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Supply Chain Finance: Techniques, Benefits, and Trends

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ABSTRACT

This major research paper surveys the various aspects of supply chain finance, a recent sphere of working capital management techniques, and its importance for managing small, medium, and large-sized businesses. Globalism and elimination of trade obstacles have encouraged managers to reassess their capital investment priorities. The transition of managements' focus from manufacturing, stocking, and distribution to establishing and preserving a network of multiple partners entails adopting more trust-based and inclusive financing techniques. Moreover, the technological and managerial breakthroughs have reduced the inefficiency in the supply chain's physical flow, justifying taking a similar approach to financial flow within a supply chain. As a complex of financial and managerial methods, supply chain finance aims to resolve the untrustful relationships in business environments and facilitate financing while preserving the interests of multiple parties involved. The paper also examines the various individual techniques executed in the supply chain finance ecosystem. We discuss financing processes, risk mitigation strategies, benefits, and challenges associated with all those unique techniques. Finally, the paper concludes by contemplating recent financial and technological trends shaping the future of supply chain finance, such as securitization and blockchain technology.

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PROBLEM IDENTIFICATION, PURPOSE, & STRUCTURE

Problem Statement

By using technologies and logistical techniques, the supply chain parties are becoming more connected and financially dependent. Given these changes in the external environment, stakeholders also have started to develop new plans regarding the financial aspects of the supply chain. The traditional financing methods in recent decades proved to be inefficient in facing recent challenges. For example, through traditional financing methods, parties adopt single-minded approaches to supply chain management, rigorously fulfilling their interests while shifting the financial pressure on other parties involved in transactions (Further explanation in chapter 2&4). This approach becomes challenging when the cultivation of trust and long-term relationships between participants is necessary.

Furthermore, advancement in logistic management increased the efficiency of product shipments and other associated services, demanding similar improvements in the financial and information side (discussed in chapter 2). The significant challenges in financial supply chains are lack of trust, lack of automation, and ambiguity. Supply chain methods have recently gained popularity among businesses to deal with current inefficiencies and complexities in the supply chain. According to the Global SCF Forum, supply chain finance has been growing 5% each year since 2008, which shows that participants seek approaches more trust-based and less risky after the global financial crisis.

Objectives

A literature review was conducted on supply chain finance, supply chain management, and relevant technologies. The relevance of supply chain finance to the current global economic environment was surveyed, and the benefits of this growing financing approach were identified. Therefore, the paper aims to recognize the challenges associated with traditional financing techniques, explore the opportunities regarding the supply chain's financial improvement, and assess supply chain finance capabilities in dealing with those challenges. Finally, this research tends to assist supply chain finance users by clarifying relevant concepts and processes.

Structure of the Paper

The paper's structure is presented in the form of a narrative literature review to help readers grasp a comprehensive understanding of supply chain finance. Therefore, in chapters 2 and 3, we provide a detailed description of various supply chain and supply chain management elements and explain traditional trade finance methods and associated benefits and challenges. In Chapter 4, we discussed the supply chain finance's ecosystem and its critical concepts. Later in Chapter 5, we discussed the techniques for supply chain finance. In the remaining chapters (Chapters 6-7), the paper focuses on recent trends and technological advancements to research the factors changing the supply chain finance ecosystems, especially blockchain and securitization.

CHAPTER 2

TRADITIONAL SUPPLY CHAIN MANAGEMENT

Supply Chain Management

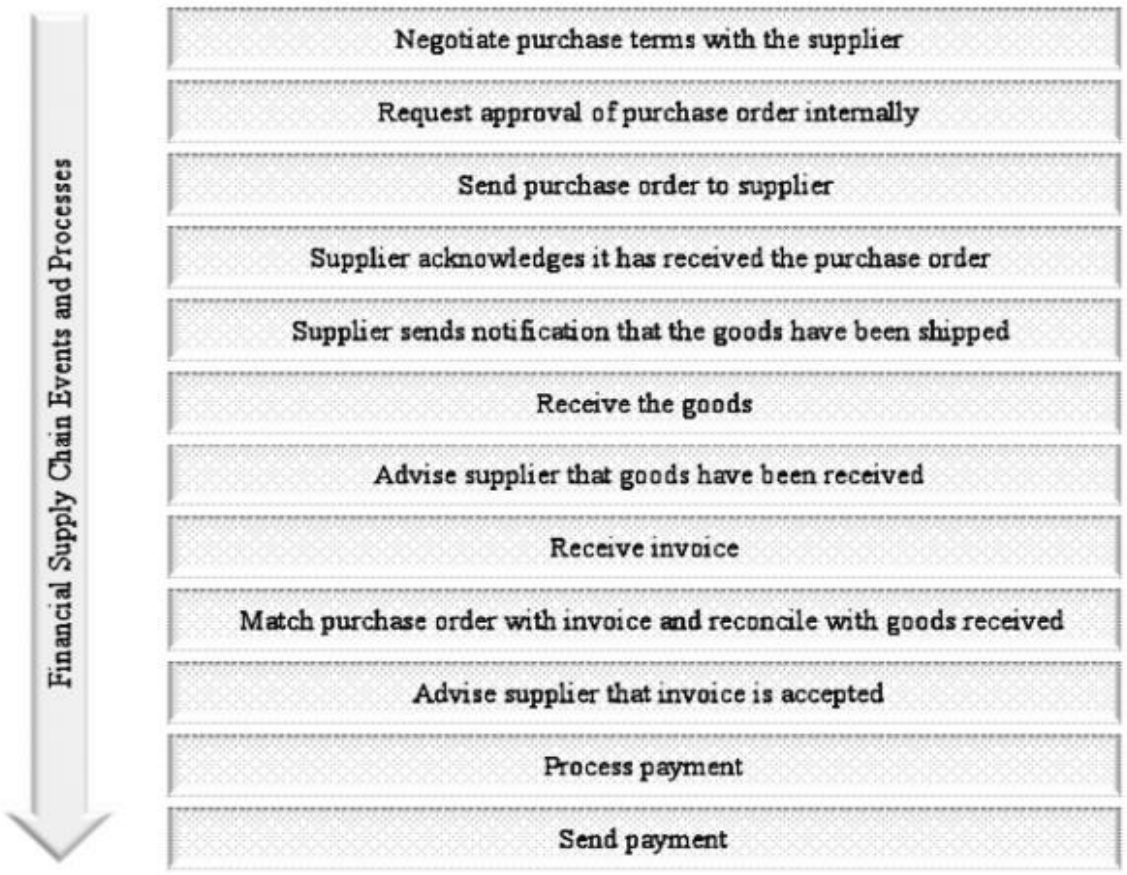
The definition of supply chain management is clarified by respected experts, all of whom encompasses a distinct perspective. At the most basic level, supply chain management manages the three fundamental flows among all supply chain participants/partners. The supply chain is a network of partners that supplies raw materials, assembles, manufactures products, and distributes them via single or multiple distribution channels. This outlay of supply chain encompasses three parallel flows: goods and services, information, and financial (Hofmann, 2011; Gupta, 2019):

- "Flow of goods and services": this flow includes all products and services traded between suppliers and buyers. Recently, remarkable breakthroughs have improved the flow of physical assets from supplying the raw materials to production lines to the end consumers, both in cost-effectiveness and quality of services. The next stage of the supply chain finance's development process must concentrate on aligning the physical flow with information and financial flow.
- "Flow of information": All products and services moved between the participants are associated with a set of specific details. This information fortifies the physical flow (flow products and services) and initiates financial transactions.
- "Financial Flow": the financial flows comprises invoices, credit note, and payments. In a typical supply chain, a vast number of invoices and payments are transferred among participants. This volume of transaction challenges companies to develop more streamlined financial payment methods.

Financial Supply Chain

The financial supply chain encompasses all series of events and processes as a commercial transaction is executed (Lamoureux, 2011). One component of these financial events is financial information (financial flow), including invoices, payment terms, and credit limits. These processes are triggered as participants purchase goods and services from another participant in a supply chain—financial events and functions are demonstrated from a buyer point of view in figure 1.4.

Figure 1: SC financial Events (Adopted from Lamoureux, 2011. P.289)



Working Capital Concept

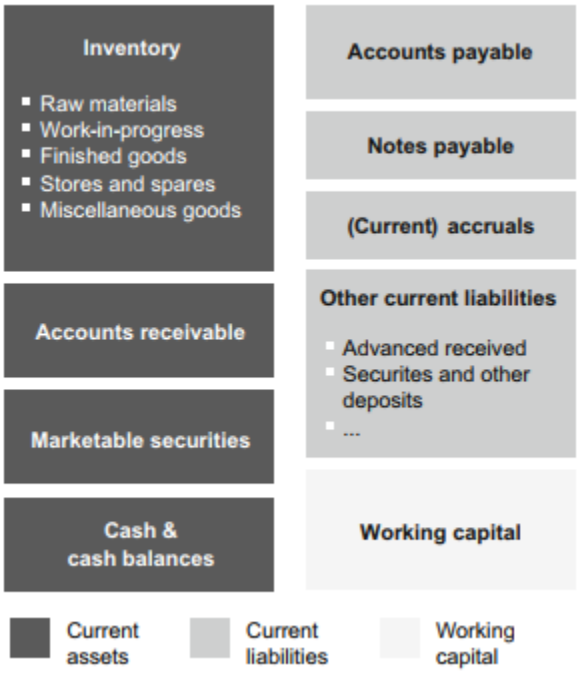
Accordingly, the most critical supply chain efficiency indicator is the participants' working capital (Bhalla 2005). In other words, a company's central attention is to make a profit and increase its enterprise value. One of the most efficient approaches to creating value is working capital management, which has been overlooked by suppliers and buyers (Hoffman, 2011; Gupta, 2019).

Equation 1:

$$\text{Working Capital} = \text{Current assets} - \text{Current liabilities}$$

Current assets include inventories, marketable securities, cash, and bank balances. Current liabilities encompass accounts payables, notes payable, accruals, and other liabilities.

