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Master's Thesis

Increasing cash conversion cycle speeds with supply chain financing in Finnish Marine Industries

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Tutkielman tarkoituksena oli selvittää, kuinka käyttöpääomasykliä voitaisiin nopeuttaa käyttämällä toimittajarahoitusta, kuinka suuri toimittajarahoituksen potentiaalinen vaikutus on ja vaikuttavatko yrityksen ominaisuudet potentiaalin määrään. Vaikutusta tutkittiin käyttämällä Suomen Meriteollisuuden organisaation jäsenyritysten viimeisimpiä tilinpäätöstietoja. Käytettävä aineisto on kerätty Amadeus-tietokannasta, ja organisaation 79:n jäsenyrityksen data ryhmiteltiin eri tavoin sen laskentaa ja tarkastelua varten. Toimittajarahoituksen vaikutuksen voimakkuutta myyntisaamisien nopeutumisena verrattiin yrityksien varastotasojen laskemiseen, joka johtaa varastojen kiertoajan nopeutumiseen. Tällöin vertailemalla kiertoaikojen nopeutumisen vaikutusta käyttöpääomasykliin saadaan kuva sen potentiaalisen vaikutuksen määrästä.

Tutkielman laskelmien mukaan toimittajarahoituksella voidaan merkittävästi nopeuttaa käyttöpääomasykliä, joka vapauttaa prosessiin sitoutuneita resursseja. Yrityksien ominaisuuksilla kuten koolla, yritystyypillä ja sijainnilla toimitusverkostossa oli yhteys potentiaalisen käyttöpääomasyklin nopeutumisen määrään. Tämä selittyy erilaisilla käyttöpääomasyklin osien painotuksilla. Toimittajarahoitus kun ei vaikuta suoraan yrityksen varastotasoihin, joten sen tuoma prosentuaalinen hyöty on suurempi yrityksillä, joilla on pienemmät varastot. Laskelmat jäsenyritysten mediaanilukujen perusteella osoittavat, että käyttöpääomasykli voisi nopeutua toimittajarahoituksen avulla 75%, mikä tarkoittaa syklin lyhenemistä 47:llä päivällä. Tulosten mukaan useimmissa tapauksissa myyntisaamisien kiertoajan lyhentäminen toimittajarahoituksen avulla varastojen pienentämisen sijaan nopeuttaa käyttöpääomasykliä enemmän. Käyttöpääomasyklin nopeutumisen lisäksi toimittajarahoitus mahdollistaa yritysten pääsyn kustannustehokkaaseen rahoitukseen ja siten pääomakustannusten pienentämiseen.

ABSTRACT

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The research was made to find out how cash conversion cycle speed could be increased by using supply chain financing, how much the potential of supply chain financing is, and do company characteristics play a role on it. The impact was measured by using the latest financial statements data from members of Finnish Marine Industries organization. The data was collected from Amadeus-database, and 79 member companies were grouped in different ways for calculations and evaluations. Influence of supply chain finance was defined by increased speed of sales receivables, and it was compared to decreased inventories that cause decrease in days inventory outstanding. Thus by comparing days sales outstanding to days inventory outstanding, it can be concluded how much those will potentially increase cash conversion cycle speed.

According the calculations made in this thesis, supply chain financing can significantly increase cash conversion cycle speed that in turn releases resources that are tied to the process. Companies' characteristics like size, type, and position in supply network, had a connection to the amount of which cash conversion cycle speed increased. That can be explained by different structures of the parts that form cash conversion cycle. Supply chain financing does not directly affect on company's inventory levels, therefore percentual benefit it brings is greater with companies that have low inventories. Member companies' median values indicated that with the use of supply chain financing, the cash conversion cycle speeds can increase 75% resulting the cycle to shorten by 47 days. The results indicated that in most cases shortening sales receivables cycle was more effective than lowering inventory levels to increase cash conversion cycle. In addition to increased cash conversion cycle, the use of supply chain financing gives companies an access to cost effective financing and thus lower their cost of capital.

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I give my most sincere thanks to my supervisors Professor Veli Matti Virolainen and Associate Professor Katrina Lintukangas for positive and encouraging attitude regarding the thesis, as well as for their feedback that made this thesis better. I thank for education they gave me in during my studies, and for sparks of interest on the matters I had never known before. I thank all faculty members of Lappeenranta University of Technology for guidance and education. I thank all fellow students for many warm memories.

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Lastly, I like to appreciate the fact that I never gave up on my goal to graduate. Even when it took longer than I planned, I still managed to overcome the challenge as I head towards new challenges in life.

Juha-Pekka Kosonen
Lappeenranta 25.10.2017

LIST OF ABBREVIATIONS

ACCC	Adjusted cash conversion cycle
CCC	Cash Conversion Cycle
DAO	Days of Advance Payments Outstanding
DIO	Days Inventory Outstanding
DPO	Days Payables Outstanding
DSO	Days Sales Outstanding
EU	European Union
FMI	Finnish Marine Industries
JIT	Just-in-time
mCCC	Modified Cash Conversion Cycle
OEM	Original Equipment Manufacturer
UK	United Kingdom
US	United States
SCF	Supply Chain Financing
SCM	Supply Chain Management
SME	Small and Medium-sized Enterprise
WCCC	Weighted Cash Conversion Cycle

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1 INTRODUCTION

This introductory section works as a prelude for the thesis and describes the background, objectives, and limitations of the research. The following chapters will present research questions and the theoretical framework used to address those.

1.1 Background

Uncertain financial times encourage companies to search alternative means to finance their operations. In harsh times, skillful working capital management can be what prevents companies from going out of business. As it is not the failure to earn profit, but running out of cash that can be the critical point for a company. (Mullins 2009, 5) Instead of focusing on finding financial solutions from outside sources, companies have started to look for solutions from within the existing networks. Companies are researching and adapting options to finance their supply chain by focusing on managing their financial flows. This has coined a concept of Supply Chain Financing (SCF) that focuses optimizing financial flows in supply chains with the help of outside financing institute, or by other members in the supply chain to gain access to cost effective financing. (Hofmann 2005)

Since this thesis comes from the supply chain point of view, rather than just purely the financial, it focuses heavily on the working capital's metric Cash Conversion Cycle (CCC). It aims to find how SCF could make CCC faster compared to the more traditional method lowering of the inventory levels. The topic and concept of supply chain financing has gained attention lately because, with the help of new technologies of information and communication, it has become a potential tool for effective financing as well as for developing supply chain relationships. SCF breaks the classical financing model that relies heavily on financial institutions, giving companies other options to get financing with lower cost of capital due more reasonable interest rates. In the process, it encourages companies to develop their supply chains due to SCFs requirements for information sharing and automation. That investment alone encourages companies to form deeper strategic partnerships and alliances.

Financing has been a troubling issue for Finnish Small and Medium-size Enterprises (SME) for years. According an inquiry done in 2013 by Federation of Finnish Enterprises

(Yrittäjät 2013), the SMEs felt like they had to give unreasonably long crediting for their customers, while they have financing problems to run their companies. They appealed to Finnish Parliament to lower standard maximum payment period from 60 days to 30 and in 2015 the law was finally updated (Finlex 2017) helping the SMEs to collect their receivables in faster phase. Another research (OpusCapita 2017) done in 2014-2015 pointed out that financing problems are still a big issue as 80 percent of SMEs are not paying in time, and 20 percent of SMEs have experienced increased credit loss. That has led to 90 percent of the companies being forced to lower their fixed costs, 75 percent feeling the influence in their financial situation and 53 percent trying to negotiate about payment periods with their customers. That reflects the latest inquiry by the Federation of Finnish Enterprises (Yrittäjät 2017) and how as many as every sixth company had not done important investments, development, marketing, or some other projects due poor availability of cost effective financing.

SMEs financing problems have increased the need for a SCF-type service that has traditionally been available only for bigger companies by banks (Simola 2015, 8). Elsewhere the government has stepped in to encourage companies. In 2012, Prime Minister of UK announced a Supply Chain Finance Scheme that aimed to encourage the leading big companies of the UK to help SMEs with SCF (Prime Minister's Office 2012). EU had also noticed similar financing needs and called to consider SCF as an alternative solution to traditional banking finance for SMEs in hopes to revive the economy more effectively (European Commission 2012).

The goal for the study is to analyse companies that belong in the Finnish Marine Industries (FMI) and to see if raw data from their financial statements would indicate there is need and room to increase the speed of CCC, and thus to use working capital more effectively. Since the companies in the FMI are good sample of the whole industry, the research should be able to point to the potential in the financing with the SCF. This thesis aims to give better understanding of what supply chain financing is. It should show what kind of potential it has as an alternative mean of financing. The use of the FMI companies as data should help the reader to understand the model when the concepts can be tied to real-life companies and context.

1.2 Objectives and limitations of the thesis

Aim of this thesis is to research financial reports of the Finnish Marine Industries (FMI) and analyse the data to see if there is a way companies to use working capital more effectively and potentially initiate supply chain financing in their supply chains. The potential positive results of the thesis could motivate companies to search for alternative new means for financing their operations, especially in contexts where supply chain financing would appear superior to alternative solutions. However, the aim is not to give direct recommendations to any single member company of FMI since the goal of the thesis is to evaluate the companies as groups by characteristics and the position they hold in the supply network.

The focus is on supply management perspective so this thesis will not go in details on financial side of matters in the way that it would compare supply chain financing to other forms of financing. There are limitations and requirements for supply chain financing to be a potential option for the companies, other than just the financial attractiveness. Those include level of digitalization, bargaining power, and level of collaboration both inside and between the firms. Limitations and requirements omitted from the thesis because that level of detail is often only available for the given company, nor would that level of detail serve the purpose of this thesis. Addressing risks and obstacles of adapting the SCF are also beyond the focus of the thesis, because some of the risks are bound to the requirements mentioned before. Therefore, related risks should be evaluated on a case-by-case basis even if the theoretical advantages would advocate implementing the SCF.

Another limitation of the thesis comes from the data that is used. There are about 870 companies working in the marine industry in Finland, but only about 80 of those belong in the FMI organization. That means it is possible to pool the data from the companies that belong to the organization, and even classify the company's position within the FMI supply network, but the financial statements data will include financial flows from companies that are not members of the FMI. Therefore, there are outside sources influencing the data, as the financial flows going outside and coming in from companies that are not part of the FMI are extremely hard to separate from flows between the FMI companies.

The results of the thesis should show the median cash conversion cycles for the companies that belong in the FMI, and point out what kind of financial and strategic potential

there is in paying focus on those. The thesis should show the potential of supply chain financing, while the companies will have to make further calculations if it is the best option for their company and for the supply chains the company is connected with.

1.3 Research questions

The goal is to show how resources are tied to the supply process, and how those could be released to accelerate cash conversion cycles by using supply the FMI's supply network as example. Smaller companies especially are more vulnerable to financing problems that could be solved within the supply chain instead of paying unnecessarily high interests to financing institutions, so company characteristics may play a critical role.

The main research question is:

How to accelerate cash conversion cycles with supply chain financing?

The goal with the main research question is to examine how the FMI member companies could increase the speed of their cash conversion cycles with the help of supply chain financing.

Supporting sub-questions are:

1) *How does supply chain financing influence working capital?*

The first supporting question focuses on finding the connection and mechanism how supply chain financing influences in working capital and to the CCC metric.

2) *How companies would benefit from supply chains to gain financing, and does company characteristics play a role in the potential value?*

The second supporting question is to find out the role company characteristics play. The aim with it is to find out is there some factors that would make SCF to be especially beneficial.

3) *What is the role of inventories compared to sales receivables in working capital management?*

The goal with the third supporting question is to find out the relative roles of inventories and sales receivables in working capital. It tries to answer whether the FMI companies should focus on lowering their inventory levels and cycle speeds or on sales receivables to increase speed of the CCC more effectively.

1.4 Theoretical framework

The conceptual framework for this thesis builds around the supply chain and how by manipulating financial flows, companies in a supply chain could offer supply chain financing. That could be a valuable alternative mean for companies to get cost effective finance and release needlessly bound resources for more productive investments. The figure 1 below connects related basic theories and concepts and relates those with each other. SCF as a concept, depending on perspective, can be as wide as supply chain management and thus cover all the theories in the figure. However, in the scope of the thesis it is viewed as a mechanism that has an effect on measurements that define cash conversion cycle, as it is illustrated in Figure 1.

Since the Finnish Marine Industries form a complex supply network of various kinds of buyers and suppliers, and since the used data comes from the network, the supply network is the widest base of the thesis. The supply network is formed of different supply chains, and that is why supply chain is the next level of the figure 1. The aim of the thesis is to tackle working capital management by giving suggestions how to modify cash conversion cycles. Cash conversion cycle is affected by three major factors; days inventory outstanding (DIO), days payables outstanding (DPO), and days sales outstanding (DSO). By modifying these factors, I will look into how supply chain financing (SCF) could help with financing within the supply chains that forms the network.

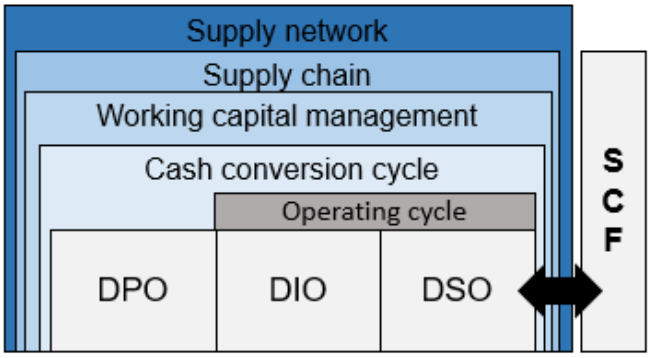

Figure 1. The conceptual framework of theories

The causality link of theories, and how those are expected to connect, is visualized in Figure 2. With SCF, companies are able to lower DSO, increase DPO, and thus lower Cash Conversion Cycle (CCC). That means lower working capital levels leading to expected increase in profits.

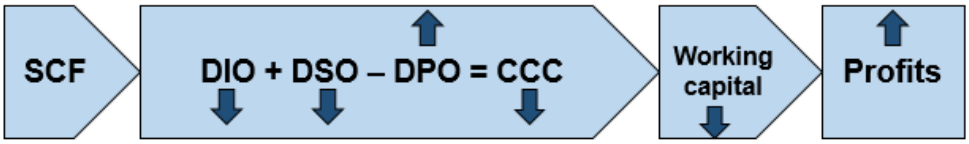

Figure 2. The expected causality link of the theories used in the thesis

While SCF does not affect companies' DIO, the increasing inventory cycle speed is another established way to lower working capital, and thus included in the picture. In the thesis, it is used as a comparative value for the other parts of CCC as an alternative of SCF. By comparing the alternatives, the potential value of SCF comes in better context. Even when those will not exclude each other and companies can use both to increase the speed of CCC.

