A Conceptual Model of Supply Chain Finance for SMEs at Operational Level

'An Essay on the Supply Chain Finance Paradigm '

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Abstract

In this essay Supply Chain Finance (SCF) is introduced based on definitions from Steeman, Hofmann and the European Banking Association.
The base of the analysis is from the capital cost model of Pfohl (Volume of Working Capital * Duration * Cost of Capital) and its impact on the Economic Value Added (EVA) according the Rappaport Shareholder Value model.
The 3 relevant elements of the working capital (Account Receivable, Inventories and Accounts Payable) are discussed for their impact on:
- Static and dynamic liquidity: The corner stones of the conceptual model
- Costs of Working Capital (e.g. EVA)

Finally the link is made between the transaction (with impact on: Account Receivable, Inventories and Accounts Payable) and the IT-systems in the supply chain or the ERP system within a company.
Some outcomes of empirical research is presented, as well as some planned empirical research in the nearest future in India, Spain and Russia.

1. Introduction

Introduction to Supply Chain Finance

Supply Chain Finance (SCF) is a relatively new topic in logistics (Coyle, 2003), (Seifert, 2009). Some recent studies show that it may reduce the working capital[1] of the focal company by 40%, as well as the costs of capital (because of the better credit rating of the focal[2] company) (Hofmann, 2010). Supply Chain Finance has its roots in <u>reverse</u> factoring. Factoring has traditionally been used for financing the Accounts Receivable (Debtors) of a company by selling the ARs to a factor – often related to a bank; the factor collects the debt from the company's clients, and the company immediately receives the agreed amount of money after deduction of a discount (Brealey, 2011). In most definitions, Supply Chain Management comes down to the design and optimisation of the flows of goods. In many cases the flows of information are included more explicitly. But in general, financial flows and their costs gain a lesser interest. By using (already existing) supply chain information, the usage of working capital and its costs can be reduced according to the Supply Chain Finance Cube model (Pfohl, 2009), see Equation 1 for the summary of the factors that influence the capital costs (i.e., Volume of working capital, Duration, and Costs of Capital (WACC[3]).

$$Capital\ Costs =$$

$$Volume\ of\ Working\ Capital \times Duration\ \times Costs\ of\ Capital\ (WACC)$$

Equation 1. Capital Costs (Pfohl, 2009).

The relationship between Working capital and Cost of Capital on the one hand, and shareholder value on the other hand is described in *'Creating Shareholder Value'* (Rappaport, 1998), where the value is decomposed in three value drivers, i.e., Operating (profit margin), Investment (working capital), and Financing (cost of capital). The three micro value drivers for working capital are Inventory, Accounts receivable, and Accounts Payable. In figure 1 the conceptual model of shareholder value is presented.

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[1] Working capital is defined in this article like; NWC = Inventories + Debtors (AR) – Creditors (AP). So, the Cash and Cash Equivalents are excluded (Hillier, 2011)