Figure 2: Working capital elements (Adopted from Hoffman, 2011. P.6)



The management of the supply chain and subsequently managing working capital aims to minimize the fund locked in the turnover process (Hoffman 2011). According to the formula, this goal is achieved by reducing the account receivables and inventory and extending the account payables. Two possibilities are resulting from this trade-off between profitability and risk regarding the working capital management (Rafuse 1996):

- Positive working capital: In this case, Account receivables and inventories exceed accounts payables and other liabilities. Since current assets are easily convertible to cash, the company's liquidity is improved. However, this financial situation leads to less profitability and degrades a company's credit rate due to the large capital commitment. This will cause higher inventory and financing costs (Hoffman, 2011).
- Negative working capital: In this case, Account payables and other liabilities surpluses account receivables and inventories. This financial situation decreases the financing and inventory costs and subsequently leads to more profitability. However, tighter liquidity might harm the creditworthiness of the company. Besides, the low inventory level increases the risk of insufficient inventory and failure to meet customer needs, resulting in loss of production and degraded goodwill (Hoffman, 2011).

Cash to Cash Cycle (cash conversion cycle)

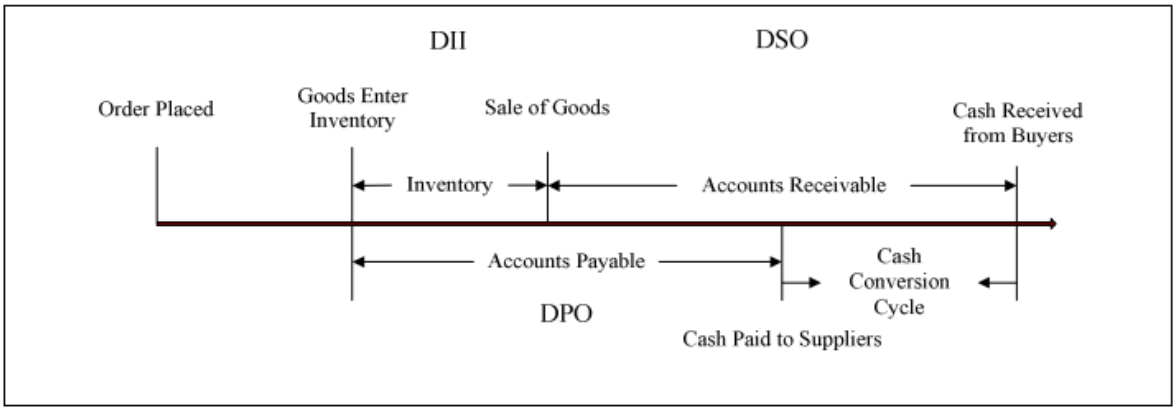
Discussing both the extreme side of working capital management and settling at an optimum working capital level is a logical approach to establishing a more efficient supply chain. The Cash-to-cash cycle is a significant indicator of optimized working capital.

Equation 2

$$\text{C2C cycle} = \text{DSO period} + \text{DIH period} - \text{DPO period}$$

"Days sales outstanding" (DSO) is the number of days it takes a company to collect its account receivables. "Days inventory held" (DIH) is the number of days it takes a company to go through staking raw material, production, and converting the finished goods into salable products. "Days payable outstanding" (DPO) is the length of time it takes a business entity to pay its suppliers. All these intervals are measured in days (Lamoureux, 2011; Gupta 2019). As shown in the following figure, the cash-to-cash cycle is the time interval between the day the trade payables are paid, and the day the trade receivables are collected. If the C2C cycle is positive, it suggests that buyers make their payment after the business pays its trade payables. In contrast, a negative C2C cycle explains that trade receivables are collected before paying for trade payables, allowing the company to invest the idle capital.

Figure 3: C2C cycle concepts (adopted from Lamoureux, 2011. P. 293)



To create an efficient supply chain, a company must decrease the C2C cycle by employing working capital management techniques. Shortened cash-to-cash cycle and better working capital management improve a company's ability to fund its operation internally and subsequently allow further growth. A shorter C2C cycle provides a company with well-timed cash that can be invested in other production areas, leading to more profitability and a higher return on investment ratio (ROA). Furthermore, due to the higher liquidity and ability to cash the

account receivable, a shorter C2C cycle increases a company's creditworthiness (Howorth and Westhead 2003)

However, shortening the C2C cycle requires identifying the significant components of the C2C cycle. Cash conversion cycle encompasses three sub-cycles: 1) "purchase-to-pay cycle": focuses on the supply side of the operation from purchasing the raw material, supplier management, and accounts payable management. 2) "forecast-to-fulfill cycle": deals with all area of production, including warehousing, order processing, manufacturing, and market research and forecasting. 3) "Order-to-Cash Cycle": deals with the demand side of the operation, including sales, revenue, and customer management (Hofmann 2011; Gupta 2019).

Challenges of Working Capital Management

Through the process of working capital management, companies in a supply chain environment must handle distinct shortcomings and challenges regarding each subsection of the C2C cycle:

- Purchase-to-pay cycle's challenges: dealing with the supply side of the supply chain entails sophistication at supplier relationships, cash disbursement, and DPO management. Buyers always try to pay at extended terms to decrease their C2C cycle while desiring a long-term relationship with their suppliers. In a volatile economy, this trade-off and interest conflict usually lead to higher unit prices or lower quality raw materials (Pike, 2005).
- Forecast-to-fulfill cycle's challenges: companies must develop forecasting and risk management capabilities to handle the trade-off between costs of cash/ stockholding (carrying costs) and costs of out-of-stock (shortage costs) (Ross, 2005).

- Order-to-cash cycle's challenges: Invoice management and reconciliation are a significant cause of the surge in working capital due to an increase in DSO. These delays are usually a by-product of credit and mismatch reviews, which create additional costs for companies. Hedging and credit risk management techniques are of use in dealing with reconciliation delays. However, this approach puts companies in a position to deal with a trade-off between additional costs resulting from hedging strategies and costly delays of payment reconciliations.

Traditional Solutions

- Enforced DPO extension: Having more bargaining power than suppliers, more substantial buyers (anchors) enforce extended payment terms to the supplier to increase their DPO and, as a result, improve their working capital. This single-sided approach transfers the working capital tension towards the suppliers' side and creates an unsustainable and unbalanced supply chain (Farris and Hutchison 2003).
- Just-in-time and inventory reduction solutions: Although the solution significantly drops the inventory and stacking cost by providing raw material to the production lines in no time, it challenges companies in periods of unexpected demand and puts massive pressure on companies' working capital.
- Enforced DSO reduction: Those suppliers with strong bargaining power may enforce tighter payment terms to their buyers, leading to a deterioration of the mutual relationship between the supply chain participants.

With a brief look at the current challenges in supply chains and approaches adopted by participants, we recognize the single-sided solutions' failure. Passing the working capital burden to other participants destroys any chance of establishing a long-term trust-based relationship and endangers

the customer base, business continuity, supplier viability, and supply chain's financial health. On the other hand, SCF methods emphasize cultivating long-term relationships through multiple-sided approaches to conflict resolution (PricewaterhouseCoopers 2009). We will discuss these methods in the upcoming chapters.

CHAPTER 3

TRADITIONAL TRADE FINANCE (TF) TECHNIQUES

Several payment methods are facilitating financial transactions in domestic and international environments and ensuring flawless financial information flow. Understanding those methods and their purpose, scope, benefit, and challenges will help comprehend supply chain finance models. The concept and the structure of traditional trade finance methods, despite various technological and management advancements, yet remain the same.

However, it is essential to consider the inherent risk of foreign exchange rooting from the fluctuation in the currencies' value. Since factors trigger these volatilities from the external environment (the economic/political surrounding within which the parties are operating), the managers, unable to prevent this risk, must adopt appropriate hedging strategies. For instance, swaps/options can be coupled with the following trade finance techniques to mitigate the economic loss of currency fluctuation.

Cash-in-advance

As the name implies, this method requires buyers to pay the agreed amount before shipment of goods/raw materials. By executing this method, buyers' risk of non-payment is eliminated, and suppliers' working capital is maximum. However, complete or partial cash payment before the shipment is the least popular option for buyers. Buyers can be concerned about non-receipt goods' risk, which places companies in challenging financial situations, particularly in international trades. There are four significant ways that the cash-in-advance method takes place: 1) wiring. 2) credit cards. 3) Escrow services. 4) checks

Letters of Credits (LCs)

This method involves a contracted commitment by the buyer's bank (issuing bank) to the suppliers that payment will be deposited to their bank account (nominated bank) as the shipment is received and the document review is finished successfully. The issuing bank facilitates the payment process in exchange for a relatively expensive transaction fee/discounting rate. This method is usually practiced when the buyer's creditworthiness or economic/political state of the trading region is under question. However, this method entails an exhausting process of analyzing documents and paper works, raising the risk of discrepancies.

Documentary Collection

Like the LCs, documentary collections (D/Cs) require a process in which suppliers sends a series of documents along with payment instructions to the buyers' bank (collecting bank) through the engagement of a partnering bank (remitting bank). The collecting bank will not transfer the documents (required to receive the shipment) to the buyer before the payment is made. However, compared to LCs, banks' involvement in the process is limited to facilitating the payment process.

Open Account

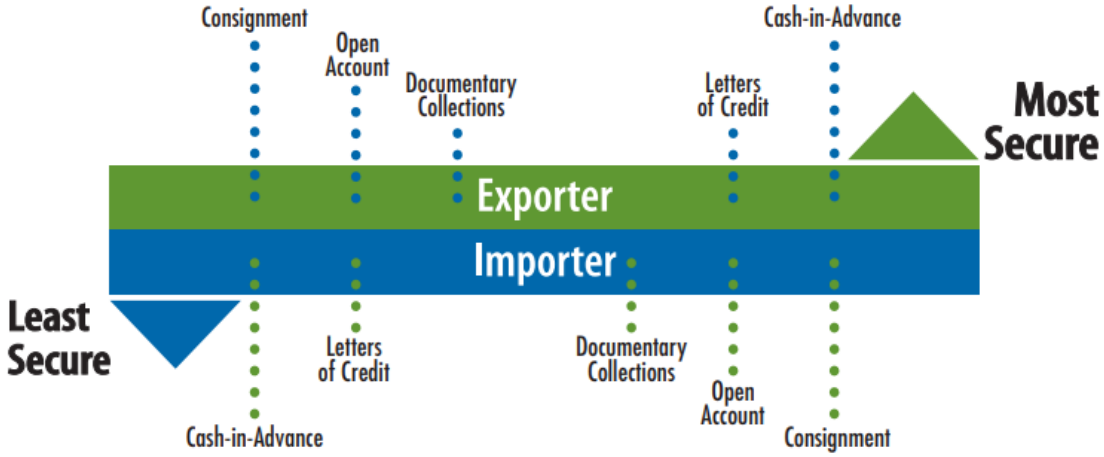
This method requires buyers to pay suppliers at a specific due date after the shipment is received—typically 30, 60, and 90 days. Although this Open Account is less attractive for suppliers than for buyers due to the high level of non-payment risks. However, to remain competitive, and due to their low bargaining power compared to buyers, suppliers are forced to offer extended payment terms. The risk of non-payment associated with this technique can be hedged through other trade finance methods such as factoring and forfeiting or various hedging

strategies such as credit insurance programs. However, all these hedging strategies increase companies' financing costs. Therefore, open accounts are usually limited to trades with buyers who hold high creditworthiness and operate in a stable economy and political environment. Despite all these associated risks, open account technique is gaining accelerating popularity among supply chain participants. This trend primarily stems from the open account's straightforward process engaging minimum level of need for third parties' interference (such as financial institutions), which decreases the transaction cost (in contrast to LCs and D/Cs).