1.5 Structure of the thesis

The thesis is made of six chapters. Chapter 1 introduces the subject matter and the thesis, chapters 2 and 3 provide the theoretical framework, and chapters 4 and 5 introduce the empirical data, methodology and analysis results, followed by conclusions drawn in chapter 6. Figure 3 illustrates the structure of the thesis in more detail.

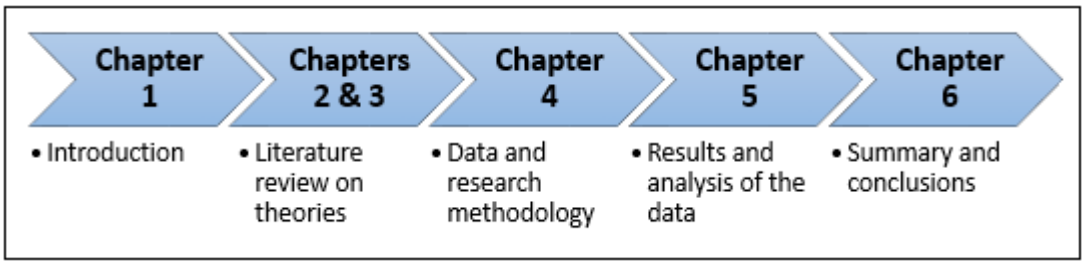

Figure 3. Structure of the thesis

Chapter 1 is an introductory chapter to the entire thesis. It offers background for the thesis by presenting objectives and limitations of the research. The chapter also introduces research questions that the thesis aims to answer as well as offer the theoretical framework for the thesis.

Chapters 2 and 3 focuses on presenting the theoretical foundation for the thesis. Chapter 2 will present concepts like supply network and supply chain. It shows how it is connected to working capital and why working capital management matters. It will also present the theory of measuring working capital with cash conversion cycle, as well as what are the crucial parts of the measurement. Chapter 3 is about supply chain financing. It could have been presented before working capital, but chapter 2 is used as the foundation for chapter 3. As a concept, supply chain financing can be as wide as supply chain management. However, this thesis uses it as a mechanism that affects on working capital and thus the measurements that defines CCC.

Chapter 4 will introduce Finnish Marine Industry as the empirical data source and the chapter will explain the research methodology that is used. The research methodology is both qualitative and quantitative as the companies are grouped by their characteristics and the groups are compared with each other by the data taken from their financial statements. That will produce answers to the research questions.

Chapter 5 presents forming groups of the FMI member companies as well as calculations and analyzing of the data. In the chapter, the data will be analyzed by different metrics and then comparisons of DIO's and DSO's effect on CCC speed is made to draw conclusions from it.

Chapter 6 is the final chapter of the thesis and presents overall conclusions based on the findings of the research. The last chapter will analyze practical use of the results and give recommendations for further research.

2 SUPPLY CHAIN MEETS FINANCING

The following chapters introduce the concept of supply chain and its connection to the financial flows of the company. Academic sources of supply chain management are extremely plentiful since it has been a majorly popular managerial approach for the past decades. The sources used in the thesis are selected to give the reader a good basic understanding of the supply chain and the supply network concepts. These concepts are the base for supply chain financing, and how the data pool is described and analysed in this research. The chapters will also present the basics of working capital management and its connection to companies' profitability. Since the focus of the thesis is on the cash conversion cycle and on the supply chain financing, those concepts are explained in more detail.

2.1 Supply Chain

"A Supply chain is a system through which organizations deliver their products and services to their customers" (Poirier & Reiter 1996, 3). Saunders (1997, 3) defines it as an interface between customer and supplier in order to plan, obtain, store and distribute materials, goods, and services to satisfy organization's external and internal customers.

There is a wide variety of different kinds of supply chains. Most of those are identified by the different levels of integration between the companies. Depending on the sector the companies work on and on the type of business needs, there has been identified as many as nine different types of supply chains. (Huges et al. 1999, 4) A generally used visualization of a basic supply chain is illustrated in Figure 4 below.

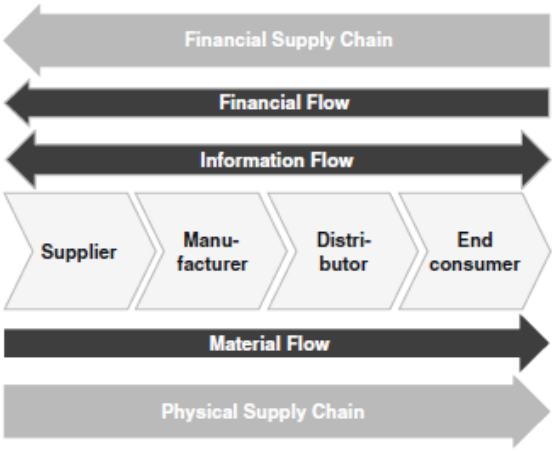

Figure 4. A supply chain with physical and financial flows (Hofmann & Belin 2011, 16)

In a supply chain, companies form a link of materials, finances and information. It starts from resources that are extracted, converted, manufactured, distributed and finally in the hands of the end customer that is the ultimate source of funds for the whole chain (Burt et al. 2003, 9). The supply chain consists of three parallel flows: material (including services), information, and financial flows. The flow of materials and services move from the suppliers to the buyers and is something that ultimately cumulates as an end product for the end customer. Information flow consists of all information that moves between the supplier and the buyer relating to the product, financing, or even details about production times and quantities depending on the relationship. Financial flow in a supply chain consists of invoices, credit notes, payments and financing. (Cooper et al. 1997, 10; Lambert & Pohlen 2001, 2-4; Hofmann & Belin 2011, 14-15)

As mentioned, there are several kinds of supply chains so even when one can identify a long chain from resources to the ultimate end customer, in reality it can be made of shorter chains with different tier companies. An example by Becker (2006, 164) of a tiered supply pyramid is visualized in below as Figure 5. On the top of the pyramid is the original equipment manufacturer (OEM). There are three different identified tiers of suppliers. Those suppliers supply not only to next tier up, but also to higher tier companies above them and closer to the OEM in the supply chain.

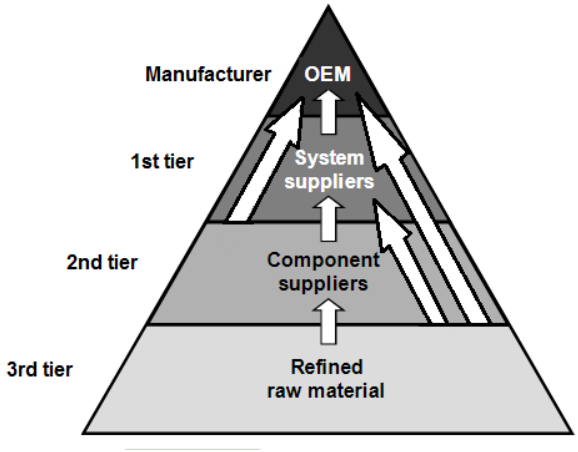

Figure 5. Supply pyramid (adapted from Becker 2006, 164)

In a supply management point of view, the position in a supply chain matters. Those firms that are in lower tier may find that higher tier customers can exercise some influence over both their internal and external sourcing operations. Thus, the position in supply chain and the relative power of participants partly determine the amount of freedom a firm has over its own destiny. (Saunders 1997, 163)

2.2 Supply Network

In most cases, supply chain is a part of a wide and complex supply network and consists of many decision-makers (Nagurney & Li 2016, 28). If the network is highly integrated, it is a flexible virtual system linked together by communication systems and alliances between the companies. The goal is to optimize the flow of materials, services, information, and money while the focus is on the ultimate customer. Optimally running supply network is designed and managed in the way that one member does not benefit at the expense of another. (Burt et al. 2003, 7) Charles Fine agrees and in his book Clockspeed (1999, 95) as he advices: "The farther you look upstream in your technology supply chain, the more volatility you see. Customers are foolish if they don't spend any time or resources thinking about the health, survival, and possible independence of their core technology suppliers". “Upstream” are the companies before the organization and “Downstream” are the companies after the organization towards the end customer in a supply chain (Waters 2009, 9).

Figure 6 is an example of a hierarchical supply network. It has different tier companies (marked with different shades of grey) that are usually similar type companies within the tiers. The end customer is depicted as the darkest square as the white ones represent the lowest tier companies. An example of a supply chain within the supply network is on the left side and connected with thicker lines.

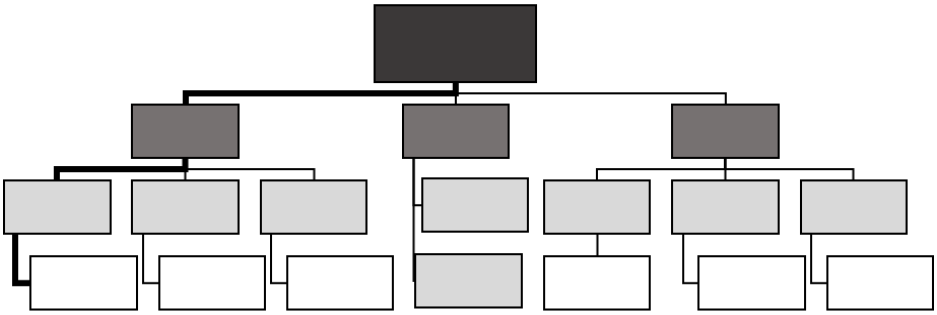

Figure 6. Visualization of a hierarchical supply network structure

Not all supply relationships are equal. Historically companies have kept buyer-seller relationships at arm's length or transactional mode where both seller and buyer tries to get a good deal at the other's expense. There can be defined three different relationships separated by the level of institutional trust as shown in the Figure 7 below. Trust is one key requirement developing supply chains and networks and making collaborations into alliances. (Burt et al. 2003, 31 & 96)

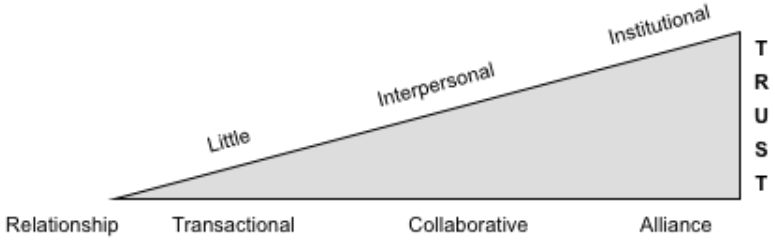

Figure 7. Spectrum of supply relationships and institutional trust (Burt et al. 2003, 95)

Financial and material flows in a supply network can get complex, but in a company level, the resources are managed with working capital management.

2.3 Working Capital Management

Working capital management is an essential part of the short-term finance of a firm. By managing working capital efficiently, a company can release and redirect capital to more strategic objectives, reduce financial costs, and improve the profitability of the company. While supply chain management typically focuses on the physical flow of goods, services and information, working capital management has the focus on financial flows. (Lind et al. 2012, 92)

2.3.1 Definition of Working Capital

The concept of working capital is broad and can be further split into smaller components like Operational working capital and Financial working capital (Figure 8). There are direct and indirect connections to financial working capital like fixed assets and relative profitability. In addition, operational working capital affects it via sales, accounts payables, accounts receivables and inventories. (Talonpoika et al 2016, 280). When talking about working capital, this thesis focuses on operational working capital, as the term is generally used for it in literature.

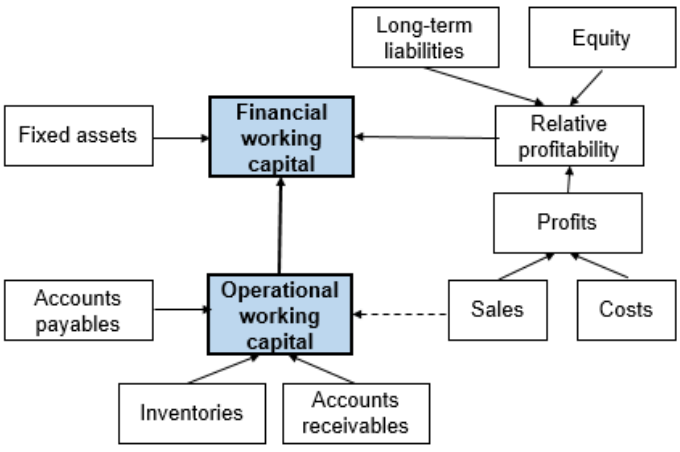

Figure 8. Financial and Operational working capital and its connections (Talonpoika et al. 2016, 280)

Working capital, in general, are finances that are required to run the company on day-to-day basis. Working capital management is split to three different sectors that are used to manage the amount of working capital in the company. Those different sectors are inven-

tory, accounts payables, and accounts receivables. When a company manages and optimizes those areas effectively, it helps the company to maintain cash reserves to run daily operations and to optimize the level of working capital. (Filbeck & Krueger 2005, 11) Thus, the amount of working capital indicates how much money running the company bounds on revolving assets and financial assets (Niskanen & Niskanen 2013, 377).

Traditional view of the reasons to manage working capital is to maintain sufficient level of liquidity to handle short-term payables and unexpected charges. Mullins (2009, 5) goes as far as claiming that it does not matter how good a company's product or service is if the company does not have finances to run their operations. He states even further that during the financial crisis of 2007, numerous companies and hedge funds went out of business due to the poor management of capital. Ironically, even financially profitable companies went out of business just because they ran out of cash during the financial crisis. Manes & Zietlow (2012, 17) also emphasize that successful companies are not only focusing on profitability, but also on working capital management.

2.3.2 Working Capital Optimization

Optimizing working capital is a challenging task that should not be neglected. The challenge of managing working capital is to find an optimal amount of working capital in a way that the company has enough cash reserves, and financial assets for investments. (Richards & Laughlin 1980, 35) The most optimal amount can be argued since decisions that tend to increase profitability also require increased risks, and conversely, decisions focusing on risk elimination will tend to come at the cost of reduced potential profitability (Pedro & Pedro 2007, 164).

Considering all the risks and obligations, the goal with working capital management is to balance between liquidity and profitability in the way that working capital is on the most optimal level. On the other hand, companies are required to have enough liquidity to be able to pay for wages and invoices. In addition, companies should maintain sufficient levels of goods in their warehouses to avoid shortages. Both problems can be avoided with adequate levels of working capital. The company could hold extra goods in the warehouse and significant amount of cash to deal with short-term and sudden payments. However, this would lead the company to lose profits on maintaining the warehouse levels and missed interests on capital. (Mott 2008, 231)

There are different views on what would be the most optimal level of working capital for a company. Some authors (Manes & Zietlow 2002, 15; Hill et al. 2010, 803) have concluded that the most optimal level of working capital in a company is zero, but line of business and other internal and external factors affects it. Re-searchers have concluded that extra working capital would be losing resources and the value of it is small or non-existent. Setting the optimal value of working capital to zero is not necessarily reasonable, because something unexpected like interruption of production can happen. Thus, companies should maintain sufficient amount of working capital to avoid problems in liquidity and is capable to handle obligations (Chiou et al. 2006, 155). One effective way to measure and manage working capital is with Cash Conversion Cycle.