[2] Focal company is the leading or dominating company in the supply chain

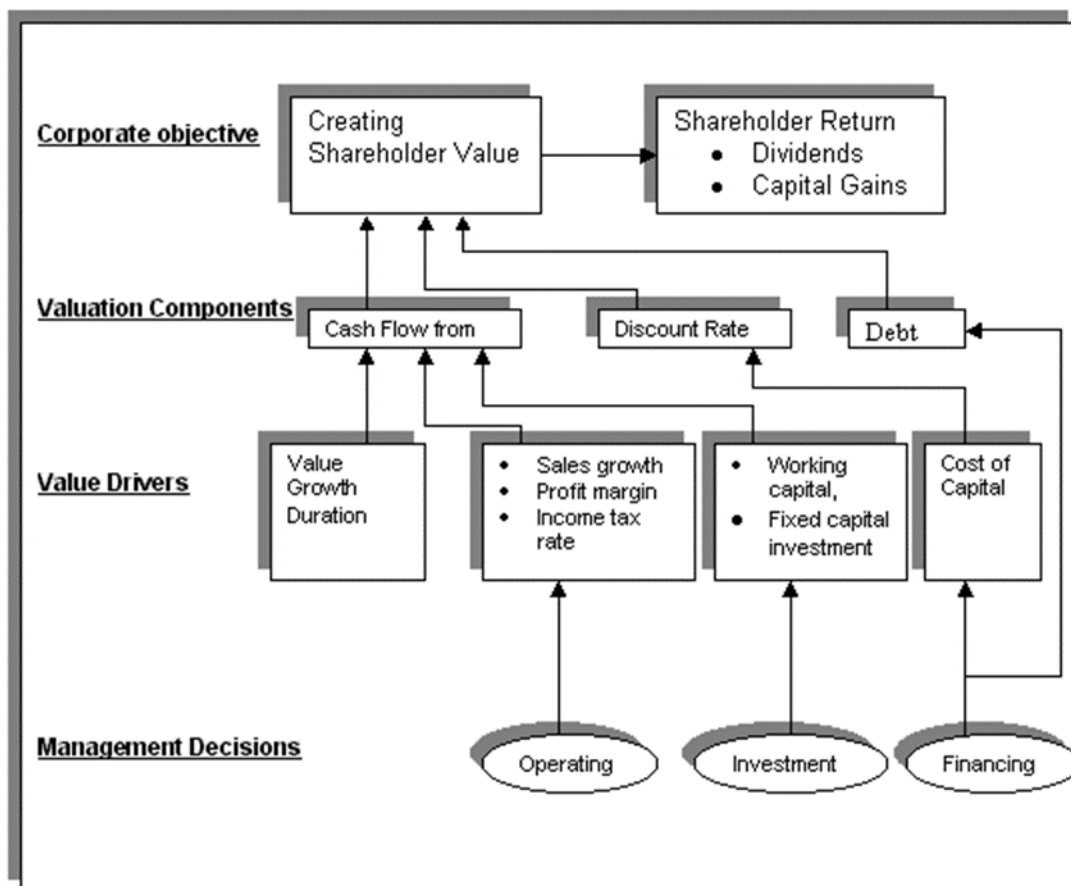[3] WACC = Weighted Costs of Capital (Hillier, 2011)

Figure 1. The Shareholder Value Network (Based on Creating Shareholder Value (Rappaport, 1998).

Source: http://corpdapp01.apollotyres.com/tmm/tmm/b2s/finance/imgs/alcar_approach.gif

According to the EVA formula presented in equation 2, lowering costs of (working) capital increases the EVA.

$$EVA = NOPAT^4 - WACC * Capital\ Employed^5$$

Equation 2. Definition of Economic Value Added (EVA).

Besides, the impact on costs e.g. capital costs, lowering working capital in volume <u>and</u> duration will also lead to a better performance in terms of liquidity. Static liquidity (current ratio[6]), as well as dynamic liquidity (Cash to Cash Cycle[7]) will be improved.

In the Netherlands, the following definition of Supply Chain Finance is quite popular:

> *'Financial arrangements in the form of debt, equity or financial contracts used in collaboration by at least two supply chain partners and facilitated by the focal company with the aim to improve the overall financial performance and mitigate the overall risks of the supply chain'* (Steeman M. , Supply Chain Finance, 2013).

The Global Supply Chain Finance Forum defines Supply Chain Finance as follows:

> *'SCF is the use of financing and risk mitigation practices and techniques to optimise the management of working capital and liquidity invested in supply chain processes and transactions. SCF is typically applied to open account trade and is triggered by supply chain event. Visibility of underlying trade flows by the finance provider(s) is a necessary component of such financing arrangement usually enabled by a technology platform'* (Hofmann, Supply Chain Finance and Blockchain Technolgy, 2017)

Different scholars have already noticed the impact of managing working capital on lowering costs and improving liquidity, an overview is presented in table 1.

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[4] NOPAT = Net Operating Profit After Taxes (Rappaport, 1998)

[5] Capital Employed = Total Assets – Current Liabilities = Non-current Assets + Working Capital. In some other textbooks Capital Invested is mentioned (Brealey, 2011)

[6] Current Ratio = Current Assets / Current Liabilities (Hillier, 2011)

[7] Cash to Cash Cycle = DSO +DIO – DPO (Hillier, 2011).

Impact on → Academic contributions ↓	Fixed capital	Working Capital (incl. interest costs)	Economic Added Value	Risk mitigation	Liquidity
Rappaport (Rappaport, 1998)	X	X	X		
Pfohl (Pfohl, 2009)		X			
Steeman I (Steeman M. , 2014)		X	X	X	
EBA					X
Steeman II (Steeman M. , 2013)	X	X	X	X	
Steeman III (Steeman & al., 2015)					X

Table 1 SCF definitions and SCF topics

In this article the emphasis will be put on the next two aspects:

- lowing working capital and lowering the costs of working capital
- increasing liquidity using SCF instruments

A possible conceptual SCF model constructed in this article is based on the findings of the literature review on the one hand, and the outcomes of the desk research (company interviews) on the other hand.