Consignment

Consignment is a method stems from the open account idea, through which buyer must pay the suppliers after selling the goods, instead of paying at the extended terms. Therefore, consignment is typically limited to trades between manufacturers and resellers/co-signers, where sellers are committed to selling the products on behalf of the manufacturer and paying their obligations right after. This payment method exposes suppliers to the maximum degree of non-payment risk since co-signers possess the right to manage and sell the inventory. This method is usually used when the suppliers first break into a region with a low penetration level and non-existent customer relationships. Second, when they require to fulfill the market demands in no time. The following figure illustrates the attractiveness of the trade finance techniques for buyers and suppliers.

Figure 4: Trade finance techniques security (Adopted from International Trade Administration, 2016. P. 3)



Risk of Mitigating Methods

Some trade finance methods are designed to mitigate the risk of non-payment associated with other trade finance techniques:

- Credit insurance: through this method, suppliers ensure that their account receivable is protected against the risk of non-payment. Therefore, the payment will be made by the insuring financial institution if buyers defaulted.
- Factoring: factoring offers suppliers a complete package of financial benefits, including credit protection, capital financing, bookkeeping and collection management. By this method, suppliers sell its account receivable to third-party credit companies against a factoring rate as the service fee. There are two types of factoring: collection and discount factoring. In discount factoring, suppliers are paid as soon as account receivables are sold to the factoring institution. On the other side, the collection factoring holds the guaranteed payment to suppliers until the date the account receivables mature.

CHAPTER 4

SUPPLY CHAIN FINANCE CONCEPTUAL ANALYSIS

SCF Definition

Supply chain finance is a relatively new approach in supply chain management (Jansen 2017). Studies suggest that it can considerably reduce the working capital and costs of capital. The idea of SCF initially developed from existing trade finance techniques such as reverse factoring (Explained in chapter 5). SCF has been defined in various ways by researchers and experts, based on their understanding of SCF's scope (Zhao, 2018).

On a broad scope, according to Wuttke et al. 2013, SCF represents the management and control of the financial flows and optimization of financial information, events, and processes among partners throughout a supply chain.

On a medium scope, the SCF is a combination of financial instruments, using collaborated models, processes and technologies to optimize management of working capital, liquidity, and inter-companies/partners relationship (Euro Banking Association, 2014).

And finally, on a more limited scope, SCF represents account payable methods initiated by buyers, helping suppliers provide the products and services with lower working capital tension. In the latter definition, a stand-alone reverse factoring technique is considered as an SCF technique, even if the financial services offered by the third-party financial institution (factor) are limited.

What Is Not A SCF?

SCF does differ with any corporate finance techniques such as overdrafts, leasing and other asset-based financings. However, similar techniques may be employed in SCF programs. But those

approaches eliminate a considerable amount of paper works, documentation review, and other inefficiency associated with corporate finance techniques.

Conclusive Definition

Supply chain finance is a set of financial and managerial techniques that improve a supply chain's financial flow while allowing buyers to optimize suppliers' payment terms (IFC, 2014). This approach improves buyers' cash flow and eliminates the risk of non-payment and working capital tension from suppliers' balance sheets. SCF also includes multiple supply chain management and risk mitigation techniques to align the financial flow with information and physical flow.

SCF is typically coupled with an open account trade method—when the transaction is not facilitated by a bank or fortified by supporting documents. In this case, SCF programs play the role of a supporting foundation through the use of a multi-sided platform, ensuring the interest of all parties involved.

There are several financial events and transactions among buyers and suppliers in a typical supply chain, such as purchase orders, invoices, and other pre-shipment and post-shipment processes. SCF platforms, programs, and financers respond to these events to intervene with supply chain processes. Therefore, SCF is considered an event-based technique. With the help of technology and more agile practices such as automation, the response time has remarkably reduced.

SCF Characteristics

The benefits and necessity of SCF can be summarized in four of its characteristics (Hoffman, 2011):

- "Dematerialization and automation": In contrast to LCs and D/Cs, the SCF techniques minimize the use of paper works and exhausting credit assessment processes. this trait of the SCF model expediates the financial flow and flow of information. It also creates an alignment between those flow and physical flow in a supply chain.
- "Transparency": visibility and accessibility of data and information in SCF, mainly through technology and automation, eliminates the risk of uninformed decisions. The ease of transferring data among participants enhances the mutual relationships and helps grasp the big picture.
- "Predictability": As a result of automation and transparency, participants can predict their working capital needs and plan any shortage of cash way ahead of new purchase orders.
- "Collaboration": In contrast to single-sided approaches, SCF provides all participants with an ecosystem that allows a stable trading relationship. This collaboration extends to all processes of procurement, logistics, and finance.

SCF Accounting and Regulatory Challenges

Executed on the foundation of open account payment method, SCF techniques allow buyers to extend their payment terms beyond business norms. As we discuss in later chapters, we realize that, through SCF techniques, financial institutions take ownership of suppliers' trade receivable. However, in contrast to asset-based lending, buyers are not required to record the mandatory payments to financial institutions as debt. All these benefits to buyers (especially undervalued obligations) may misinform the financial institutions and auditors in assessing buyers' creditworthiness and financial health. The collapse of Carillion, a UK-based construction firm, in 2018, is considered to be resulted from this inefficiency in the identification of the real impact of SCF programs on a company's creditworthiness.

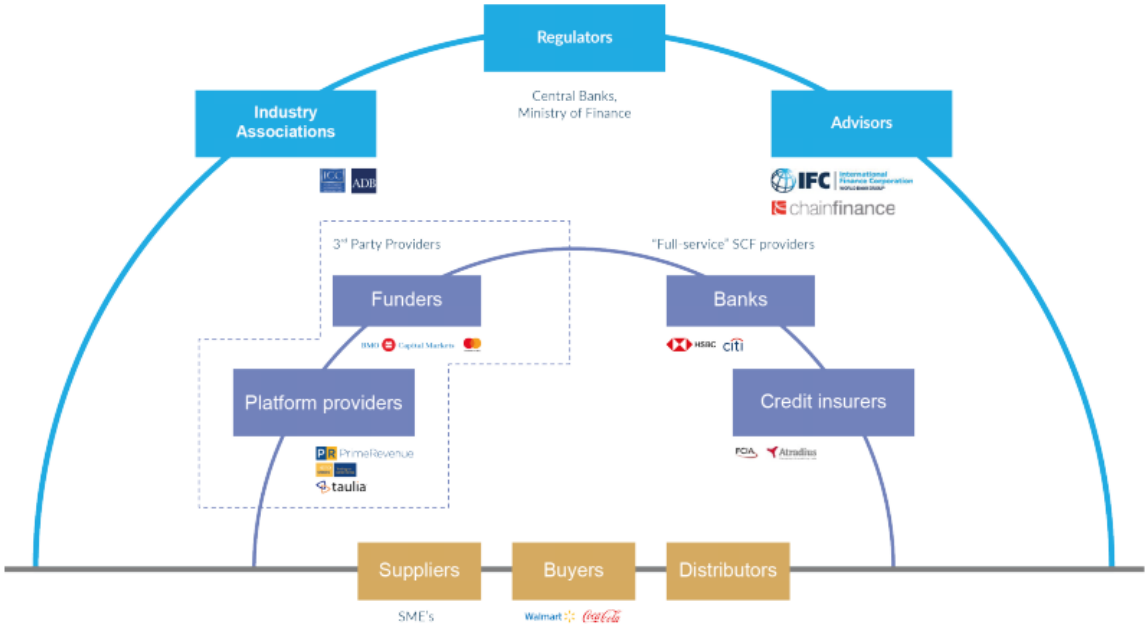
SCF Ecosystem

Optimizing the working capital management and creating a win-win situation requires a collaborative SCF ecosystem that provides a secure space for all participants to resolve their working capital issues. In an SCF Ecosystem, there are typically four major types of participants:

- Buyers: Typically, they are the initiator of the SCF intervention. As discussed in later chapters, SCF programs typically revolve around buyers as the center of the financing process. In other words, payments and financings are made based on the creditworthiness of buyers. Therefore, buyers should typically be in a medium-to-large size as well as financially healthy condition. Their importance in the eyes of financers is the reason they are called anchors.
- Suppliers: they are the suppliers of the anchors. However, some larger suppliers deal with their own complex supply chains.
- Funders: In an SCF model, funders can be banks, financial institutions, and individual investors. They provide investment capital to cover the approved invoices of suppliers.
- Platform providers: Considering the new technological improvement and popularity of innovative online platforms, platform providers are the latest SCF ecosystem participants. They provide technology solutions to all other participants. Since these platforms are cloud-enabled, they do not require any installation, and the onboarding process is considerably shortened.

In addition to these participants, depending on SCF services' scope and required efficiency, other parties may be included in a supply chain ecosystem (Explained in Chapter 6).