2.4 Cash Conversion Cycle

Richards and Laughlin created a new measurement called Cash Conversion Cycle (CCC) in 1980. It could define and measure the timespan (days) from buying products to the warehouse, to the moment you get money from sales. It is also known as the cash-to-cash (C2C) cycle (Farris & Hutchison 2002). The CCC presents the length of the time in days a firm has its funds tied up in working capital. The CCC consists of three different cycle times: inventories, accounts sales receivables, and accounts payables. (Lind et al. 2012, 93)

$$CCC = DIO + DSO - DPO \qquad (1)$$

The formula above shows the Equation (1) of how CCC is calculated (Berk & DeMarzo 2014, 887). It also shows how each part of the three cycle time components forms the CCC. It is defined as Days Inventory Outstanding (DIO) + Days Sales Outstanding (DSO) - Days Payables Outstanding (DPO). In other words, it is “an additive measure of the number of days funds are committed to inventories and receivables less the number of days payments are deferred to suppliers” (Shin & Soenen 1998, 38).

Figure 9 below visualizes a company with a positive CCC. There is evidence that a company can operate even with negative CCC or when CCC is zero days. In those cases, the company has received advance payments from the product (DSO) before the company has paid payables to suppliers (DPO), and inventory turnover (DIO) is smaller than differ-

ence between DSO and DPO as shown in Equation (2). (Lind et al. 2012, 93) That is when:

$$DIO + DSO \leq DPO \qquad (2)$$

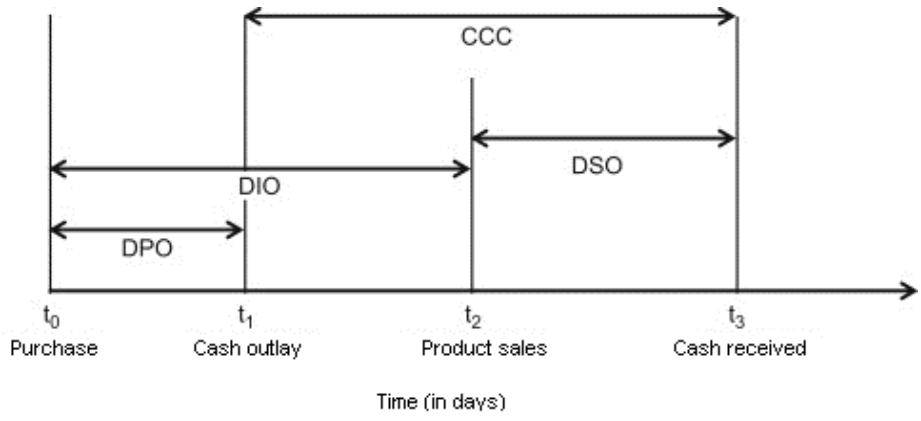

Figure 9. Cash Conversion Cycle (Lind et al. 2012, 93)

Positive CCC shows that the company has to pay payables to suppliers (DPO) before it gets payment from the customers (DSO). Fast CCC indicates that the company manages working capital effectively and need for additional financing is lower. (Hutchison et al. 2007, 42-43). The CCC is usually calculated at company level, but it can also be calculated on a business unit, a customer, or even on level of orders (Lind et al. 2012, 93).

2.4.1 Operating Cycle

A part of CCC is called an operating cycle. The operating cycle is the interval between the arrival of inventory stock, when bought with credit, and the date when cash is collected from receivables. In other words, it is a sum of average number of days necessary to purchase on credit (inventory conversion period, DIO) and the average number of days needed to collect from sales (receivables conversion period, DSO). (Richards & Laughlin 1980, 33; Moss & Stine 1993, 25; Berk & DeMarzo 2014, 888). The way operating cycle is calculated is presented as an Equation 3 (Ross et al. 2008, 751):

$$Operating\ cycle = DIO + DSO \qquad (3)$$

Operating cycle is same as CCC when DPO is left out. That means operating cycle is always longer (bigger as a number) than CCC, unless the firm has paid advanced payments leading to negative DPO. Consequently, operating cycle is same as CCC when DPO is zero days. (Ross et al. 2008, 749-751)

2.4.2 Different versions of Cash Conversion Cycle

Since the CCC is such a useful tool for managing working capital, there have been attempts to develop it even further. One goal was to make the measuring CCC even more exact. The following presents three examples of different versions of CCC.

In 1990, researchers (Gently et al. 1990, 90-92) presented Weighted Cash Conversion Cycle (WCCC) that took in consideration capital that was bound in the different components of CCC. The WCCC scales the timing by the amount of funds in each step of the cycle and therefore includes both the number of days and the amount of funds that are tied up at each stage of the cash cycle (Shin & Shonen 1998, 38).

The developers (Viskari et al. 2012) of 'adjusted cash conversion cycle' model (ACCC) refined it from WCCC. The ACCC is based on the same principles, but it is directed more to operational use than on the company level. It is used to evaluate the efficiency of working capital management on the level of customers, products, or orders. (Talonpoika et al. 2014, 344). Viskari et al. (2012, 5) lists advantages of their model (compared to WCCC) as taking a value chain approach, eliminating negative operating margin from the calculation, simplifying calculation of account payables, and extending the metrics of calculating cost of working capital.

The third notable version of the CCC is called modified Cash Conversion Cycle (mCCC). It was created in 2014 by researchers (Talonpoika et al. 2014) to introduce a modification to CCC measurement in the way it takes into account advance payments as a component of operational working capital. It will be explained in more detail later in the chapter 2.4.6.

2.4.3 Days Inventory Outstanding

Days Inventory Outstanding (DIO) is the first component of calculating CCC (Equation 1) and it measures cycle times of inventories (in days) and shows how long cash in tied to

inventories. Lower level of inventories causes lower DIO. It is calculated by inventories divided by sales and multiplied with 365 as shown in Equation (4). (Berk & DeMarzo 2014, 887)

$$DIO = \frac{\text{Inventories} \times 365}{\text{Net sales}} \quad (4)$$

DIO is used as a measurement for warehouse management since most producing companies keep inventories of raw materials, work in process, or finished goods that are waiting for sale and shipment. (Brealey et al. 2010, 786) There is no upper limit on warehouse sizes, which would lead to longer DIO, but companies want to limit how much resources are tied up on something that causes direct and indirect costs in the form of maintaining storages, insurances, loss of interests, and risks of spillage or obsolesce. (Scherr 1989, 286; Brealey et al. 2010, 786; Niskanen & Niskanen 2013, 379) There are some positive reasons to maintain higher inventory levels like price speculations, expected increase in demand, and to secure production against delivery interruptions or scarcity of products. (Wang 2002, 162; Niskanen & Niskanen 2013, 380; Berk & DeMarzo 2014, 897)

Even with the risks, the costs of inventories have encouraged many companies to adapt a just-in-time (JIT) inventory management approach and to streamline their production. JIT aims to minimize or even reduce inventory levels to zero as the goods are produced and delivered right when those are needed. Implementing JIT requires extreme coordination between units and suppliers. (Scherr 1989, 286-287) Even if the company has not adopted JIT, lowering inventory levels drastically makes it more vulnerable to bullwhip-effect. Bullwhip is an information distortion where companies in a supply chain overreacts on demand signals from the customers causing increased overreaction down the supply chain. The easiest way to counter it is open information sharing trough the supply chain. (Lee et al. 1997)

The most suitable inventory strategy for a company, and thus the most optimal level of inventories (and DIO), depends on the company and business environment it is in (Scherr 1989, 289-290). The goal is to have an optimum balance between the benefits and the costs of holding inventory while keeping the required level reliability of delivery to customers by avoiding shortages (Syntetos et al. 2010, 103; Brealey et al. 2010, 786).

2.4.4 Days Sales Outstanding

Days Sales Outstanding (DSO) is the second component of calculating CCC (Equation 1). It is used to calculate how long in average (days) it takes for a company's receivable investments to be converted in to cash (Richards & Laughlin 1980, 33). Equation 5 shows how DSO is calculated. It is receivables divided by sales times 365, and the outcome is the cycle time in days. (Berk & DeMarzo 2014, 887)

$$DSO = \frac{\text{Accounts receivables} \times 365}{\text{Net sales}} \quad (5)$$

The DSO measurement is one way a company can follow and manage accounts receivables. Length of the cycles is agreed with the customers and even in CCC sense; there are motives to keep it as low as possible. There are also reasons why companies give their customers time to pay back, like to increase sales or straight up crediting the customers. Especially, if they were in a position to get lower cost financing with better credit terms than their customers would get. Giving small companies longer payment periods can be crucial since traditionally their financing costs are higher on financing markets. (Niskanen & Niskanen, 2013, 387-390)

Changes in credit and collection policies have a direct impact on the DSO cycle. Granting terms that are more liberal to customers creates larger and potentially less liquid receivables. If sales do not increase at the same pace with receivables, that will lead to lower receivables turnover and receivables collection periods. (Richards & Laughlin 1980, 33) When it comes to concept of most optimal credit policies, Ross et al. (2008, 802) argues that in perfect financial markets there should not even be one and the decision to grand credit should be done situationally by financial managers.

If a company has a credit term policy of "30 days Net" and the DSO is 50, that means that the customers are paying 20 days late on average. The DSO number itself has a major weakness because it conceals much useful information. It can also look reasonable even when substantial percentage of the company's customers are paying late. (Berk & DeMarzo 2014, 893)

2.4.5 Days Payable Outstanding

Days Payable Outstanding (DPO) is the third and last component of calculating CCC (Equation 1) that differentiates it from the Operating cycle (Equation 3). DPO is a measurement of how many days in average it takes for the company to pay for their payables to the companies they have bought services and/or materials. It is calculated by dividing account payables with net sales and multiplying that with 365 as shown in Equation 5 below. (Berk & DeMarzo 2014, 887)

$$DPO = \frac{\text{Accounts payables} \times 365}{\text{Net sales}} \qquad (5)$$

Since payables are credit debts owed to suppliers of goods and services, Mott (2008) recommends straightforward approach dealing with those. He recommends that if no cash discounts are given from early payments, then the full credit period should be taken. Doing otherwise and paying early and thus lowering DPO, would reduce profit by increasing working capital (from increased CCC), which has to be financed some other way. (Mott 2008, 241)

2.4.6 Modified Cash Conversion Cycle

Talonpoika et al. (2014) revised the traditional CCC and came up with modified Cash Conversion Cycle (mCCC) measurement. They concluded in their findings, that "the mCCC revealed the real efficiency of operational working capital in companies that receive advance payments to a remarkable extend" (Talonpoika et al. 2014, 341). The mCCC is not just modified, but more like an extended version of CCC. It still uses the components of the CCC, including the DIO, DSO, and DPO. It just adds a new component to the CCC (Equation 1) called Days of Advance Payments Outstanding (DAO) as shown in the Equation 7. (Talonpoika et al. 2014, 345)

$$mCCC = CCC - DAO \qquad (6)$$

The calculation of DAO follows the pattern of the other components of CCC:

$$DAO = \frac{Advance\ Payments \times 365}{Net\ Sales} \qquad (7)$$

Figure 10 visualizes how DAO affects CCC (Figure 9, page 25) forming mCCC (Equation 6). The other components of the CCC remain the same and the DAO is added to account for advance payments that reduce the time cash is tied up into CCC. Advance payments may be paid in one payment or by several payments, since a part of the price is usually paid after the product has been delivered with the traditional trade credit terms. (Talonpoika et al. 2014, 345)

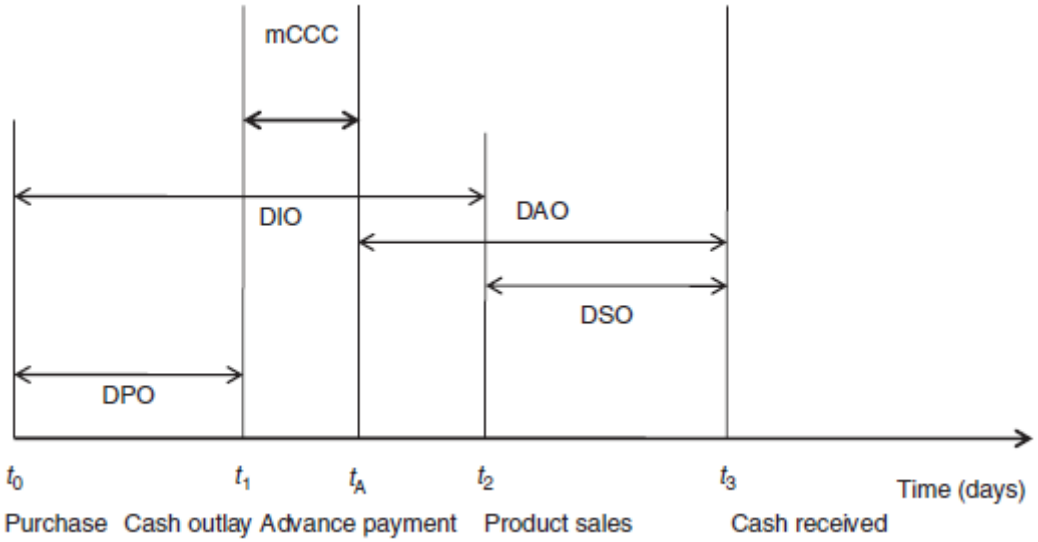

Figure 10. Modified Cash Conversion Cycle (Talonpoika et al. 2014, 346)

The researchers concluded (Talonpoika et al. 2014, 351) that on their empirical tests, the advance payments can have a remarkable effect on the cycle times of working capital and it should give a more realistic picture of efficiency of working capital management. The connection between working capital and profitability has been studied quite extensively in the past.

2.5 Connection between working capital management and profitability

Since early 1990s, researchers have studied the connection between working capital management and company's profitability. The studies have concluded that companies can increase their profitability by shortening the CCC (Soenen 1993; Shin & Soenen 1998, Deloof 2003; Lazaridis and Tryfonidis 2006; Raheman & Nasr 2007; Grosse-Ruyken et al. 2011). Companies can shorten their CCC by focusing on its three components; DIO, DSO

and DPO (see Equation 1, page 24). It was noted in a research that in an average company, decreasing working capital by 30 percent led to a 16 percent increase in after-tax returns on invested capital (Seifert & Seifert 2011, 34).

By shortening cycle times of inventories (DIO) with good warehouse management and by minimizing inventory levels, companies can reduce the amount of resources that are bound to inventories. It should be noted that exceedingly low warehouse levels make the company more vulnerable to production problems, due delivery interruptions, price fluctuations and to losses due to the scarcity of products (Blinder & Maccini 1991; Wang 2002, 162). Secondly, the company can shorten time periods from the receivables (DSO) and get money faster from the sales, but there is a risk of losing business due customers need for credit (Wang 2002, 162). The third way to shorten CCC and increase working capital is to increase duration of payables cycle (DPO).