The European Banking Association (EBA) provides a good definition of Supply Chain Finance (EBA - European Banking Association, 2014), in which we can distinguish two important goals of SCF:

- Management of working capital
- Management of liquidity

In the same publication, the following three main categories of (operational) supply chain finance instruments are distinguished:

- Accounts Payable or Buyer centric
- Accounts Receivable or Supplier centric
- Inventory centric

> "the use of financial instruments, practices and technologies to optimise the management of the working capital and liquidity tied up in supply chain processes for collaborating business partners. SCF is largely 'event-driven'. Each intervention (finance, risk mitigation or payment) in the financial supply chain is driven by an event in the physical supply chain. The development of advanced technologies to track and control events in the physical supply chain creates opportunities to automate the initiation of SCF interventions." (EBA - European Banking Association, 2014)

Problem

Supply Chain Finance is rather a new phenomenon in Supply Chain Management and Finance & Control. As for MNEs (multinational enterprises), SCF is a more common practice (Steeman M. , The Power of Supply Chain Finance, 2014). However, SCF is relatively unknown to SMEs.

On the other hand, we assume that SCF offers opportunities for SMEs as well, and that SMEs might profit from SCF. In corporate finance, many similar theories exist and they are applied to business practices. The question is what SCF may add to the existing theories of Corporate Finance and Supply Chain Management, and applications of Corporate Finance, Supply Chain Management, and ICT concepts.

The main research question to be posed in this paper is:

What is the (global) conceptual model of Supply Chain Finance for SMEs?

Methodology and Research Model

In order to answer the main research question, a literature review in the new field of Supply Chain Finance has been conducted in the existing (related) fields of expertise:

- Finance (especially Working Capital Management, Weighted Average Costs of Capital, Capital Asset Pricing Model and Risk Management)
- Advanced Planning & Scheduling (APS) and ERP
- IT platforms

Some empirical research is described in order to evaluate whether there is some evidence of the Supply Chain Finance theory in real business life of a SME (Goeij de, 2017).

Development of a new paradigm is not only based on reading the latest contributions to the field of expertise, but also based on discussions with peers. Knowledge DC Community SCF (KDC, 2014), Dinalog SCF community (Dinalog, 2014) and Supply Chain Finance Community (scfcommunit, 2014) bring together peers from universities of applied sciences in the Netherlands to facilitate the discussion about Supply Chain Finance. The academic development of the SCF paradigm is the process that develops gradually, and has its own dynamics. For universities of applied sciences (UAS) there is an extra drive to update their curricula with new fundamental trends, like SCF probably is.

The literature review of recent contributions to the field of Supply Chain Finance will be presented; as well as its foundations in Supply Chain Management, Finance and Procurement & Sourcing. A summary of this new paradigm called Supply Chain Finance is provided in figure 2.
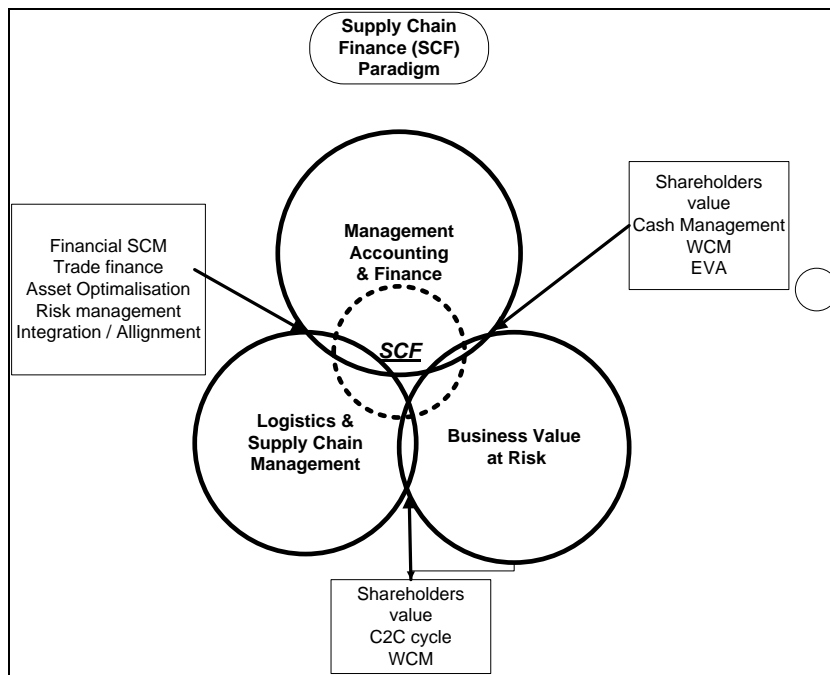
Figure 2. Supply Chain Finance Paradigm (Cosse, 2011).