Figure 5: Parties in the SCF ecosystem (adopted from IFC, 2014. P.7)



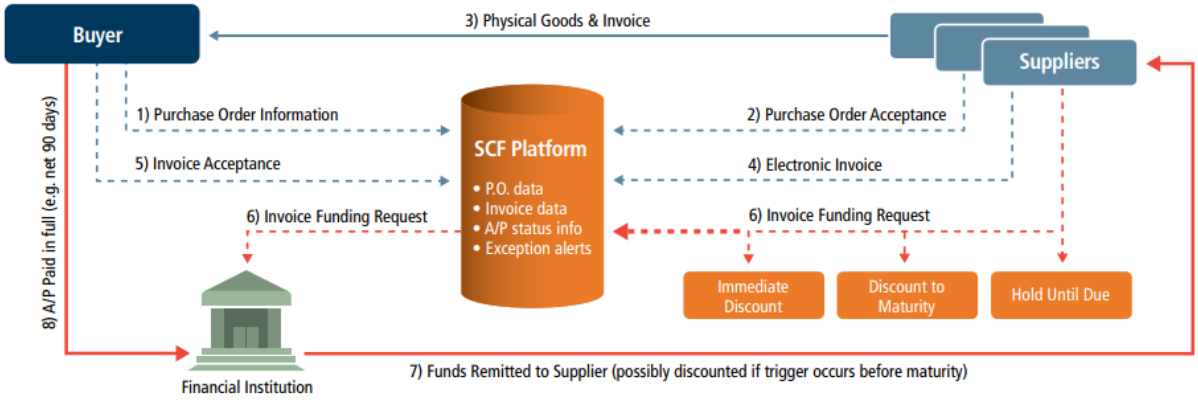
CHAPTER 5

SCF TECHNIQUES

General SCF Mechanism

As Mentioned, SCF is a range of financing and business processes that associates buyers and sellers with their working capital management (EDC Canada). An SCF process diversifies based on the values required by participants and triggering events (Chapter 3). Figure 4.1 demonstrates a step-by-step breakdown of typical transactions between buyers, suppliers, and financial institutions in an SCF ecosystem. All these steps represent an event that can potentially trigger the use of different types of financial instruments and business activities.

Figure 6: SCF Mechanism (adopted from the EDC website)

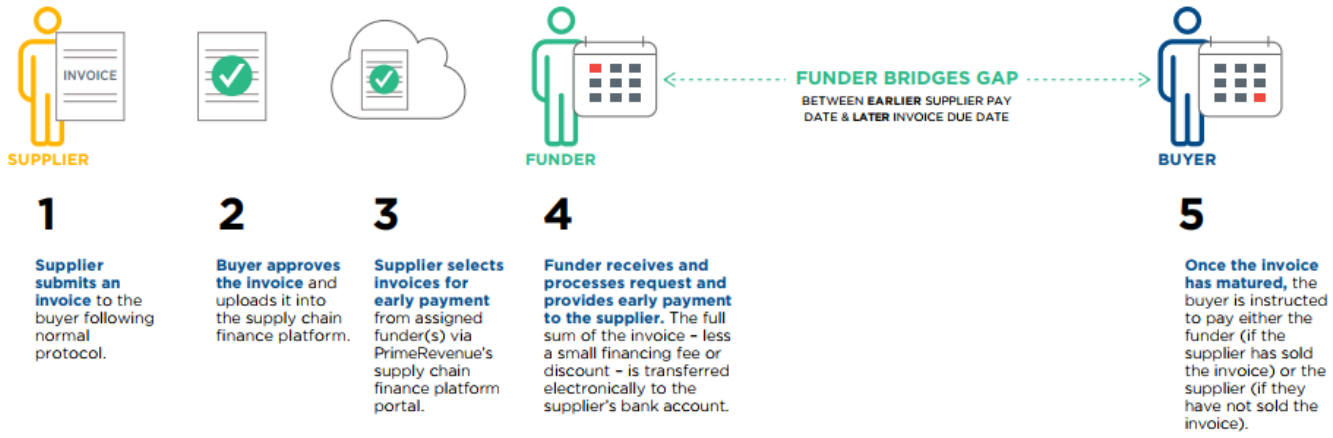


In an SCF ecosystem, there are multiple types of transaction, typically including (EDC Canada) (PrimeRevenue 2020)(Figure 7):

- A company purchase goods and services from a supplier, and in return, the supplier issues an invoice submitted to the buyer.

- The buyer approves the invoices, and subsequently, it is obligated to make the agreed payment to the supplier at the agreed due date.
- The supplier chooses the invoices associated with the order and submits them directly to the financial institution or third-party providers.
- The financial institution (funder) receives and processes the supplier's request and issue an early payment.
- At the maturity date of the payment, the financial institution collects the receivables from the buyer.

Figure 7: Typical SCF process (adopted from PrimeRevenue website)



SCF Products

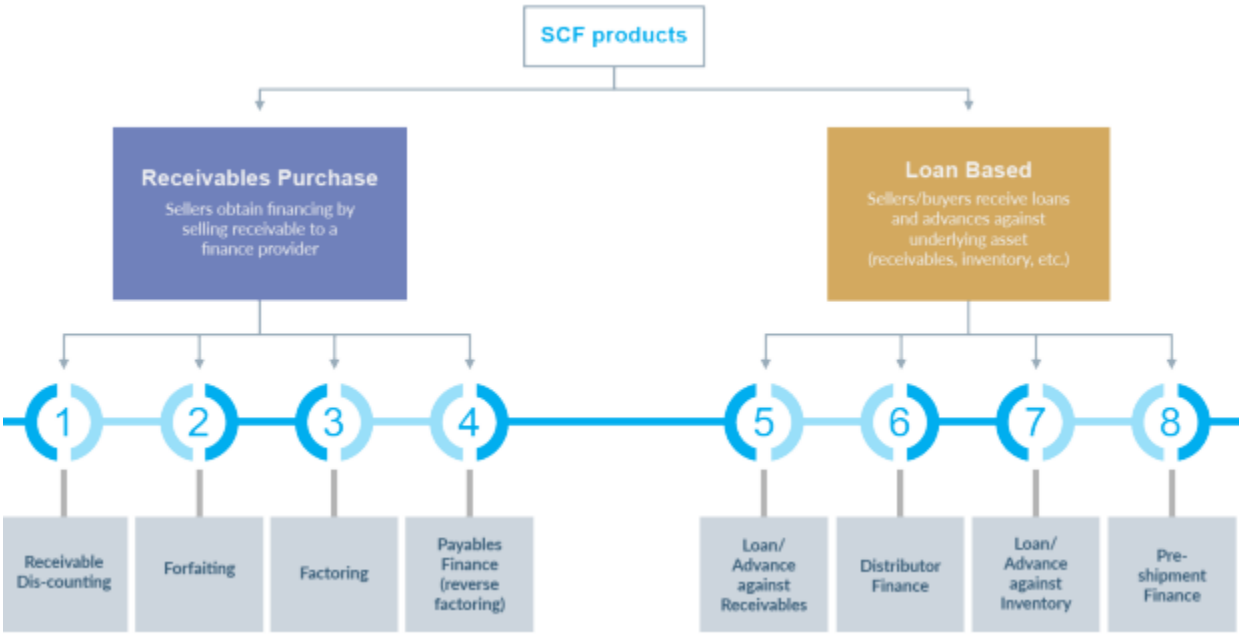
We discussed that SCF is not a financing method but a combination of financing instruments and management practices. Therefore, depending on triggering events and participants' goals, this combination changes and creates different SCF products.

In general, SCF products is comprised of two major categories (ICF, 2016):

- "Receivable purchase products": Within this solution, financial institutions acquire and take ownership of sellers' (suppliers) receivables. Suppliers accept an early payment upon the reduction of banks' fees.
- "Loan-based products": this solution involves an early payment by financial institutions to suppliers in the shape of a loan against specific collateral, such as AR, Inventory, and PO. The major difference with the previous category is that suppliers cannot remove the accounts from their books.

The following figure describes the different products under each category. Each product will be detailed next.

Figure 8: SCF products (adopted from IFC, 2014. P.4)



All these products must be executed in an SCF ecosystem to be considered SCF solutions. For example, these products must provide automation, transparency, development of relationships, and mitigation plans, compared to just a stand-alone trade finance technique (PrimeRevenue, 2020). Therefore, since factoring, forfaiting, loan against inventory, and loan

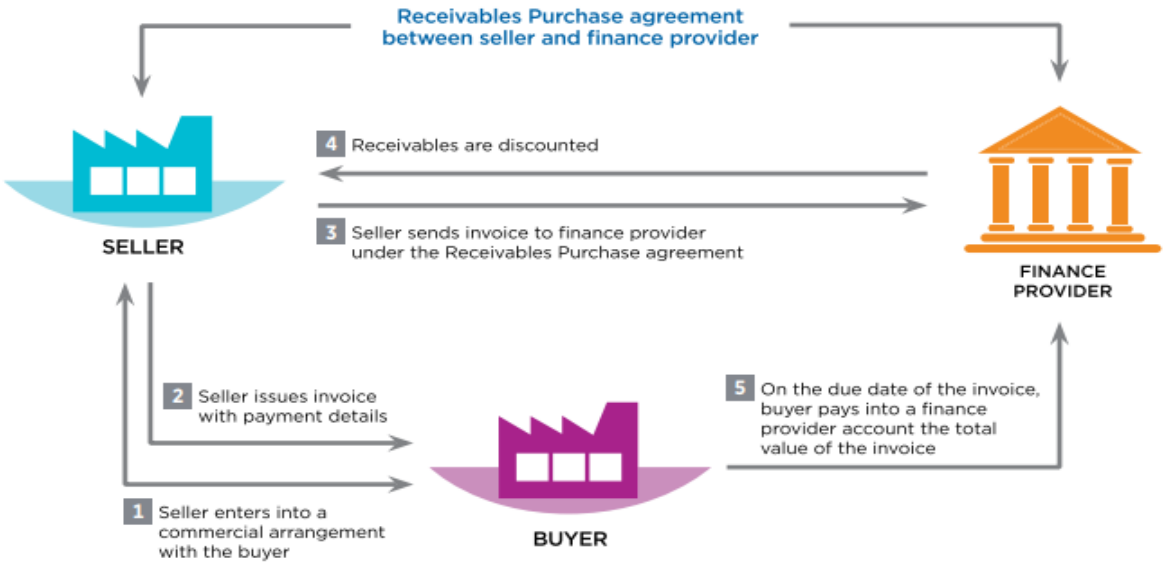
against receivables are also widely used outside SCF ecosystems, this paper will focus on other products commonly or occasionally associated with SCF programs. In the next section, these various products and their characteristics will be explained.