There is some research (Raheman & Nasr 2007; Deloof 2003) that links shortened DPO to better profitability, against the theories of increased working capital due faster CCC to be better for profitability, but it could be explained in the way that highly profitable companies are also more likely to pay in faster pace to their suppliers.

Companies as customers are rarely single entities like consumers are, and those connected companies are part of more permanent supply chains and networks. Therefore, focusing just to maximize own profits might not be the most profitable on the long run. When a company shortens CCC, it has direct effects to the other companies in the supply chain. A decrease in DSO will decrease the customer's DPO, and an increase in DPO will consequently mean an increase in supplier's DSO (Figure 11). When one company reduces its CCC, the other companies' CCC will increase, because it is a "zero sum game". (Hofmann et al. 2011, 20)

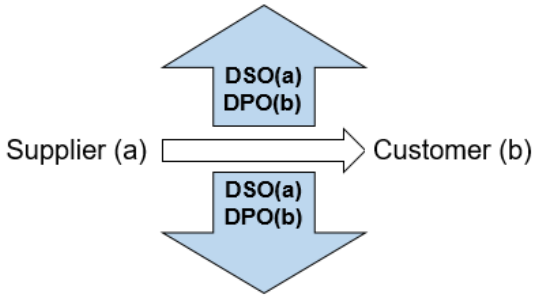

Figure 11. The linked connection between DSO and DPO

The literature of working capital management focuses on company level and lacks perspective of supply chain. It is harder to adjust components of working capital if we take perspective of the whole supply chain since adjusting payment periods has straight causality to payment and receivable periods of the other companies in the chain like shown above. (Lind et al. 2012, 94)

That problem could be solved by using supply chain financing, and by making management of financial flows an active part of supply chain management. With help of an outside financing institution, the companies can adjust financial flows and CCCs more independently, or optimize the financial flows co-operatively making the supply chain work more effectively.

3 SUPPLY CHAIN FINANCING

The following chapters introduce the different concepts and definitions of Supply Chain Financing (SCF), and its connection to the theories presented in the previous chapters. The literature on the subject uses “supply chain financing” and “supply chain finance” interchangeably when talking about a method of financing or a goal of the finance, so this thesis will do the same by using the abbreviation SCF for both.

3.1 Background of SCF

The concept of Supply Chain Management (SCM) dates back to early 1980s when companies started to pay more attention on the supply chain through improved collaboration of internal departments and external trading partners and by managing financial flows, material flows and relationships of the connected network. (Harland 1996, 64). SCM has been an effective managing method that is widely adapted, but the focus has been on flows of goods, services and information (Pfohl & Gomm 2009, 149). Managing financial flows has been neglected until recently, partly due to the recent financing challenges and growing academic interest on finding new solutions to optimise working capital (Hofmann 2005, 203).

As the economic collapse of 2007 dried up liquidity from banks and consequently from industries, it led financially vulnerable companies to negotiate extended trade credit from suppliers as an alternative source of finance (Cornett et al. 2011, 297). Naturally, passing the financing bill upstream in the supply chain creates even bigger problems for those companies, as they could be forced to compete with other suppliers by the ability to give extended credit. (Coulibaly et al. 2013)

The financing problems seem to be focused especially on SMEs, since there has been political pressure in EU and UK to promote SCF solutions as a way to boost the economy by offering the SMEs alternative and more effective ways to finance. (European Commission 2012; Prime Minister's Office 2012)

3.2 Definition of SCF

Strict definition of SCF can be tricky since even the academic literature has no clear consensus of it. Hofmann (2005, 206) defines it as: “located at the intersection of logistics, supply chain management, collaboration, and finance, Supply Chain Finance is an approach for two or more organizations in a supply chain, including external service providers, to jointly create value through means of planning, steering, and controlling the flow of financial resources on an interorganizational level”.

Due the different definitions and novelty of the subject, Gelsomino et al. (2016) noted on their academic literature review on SCF that the concepts are scarce and disconnected, and that there is no “general theory of SCF”. It could be the cause of disparity between SCF theory and practice. SCF is complex and relatively new concept with the division of two different major perspectives; *Supply chain oriented perspective* and *Finance oriented perspective* (Gelsomino et al. 2016, 356):

1) *Supply chain oriented perspective* (for example Hofmann 2005; Pfohl & Gomm 2009; Gomm 2010; Wuttke et al. 2013) – that focuses on working capital optimisation with accounts payable, receivable, inventories and sometimes even on fixed asset financing.

2) *Finance oriented perspective* (for example Chen & Hu 2011; More & Basu 2013) – that focuses on short-term solutions provided by financial institutions and addressing SCF by using accounts payables and receivables.

Hofmann & Belin (2011) introduces additional attributes to define SCF even further. It can be defined by the scope, elements required to run it, or by types of customer-supplier relationship and possible third party companies taking part in the supply and financing process.

3.2.1 Scope of SCF

Definitions of SCF are party dictated by the scope of what is considered included in SCF. Pfohl & Gomm (2009, 151) describes SCF as “inter-company optimisation of financing as well as the integration of financing processes with customers, suppliers, and service providers in order to increase the value of all participating companies.”

Figure 12 below illustrates the different scopes of SCF definitions under the concept of Supply Chain Management (SCM). As some authors (like Hofmann 2005; Hofmann & Belin 2011) talk about SCF, they describe it broadly as management of the financial flows in the supply chain, and even going as far as including information flows, technology, and data management under the concept of financial supply chain management. The scope of Supply Chain Financing interprets SCF to be a set of supply chain financing instruments for managing the financial supply chain with focus on payables and receivables, but not on inventories. The third scope is defined as buyer-driven payable solutions. It is often modelled as an evolved form of reverse factoring supported by the appropriate information technology, and focuses on invoice settlement at the very end of the financial supply chain. (Gelsomino et al. 2016, 356)

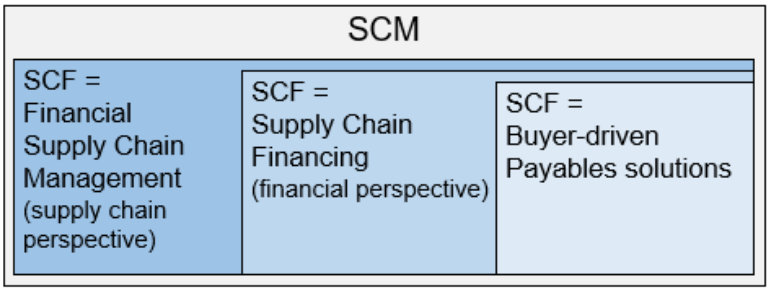

Figure 12. Different scopes of SCF according various authors

It is easy to see how differing terms and views of what should be counted in the concept of SCF causes further confusion among scholars and making practical implementation harder for managers (Gelsomino et al. 2016, 362).

3.2.2 Elements of SCF

There are common elements between the different SCF approaches deriving from the requirements and expected outcomes of implementing SCF. The five key elements common to all SCF approaches are (Hofmann & Belin 2011, 16-17):

Requirements

- *Collaboration*: As the aim of intercompany optimization is to create trust based win-win situations considering the end-to-end supply chain and stable trading relationships as well as to encourage intra-

company collaboration within different departments of the companies. Collaboration encourages companies to connect with internal and external partners within supply chains.

- *Information Sharing*: With increased transparency, the companies assimilate a wealth of information by enabling internal and external sources to exchange data with automation. Shared visibility of supply chain events further enables better forecasting and risk management.

Means

- *Automation:* As a physical mean to adapt SCF via automation, it is an important part of enabling the acceleration of financial and information flows and timely solutions.

Results

- *Predictability:* Whereas paper-based processes inhibit predictability, automation facilitates it by providing various sources of detailed data.
- *Control:* Increased level of control derives from better information sharing and higher predictability that help to identify exceptions and confirm the actions, adequate control mechanisms and results that comply with both internal and external standards.

3.2.3 Types of SCF relationships

The participants involved in the trading and financing of SCF can be used to define the SCF. That includes not only different companies taking part in the SCF process, but also their organization subdivisions and units. The financial perspective on the supply chain requires an extension of the traditional supply chain institutions having four different types of market players (Figure 13). Supply chain, and SCF also, needs to have a supplier and a buyer. In addition, a SCF solution can have other legally and economically independent actors like focal companies or financial institutions. Those financial institutions, like banks, can have a passive role managing accounts of the companies, or an active role taking part financing the supply chain. On wider sense, the financial service provider is any institution funding and taking risk from funding while charging for services. (Hofmann 2005, 207-208)

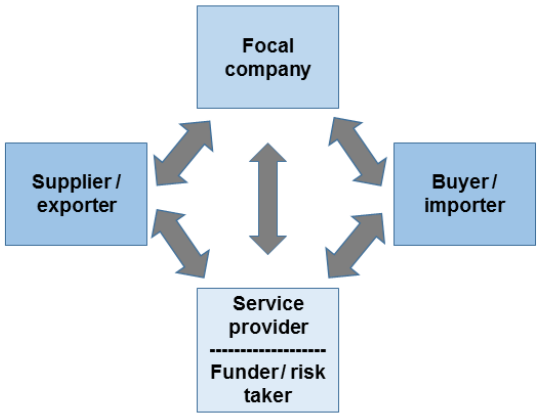

Figure 13. The market players of an SCF solution (adapted Hofmann & Belin 2011, 29)

In a three-actor SCF process, transactions are between a supplier, a financing institute, and a buyer. In those forms of SCF, the financing institute has an active role financing and managing the financial transactions. An example of the process is pictured in Figure 14. The participants on the transactions are the Supplier with high interest rate of 10%, the Bank that is charging a transaction fee of 0.5%, and the Buyer with more favourable interest rate of 4.5%. Firstly, the framework contract with buyer-bank (1), then SCF contract with supplier-bank (2). The Supplier delivers product or service (3), and the Buyer releases invoice to the Bank (4). The Supplier can now obtain finances for amount of the given invoice with the rate of 4.5% with added 0.5% fee of additional interest adding up to 5% (5). Lastly, the Buyer repays for the Bank with agreed terms (6). The payment period (DPO for the Buyer) extended and be longer than what the Supplier could provide. In the end, the Supplier gets financing at the cost of 5% instead of 10%, and the Buyer gets possible extended payment terms and indirect advantages caused by the Supplier's access to cheaper capital or by increased co-operation due SCF. (Wuffke et al. 2013, 149)

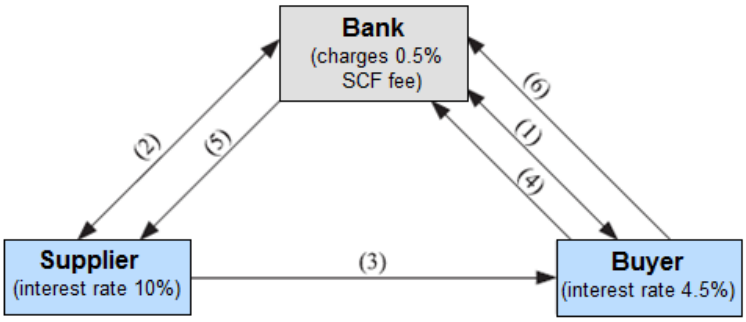

Figure 14. An example of a three-actor SCF process (adapted from Wuffke et al. 2013, 149)

The process is similar to ordinary factoring where a firm sells its complete portfolio of receivables to a financing institution for a price lower than the combined value of the receivables to get the financing. Due the higher risks for the financing institution, the cost of early-acquired capital is high. With reversed factoring (an another name for SCF), the buyer initiates the process and can negotiate better credit terms and lower cost of capital for the supplier due better rating the buyer possesses. (Klapper 2006, 3115-3119; Seifert & Seifert 2011, 39)

Many of the authors (like Pfohl & Gomm 2009; Hofmann & Belin 2011; Wuffke et al. 2013) seem to consider a financing solution to be SCF only when there is an active outside financing company taking the risk. That could be explained by differing views between scholars of what constitutes as SCF, or that is it an easy and common way to model the concept of SCF process through reversed factoring.

In reality, direct financing between companies within a supply chain should also be considered as a SCF method. Especially, since payment terms and price discounts are widespread mechanisms of allocating benefits in the supply chain (Arcelus et al. 2001; Giannetti et al. 2011; Lee & Rhee 2011). In that form of the SCF (Figure 15), a financing institute has just a passive role managing the transactions while the Buyer provides the financing by accepting price discounts of advanced payments (2), or the Supplier provides financing by crediting and offering longer payment periods to the buyer (1) with agreed terms. (He et al. 2010, 72-73)

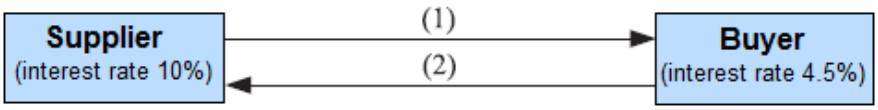

Figure 15. An example of a two-actor SCF process (adapted from Wuffke et al. 2013, 149)

Due to the link between Supplier's DSO and Buyer's DPO (see Figure 11, page 32) and without third party financing, the company that is financing does it either by using advanced payments, or by crediting with extended payment periods. With the DSO-DPO connection and "zero sum game", a company will increase own CCC duration to lower another's and thus giving it financing. (Hofmann et al. 2011, 20)

3.3 Drivers of SCF

In today's competitive and globally acting and trading business world, a supplier's internal processes and management of those processes, have increased in importance because the supplier now share the business risk with the firm it services. Performance of the suppliers directly influences the performance of various other supply chain partners and the supply chain as a whole. Typically, companies select suppliers primarily based on their operational capabilities, but in today's deteriorating credit environment it is not enough. A supplier's operations and finances need to be given equal weight as a financially unstable supplier can have detrimental impact on the entire supply chain. (Ambrose et al. 2010, 1281; Hald & Ellegaard 2010, 890)

Global supply chain comes with a price. As supply chains come longer and decentralized, it increases complexity, risks and costs associated with long distance supply chains, meanwhile many companies have experienced challenges in capital availability. To combat those growing supply chain risks, companies have begun focusing efforts on minimizing the capital exposure in their supply chains and it drives to adapt SCF solutions. (Hofmann & Belin 2011, 20-21) This increased environment of competition among suppliers has forced them to compete by giving better credit terms and increasing their DSO and thus increasing their customer's DPO periods. While the suppliers finance customers by crediting with extended paying periods as a form of SCF (Coulibaly et al. 2013), they themselves are caught in increased CCC that must be solved with an external financing or with a SCF solution.

The pressure and driving force can also come from an outside source. As automation has become increasingly adapted by the use of new technologies, it has made implementing SCF solutions easier as companies move from letter of credits to open accounts. That has caused decline in profits for banks who see SCF as a new possible source of income and thus encourage companies to use it. The driving force can also come in a form of increased compliance regulations on company's financing, requiring financing data that could be easily produced by using SCF. (Hofmann & Belin 2011, 21-23) There is also constant pressure from stockholders to improve and innovate key financial metrics and new capital cost effective financing methods (More & Basu 2012, 629).