The SCF paradigm developed by Cosse (see figure 2) is focussed more internally on the value chain of the (focal) company. A more recent contribution of Steeman (2014) focuses on:

1. A set of supply chain financing instruments (trade financing, fixed asset financing, working capital financing and supplier financing) to manage the financial supply chain. Collaboration and IT platforms are important characteristics.
2. The purpose of SCF models. What value does SCF create? Lower financial costs, and mitigating supply chain/suppliers' risk.
3. The perspective of SCF programmes. Is the programme initiated by a (dominant) buyer (focal company) or supplier?

Partly in line with Steeman (2014), SCF is to be considered as a part of SCM (Supply Chain Management), but the severe theoretical foundations in Corporate Finance as well as the recent developments in the role of (business) controller (Desroches, 2013) might argue to place SCF under the business controller or CFO.

In a recent contribution to the SCF paradigm (Jansen, 2016), SCF was positioned in Finance & Control (e.g. Corporate Finance), IT platform / ERP and SCM, see figure 3.
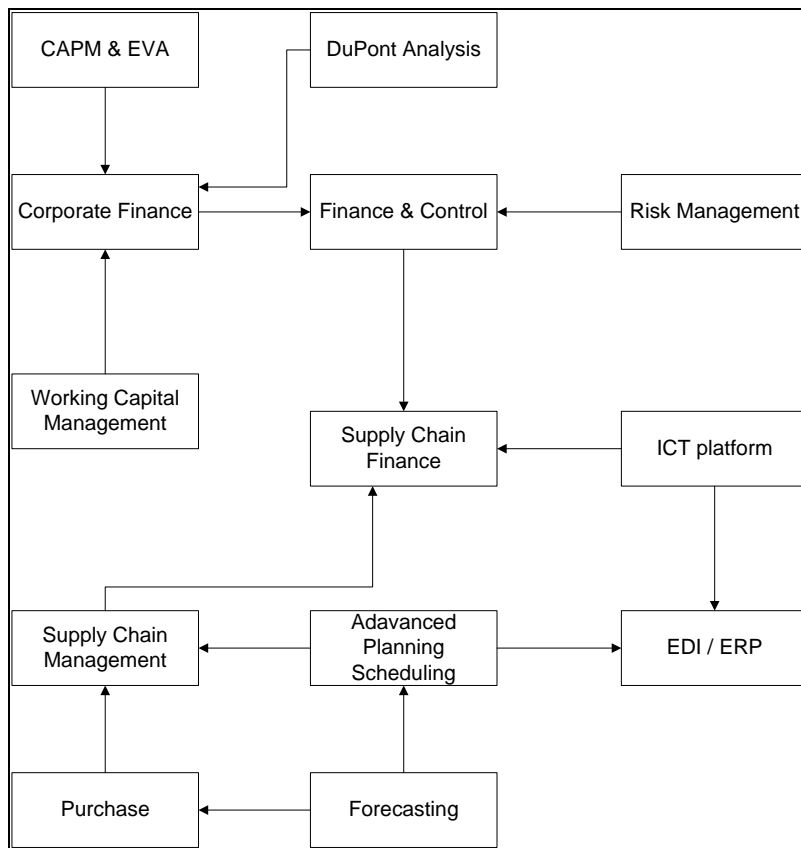
Figure 3. SCF paradigm (Jansen, 2016).