Receivable Discounting

Receivable discounting, as a SCF techniques, represents the process of receiving required finances against providing invoices to financial institutions at discount. Execution of this method helps sellers (suppliers) receive funds for a part or majority of their receivables. However, this product is typically limited to corporate clients and larger SMEs. Since financial providers are exposed to the buyers' credit risk, they will restrict their funds to buyers only upon satisfying specific criteria. Receivable discounting can be executed without or with resources (GCFF, 2014).

Since buyers are not a direct party in the transaction, they may or may not be included in the shared platform. However, since the provision of funds depends on buyers' financial health, they may be asked to provide certain documents (i.e., invoices) or be informed of their creditworthiness. The services, such as credit assessment, can also be conducted by the financial provider or outsourced. In the latter case, a new party will be added to the SCF ecosystem. The following figure demonstrates the specific events and flows in receivable discounting solutions—assuming only three parties are involved, and the financial institution is the platform holder (ICF, 2016).

Figure 9:Receivable discounting process (adopted from GSCFF, 2016. P.33)



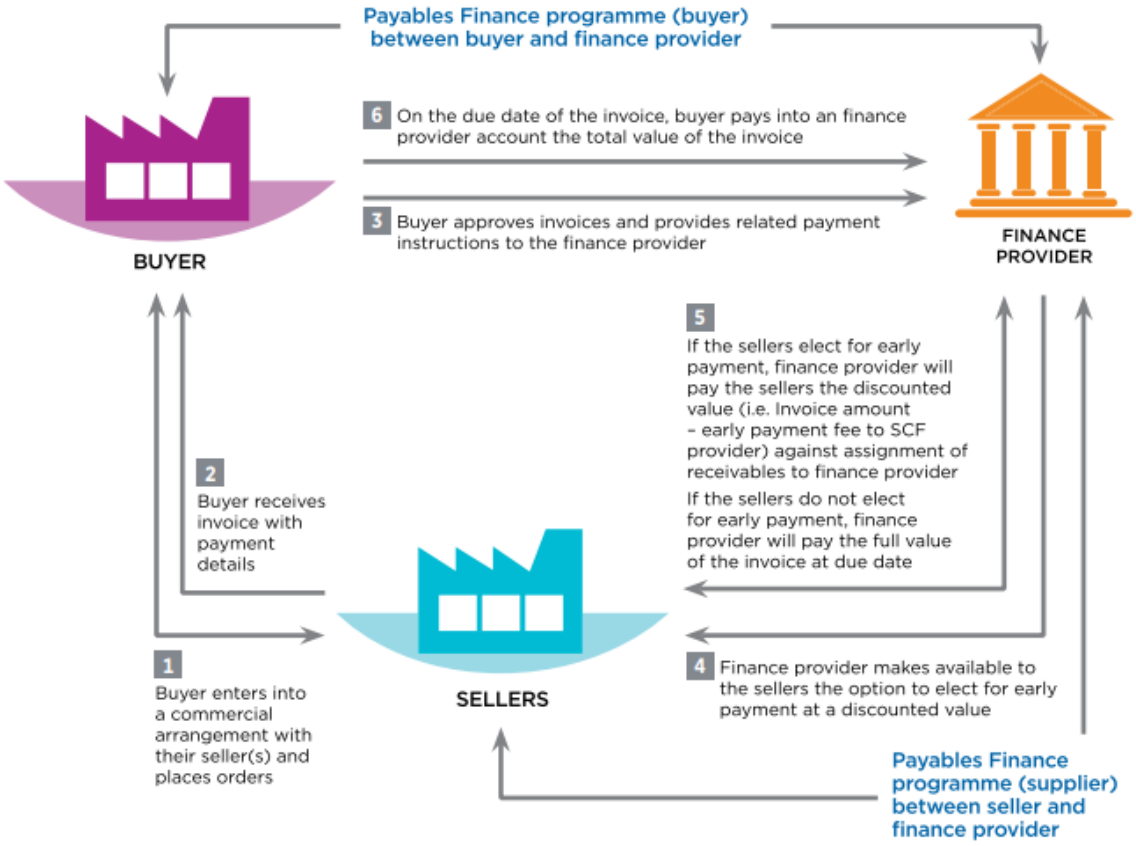
Payable Finance (Reverse Factoring)

Initiated by the buyers, payable finance allows sellers (suppliers) to receive a discounted value (post-fee-deduction) of their receivables. In this case, the buyer must share its accounts and invoices related to that specific transaction with the finance provider. Due to heavy dependence on buyers' creditworthiness and their commitment to pay at the maturity date, the payable finance structure is buyer-centric. In other words, the buyer (the anchor) establishes a network with single or multiple financial providers to ease the working capital tension on its suppliers, resulting in a long-term win-win relationship. However, it is the supplier's choice to join the program created by its buyers (ICF, 2014).

Since these programs are built around anchors' creditworthiness, the reverse factoring method typically is executed non-recourse (the absorption of non-paid invoices by suppliers is not required), eliminating the risk of non-payment for sellers. Other risks such as dilution,

ownership, and non-receipt of goods can be mitigated with some SCF ecosystem benefits such as automation, transparency, and outsourcing credit analysis. The following figure demonstrates the step-by-step processes and events typical in a reverse factoring SCF program.

Figure 10: Payable finance process (adopted from GSCFF, 2014. P.48)



Distributor Finance

In the case of the purchase of goods from large manufacturers, distributors can receive necessary funds for coverage of their payables, holding inventory, and sale expenses in the form of loans or advances. These SCF products help smaller distributors, either a third-party company or owned by the manufacturer, obtain access to financing, especially if there is a gap between

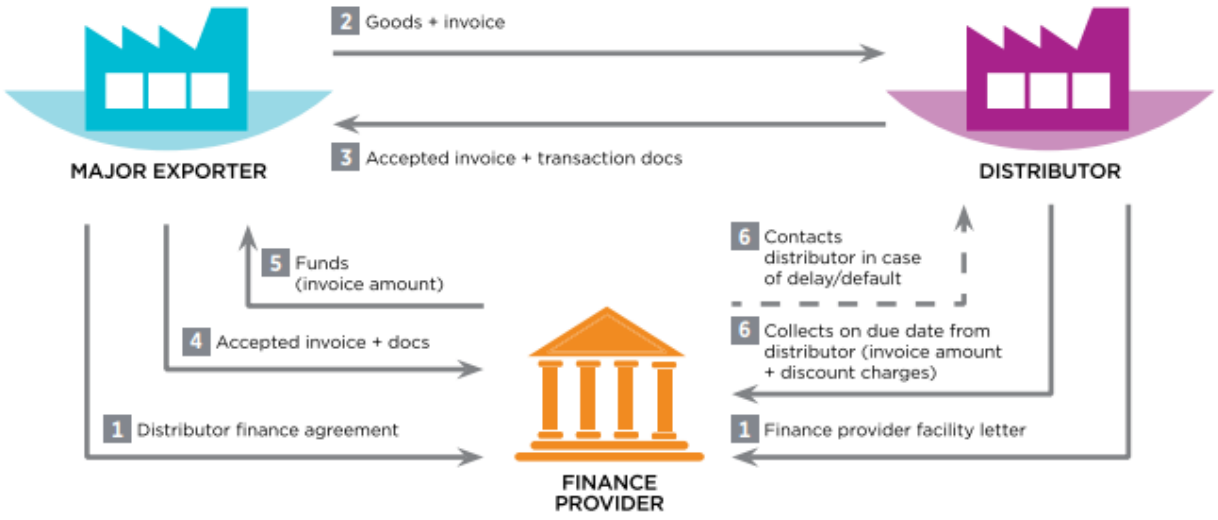
distributors' payable and receivable maturity date. This approach significantly lessens working capital tension on the supply-side of the supply chain (ICF, 2016).

There is a critical distinction between an SCF distributor financing and a loan against inventory sought solely by a distributor: The distributor financing requires the financial provider to engage the anchor (manufacturer/buyer) in financing processes through contractual agreements and sharing risks. This approach reduces the risk exposure for financial providers by sharing risk with other participants and facilitates non-investment grade SMEs' financing process.

In the case of SCF distributor financing, execution, and the existence of SCF characteristics such as automation, transparency, and provision of a trust-based atmosphere in the supply chain are necessary. Otherwise, the financing product is just corporate lending associated with various risks and expensive fees (ICF, 2016).

However, since this method considerably supports distributors, primarily small and local SMEs, the credit assessment process, due diligence, monitoring, and provision of accurate distribution contracts can mitigate the risk of non-payment to financial providers. The engagement of other parties for these purposes is of importance to create more transparency and security. The following figure demonstrates the process of distributor financing in a typical SCF Ecosystem (GCFF, 2014).