The SCF innovation requires cross-functional collaboration of finance and logistics as well as procurement (Wuttke et al. 2013, 156). Therefore, the main driver to adapt SCF within a supply chain is most likely the one that would also benefit the most. Especially if the organization also in a dominating position in the supply chain. (Arshinder & Deshmukh 2008, 332). However, any large-scale adoption of SCF cannot be completed without a substantial proportion of its suppliers also adopting SCF. Therefore, the decision is not only to be made within an isolated organization, but rather between several actors within supply chain. (Wuttke et al. 2013, 151)

Lastly as a conclusion, one of the main general drivers for companies to adopt SCF is to gain access to expected financial benefits, and to release resources tied to accounts receivables and accounts payables. It motivates spreading of SCF even though its adaptation and implementation can be complex and organizationally challenging. (Seifert 2010, 73-76)

3.4 Expected benefits of SCF

The goal of SCF is to lower capital costs by means of better mutual adjustments or with completely new financing concepts within supply chains that would eventually be combined with changed roles or task sharing. As SCF is noted to be more beneficial for companies that are strongly integrated within the supply chain, and have high level of cooperation or collaboration with information sharing. (Pfohl & Gomm 2009, 151, 159) From SCM point of view, the expected benefits of SCF align with Porter's (1985) view on how sustainable competitive advantage can be expected and achieved by reducing costs of the value chain, or by reconfiguring the value chain the companies operate at to be more effective.

Hofmann & Belin (2011, 41) separate the expected benefits in two different groups as quantitative benefits and qualitative benefits. On quantitative benefits, there are reduced and more effectively used working capital, increased funding and better liquidity. As well as savings in risk cost that causes cost of capital savings due lower than normal interest rates. With automation required by SCF and outsourcing tasks to the SCF service providers, companies can expect saving in administrative costs too. Lastly, the SCF should have a direct positive effect on profitability in the whole supply chain (Wesley et al. 2009, 685-686; Hofmann & Belin 2011, 41-43)

Qualitative benefits are also wide in range. As companies adapt SCF solutions, they increase transparency in the supply chain. That increases flexibility trough online visibility (Caridi et al. 2010, 610) into payment process and automatization, which is beneficial especially to suppliers. Some SMEs have troubles to find cost effective financing so having another potential source of finance could be more valuable than mere financing cost difference. From SCM point of view, the improved level of trust, information sharing and commitment are valuable steps for developing the relationships and the whole supply chain. (Wesley et al. 2009, 686; Hofmann & Belin 2011, 44-45; Wuttke et al. 2013, 158)

Most of the benefits do stack on the supplier, but buyers can get longer DPO periods and thus lower their CCC. Some of the expected benefits for buyers are indirect benefits as financing costs in the supply chain have a substantial impact on the cost of products experienced by the end customer. It is estimated that financial costs account for four percent of finished goods. (Wesley et al. 2009, 672) It is reasonable assume that the supplier covers all costs by increasing price of their product, so if the buyer helps the supplier to acquire more cost effective financing, the price of their products can go down and cumulatively lower the price of the end product for the whole supply chain. As SCF adds financial stability to suppliers, Xu et al. (2010), suggests it could lower the risk of bankruptcy throughout the supply chain. Stability of the supply chain is another important source of benefit for large supply chain players that do not get as much direct benefit from SCF.

However, timing decisions in the implementation of SCF matters and it is not automatically beneficial for all buying companies. Even in those companies where it is beneficial, timing of implementation matters against general view of several management reports encouraging adapting SCF as soon as possible. Company characteristics like procurement volume, the company's interest rate and the initial payment terms are factors to be taken in account. (Wuttke et al. 2016, 78)

3.5 SCF potential by company characteristics

There are characteristics in companies and supply chains that effect on the potential of SCF. The value of SCF is relatively large for suppliers in industries with large growth rate allowing those to grow organically with their business (Grüter & Wuttke 2017, 6). Trading position matters as suppliers get lower DSOs, and buyers get longer DPOs by using SCF with the help of outside financing institution (Hofmann & Belin 2011, 42).

Industry type plays heavy role on SCF potential. Based on research, Hofmann & Belin (2011) estimates SCF potential for different industry categories varies greatly (Table 1). The potential was calculated by using degrees of competition and margin pressure combined with the duration of industry's normal CCC. (Hofmann & Belin 2011, 48)

Product category (industry segment)	SCF potential (%)
Food (and live animals)	up to 60
Beverages and tobacco	up to 60
Crude materials (except fuels)	up to 10
Mineral fuels, lubricants and related materials	less than 5
Animal and vegetable oils, fats and waxes	less than 5
Chemicals and related products	up to 60
Manufactured good	up to 90
Miscellaneous manufactured articles	up to 90
Machinery and transport equipment	up to 60
Commodities and transactions not classified elsewhere	less than 5

Table 1. Potential of SCF solutions for different product categories (Hofmann & Belin 2011, 50)

As manufacturing is the most obviously one of the leading industry sectors for potentially gaining for SCF, the position in supply chain is one characteristic that matters. According Seifert & Seifert (2011, 35) US data suggests that relative accounts receivable and payable increase the further those are from the end customer. That would mean lower tier suppliers are more potentially getting benefits from SCF. Supply chain design also matters when potential of SCF depends on trading relationships. As mentioned in the previous chapter, companies that are strongly integrated within the supply chain, with high level of co-operation and information sharing will get more out of SCF (Pfohl & Gomm 2009, 151).

Hofmann & Belin (2011, 50) suggests that size of a company and especially volume of the trade would be limiting factor as a characteristic for adapting SCF due high implementation costs. Surely, it is a factor worth calculating, but consensus among all the academic literature underlines SMEs are potentially the ones directly benefitting the most from SCF.

Companies and especially SMEs can have large initial net liquidity needs, but might not have credit rating to get it cost effectively at low rate of interest. That means if a company has high cost of capital from traditional crediting and low SCF capital cost due the difference in interest rates, the SCF has more potential to help. Even when SCF has helping potential due the difference in interest rates, the structure of working capital (and CCC) matters. Companies with high DSO and low DPO can get most out of SCF solutions, especially those with relatively high amounts of capital tied to DSO. SCF can also help to prevent operational losses due production methods. With production methods like JIT, there are high costs for running out of liquidity. (Grüter & Wuttke 2017, 6)

4 USED DATA AND RESEARCH METHODOLOGY

Maritime Industry is a part of larger Finnish Marine Cluster. The cluster itself is a huge network of different industries forming three different main groups defined as maritime industries, seafaring, and ports with combined turnover of 12.7 billion euros while employing about 48 400 people in 2014. The number of companies that are defined to be a part of the maritime industries is 867, with turnover of about 7.9 billion euros and 28 600 employed people. (Työ- ja Elinkeinoministeriö 2016) Only a part of those about 870 companies, which belong to maritime industries, are members of an organization called Finnish Marine Industries (Finnish Marine Industries 2017a).

Maritime industry in Finland provides products and solutions to various business areas like offshore technology, cruise vessels and ferries of various sizes. Some of the companies have been successful in international markets due their ability to innovate and gain new business opportunities, for example, by offering technologies that make seafaring more environmental friendly. (Työ- ja Elinkeinoministeriö 2016, 47)

Finnish shipbuilding is getting more and more based on a model that is based on co-working of networking companies. From cruise vessel manufacturing, about 80 percent of work is done by network of companies, and only 20 percent by the shipyard. The percentage of work done by a shipyard is a bit higher with ferries manufacturing. In general, the manufacturing in shipyards is largely like in an assembly factory where parts that are produced elsewhere is just put together while majority of the workers are not directly on the shipyard's payroll. Rauma Marine constructions, a member of the FMI, is one of such companies and a good example of networking companies to gain most of the skills and experience of given companies. The company is keeping their own personnel size low, while hiring suitable companies from the network that are optimal for any given project. (Työ- ja Elinkeinoministeriö 2016, 50-51)

Financial instability is noted to be a threat to 25 percent of the companies in the maritime industries. Their equity ratio is low and it weakens companies' ability to deal with operating loss and get over challenging economical situations. (Työ- ja Elinkeinoministeriö 2016, 36)

4.1 Introduction of the Finnish Marine Industries

Finnish Marine Industries (FMI) is a registered non-profit organization with some 80 member companies of the industry of about 870 companies. It was founded in 2001. The member companies are a part of large shipbuilding networks that also consists repair and offshore yards, turnkey suppliers, design offices, software solution companies, system and equipment providers. The organization promotes networking and coordinates research, development and innovation activities. It also promotes favourable conditions in industrial and economic policies, as well as the application of EU shipbuilding policies in Finland. (Finnish Marine Industries 2017b)

Descriptions of the members and their company characteristics is presented further in chapter 5. The chapter and its sections focuses on describing the member companies as data that is then used for calculations.

4.2 Data used in the thesis

Data used in the thesis is both quantitative and qualitative. Quantitative data in the thesis is collected from the FMI member companies' financial statements by using commercial Amadeus database (Bureau van Dijk 2017). It is a comprehensive database of financial information of companies across Europe.

Qualitative data is used to define the FMI member companies' characteristics according their tier in the supply chain (position), company's type, and size. Tier classification is based on research done by Virolainen et al (2017) where they did a comprehensive study of the structure of the FMI network and member's position in it. Company type classification comes from Amadeus database. Company size classification is in the thesis is defined by European Commission's classification of SMEs (Table 2). Companies that are not considered as SME are considered as "large" in this thesis. According European Commission definition, a company is classified as SME if it has annual turnover less than 50 million euros, and the number of employees is less than 250. (European commission 2017)

Company category	Staff headcount	Turnover	or	Balance sheet total
Medium-sized	< 250	≤ € 50 m		≤ € 43 m
Small	< 50	≤ € 10 m		≤ € 10 m
Micro	< 10	≤ € 2 m		≤ € 2 m

Table 2. EU definitions of SMEs (European commission 2017)

4.3 Research methodology

While the thesis has holistic approach on SCF, the research methodology is quantitative as the aim is to test the objective theories and research questions by examining the relationships among set variables. The qualitative data in the thesis is used to group quantitative data. Then the data is compared between the groups and base values. (Creswell 2014, 4)

First, the companies are disconnected from the supply network (Figure 16). By doing so, the research avoids making claims that different tier suppliers have a direct and 100 percent connection of their cash flows to the next tier downstream (smaller tier number) or upstream (larger tier number). For the purpose of the research, it is assumed that the form of SCF is reversed factoring where outside financing source breaks the direct causality of supplier DSO being same as buyer DPO. When those values do not have direct link, the position in the supply chain is less relevant for pointing out the financial flow. The disconnection allows to group up the companies by their characteristics like tiers, type and even size as the companies will group up differently for each characteristic. Thus, the thesis will evaluate the companies without claiming that changes in financial decisions and financial flows of a group is having direct causality to another.

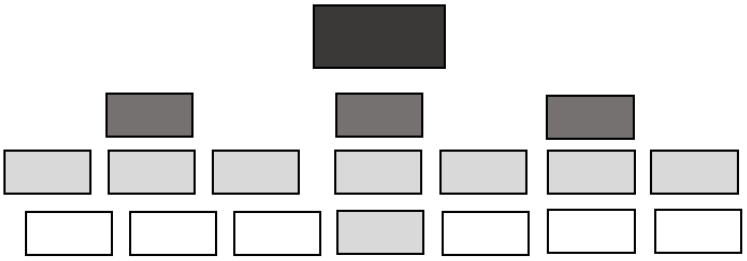

Figure 16. Disconnected supply network

The reason to disconnect the companies in the shipbuilding network that are the members of the FMI, and how there are almost 800 companies in the industry are not members. Those companies are marked as “?” in the Figure 17, and it is a visual representation of the problem. As the members of the FMI have financial connections to companies outside of the FMI, it is extremely hard to reliably point out causality of finances going downstream in full to other companies of the FMI. The connection is there, since the companies are part of the shipbuilding network. Nevertheless, since one cannot point out the exact volumes, it is impossible reliably point out causalities and sources of finances between the actors within the network just from financial the statements data.

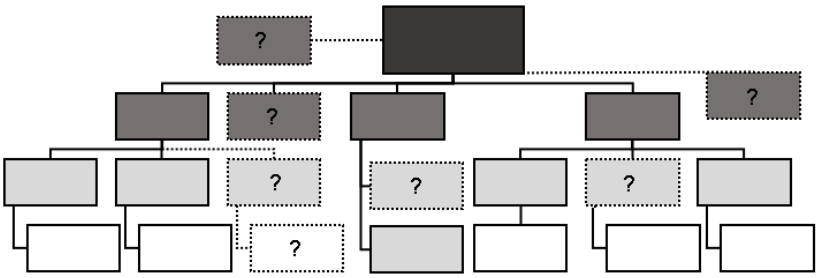

Figure 17. An example of a supply network with actors that do not belong in the data pool

Ceteris Paribus principle is used to analyse the data. It is a principle used in economics when evaluating or doing calculations as everything else relevant remains the same and do not interfere. (Held 2017, 1-2). The way it is used in the thesis, is to leave out DPO and focus to compare whether DIO or DSO has bigger influence on CCC. By assuming that DPO values stays the same, the research focus on the operating cycle part of CCC, as operating cycle is defined by adding values of DIO and DSO. An another reason to leave

out changes of DPO values out of CCC calculations is that SCF can make it possible that there is no maximum for it. At least hypothetically. As a company uses outside financing service provider to negotiate payment periods with the buyer, it does not affect when the supplier gets the money from receivables (figure 18).

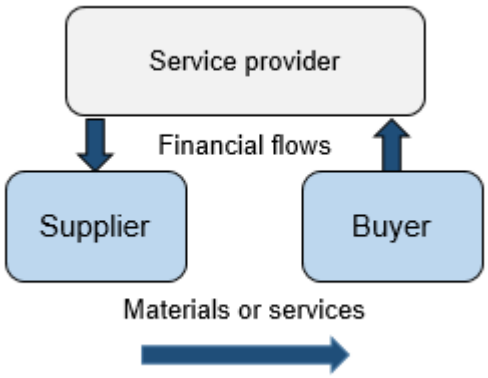

Figure 18. SCF with a service provider

That means DPO can be extremely high (realistically between 30-90 days), while DIO and DSO values aim to go down to zero. Potentially to even less. The thesis will use hold zero as the goal for both values to make comparison and evaluation of the values more reliable. That makes focusing minimizing DIO and DSO more reasonable in the thesis. Comparison of the values DIO=0 and DSO=0 would show which increases the CCC speed more. Thus, it will point which companies should focus to lower the CCC as DPO is presumed to stay the same. It is worth noting that DSO=0 is hypothetical as it would require SCF solutions with all suppliers and thus sources of finances, and DIO=0 is not a reasonable goal for all companies due the costly vulnerabilities it has. Nevertheless, those are used as hypothetical goals for the companies to work towards to as increasing CCC speed shown to be in connect with better profitability. Table 3 is a collection of equations and definitions used for analysing the data. The calculations define how the capital moves in CCC processes among the companies.