2. Conceptual Model of Supply Chain Finance

Introduction

According to a well-known classification of SCF instruments, Strategic, Tactical, and Operational levels can be distinguished (Boer de, 2015), as plotted in figure 4.
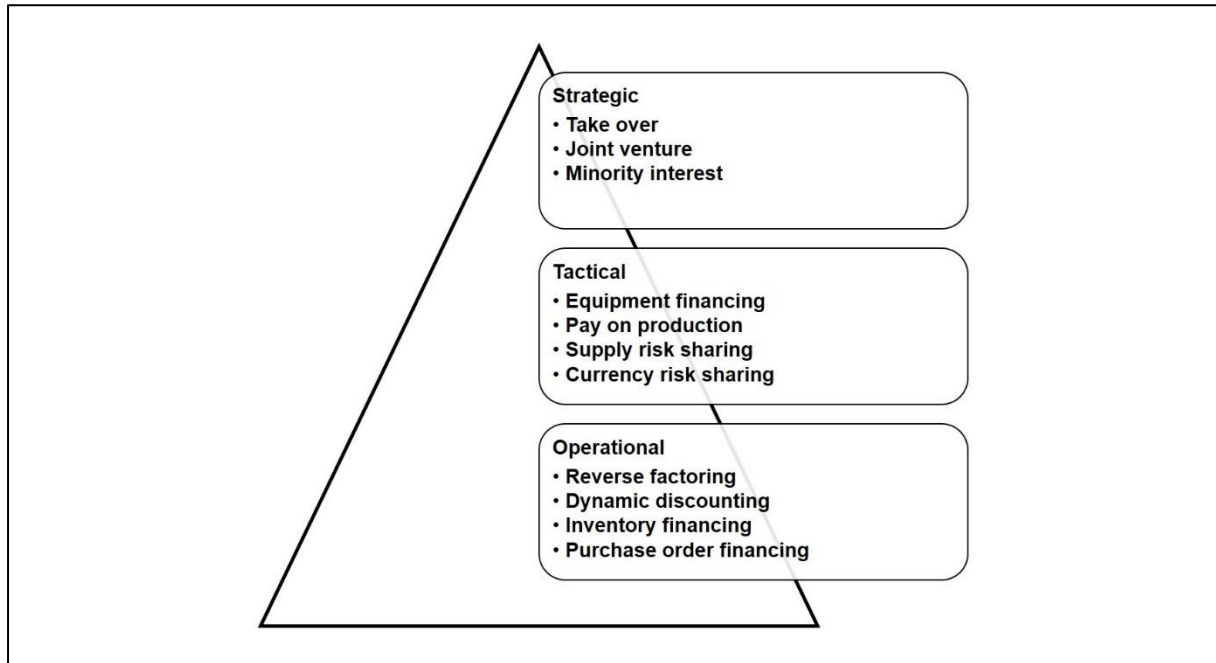

Figure 4. SCF instruments (Boer de, 2015).

We can observe (from their annual reports) SCF instruments in multinational firms like Philips, Unilever, Shell, Microsoft, Volkswagen, etc., which act as focal companies in their supply chain. The focal companies often want to safeguard their procurements in the long term, so they buy a stake from their suppliers via buying shares or starting a joint venture.

Tactical SCF instruments are often used to finance the equipment (e.g. trucks) of the focal company's supplier, because the supplier does not have the financial resources to do it and/or is not powerful enough to get a loan from a bank.

Operational SCF instruments are used to directly improve the liquidity of companies in the supply chain (i.e., reverse factoring, dynamic discounting, inventory financing and purchase order financing).

A more detailed overview of operational SCF instrument can be found in the report *Supply Chain Finance* of the European Banking Association (Bryant, 2014), the EBA splits up the operational SCF instrument into four categories:

1. Accounts payable/Buyer centric
    a. Reverse factoring (Confirming/Approved payables financing)
    b. Dynamic discounting

2. Inventory centric
    a. Pre-shipment
    b. Purchased Order-based finance
3. Accounts receivable/Supplier centric
    a. Receivables purchase
    b. Invoice discounting
    c. Factoring
    d. Forfaiting

Supply Chain Finance is a relatively new topic in logistics (Coyle, 2003), (Seifert, 2009). Some recent studies show that it may reduce the working capital of the focal company by 40%, as well as the costs of capital (because of the better credit rating of the focal[8] company) (Hofmann, A supply chain-oreinted approach of working capital management, 2010). Supply Chain Finance has its roots in <u>reverse</u> factoring. Factoring has traditionally been used for financing the Accounts Receivable (Debtors) of a company by selling the ARs to a factor – often related to a bank; the factor collects the debt from the company's clients, and the company immediately receives the agreed amount of money after deduction of a discount (Brealey, 2011). In most definitions, Supply Chain Management comes down to the design and optimisation of the flows of goods. In many cases the flows of information are included more explicitly. But in general, financial flows and the costs of financial flows gain a lesser interest. By using (already existing) supply chain information, the usage of working capital and its costs can be reduced according to the Supply Chain Finance Cube model (Pfohl, 2009), see Equation 1 for the summary of the factors that influence the capital costs (i.e., Volume of working capital, and Duration and Costs of Capital (WACC[9]).

