circumstances Relatively high participation rate with Tier 1 suppliers Low attrition once a supplier has adopted SCF program
Role of SCF technology platforms	Enabler for transparency, trust, speed, and efficiency Value of block chain technology for SCF still being explored
Other emerging insights	SCF for multitier suppliers is in experimental stage Monitor implications of new Financial Accounting Standards Board guidance for accounting transparency of SCF instruments in financial reports

Note. SCF = supply chain finance.

These insights included the role of leaders in the corporate finance department responsible for oversight and fostering of the SCF program for the Americas. Other insights came from both procurement and supply chain leaders responsible for directly engaging with supply base partners. This group's responses included perspectives from the CEO of an SME supplier to the commercial OEM. This group also included the general manager of a leading fintech firm providing the SCF technology platform for the OEM buyer.

Respondent feedback from Group 3 (defense contract OEMs and SME suppliers) provided insights into payment and cash flow implications based on personal experiences of senior executives in four defense OEMs and key leaders of four Tier 1 SME suppliers. Table E5 provides profiles of respondents. Table E6 summarizes patterns of responses for each of the contextual variables used for exploring trends of SCF adoption for firms within the DIB.

Table E5: Defense Industry Base Respondent Profiles (OEMs and SME Suppliers)

Respondent	Roles and Experience
Defense OEM 1	Sr Manager – Technology Procurement & Strategic Sourcing, 15 Years with DIB
Defense OEM 2	Sr Finance Manager – Aerospace and Defense, 18 Years
Defense OEM 3	President – Business Unit and Vice President Supply Chain Operations (Defense Business Unit)
Defense OEM 4	Sr Manager – Global Sourcing Category Manager
DIB SME Supplier 1	CEO – Precision Machine Shop - PhD – NDIA Chair for Manufacturing – 37 years' experience with DIB
DIB SME Supplier 2	CEO – Mechanical Pumps for DoD Systems – NDIA Chair for Manufacturing
DIB SME Supplier 3	VP and COO – Printed Circuit Boards for DoD Systems - PhD
DIB SME Supplier 4	VP Strategy Defense and Space and VP Supply Chain Operations – PhD – 16 Years – Intermediator with Defense OEMs and Supply Base

Table E6: Defense Industrial Base—Defense Contract OEMs and Small-Medium-Sized Enterprise (SME) Suppliers

Conceptual variable	Summary of responses and emerging themes
Financing practices for defense subcontractors (large or SME suppliers)	Commercial debt lending (majority) Defense contract finance instruments (flow down ~30%) Accelerated payments (conditional on short-term events) Reverse factoring practice (rare)
Strategic motives (for OEMs)	Financial metrics—improve cash conversion cycle time OEM 3: Design out supplier fragility OEM 1: Willing to go cash flow negative to keep supply network healthy
Strategic motives (for SME suppliers)	Cash is king—making payroll is not just a cliché Seeking survival in a fierce global ecosystem Burning platform—the DoD is losing core value-added manufacturing capacity because of late payments and terms Financial risk continues to be pushed onto the supply base
Supplier interdependency	Limited and difficult with private firms Evolving with supply chain risk management platforms and artificial intelligence tools (e.g., Resilinc platform)
Collaboration culture	Current contracting practices keep government customer at arm's length from value-added supplier tiers OEM 4 not a bank—financial support is by exception only OEM 1 shifting from transactional to network readiness
Role of SCF technology platforms	Limited understanding and application in defense industrial base
Other emerging insights	Supply chain orchestration needed between and beyond DoD and OEMs: Offer more direct contracts to SME suppliers Workload variance can be very harmful to niche of small business suppliers Exodus of small business suppliers can be reduced if mindset altered from transactional to partnership Defense industrial policy advocacy needed to improve cash flow parity for subcontracting small business suppliers Flexibility needed in acquisition procedures to attract and retain small businesses in the supply base

Note. DoD = Department of Defense; SCF = supply chain finance.

Respondent feedback from Group 4 (financial service providers) included personal views of executives from a large U.S. bank and three SCF fintech firms, who provided insights into how SCF has been evolving to provide services for SME suppliers and further clarified limitations with respect to government contracts. Table E4 summarizes patterns of these responses for the conceptual variables used for exploration.

Table E7: SCF Financial Service Providers Respondent Profiles

Respondent	Roles and Experience
SCF Banker	VP Global SCF with large US Bank – 30+ years in International Finance
SCF Fintech 1	Managing Director – Global SCF Fintech
SCF Fintech 2	Director Working Capital Solutions – Global SCF Fintech – 25 years in Finance and Consulting
SCF Fintech 3	VP Global Fintech – Global Program Manager - 6 years
GOVCON FSP	CEO - Working Capital Finance Firm for Government Contractors

Table E8: Financial Service Providers – Working Capital for SME firms

Conceptual variable	Summary of Findings and Emerging Themes
Financing practices for SME suppliers	Reverse factoring is the dominant SCF practice and growing Dynamic Discounting is widely available – tends to be more automated given unique cash flow situation of SME Supplier Investment grade buyers discount rates at 150–350 basis points Sub-investment-grade buyers ($500,000,000–$1,000,000,000) discount rates are secured overnight financing rate + 400–700 basis points For government contracts – Traditional AR factoring fees at 250 – 300 BPS per month; GovCon Factoring Agency fees at 100 – 120 BPS per month; Line of Credit Fees at 75 BPS For Federal government contracts – there are limitations to assignment of claims that must be carefully understood and negotiated For government contracts assume limitations exist regarding extension of payment terms, therefore often no business case to meet return on capital Working Capital finance is not the core problem - - it's the defense procurement process that creates much turbulence in expected cash flows
Strategic motives	Highest priority is to generate positive working capital position for OEMs by expanding the reverse factoring instrument to a much broader supply base
Interdependence	The SCF ecosystem remains fragmented and misunderstood by many stakeholders – modifications to public policy, regulations, and processes can be the glue for generating a demand signal to benefit SME suppliers Seeing improvements to extend visibility post pandemic Traditional tools used by OEMs to assess SME financial health are Dun and Bradstreet/credit ratings Visibility of SME financial health is being augmented with artificial intelligence/machine learning analytics
Collaboration culture	Many SME suppliers understand receivables factoring; However, there is a prominent misunderstanding about features and benefits of nonrecourse reverse factoring
Role of SCF technology platforms	Platforms are improving interfaces with OEM enterprise requirements planning and supplier host bank, Improvements in visualization of cash flow gain over time Platform enables efficient adoption and onboarding
Other emerging insights	Certain state regulations (e.g., California) can be very difficult to navigate in the assignment of receivables for government contracts SCF industry can offer beneficial financing capabilities to support in-sourcing of semiconductor cluster initiatives (e.g., CHIPS Act) SCF industry is focusing more effort to leverage the reverse factoring practice to improve resiliency and sustainment with supply chain partners Innovation target—financing inventory for Tier 1 and beyond suppliers As capital markets tighten—and investors scrutinize working capital management—large banks limiting SCF to investment grade buyers (BBB/BB+) New guidance from Financial Accounting Standards Board to improve off-balance-sheet transparency of reverse factoring practices in financial accounting statements following significant bankruptcies such as Greensill Capital Nonrecourse—supplier not obligated if buyer does not pay invoice

Note. CHIPS = Creating Helpful Incentives to Produce Semiconductors