Amadeus definition	Accounting definition, calculation
Operating revenue	Turnover
Sales	Sales
Stock	Inventories
Days inventories outstanding	DIO = (Inventories × 365) / Sales
Collection period, days	Days sales outstanding (DSO)
Credit period, days	Days payables outstanding (DPO)
Cash conversion cycle	CCC = DIO + DSO - DPO

Table 3. Collection of equations and definitions

There is a slight variation on the definitions, but the values of the calculations stay true. Since Amadeus defined values for DSO and DPO, those are not calculated, but gathered from the financial statements. DIO and CCC are further calculated from the values given in the statements.

5 RESULTS AND ANALYSIS OF THE STUDY

The following chapters focuses on describing and producing data used in this thesis that is gathered of the members of the FMI. Finally, the results are presented and those are analysed in the perspective of the theories introduced in the previous chapters.

5.1 Description of the data

Total sample size for the thesis are all the members of the FMI. When the data was collected in January 2017, the FMI had 79 member companies. None of the companies was excluded from the data pool and the latest available financial statement information was used from those companies. Even when the sample size is relatively small, it can be considered as a good representation of the whole industry and about 870 that belong into it. Including the members of the FMI.

Some of the data is based on Virolainen's et al. (2017) research tier definitions and companies' tier classifications within the FMI. There are four different roles (tiers) the companies are identified as: "Principal" as tier 0, "Main contractor" as tier 1, "Sub-contractor" as tier 2, and "Supplier" as tier 3 (see Figure 19, page 53). The Principal companies in the shipbuilding network are shipyards and have the main responsibility for the end products. Main contractors are first tier suppliers for the Principals, and since they tend to have less blue-collar workers, they use a range of sub-contractors, service-providers and suppliers to fill their needs. The lowest tier group Suppliers that are classified as tier 3, are mainly providers of parts, components, raw materials or specific services for Main (tier 1) and Sub-contractors (tier 2). (Virolainen et al. 2017, 10)

Shipbuilding as an industry has an abnormal way the finances are realized from the end customer, the ultimate source of funds. It is typical that the ship owner pays for the ship when it is made and no advanced payments are made. In some cases when the advanced payment is made, it is only less than 10 percent of the ship's value (Torvinen 2016). Therefore, during the whole shipbuilding process, what can take from two to three years, the shipbuilding network has to commit and find a way to finance building an end product that can costs as much as 800 million euros for a ship. Some of the funding comes in form of subsidies provided by Finnish state, making the huge projects possible.

That, and the large cap between order and payment, cause some distortion in financial flows that is expected to show in the financial statements. (Virolainen et al 2017, 12)

As a network of 79 companies, the members of the FMI employ over 52 000 workers, and have combined turnover of almost 17.0 billion euros according the most recent financial statements. It is widely different from the industry statistics given Ministry of Economic Affairs and Employment (Työ- ja Elinkeinoministeriö 2016), but could be explained by differing qualifications for the companies to be counted as part of marine industry in Finland. Some of the large companies that are members of the FMI, like Valmet and ABB, are working in several industries. It is also noteworthy that the combined turnover is a result of companies dealing with each other so as the products move up in a value chain, the values of each sales steps multiplies the value. The combined turnover among six Principal actors (tier 0) of the FMI member companies was about one billion euros for the financial year of 2016.

5.1.1 Characteristics of the companies

The FMI member companies are analysed by putting those in different groups according the given characteristics. One way to group the companies is by their sizes. The second way the groups are formed is by industry type they are classified in the financial statements. The third characteristic to form groups of those companies is by their tier and thus the position in the supply network. As the data is analysed by different ways the companies are grouped, it can be seen if and how the characteristics are shown in the data.

According EU's SME classification definitions (European commission 2017), 23 of the companies are considered large and 56 as SMEs. Eight of the companies did not have details on their employee numbers, but their turnover puts those in SME group. The further assessment of their sizes is done by using best estimation of the financial statements data. Table 4 has further details on the sizes of the companies.

Size	Number of companies in FMI
Large	23
Medium	37
Small (and Micro)	19
Total	79

Table 4. Sizes of the companies in the FMI

Company type characteristic is determined by published industry types on the financial statements. Companies in the FMI can be assigned to following groups: “Manufacturing”, “Building and repairs”, “Construction and wholesale”, and “Knowledge-based organizations” as listed in the Table 5. The first type Manufacturing includes companies that manufacture various materials, parts and machinery. Building and repairs group consists of shipyards and such that focuses on building and maintenance of ships and floating structures.

The third group of Construction and wholesales could be in two separate groups, but those are combined into one to avoid splitting the data in too many groups since the sample size, the number of companies in the FMI, is only 79. The companies in that group do installations and specialized constructions, and wholesales of various parts used in shipbuilding as machinery, interior coating (floors, walls), heating and plumbing solutions.

The last group Knowledge-based organizations, is formed from various companies that focus on management, consulting, engineering, information technology, research and development, and even education. The reason to put those companies in one group is that those are expected to have similar working capital structure with each other, and avoiding splitting the data in too many small groups.

Industry type	Number of companies in FMI
Manufacturing (materials, parts, machinery)	28
Building and repairs (ships and floating structures)	14
Construction and wholesale (installation and sales of various parts)	13
Knowledge-based organizations (management, consulting, engineering, IT)	24
Total	79

Table 5. Industry types of the companies in the FMI

The third and last characteristic used to form groups from the FMI member companies is tier as described in the chapter 5.1. The tiers form four different positions the companies have in the shipbuilding supply network. Figure x visualizes the structure as Principal actors (tier 0) are on top and represent OEMs, the shipyards. Below that are the Main contractors (tier 1) that are responsible for delivering specific parts of the ship's structure, equipment, or solutions as they coordinate and manage sub-contractors. Sub-contractors (tier 2) are responsible for delivering services and goods to the main contractors as Suppliers (tier 3) fill the needs of both Sub and Main contractors as shown in Figure 19.

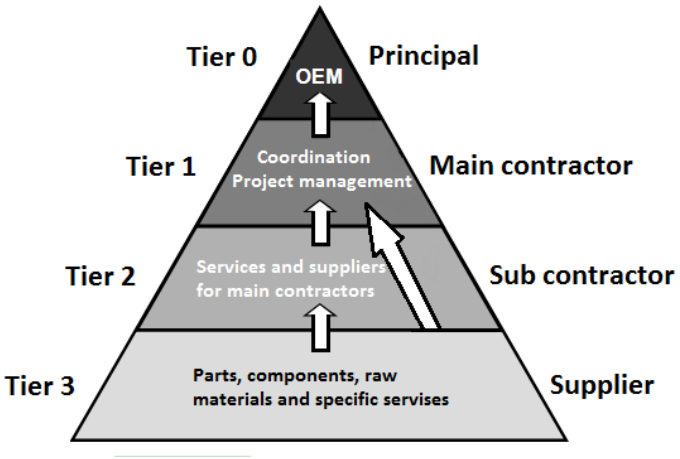

Figure 19. FMI tier pyramid

Tier classification of the FMI done by Virolainen et al (2017, 10) had four companies that did not fall in any specific tier category. The number of non-tiered companies increases to eight in this research. The reason for it is the original four and some company changes, as this thesis will use newer list of the FMI members. The number of companies that belong in each tier are listed in the Table 6.

Tier	Number of companies in FMI
Tier 0	6
Tier 1	39
Tier 2	14
Tier 3	12
Unspecified	8
Total	79

Table 6. Tier position numbers of the companies in the FMI

By using the different ways to group up the companies, it can be seen whether there is a significant change in CCC component values and a reason to believe it is related to that characteristic. There are some typical DIO and DSO values depending each of those characteristics, but choosing only one would skew the data of the group. For example, knowledge-based organisation is not expected to have as large warehouse and as long DIO as manufacturing companies have. Nevertheless, those companies can be in same tier and be the same in size.

5.1.2 Days Inventory Outstanding in FMI

Inventory levels compared to sales are usually dependant on company size and type. The Table 7 is a collection of calculated data from the FMI member companies' latest financial statements. Days inventory outstanding data is calculated by:

$$DIO = (Inventories \times 365) / Sales$$

The table has information about sample sizes, DIO value range (days), median (days), and mean (days) as well as three different groups. Those groups are formed by three different characteristic: size, type, and tier. DIO varies greatly among all of the 79 FMI mem-

ber companies. Some companies have DIO duration of zero days and the others as long as 2 112 days. Median of the all FMI members is 30 days.

When the companies are grouped by their sizes, each size groups have company or companies that have DIO as low as zero days. However, the large companies have as long as 2 112 days, compared to 167 days for medium companies and 282 days for small companies as the highest value among the samples. Again, the median for large companies is more reasonable by 44 days and the mean of 129 is caused by the extreme exceptions. Large company sample size of 23 companies is second largest of the group as medium sized companies for the biggest group of 37. DIO value range is wider with medium size companies than with small companies, but both are close to each other when comparing median values of DIO. Medium sized companies have median of 26 as small companies have 23.

Grouping the companies by type characteristics, manufacturing is the biggest group with 28 companies. Manufacturing companies' median DIO is 57 as the values range from 9 to 124. Building and repairs group is formed from 14 companies, and even when the DIO values range greatly from 0 to 2112 days, as the median duration is only five days. Construction and wholesales group consists of 13 companies, and even when DIO value range is higher than with the manufacturing group, the median is lower with 42 days. The last group by company type are knowledge-based organizations with 24 companies. They represent almost a third of all of the FMI companies. As with other company types the DIO value range starts from zero and even when there are some companies with higher DIO putting the maximum value to 154 days, the median is extremely low at two days as one could expect from the company type.

The third way to group the FMI companies is by their position in the supply network with tier characteristics. Tier 0 companies are primary actors and consists only six companies. The value range goes from 5 to 2 112, but the median of 15 is relatively low. Tier 1 companies are main contractors and the biggest group. It has 39 companies, and even when there are some companies with high DIO of 282 days, the median is only nine days. Subcontractors (tier 2), and suppliers (tier 3) have both about as many companies with 14 and 12 in their groups. Tier 2 company group has DIO value range of 0 to 169 with median DIO of 61 days as tier 3 companies have inventories that cycle faster. Tier 3 companies have median DIO cycle time of 43.

	Characteristics	Sample size	DIO value range	Median	Mean
	All FMI members	79	0 - 2112	30	66
Sizes	Large companies	23	0 - 2112	44	129
	Medium companies	37	0 - 167	26	44
	Small companies	19	0 - 282	23	33
Types	Manufacturing	28	9 - 124	57	59
	Building and repairs	14	0 - 2112	5	163
	Construction and wholesale	13	0 - 282	42	62
	Knowledge-based org.	24	0 - 154	2	20
Tiers	Tier 0	6	5 - 2112	15	384
	Tier 1	39	0 - 282	9	34
	Tier 2	14	0 - 169	61	63
	Tier 3	12	3 - 124	43	51

Table 7. Days inventory outstanding among the FMI companies

One can draw few conclusions from the DIO data. Firstly, the extremely high value of 2 112 days can be explained by a shipyard as those are in classifying groups of large companies, building and repairs, and tier 0. The extremely long time of DIO can be explained by the slow process of shipbuilding as the end product is considered as inventory as it is in building process. The reason how those groups have reasonable low median values could be explained by that other shipyards have not had a building project in process or that those classify parts as inventory of lower tier sub-contractors while those are assembled on the shipyard. It is surprising how well medium and small companies have managed to keep inventory level medians reasonably low with DIO of 23 days for medium sized and 26 days for small ones. Companies of various industry types being grouped in the same size group can explain it. When evaluating DIO values by company types, one can see what could be expected. Knowledge based organizations, and building and repair group have low DIO meaning fast cycle speed of their warehouses due the low level of inventories those type of companies usually use. On the other hand, manufacturing, construction, and wholesale companies tend to have larger inventories and thus the median DIO times from those companies are 42 and 57 days.

As the tier classification shows, the structure of the supply network it is expected that in the marine industry higher tier companies have lower median DIO values as tier 0 and tier 1 companies consists of primary actors and main contractors that manage the operations. Tier 2 and tier 3 companies consists mostly from construction and manufacturing compa-

nies and it shows in the DIO medians accordingly. Since no matter how the data is grouped, there are companies with zero DIO values, it can be said that there are companies with extremely effective inventory management. It is balanced by companies with questionably long DIO cycle times indicating ineffectiveness of inventory management among all the groups.

5.1.3 Days Sales Outstanding in FMI

Days sales outstanding measures the average time companies will wait to collect the payments for pending receivables during the financial year making it a way a company can follow and manage account receivables. Therefore, the lower the value is, the better it is for the company. Added to the company's DIO, the DSO value gives company's operating cycle speed. The values are gathered from the Amadeus database.

Among all the FMI member companies, the median time for DSO is 47 days as shown in the Table 8. The lowest DSO value of the range is zero no matter how the companies are defined and grouped, but there are some quite large values within the groups. Large companies group has the sample size of 23 and the median of 45 days is close to the FMI median. However, the medium sized companies with sample size of 37 have DSO median at 54 days with DSO value range going as far as 260 days within the group. Surprisingly, the small companies' group has lowest DSO of 36 days median and 95 days maximum within the group.

When the companies are grouped by industry type characteristic, the largest group by number of companies, Manufacturing, has DSO median at 44 days. It is only slightly lower than the FMI median. Building and repairs as a company group has the lowest DSO median by 23 days. Construction and wholesale group with 13 companies has almost as many companies in it as building and repairs, but the median DSO is over twice as long with 56 days. The group of knowledge-based organizations has the largest median for DSO with 68 days.

Analysing the FMI companies by forming the groups by tiers shows that tier 0 companies, that are primary actors on the shipbuilding network, have the lowest DSO median by it being only 10 days. Tier 1 companies have much bigger median with 63 days. At the same time, the tier 1 has the most companies of the FMI in it, by having 39 companies out of 79 in tier 1, and it also has the longest DSO. Tier 2 companies have DSO median

slightly under the FMI median with 42 days and tier 3 companies have slightly over the FMI median with 50 days DSO median.

	Characteristics	Sample size	DSO value range	Median	Mean
	All FMI members	79	0-260	47	51
Sizes	Large companies	23	0-125	45	49
	Medium companies	37	0-260	54	57
	Small companies	19	0-95	36	42
Types	Manufacturing	28	0-260	44	50
	Building and repairs	14	0-140	23	36
	Construction and wholesale	13	0-116	56	56
	Knowledge-based org.	24	0-125	68	58
Tiers	Tier 0	6	0-83	10	22
	Tier 1	39	0-140	63	56
	Tier 2	14	0-116	42	43
	Tier 3	12	0-260	50	66

Table 8. Days sales outstanding among the FMI companies

When comparing the FMI median DIO of 30 days to median DSO of 47 days, it is clear that DSO values are generally larger. Even when the DSO value range is lower than with DIO as the values range from 0 to 260 days, the maximum lengths of DSOs are still high. Large companies' median DSO is close to the FMI median, and medium companies experience longer DSO cycles as could be expected with the median length being 54 days. What is surprising is that small companies are able to collect receivables clearly more effectively as the median is well below the FMI median with 36 days being the median cycle time. Company type does not seem to be clear indicator of DSO time, with exception of building and repairs as those companies have median DSO of 23 days. That could be explained how the big and long production projects are paid in timely fashion as those are done. What is surprising is how long knowledge-based organizations wait for the receivables as the median DSO for that industry type is 68 days.