    I.   Related
        a. Documentary trade finance
        b. Bank payment obligation (BPO)
        c. Asset-based lending
        d. Payments & Foreign exchange

In the EBA report mentioned above, each category is very well defined and explained.

The literature review of recent contributions to the field of Supply Chain Finance will be presented; as well as its foundations in Supply Chain Management, Finance and

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[8] Focal company is the leading or dominating company in the supply chain

[9] WACC = Weighted Costs of Capital (Hillier, 2011)

Procurement & Sourcing. A summary of this new paradigm (by Cosse) called Supply Chain Finance was already provided in figure 2.

 A more recent contribution of Steeman (2014) focuses on:

- A set of supply chain financing instruments (trade financing, fixed asset financing, working capital financing and supplier financing) to manage the financial supply chain. Collaboration and IT platforms are important characteristics.
- The purpose of SCF models. What value does SCF create? Lower financial costs, and mitigating supply chain/suppliers' risk.
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Partly in line with Steeman (2014), SCF is to be considered as a part of SCM, but the severe theoretical foundations in Corporate Finance as well as the recent developments in the role of (business) controller (Desroches, 2013) might argue to place SCF under the business controller or CFO.

Conceptual Model of Supply Chain Finance (Operational Level)

Constructing a conceptual model of SCF brings us back to economic modelling in general. In figure 5 this general approach of an economic model is explained (Compaijen, 1992).

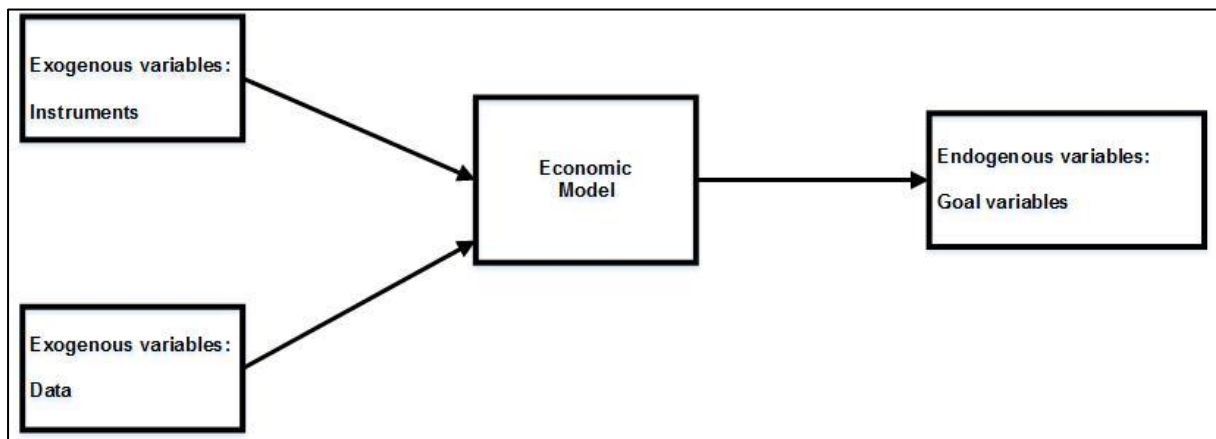

Figure 5. Economic model (Compaijen, 1992).

In an economic model (Compaijen, 1992), we normally distinguish the following so-called "structure" equations:

1. Definitions or Identities
2. Behaviour
3. Technical
4. Institutional
5. Equilibrium

In the approach concerning modelling which was mentioned above, some mainstream financial equations like CAPM, WACC, NWC, CCC, CR, etc. (Hillier, 2011) covering most of the five "structure" equations of the economic model are used in this paper. The author has a so-called SCF Quick Scan in MS Excel available to test the financial model on a form level for SMEs.

Additional literature in the field of SCF (Malaket, 2014), (Templar, 2016) (Preve, 2010) and (DeSmet, 2017) confirms this suggested approach for the conceptual model of SCF.

Building Blocks for the Conceptual Model

In this paragraph the financial building blocks of SCF will be described, and an overview of financial topics like Working capital management, Risk management, Planning & Control and Economic Trade-Offs will be provided. This overview is partly based on the level of the value chain (corporate level) and partly on the level of the supply chain.