Figure 11: SCF distributor financing process (adopted from GSCFF, 2014. P.55)



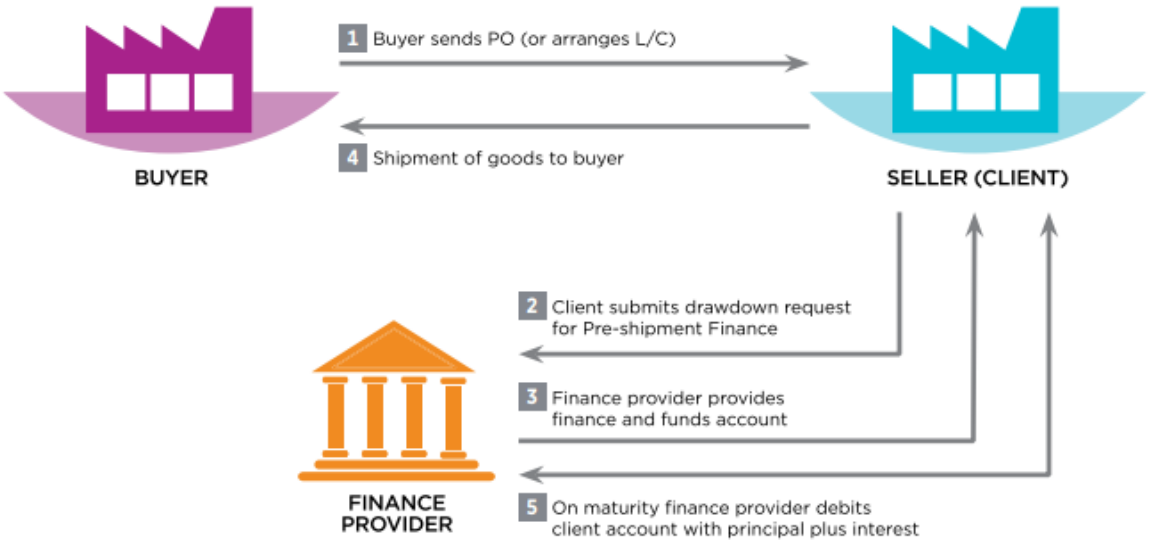
Pre-Shipment Financing

Pre-shipment financing involves a single or multiple financial providers providing funds to suppliers necessary for manufacturing, holding inventory, fulfilling orders, and other working capital needs. This technique is cooperative with various trade financing payments such as LCs, D/Cs, and open accounts, although the latter is common. In all mentioned examples, the financial provider issues the payment on behalf of the anchor. Funders provide the financing against the provision of purchase orders (not invoices; since the goods might not be manufactured yet) or agreed commercial contracts.

Comparable to previous SCF products, the anchors are the center of the financing process. The buyers at the maturity date must pay all payments. Therefore, it is the creditworthiness of the anchors that are assessed. Moreover, this SCF method allows both single-time and recurring financing to suppliers, depending on the anchor's relationship with financial providers. The service fee is typically a percentage of the goods' contract value or a factor rate of the supplier's receivables. Pre-shipment financing might also be coupled with several post-

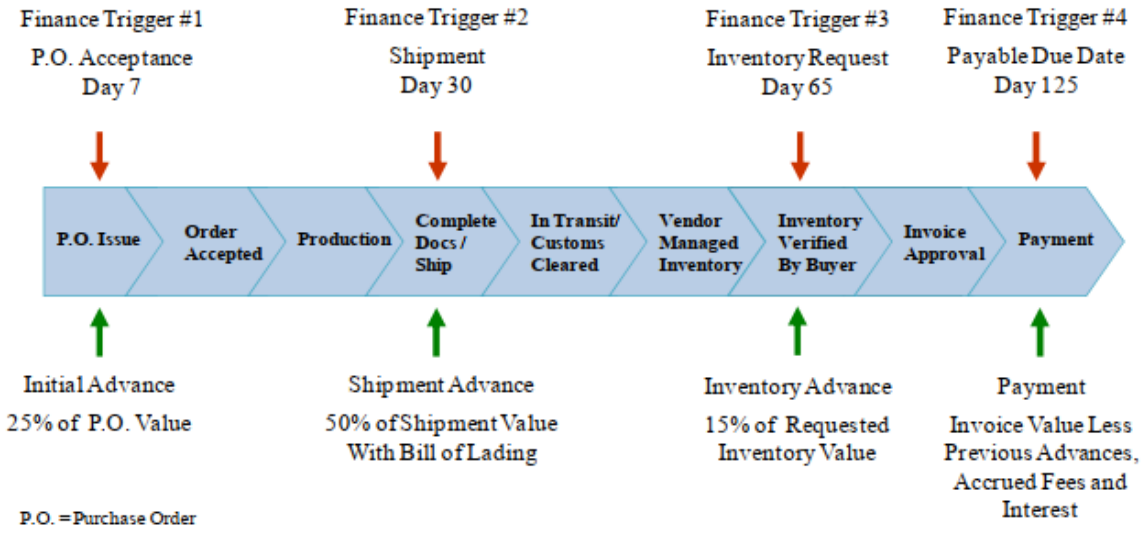
shipment financings such as receivable discounting and payable finances upon shipment of products. The following figure exhibits the typical process of pre-shipment financing in an SCF ecosystem (GSCFF, 2014).

Figure 12: Pre-shipment financing process (adopted from GSCFF, 2014. P.62)



In addition to these products, SCF can also offer other services based on its participants' needs. As we mentioned, SCF is event-triggered, which means that SCF techniques vary according to the supply chain's triggering transaction. The following figure explains the typical supply chain events that allow financing requests either by buyers or suppliers.

Figure 13: Financing triggers in SC (adopted from Export Development Canada, Jean-François Lamoureux and Todd Evans. P.11)



CHAPTER 6

RECENT TRENDS AND TECHNOLOGIES

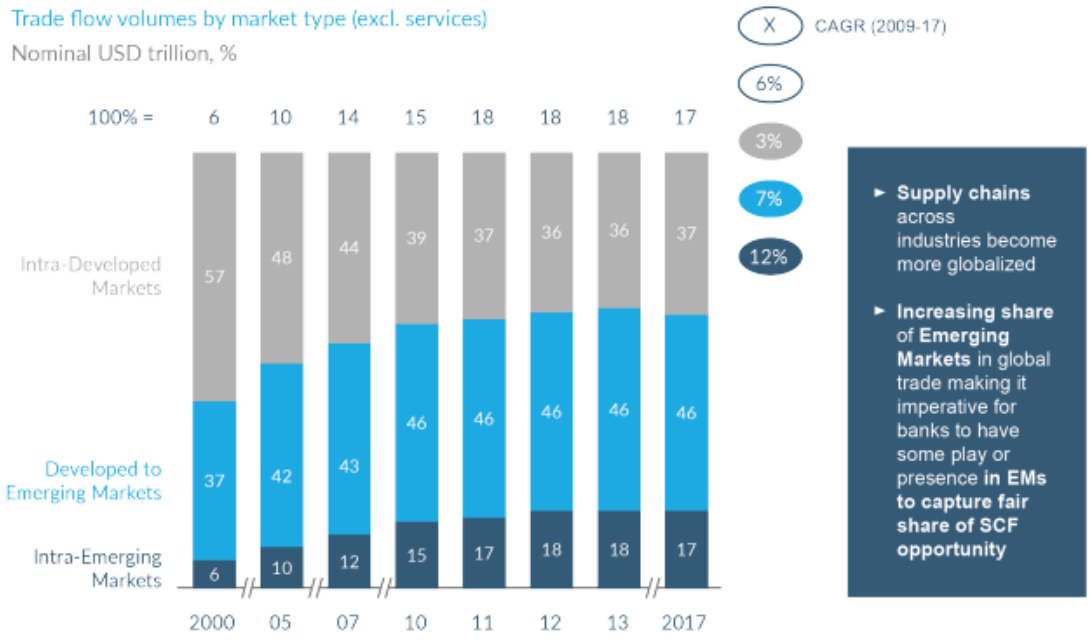
Various trends in recent decades have shaped the SCF Ecosystem. Traditional supply chain management and financing techniques created an unstable supply chain, transitioning working capital tension to supply- and demand-side and away from anchors. Although the need for collaboration between all participants in the supply chain (Jones, 2008) has expedited the execution of SCF methods globally, certain developments in technologies and management techniques allow for this expansion. In this chapter, we discuss these SCF accelerators.

Globalization

In recent decades, eliminating trade barriers through multilateral trade agreements and establishing the World Trade Organization has been changing supply chain participants' behaviour, demanding new SCM strategies. Globalization has shifted businesses' focus from manufacturing to the management of a complex network of suppliers. This radical shift directly results from capital investment transition from labour-intensive production/distribution to working capital financing, primarily through outsourcing to global partners (Hoffman, 2011). Furthermore, globalization and supply chain management are integrally affecting each other. In other words, although globalization opens new markets and allows for access to new customers, it creates new challenges previously irrelevant to managers (Vidrova 2019). The challenges associated with managing these global networks of suppliers/partners, massive risks of global trades, and expensive trade finance and credit insurance methods have triggered SC participants to seek replacement financing and risk mitigation techniques (Mentzer 2006).

This Increase in global trades, especially in emerging economies (Figure 5.1), has been coupled with a surge in managers' awareness of open account transactions' advantages (Wyman 2020). Therefore, given the surge in global transaction and demands for cheaper and more efficient financing techniques, SCF is becoming more relevant (GSCFF, 2014).

Figure 14: Global trade volume (adopted from IFC, 2016. P.13)



SCF Providers

The emergence of AI, cloud-based platforms and fintech start-ups has disrupted the financial industry and financing solutions, especially SCF. These disruptive innovations make the full automation of the procurement-to-pay and order-to-cash cycle possible, further enabling SCF solutions to eliminate or mitigate risk and challenges associated with traditional approaches. Technological advancements in the forms of innovative SCF platforms have also reduced the length of onboarding process (Chen 2019). Furthermore, the accessibility of these platforms based on SaaS technology increases information transparency, reduces the service fee, and