As mentioned with the industry types, the top tier companies are getting receivables on faster pace, the median time for tier 0 companies being only 10 days. Tier 1 companies, that are mostly knowledge-based organizations, have long median DSO of 68 days. Tier 2 and tier 3 companies are getting their sales receivables in faster pace as the median DSO is 42 for tier 2 and 50 for tier 3. There are companies in those tiers that get money instant-

ly (DSO zero days), but what is worrying is the extremes on the other end as it can take up to 116 days for tier 2 and 260 days for tier 3 company to get the money from receivables. It would be reasonable assume that it causes serious financial challenges to those companies.

5.1.4 Days Payables Outstanding in FMI

The third value of defining a cash conversion cycle is days payable outstanding (DPO). As a measurement, it provides information of how long in average a company holds onto its cash. It is an indicator of company's payment policies and possible inabilities to pay in time.

Data in Table 9 is also collected form the financial statements of the companies provided by the Amadeus database. Among all the FMI member companies, the median DPO is 22 days. Large companies have larger median of 28 days, as medium sized companies that represent the largest group when companies are grouped by their size, have the same median DPO of 22 days as the median among all of the FMI companies. However, the DPO value range within medium sized companies go from zero up to 97 days. Small companies seem to be most active with their payments as their median DPO is lowest of the three group at 17 days.

Manufacturing companies have the same DPO median with 22 days, as is the median among all FMI members. Building and repairs have median of 26 days, and the company type group of construction and wholesale has median of 23 days. Knowledge based companies have the smallest DPO among different types of companies within the FMI as their median DPO is only 15 days. It is still worth noting that the group has also longest DPO of 97 days.

When the companies' DPOs are evaluated by position they have in the shipbuilding network, the median values are quite even from 21 days to 23 days among the tier 0, tier 1 and tier 2 company groups. Tier 3 companies have the longest DPO with the median of 34 days.

	Characteristics	Sample size	DPO value range	Median	Mean
	All FMI members	79	0-97	22	25
Sizes	Large companies	23	0-65	28	31
	Medium companies	37	0-97	22	26
	Small companies	19	0-50	17	18
Types	Manufacturing	28	0-65	22	27
	Building and repairs	14	8-56	26	30
	Construction and wholesale	13	0-45	23	24
	Knowledge-based org.	24	0-97	15	22
Tiers	Tier 0	6	8-53	23	28
	Tier 1	39	0-65	21	23
	Tier 2	14	9-50	23	27
	Tier 3	12	7-54	34	32

Table 9. Days payables outstanding among the FMI companies

What is the first and most obvious conclusion from the DPO data is that the median DPO times among the FMI companies are surprisingly low. It cannot be said that longer DPO would be typical to some company characteristic group, as the median values among the groups are reasonably even. However, each group has one or several groups that have maximum DPO of 50 days or more up to 97 days. Having a long DPO could indicate of financial troubles and inability to pay suppliers in time. When DSO median among the FMI companies is 47 days, and thus over double of DPO median that is 22 days, it is an indicator that there are large financial flows coming in and going out from companies that are not members of the FMI. It is interesting that each group have a company or companies that will pay in fast pace. Some even having DPO as low as zero days, indicating that those companies have some early payment agreements with their suppliers.

5.1.5 Cash Conversion Cycle in FMI

As cash conversion cycle measures the time how long finances are tied to the products, it is an indicator how effectively those resources are managed. It is calculated from the parts presented on the previous chapters. The equation 1 used to calculate the FMI member companies' CCC is defined as:

$$CCC = DIO + DSO - DPO \quad (1)$$

The CCC value ranges among the FMI companies are huge as those can be seen from Table 10. CCC values goes from negative 52 days to 2 086 days. Median duration for CCC is 63 days. Median value among large companies is 62 days so it is almost identical to the FMI median. CCC slows down when comparing to medium sized companies group, as those have median CCC of 70 days. Small companies have similar CCC value range as medium sized companies, but the small companies are able to keep the fastest cycle speed out of the three different groups with the median CCC of 52 days.

Manufacturing group is the company type group with the longest CCC with 74 days median duration. Even when building and repairs have the fastest CCC median of only 16 days, it simultaneously has extremely large range as the group has a company with CCC of negative 31 and CCC of 2 086 days. Construction and wholesale is almost the same sized group as building and repairs with the 13 companies in the group, but the variation of CCC values within the group is not as extreme. Still, having the CCC values range from negative 3 days to 335 days is quite large. Median CCC for the company type group is 58 days. The fourth group, knowledge-based organizations, have the least diversified CCC speeds of company type groups, but the median CCC of 60 days is near the FMI median.

As the companies are grouped by the tier levels, the tier 0 companies have the fastest CCC speed of 38 days. Tier 1 companies represent the largest group of all tiers and it has median close to the FMI median with CCC of 64 days. Tier 2 companies have longer CCC median with 74 days as the CCC values range less than with tier 1 companies. Tier 3 companies manage their working capital more effectively as tier 2 companies as their median CCC is 60 days. That is 14 days less than tier 2 median.

	Characteristics	Sample size	CCC value range	Median	Mean
	All FMI members	79	-52 - 2086	63	92
Sizes	Large companies	23	-13 - 2086	62	147
	Medium companies	37	-52 - 323	70	74
	Small companies	19	-46 - 335	52	58
Types	Manufacturing	28	11 - 323	74	83
	Building and repairs	14	-31 - 2086	16	170
	Construction and wholesale	13	-3 - 335	58	94
	Knowledge-based org.	24	-52 - 132	60	56
Tiers	Tier 0	6	-13 - 2086	38	378
	Tier 1	39	-31 - 335	64	67
	Tier 2	14	-46 - 256	74	80
	Tier 3	12	11 - 323	60	86

Table 10. Cash conversion cycles among the FMI companies

Considering how diverse the CCC value ranges are, the median values are reasonable. However, it is curious how much there is variance in the CCC speeds, as there are companies with negative CCC in almost all groups. The effective working capital management does not seem to be the practice in all of the member companies as there are plenty with extremely slow CCC speeds. All but one group, knowledge-based organizations, have at least one company with the CCC longer than 255 days. It is maybe unnecessarily long time for the companies to have the resources tied to their products.

There are some expected results on the CCC data as medium sized companies have the longest CCC. What is surprising is that small companies are able to have the fastest median cycles even when their DPO values were low compared to large and medium sized companies. As the companies are grouped by the company type, the manufacturing has the slowest median CCC as building and repairs have clearly the fastest CCC median. That is due their low inventories that cause fast DIO, and their ability to collect receivables effectively that leads to low DSO. Even when knowledge-based organizations have small inventories, their long DSO periods combined with fast pace of paying for their suppliers and thus causing low DPO, the median CCC of 60 days is remarkably close to the FMI median.

When the CCC speeds are evaluated by the tiers, the tier 0 companies have the shortest CCC median. Tier 1 and tier 3 speeds are close to the FMI median, even when those are

almost double from tier 0 median speed. The troubling CCC median of 74 is with the tier 2 companies that indicate ineffectiveness. However, their DPO is on the same level with other tiers and DSO is even lower than with tier 1 and tier 3 companies. That leads to the root of the problem, as their DIO median is two times longer than the FMI's median. The reason for longer DIO could be found from the industry type as manufacturing companies typically have longer DIO as they keep larger inventories.

5.2 Comparing and calculating the data by company characteristics

As the chapter 3 indicated, companies can increase their cash conversion cycle speed by using supply chain financing. As SCF reduces the time companies are waiting to get their receivables from the sales, and thus reducing the duration of DSO, it can be valuable tool for companies. Another way it can affect on working capital and CCC speed is by increasing companies' DPO durations. However, the possible increase of DPO solely depends on agreed terms with a third party financing institution, or with suppliers.

It is easy to say that companies would benefit and gain financing from supply chains, than it is to qualify and quantify the benefits. In this thesis, the potential benefits are defined by ability to speed up CCC, and the focus is not on the benefits gained by lowered cost of capital due lower interest rates. Therefore, even when adopting SCF for two different companies that are not in business with each other, and it would cause their CCC speeds to increase equally, the difference of the companies' credit ratings would lead the company with higher interest rates gaining more from SCF. As the results of the data is analysed, it is assumed that large companies have lower interest rates than small companies even when the comparison of the benefits will focus on comparing CCC speeds.

Even when DPO will be left out of the calculations on SCF's effect on CCC, there are few interesting findings about DPO in the data. The DPO value range among the FMI companies is from 0 to 97 days (Table 9, page 60). That means there are companies that pay immediately and companies that hold their payments up to 97 days. The median durations for DPO is quite even among all the companies no matter how the companies are grouped, as the median values range between the groups from 15 days to 34 days. It shows that in general the companies are paying their suppliers within reasonable times.

That gives contrasts to DSO results (Table 8, page 58) as DSO median is 47 days while DPO median was only 22 days among all the members of the FMI. There can be made two conclusions from it. Firstly, the amount of financial flows coming in and going out to companies that are not members of the FMI is significant. Otherwise, the DSO and DPO values would be closer to each other. Secondly, it shows that the companies will deal with the payables in timely matter even when they have to wait for receivables over two times as long.

5.2.1 Should DIO or DSO be the focus point for faster CCC?

Table 11 (page 67) is a collection of data that is calculated from the previous tables. The table shows estimations how much lowering DIO or lowering DSO will effect on CCC while DPO values stay unchanged by using Ceteris Paribus principle. The first column is for company characteristics, as in previous tables. The second column “CCC” are the median values from the Table 10 (page 62). The column “CCC - DIO” is for values when CCC speed is calculated, as DIO is zero. That can be calculated by adding parts of CCC in the normal way (0 + DSO - DPO) or simply by subtracting DIO’s value from CCC. The column “decrease” indicates the decrease in CCC duration when length of DIO is zero days.

The next two columns follow the same logic as “CCC - DSO” is calculation of median values when DSO is zero days, and how much CCC will decrease due to it. The last column is to indicate the difference of the two options by subtracting the percentage points of the decrease caused by the two different solutions. Since the calculation is done by subtracting the decrease of CCC when DIO is zero from the decrease of CCC when DSO is zero. The positive outcome means that DIO caused bigger decrease than DSO. Likewise, when the difference is negative, it means that DSO caused bigger decrease than DIO. That gives a direction for the companies to focus to if the difference, whether negative or positive, is consequential in percentage points. The larger the difference is, the more it should be focused on.

As the Table 11 shows, collecting median values of the FMI members indicates that even if they could lower their DIO duration to zero days, it would cause CCC duration to decrease by 48% compared to their median CCC speed. However, if they all would focus on lowering DSO to zero days, the CCC duration would decrease by 75%. The 27-percentage point difference in favour of lowering the duration of DSOs instead of DIOs indicates that focusing on it would be a good way to decrease CCC durations. However,

since DSOs and DPOs are connected and there is not a third party SCF provider, decrease on supplier's DSO causes decrease in buyer's DPO. Figure 20 visualizes the amount of decreases of CCC with DIO and DSO.

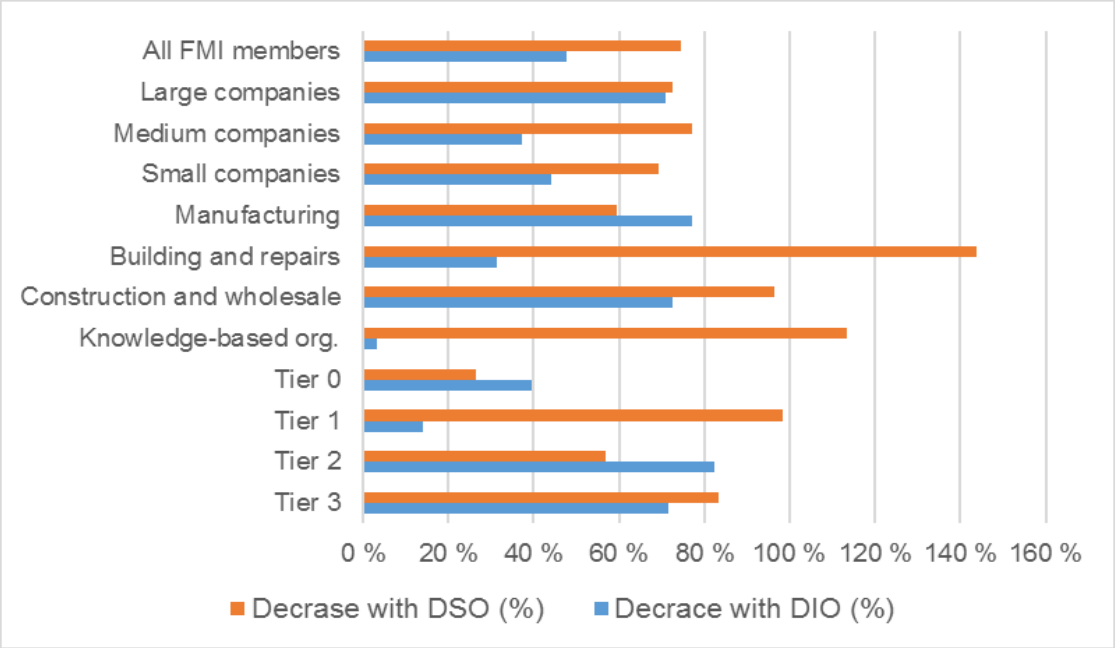

Figure 20. Percentile decrease of CCC durations with DSO and DIO being zero

When the companies are analysed and compared according their sizes, the large companies get almost equal advantage to CCC speeds no matter if they focus on DIO or DSO. If they would lower DIO duration to zero, it would decrease CCC duration by 71% meanwhile focusing on lowering DSO to zero would cause the CCC durations to drop 73%. Medium companies have a similar drop in CCC duration if they reduce the DSO to zero days, causing 77% decrease in the length of CCC. The decrease on CCC duration is not as drastic with lowering DIO to zero days, but it can be explained by different types of companies with various sizes of inventories are all in the medium size company group. The small companies would also get greater decrease to CCC duration by focusing on minimizing DSO than rather than DIO. The decrease would be 69% from the normal duration and 25-percentage points more than with reducing DIO to zero days.