Based on the main theories of working capital (Brealey, 2011) (Preve, 2010), the Cube model of SCF (Pfohl, 2009), recent academic contributions (Hofmann, 2017), and empirical research in the Netherlands (Steeman M. e., 2016), the following conceptual model at operational level of supply is developed in figure 6.

On the left hand side, the three elements of working capital are to be recognised: Debtors / Account Receivables (AR), Inventory, and Creditors/ Account Payables (AP). Other elements of working capital (Brealey, 2011) (Preve, 2010) are not relevant in this paradigm of Supply Chain Finance, because they cannot be influenced by the managers in the supply chain (like purchase, sales, warehouse and logistics). Each element of the working capital has instruments like:

- Account Receivables
  - Collection policy
  - Factoring
- Inventory
  - Lean manufacturing
  - Just In Time approach
  - Vendor Managed Inventory (VMI)
- Account Payables
  - Payment policy
  - Reverse factoring (RF)
  - Dynamic Discounting (DD)

In a very detailed publication, the European Banking Association (EBA, 2014) explains each of the above mentioned Supply Chain Finance instruments like factoring, VMI, RF, and DD.

All three elements of working capital have an impact on how a company organises its business processes like planning and forecasting (MRP, APS & ERP), the registration in the warehouse (WMS & ERP), and the flow of outgoing and incoming invoices (ERP). Nowadays, the company's information flows are managed through EDI or IT platform and accessible for suppliers and clients that is reflected in the rectangle Business Processes to register Working Capital (Hoeven van der, 2016) (Sumner, 2004) (O'Sullivan & Caiola, 2016).

According to the so-called Cube model, Working capital has three elements (Pfohl, 2009):

- time or duration
- volume (the value of each of the three components of working capital)
- interest rate, reflected by the company's WACC[10] (Jansen, 2016)

The multiplication of all the three elements (Time * Volume * WACC) determines the cost of working capital. Lowering the costs of working capital will ultimately increase the so-called Economic Value Added (EVA[TM]) of the firm (Jansen, 2016).

Another aspect is the influence of the elements *time* and *volume* on the static liquidity (Current ratio) and dynamic liquidity (C2C cycle: DIO - DPO + DSO)[11] of the company.

So, in figure 6 all the factors that influence the cost of working capital <u>and</u> liquidity are presented in one coherent model, in which we can distinguish:

- Input variables: ARs, APs and Inventory (with sub-instruments)
- Throughput variables (Business process)
- Output variables: Costs of working capital and Liquidity

The conceptual model was tested in eight case studies of suppliers (Tier 1 and/or Tier 2) in the automotive sector, four case studies in the Netherlands and four case studies in Germany (Federal state of Baden-Württemberg). Apart from the eight Tier 1 and/or Tier 2 suppliers in the automotive sector, two regional banks were interviewed to test this conceptual model (Jansen, Tascher, & Beyer, 2018). The conceptual model will be tested during 2018/2019 in the following regions:

- Bangalore (India) (Ramdas & Jansen, 2018),
- Madrid (Spain) (Morales & Jansen, 2019), and
- Chelyabinsk Oblast (Russia) (Shumakov, Ashmarin, & Jansen, 2019).

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[10] WACC $= \varepsilon * R_E + \{ \lambda_L * R_{D-L} + \lambda_S * R_{D-S} \} * (1 - t)$ and $R_E = R_{RF} + \beta * (R_M - R_{RF})$ (based on CAPM model)

E = Equity ratio; λ_L = Long-term debt ratio; R_{D-L} = Long-term interest rate; λ_S = Short-term debt ratio; R_{D-S} = Short-term interest rate; t = corporate tax rate; R_E = Return on equity; R_{RF} = Risk-free interest rate; β = Company Beta & R_M = Required market return.