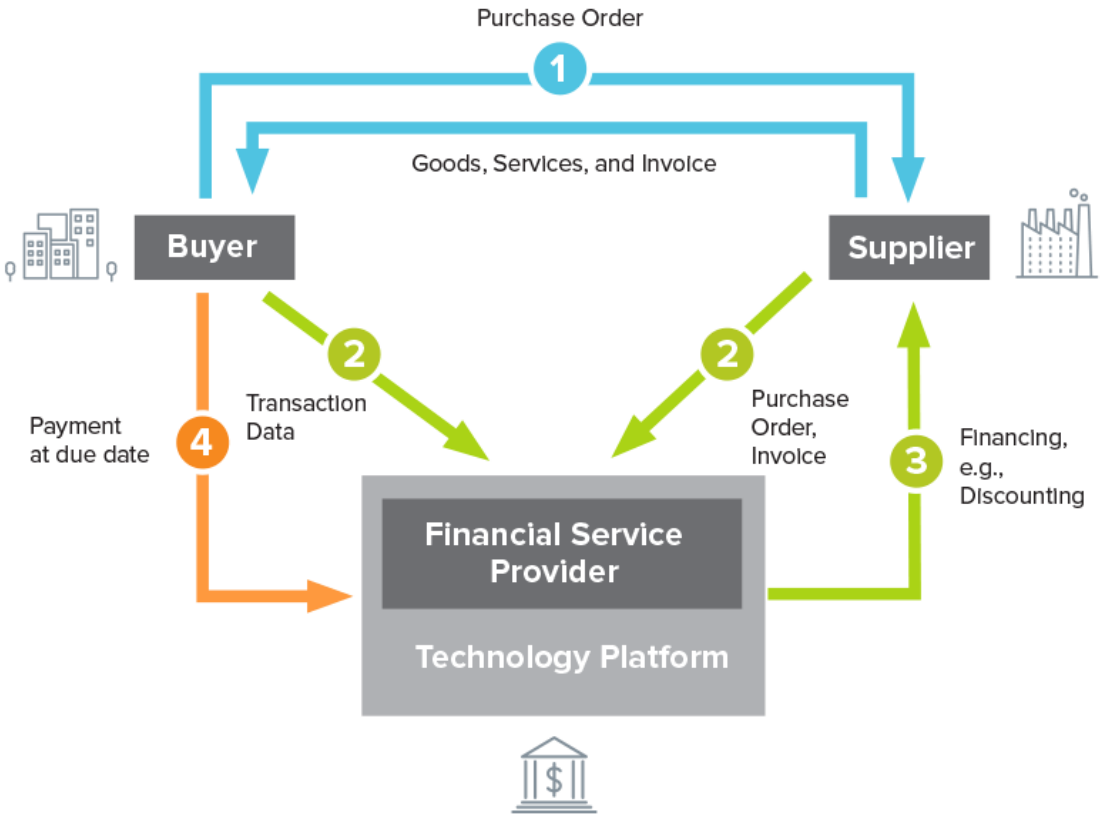
fortifies the accurate flow of financial data among the participants (Babich 2019). Empowerment of SCF through innovative platforms has created two major types of SCF providers:

- "Full service" banks: Through access to massive funds and the establishment of Long-term relationships with various partners in SC, Banks are capable of the provision of SCF platforms, offering SCF products all on their own. Global banks develop these platforms either by using their developing teams and IT capabilities or by outsourcing to external vendors and cloud system providers (GSCFF, 2014) (PrimeRevenue, 2020).

  Since full-service banks hold extensive resources and are of established relationships in their jurisdiction, they are more attractive for both anchors and suppliers. Further, the integration of platform services with financing services decreases the financing process's complexity and length.

  However, Since each platform is limited to one funder (bank), suppliers without an established relationship with anchors might be ignored and underfunded by financial providers (banks) due to their lengthy credit assessment process (KYC: Know Your Customer) and low trade volume. The same reason creates difficulty for suppliers working with multiple buyers (anchors). Since each buyer may cooperate with a different bank, a supplier must pass the onboarding process with multiple banks, resulting in delays and high switching costs (GSCFF, 2014) (Hoffman 2011). The following figure demonstrates a full bank provision of SCF. option expensive and less adaptive. Big banks such as Citibank, HSBC, ICICI Bank, Deutsche Bank, Santander, and JPMorgan Chase provides their own SCF platforms.

Figure 15: Funder as a platform provider (adopted from BSR, Charlotte Bancilhon,2020)



- Third-party platforms: The popularity of e-invoices among buyers and sellers and the success of outsourcing cloud-based platforms by banks encourage start-ups to develop their own platform in a B2B business model. These platforms operate independently, connecting buyers, suppliers, funders, and other participants. Since these third parties can not provide the required funds on their own, they are required to cultivate a long-term relationship with a portfolio of funders. These funders include two major categories: 1) "bank funders": these banks cooperate with platform providers. 2) "Non-bank funders": every entity with enough capital can participate in funding processes. Such entities include hedge funds, large corporates, and so on.

As third-party platforms participate with multiple funders, it creates competition among financial providers. Therefore, the service fee (discount/factoring rate) drops accordingly. Furthermore, those Suppliers who hold low volume receivables, possess a limited network of anchors, and suffer from low creditworthiness can also benefit from available finances since third party platforms are less dependent on anchors than other platform providers (PrimeRevenue, 2020). These characteristics can significantly balance the supply chain of those areas with fewer anchors (such as Canada) (Jean-François, 2011). Settlement processing. These platforms are provided by companies such as Ariba, Oxygen, and PrimeRevenue.

The Emergence of Facilitators

Certain facilitators have been shaping the evolution of SCF ecosystems:

- Service providers: By providing capital or required services, these participants have taken an essential role in the global expansion of SCF. These Services include (SCF Forum) (Hoffman 2011):
    1) Advisory services: As mentioned, SCF is a concept encompass techniques beyond financing, aiming at increasing the SC efficiency and stability. These partners help the SCF ecosystem develop certain capabilities to create inclusive regulation (such as factoring laws and insolvency regimes), help banks build appropriate business operation (this empower banks to expand their client bases and reduce the underwriting risk associated with traditional financing process), and expand their knowledge of SCF practices. The World Bank, IFC, and The International Chamber of Commerce (ICC) are classified under this category (ICF, 2016).

2) Financial Infrastructure: Some facilitators reward the SCF ecosystem with credit assessment facilities and IT development. Recently, SCF providers cooperate with fintech start-ups and technology companies to empower the SCF platform and introduce new technologies such as Blockchain (Chen 2019). ICC is also classified under this category.

- Investment: Some partners, especially government-backed entities, develop SCF programs, providing millions of dollars to smaller SMEs in both the demand and supply side of the supply chain. The Export Development Canada's (EDC) supplier payment program is classified under this category (Hoffman 2011).
- Credit insurance companies: to further reduce the credit assessment and receivable reconciliation process, credit companies are growing popular in SCF ecosystems as regular partners (Rinoald Tomas, 2013) (Vousinas, Georgios, 2018). These companies provide services such as (ICF, 2016):

    1) Credit risk absorption: credit insurance companies allows financial institutions to hedge their acquired receivable against non-payment risk. Therefore, non-investment suppliers can also be financed by financial providers. This additional risk tolerance encourages financial institutions to transfer their revenue stream from traditional approaches to SCF techniques. In SCF ecosystems, the credit insurance process can be either corporate-led (an individual corporation buys and ensures the payment of suppliers' receivables) or financial institution-led (already familiar with other financing techniques) (Zhao, 2018)

2) Outsourcing credit assessment process: credit insurance companies also empower the financial institution and platform providers with the credit assessment process. (e.g., Euler Hermes, AIG, and Coface)

Other trends, such as securitization and blockchain technology, also heavily influence the SCF growth. These trends are discussed in upcoming chapters.

CHAPTER 7

SCF SECURITIZATION

Securitization

Securitization is a financing technique that alleviates risks and challenges associated with other financing techniques such as loans, bonds, and equity capital (Jobst, 2008). In recent years, challenges and instability in the credit market (especially after the 2008-financial crisis) have encouraged businesses to use more risk-transferring techniques (Scheicher, 2009). In general, securitization is a structured finance technique that commoditizes and sells assets of a similar class. Therefore, assets that once were difficult to trade are available to be purchased, particularly by third parties. These assets are used as underliers for other securities (Securitization, European Parliament, 2016).

The securitization process starts with the identification of same-class assets by the sponsor. These assets are assessed to ensure that they possess specific characteristics required for securitization. Next, the assets/collateral must be investigated, and the financial model is developed to project the upcoming cashflows. Subsequently, the assets are sent to SSPE/issuers, which issue securities such as bonds and derivatives ready to be invested in by third party entities.

Securitization in Supply Chain Finance

Even though traditional securitization focuses on short-term assets such as mortgages, it is recently becoming popular with all kinds of self-liquidating assets such as corporate loans, lending agreements, and trade receivables (Hoffman 2018). All these assets create asset-backed securities (ABS). Special purpose vehicle companies (SPVs), instead of a bank, purchase these

assets with projected income at a discount, which is the significant difference between traditional supply chain finance techniques and securitization. However, like reverse factoring, securitization also provides suppliers with multiple funders/investors (Carlo, 2013; Hoffman, 2018).

Since supply chain finance is an event-triggered ecosystem, integrating securitization techniques with SCF must follow the same pattern. Given the specific events in an SCF ecosystem, such as receiving POs, Issuance of invoices, stocking inventory, and approval of invoices, securitization can provide the participants with relevant financing opportunities.

Trade-Receivable Securitization

An account receivable can be financed through receivable discounting and securitizations (Katz 2011, P.23). Since suppliers are holders of these classes of assets, they are typically the originator of these financing processes (Hoffman, 2020). suppliers usually hold low creditworthiness and bargaining power and suffer from their inefficient invoice reconciliation process. Although these shortcomings may become problematic with other SCF techniques, suppliers through the SCF securitization are associated with a different risk assessment process (Kerle and Gullifer 2013). The new risk assessment process focuses on suppliers' historical performance regarding the account receivable, Rather than the business's overall creditworthiness. In this case, possession of a diversified set of buyers reduces the riskiness of the account receivable's riskiness and results in higher market value for issued securities (Hoffman 2018). Besides, the overall risk of account receivable from an issuer's viewpoint can be mitigated through the expansion of the client/supplier/originator base (Fabozzi et al. 2006, p. 81; Hoffman 2018). This class of assets is then sold through the capital market in the form of asset-backed commercial notes (ABCN).

Inventory Securitization

Like AR securitization, the inventory version also provides the suppliers with required financing, but in this case, before the sale. Although this method is limited to luxury stocks, it can be extended to other products with high liquidity and low stocking costs. Commoditization of inventory allows suppliers to receive capital while buyers are not recording any debt in their books, resulting in higher creditworthiness (Hoffman 2018).

Payable Securitization (Reverse Securitization)

Led by buyers, this technique entails commoditization of account payable of buyers into tradable securities. In contrast to receivable securitization, reverse securitization does not focus on portfolio diversification to reduce riskiness, but similar to traditional SCF techniques, it emphasizes the anchors' creditworthiness (CRX Markets AG 2015) (Hoffman 2018). Therefore, this method is the most popular securitization technique among SCF platforms.