Company type grouping is expected to show interesting data, as companies tend to have different size inventories depending of their type, causing the structure of CCC being more homogenous within the groups. The clear indicator of that is how both manufacturing gets significant 77% decrease, and construction and wholesale gets 72% decrease to CCC from lowering DIO to zero days. Both groups are types of companies that have resources

tied to their inventories so potential on lowering the inventory levels and thus decreasing DIO, would cause CCC to speed up significantly. Then knowledge-based organizations that normally hold low inventories, if any, would not get advantage focusing on the inventories as means to increase CCC speed since the calculated median duration decrease is only 3%. Manufacturing as a group is one of the few company groups that would get bigger decrease to CCC duration by focusing eliminating inventories and getting the duration of DIO to zero, than from decreasing DSO to zero. Nevertheless, the decrease in DSO would cause 59% decrease in CCC durations. Out of all the ways the companies can be grouped, the group building and repairs would get the greatest decrease to CCC duration if they could lower DSO to zero. The decrease in CCC duration would be as much as 144%, meaning focusing on DSO would increase CCC speed far more greatly than focusing on lowering DIO to zero. Construction and wholesale group would have decrease of 97% and knowledge-based organizations would have decrease of 113% in CCC durations, if those companies could lower their DSOs to zero days. Both indicating significant increase in the CCC speed.

Grouping and comparing the companies by the type showed remarkable decreases on their CCC if the companies focused on the DSO, but when the companies are grouped by their tiers, the differences are less drastic. Tier 0 companies and tier 2 companies would benefit more from lowering DIO than DSO to zero. It can be explained partly by the types of companies that tend to be in those tiers. With the tier 0, there is a subtle advantage of lowering DIO to zero causing 39% decrease, than lowering DSO to zero causing 26% decrease in CCC. One tier down and away from the end customer in tier 1, which are main contractors in the shipbuilding network, the structure of CCC comes in the play, as the main contractors do not tend to have large inventories. Those companies would benefit a lot more from lowering the DSO to zero as it would decrease the CCC duration by 98%, compared to just 14% decrease from lowering the DIO to zero. In a shipbuilding network, that could be an indication of a potential significant bottleneck of delayed financial flows that echo through the chain to lower tier companies. However, as the tier 1 has median DPO lower than other tiers', it cannot be blamed for delayed sales receivables for lower tiers.

The tier 2 companies that are sub-contractors have a significant advantage of lowering inventories to zero to speed up CCC by 82%, but the effect of lowering DSO to zero days should not be underestimated. In some cases, the companies cannot lower the inventory levels under certain point, so ability to get receivables in faster pace is still relevant for

increasing CCC speed. The tier 3 as the last tier of companies are also usually those that are financially most unstable. Tier 3 companies consists of SMEs that suffer the most from delayed receivables. The tier 3 companies would get 72% increase to their CCC speed by lowering DIO to zero days and it can be explained by inability to keep inventories on low level due their company types or by lack of efficiency in inventory management. Nevertheless, the tier 3 companies have sizable amount of finances tied to their sales receivables. The companies would get 83% decrease in their CCC duration if they would be able to lower their DSO to zero days.

	Characteristics	CCC	CCC - DIO	Decrease	CCC - DSO	Decrease	Difference (%)
	All FMI members	63	33	48 %	16	75 %	-27
Sizes	Large companies	62	18	71 %	17	73 %	-2
	Medium companies	70	44	37 %	16	77 %	-40
	Small companies	52	29	44 %	16	69 %	-25
Types	Manufacturing	74	17	77 %	30	59 %	18
	Building and repairs	16	11	31 %	-7	144 %	-113
	Construction and wholesale	58	16	72 %	2	97 %	-25
	Knowledge-based org.	60	58	3 %	-8	113 %	-110
Tiers	Tier 0	38	23	39 %	28	26 %	10
	Tier 1	64	55	14 %	1	98 %	-84
	Tier 2	74	13	82 %	32	57 %	25
	Tier 3	60	17	72 %	10	83 %	-11

Table 11. Collection of the data with calculations of DIO's and DSO's effect on CCC

As a generalized outcome, focusing on lowering DSO would increase CCC speed more than focusing solely on lowering DIO. In reality, it is not one or another but a combination of both. However, if the companies cannot lower their DIO any further without causing unnecessary risks in production or product availability, they should focus on DSO.

5.2.2 Comparing the calculations

When the characteristics are compared, few interesting results come up. Medium sized companies have the longest CCC duration of 70 days, and if SCF would be fully incorporated and they would be able to reduce DSO to zero days, the decrease of CCC duration by 77% is quite large. Even when building and repairs company type group would get the largest percentile advantage to CCC speed by doing the same, the group already has short median CCC of 16 days. Advantages for the other company type groups to focus on either DIO or DSO depends on the types. However, if the company like companies in manufacturing have large inventories and thus getting rid of those would lower CCC more than getting sales receivables instantly (DSO as zero), it is not always viable solution for production reasons. That makes the lowering DSO to zero with SCF solutions more viable option. The tier characteristic classification of the groups shows how lower tier companies also have larger median CCC. SCF solutions would help companies from tier 1 to tier 3 more than it would help tier 0 companies. Nevertheless, as the SCF solutions are buyer initiated and focus the financing help on lower tier companies, adapting it in the FMI would make their CCC shorter. That causes decreasing costs of financing on those lower tiers, and in turn, it can lower production costs and eventually lower their prices.

The theoretical SCF potential by company characteristics was presented in the chapter 3.5. It is interesting that the Table 1 (page 42) shows the largest SCF potential with manufacturing companies. That does not reflect with the findings of this research that is focusing on describing the potential by the decrease of CCC speed. Manufacturing having a larger part of CCC in DIO rather than in DSO will not get as much of use from eliminating the duration of DSO by dropping it to zero, as the other types of companies that have lower inventory levels. Another expected phenomenon presented in the chapter, is that lower tier companies that are further from the end customers tend to have larger relatively longer DSO than DPO. That can also be seen from the FMI member company data. Even when it does not get gradually larger, the difference is notable from tier 2 companies downward to lower tiers. Those tiers also show potential in minimizing DSO with SCF.

In their research on the effect of advanced payments have on CCC, Talonpoika et al. (2014, 348) concluded that advanced payments would make mCCC 35 days shorter in average. Their data pool of companies was made of project businesses, information communication technology industry, and publishing services. The closest group that would be the same in the data pool of the FMI companies is the group knowledge-based organizations. If the company group would get their receivables in advance by lowering DSO all

the way to zero days, it would shorten the CCC by 68 days. Even when the data pools are different and not straight one to one comparable, it is an indicator how much DSO can increase CCC speed by shortening it. It also validates how companies should start paying more attention on DSO finding ways to make it shorter, if it does not cause loss of customers.

The monetary value of SCF is hard to define. Like the chapter 3.4 on expected benefits presented, the benefits are both qualitative and quantitative. Qualitative benefits can result having a positive value that is measurable with different metrics, as some of the quantitative benefits comes in the form of cheaper cost of capital due reduced interest rates for the supplier. The interest rates however, was not basis of the data how the comparison was made in this thesis, but SCF's effect on CCC speeds among the FMI member companies. The crude estimation of the monetary value due the increased CCC speed by using SCF is equal of the speed increase. Since SCF effects on DPO and DSO durations and since the DPO durations were kept on their current level to compare DSO and DIO, the value in this thesis bases on the speed increase caused by DSO durations going to zero. As the median CCC would drop by 75% among the FMI member companies, the crude estimation of the SCF value is equal to 75% of the finances tied to CCC. In reality, the value is anything from 26% to 114% depending of the company characteristic groups, but even the group that would get the least amount of advantage of lowering DSO to zero, the value would be 26% of the finances tied to their CCC.

These estimations are crude calculations as the data varies on company level. The estimation doesn't take in account any other potential benefits of SCF that would lead it to have even more monetary value, nor does it take in account the costs of adapting SCF. If the released finances from increased CCC speed can be used with higher profits than what the costs of lowering DSO to zero are, then there is a good reason to adapt SCF solutions to finance the companies.

6 SUMMARY AND CONCLUSIONS

There is a growing interest in supply chain financing as companies, especially SMEs, try to find cost effective financing. It can be an effective method for suppliers to get lower interest rates for capital, and it can be used to increase cash conversion cycle speeds. That in turn releases needlessly tied resources from working capital. The main research question was how CCC could be decreased with SCF. By implementing it, companies can decrease their DSO durations and increase their DPO cost effectively, when in more traditional focus to lower CCC is to lower inventory levels and thus DIO. With SCF, the companies in Finnish Marine Industries could increase their CCC without passing the burden and slowing CCC for the other companies in the supply chain. Therefore, as SCF affects in the working capital management metrics DSO and DPO of the companies, it does not directly influence in DIO. As the structure of CCC depends on company characteristics, it can be seen that the characteristics also play a role in the potential value of SCF, answering to the supporting sub-question about the connection of the two.

The third research sub-question was made to examine the effect of inventories and sales receivables have in forming working capital. It was done by comparing DIO and DSO since there is no optimal DPO value, and higher DPO is generally considered better. The comparison was made with the presumption that either the companies would lower their inventory levels and DIO to zero with JIT production process, or they would lower DSO to zero by using SCF. The comparison shows, which approach should be the focus point and cause larger decrease in the company's CCC speed.

The data for this study was collected from the latest financial statements of the members of Finnish Marine Industries organization. The organization had 79 members during the time the data was collected, and those companies are a part of a large shipbuilding network in Finland. The companies were grouped in different groups by their characteristics and median values of the key data was calculated for each group. Since exact information about financial flows is not available, median values are a good way to examine the data and get reliable estimations without outlier values skewing the results too much. However, in the data there were extreme outliers on the data. Which indicates there are the FMI member companies with short CCC, as well as companies with extremely long CCC durations that can cause financing problems. Shipbuilding as an industry is financially challenging since the end customers pays vast majority of the end product price when it is

completely finished. It can be a financial challenge as building a large ship can be a several years long project requiring the companies to finance their operations during building process.

Since the median values were used, the results are not absolute for each member company of the FMI, but can give direction for focus depending on the company characteristics. Different characteristics give different viewpoints to the data and shows that choosing just one viewpoint can be misleading. Grouping companies by their type is probably the most revealing grouping method, as the companies have, or are supposed to have similar CCC structures with each other. Interestingly the value of SCF, and thus lowering of DSO, was the greatest when the companies were grouped by the company types.

The only company characteristics groups where lowering DIO to zero was more effective than SCF were the tier 0 companies, the tier 2 companies, and the manufacturing groups. Those can be explained by their large inventory levels and it should be noted that aiming for JIT production model, which would cause DIO duration being zero days, is not even realistically viable option for all companies. All the other company groups would have had greater increase on CCC speed if they could lower their DSO to zero. That shows great potential in SCF; even when the comparison does not take into account the additional benefits of lower interest rates leading to lower cost of capital. Nor does it take into account the qualitative benefits from adapting SCF as they increase their information sharing and make the supply relationships closer, potentially resulting in increased effectiveness in the whole supply network.

Wide scale adapting of SCF solutions among the FMI members has a great potential for decreasing length of the companies CCC. Calculations indicated that the median duration of CCC could shorten as much as 75% among the members since the median CCC of 63 days is shortened by 47 days. Those calculations are made with the expectation that DPOs stay the same. In reality, using outside financing institution for SCF can increase the DPO durations further making CCC even shorter. The calculations also indicated that the companies that usually need cost effective alternatives for financing, and have need for lower interest rates, would also greatly shorten their CCC with SCF. Those companies are usually SMEs and lower tier companies within the supply network.

Treating SCF solutions merely as financial solutions is missing all the other advantages they can provide. Due the requirements, SCF relationships should be established with

supply relationships that are not just on transactional basis. There needs to be deeper level of trust between the supplier and the buyer, and there should be interest to develop the relationship even further to make the supply chain work more effectively. If the requirements and mutual will for adapting a SCF solution is established, it should not be seen only as a financial solution but as a part of supply chain management and as a mean of developing the supply relationship for mutual benefits.

6.1.1 Reliability and limitations

Forming different company groups by their characteristics gave better a view on the data pool lowering the risk of calculations giving distorted results as opposed to forming groups just one way. That builds reliability on the results and since the median increase of CCC speeds was so drastic with SCF enabling to lower DSO, it points to SCF having positive results even when amount of potential benefits varies between companies. The results of this study can be generalized and the research methodology replicated for industries of all types and sizes.

There are some limitations on the thesis. The data pool was gathered from all the FMI members, but 79 companies as the sample size could be larger to give results that are even more reliable. The calculations were based on median values of the given group, so there are outliers and companies within the group that would gain more of adapting SCF than the others. Another limitation is reliability of causation. It cannot be shown how SCF affects the downstream or upstream of the supply chain from a given company, as the FMI members have financial flows with companies that are not in the data pool.

Some obstacles could be expected and those could explain why practical adaptations of SCF solutions are not a common practice. It could be explained by the lack of knowledge of SCF within the companies or by the managerial attitudes on financing. Financing departments and financial managers tend to focus on raw numbers and thus on quantitative advantages when they compare different financing solutions. However, supply chain management point of view offers not only quantitative, but also qualitative advantages that cause indirect financial profit. Sometimes those are hard to define, pinpoint, or even quantify. Furthermore, financing is usually not the concern of supply department, so having a solution that is located between the two different departments, can be a reason why implementing SCF solutions to practical use is spreading so slowly. Another obstacle could be that SCF is buyer driven, while the supplier is usually the one getting more potential

direct benefits. Even when those potential benefits can result in lowered product prices for the buyer, thus leading to lower expenses for them, financing as the concept is often seen as competitive and not co-operative by nature.

6.1.2 Use of results and recommendations for further research

This thesis provides examples on how SCF could affect on company's CCC durations and how significant the effect is by using DIO as a comparative metric. SCF needs further academic research to form universally agreed terms and theories, as currently the concepts are scattered. There should be more research on implementing the SCF solutions and how it could be done successfully because SCF in the grey area between supply management and financial management. There should also be research on how well the basic concepts of SCF are known among companies and how the companies have determined the value of SCF's potential. It should also be researched how well companies are aware of the current financial situation of the other companies in their supply chain, and would they be interested to take part in financing a buyer or a supplier by giving them an access to lower interest rates and increased CCC speed.

SCF has caught political interest in EU, but it should also be encouraged by governmental level in Finland. That can be done by making sure that policies and laws do not prevent the adaptation of SCF, but also by encouraging and informing companies about the solutions and potential advantages. SMEs are traditionally the major sector that employs people, so it would make politically sense to clear financial obstacles those companies might have, and to give them an alternative access to cost effective financing. By granting the access to lower cost capital, companies are encouraged to do investments that in turn help the companies to grow.

The members of Finnish Marine Industries can use this thesis as a reference point for their company. Each company need to make detailed calculations of their situation, but this thesis shows that there is great potential in the benefits of SCF. The potential is not only with shipbuilding networks, but also with all types of industries and supply networks. This research has shown significant advantages of using the financing method, and it recommends both financial and supply chain managers to look further into the Supply Chain Financing.

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