CHAPTER 8

BLOCKCHAIN-DRIVEN SUPPLY CHAIN FINANCE

Blockchain Technology

As discussed previously, SCF techniques' central goal is to mitigate risks and challenges associated with traditional approaches to supply chain management, such as conflict of interests, lack of trust, the inefficient flow of information and finances, lack of coordination among SC participants, lack of automation, and obscurity. Moreover, non-technology solutions to these challenges proved inadequate, especially regarding automation, transparency, and trust in SCF ecosystems. Although innovative approaches such as e-invoices, SWIFT, and electronic signature have removed the initial hurdles in the path toward an efficient SCF, one technology appears to be the final piece of this puzzle: blockchain (BCT) (Chen 2019). In general, blockchain/distributed ledger technology facilitates data transition from one database to another while changing the ownership of that information (Hoffman 2018). Blockchain technology allows trusted participants to access relevant information, resulting in transparency and traceability. In other words, with the use of algorithms and a shared database, BCT transform contracts and financial information into digital codes and smart contracts, providing automation to the ecosystem (Saberi 2019).

Blockchain possesses specific characteristics that allow SCF expansion: 1) peer-to-peer exchange-value system, 2) group consensus mechanism, 3) distributed validation network, 4) smart contracts.

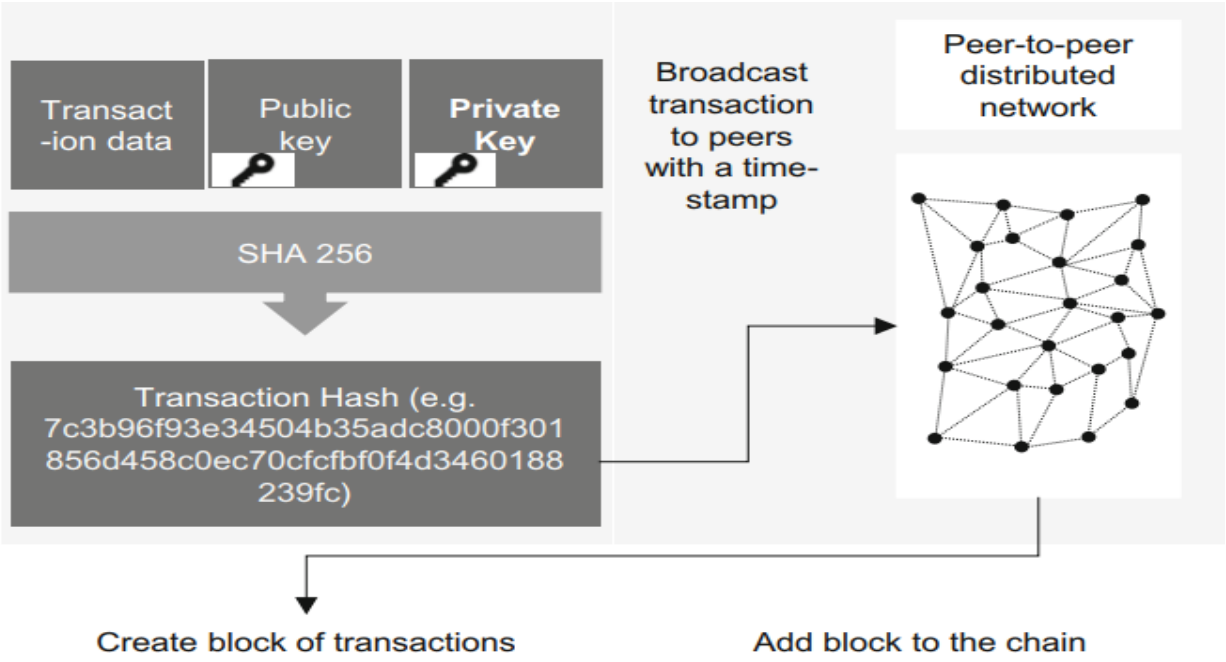
Peer-to-Peer network

Due to the digital nature of information in blockchain technology, the financial and ledger records can be easily subject to fraudulent activity, such as overvaluing invoices. To eliminate this risk, changes in data and records of transactions must be compared against a trusted fundamental center (Cham 1992). In 2009, Nakamoto suggested a "peer-to-peer distributed timestamp server that provides computational proof of chronological order of transactions." According to Schollmeier et al., a peer-to-peer network under a distributed ledger network is defined as sharing hardware and resources without the interference of a central entity, resulting in higher efficiency in the transition of data and more vital trust among participants.

To improve the security and establish trust, blockchain technology's timestamp nature entails sorting transaction data into separated blocks chronologically connected to previous transactions, creating a chain of events by which the risk of fake transactions is mitigated (Dykes 1995).

Moreover, to eliminate the tampering possibilities by participants, Electronic Signature is leveraged by BCT. In other words, through the cryptographic proof process, the BC participants are enabled to fact check the validation of transactions by using specific private and public keys (Hoffman, 2018). The following graph illustrates the peer to peer network in a blockchain-driven platform.

Figure 16: BC peer-to-peer network (adopted from supply chain finance, Hoffmann 2018. P.38)



Consensus Mechanism

A single-versioned transaction history must be recorded in the distributed ledger to solve the conflict of interests among parties. BCT leveraged a group consensus mechanism, associating parties to reach a collective agreement (Chen 2019). There are several consensus mechanisms. Proof-of-work consensus (PoW), used by Bitcoin, aims to connect agreed transactions and create a series of blocks as a chain to create an immutable history after a couple of transactions. Proof-of-stake consensus (PoS), to handle the challenges PoW techniques, allow participants to reach an agreement based on their digital assets possession. Proof-of-elapsed time consensus (DPoS) is designed for permissioned BC networks, requiring specific permission to access the platform and its services, such as voting principles (Chen 2019).

Public and Private BCs

Depends on the nature of the industry's transactions and the context within which a BC platform operates, the network that parties are interacting with can be public or private. As the name implies, public blockchains (permission-less) do not require the participants to gain permission to access the records and transaction data. However, the challenges (such as the need for the development of complex consensus) and security concerns associated with public blockchains encourage the utilization of a permissioned ledger, which tightly controls access to the data. There are two major categories of permissioned BCs (Chen, 2019; Hoffman, 2018):

- "Consortium BCs": these BC possess distributed ledgers managed by several entities, and the creation of each block of transaction records requires the consensus of all controlling entities.
- "Fully private BCs": In this case, the distributed ledger is controlled by only one central entity, which possesses the right to audit, assess, and manage the participants' entry to the system.

Smart Contracts

Since every transaction in an SCF or any business-related ecosystem demands compliance with legal requirements and terms of contracts/agreement between parties, BC technology's use must provide a structured environment that allows for regulatory and contractual compliance in an efficient way. For this purpose, BC leverages the Turing-completeness programming languages, which associates developers create arbitrary rules. These capabilities ensure contractual alignment among participants and reduce the possibility of accidentals, discrepancies, fraud, and intermediaries' interference (Hoffman 2018; Chen 2019). Regarding the traditional SCF's challenges, the use of independently operating smart contracts empowers an SCF ecosystem with automation, decentralization, and self-sufficiency.

Blockchain-Based B2B Payment

Despite experts' long-term endeavours to clarify the blockchain concept and its application to businesses, it has remained ambiguous about how exactly blockchain can provide tangible and intangible benefits. The best first step to this clarification can be the provision of a clear, simple definition. Blockchain is a high-level, "secured cloud-based spreadsheet" that can be analyzed by several parties. Transactions in this spreadsheet are guaranteed through cryptographic keys and stored in the database (Enrico Camerinelli, 2016).

Given this definition and BC's features in previous sections, it is clear that blockchain technology can expedite transactions among parties within which transferring money and ownership are required. Within this DLT-powered arrangement, the buyer paying the suppliers will trigger the process of changing ownership in distributed ledgers, following with real-time crediting the suppliers' account and debiting the buyer's payable accounts. This transaction becomes "irrevocable" considering the timestamp nature of blockchain technology. This digital nature and irrevocability help the financial providers easily format-translate the invoices and payment information and minimize the cost associated with document review. Moreover, smart contracts also automize the assessment process regarding compliance with the agreed criteria, which reduces the audit and service fee (Enrico Camerinelli, 2016).

Blockchain-driven SCF

Given the technical superiority of blockchain/DLT, it is essential to survey the application of DLT regarding financing techniques and SCF ecosystems. Although traditional SCF platforms provide partial automation and transparency, the lack of trust among participants prevents the efficient transition of information among SC parties. In other words, each

participant has the potential to twist its ledger records. Moreover, since each transaction requires a collective agreement among participants, the automation provided by traditional SCF is delayed ensuring the agreement is reached.

Given the challenges of traditional SCF and the technical benefits of DLT, blockchain-driven has proved a practical solution. By providing a special key to trusted parties, suppliers and buyers can secure access to their profile on the platform. At this stage, based on the previously designed smart contract, the suppliers' or buyers' (depends on the triggering event) fund request is assessed automatically, while both parties are informed of the process. If the request is approved, after E-assessing electronic documents, the payment will be deposited at the suppliers' account, and they are noticed to ship the products to the buyers. The inclusion of the logistic providers in the platform can further increase the financing process's transparency by informing both parties on the shipments' location.

CONCLUSION

Through a review of publications surroundings supply chain finance, it was discovered that there is an ongoing tendency among the supply chain's participants to avoid controversial and single-minded approaches and look for more inclusive and trust-based techniques. This paradigm shift has been expedited by several driving forces in the economic environment, such as the need for transparency, working capital tension in the supply-side, the 2008-credit crisis, automation, and technological improvement in the physical supply chain. The traditional trade finance techniques were also examined. Although traditional techniques prove practical when meeting individual participants' interests, there is a lack of an efficient strategy for cultivating a long-term trust-based relationship with other participants. Also, traditional techniques are associated with a high level of non-payment risks.

The literature review also suggests that supply chain finance combines managerial practices, financing techniques, credit assessment processes, and technologies aiming to reduce the working capital tension while meeting all participants' interests. Furthermore, financing in a supply chain finance ecosystem is triggered by transactions and associated events between the participants. Each of these events is associated with a specific technique and originator (a party that initiates the financing request). This event-triggered nature allows the SC participants to execute the most relevant techniques to their interests.

The literature also suggests that several trends are shaping the future of supply chain finance. The inclusion of advisory services, infrastructure developers, and credit assessors allow the supply chain finance participants to reduce risk management and advisory costs while providing an ecosystem by which every concern is handled within the platform. On the other

hand, blockchain technology can offer a secure platform for supply chain finance, allowing it to live up to the expectations regarding the provision of automation, accuracy, and transparency.

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