[11] Cash to Cash Cycle is defined like Days In Inventory Outstanding (DIO) – Days of Payables Outstanding (DSO) + Days of Sales Outstanding (DSA), (Arnold, 2008) (Berk, 2007).
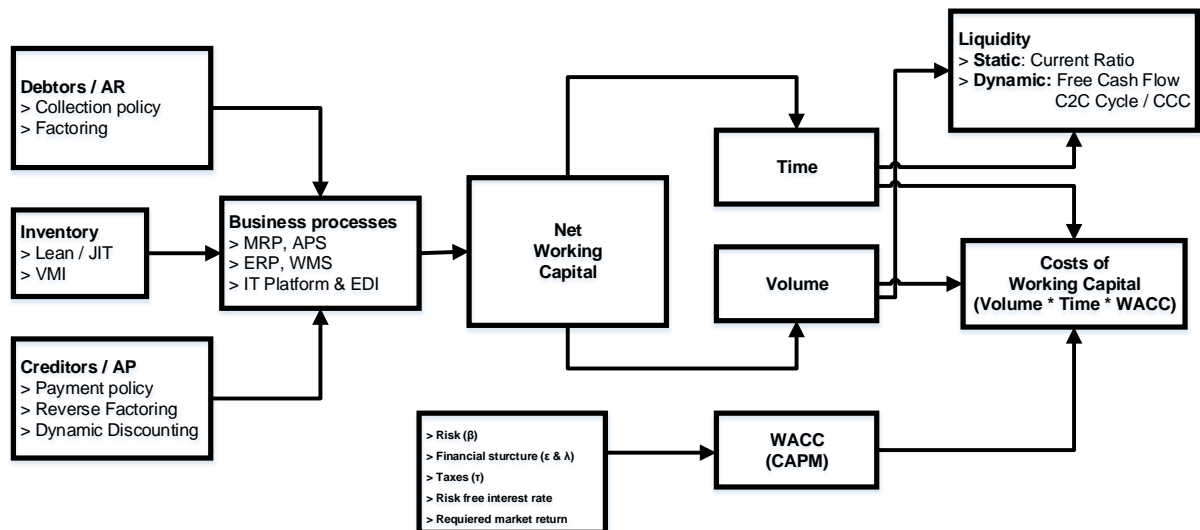
Figure 6. Conceptual model SCF at operational level.

Recent research at Windesheim University of Applied Sciences (Graaf, 2016) and other academic sources (DeSmet, 2017) (Preve, 2010) shows that in the order-to-cash process there is a lot of potential to improve the cash-to-cash cycle, and the over-all financial performance (ROE and EVA^{TM}).

By improving the process of:

- Sending the (right) invoice by the supplier,
- Confirmation the invoice by the client,
- Earlier payment by using SCF instruments,

the business process has potential to improve liquidity <u>and</u> to lower costs of working capital.

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3. Conclusion & Discussion

In section 2 of this article, a possible conceptual model for (the operational level) was developed.

The conceptual model was based on a literature review, with some empirical results in the Netherlands.

Further empirical research needs to be done to validate this developed conceptual model (see also appendix II for a first empirical impression).

Research projects in the Netherlands, South West Germany (Baden Württemberg Region), India (Bangalore region), Spain (Madrid Region) and Russia (Chelyabinsk Oblast) will hopefully generate an input to validate and/or improve the conceptual model at the level of SMEs.

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Appendix I Quick Scan Supply Chain Finance SMEs (Jansen J. , 2016)

The 3 MS Excel worksheets (A, B and C) are plotted below.

Companies where asked to calculate themselves for preparation of the interview.

A Data entry sheet of the SME

SME definition (medium)	Staff	Revenues or	Total Balance Sheet		
European Commission	>= 50 - < 250	>€ 10 mln - <€ 50 mln	> €10 mln - <= €43 mln		
Company	NL-#	D-#	RUS-#		
Industry					
Description	Omschrijving (NL)	Beschreibung (D)	Opisaniye (RUS)		Amount
Revenue (Sales)	Omzet	Umsatz	Dokhod	€	40.000.000,00
COGS	Kostprijs omzet	Umsatzkosten	Sebestoimost'realizovannoy produktsii	€	24.000.000,00
Contribution margin	Contributie marge	Deckunsbeitrag	Marzihinal'naya pribyl'	€	16.000.000,00
Overhead costs	Overhead kosten	Gemeinkosten	Nakladnyye raskhody	€	12.000.000,00
Net income (Profit)	Netto winst	Profit	Pribyl	€	4.000.000,00
Assets	Activa (Bezittingen)	Aktiva	Aktiv	€	30.000.000,00
Fixed assets	Vaste activa	Anlagevermögen	Osnovnyye sredstva	€	23.000.000,00
Inventories	Voorraden	Vorräte	Inventar	€	2.000.000,00
Accounts receivables	Debiteuren	Konten Forderungen	Debitor	€	4.500.000,00
Accounts payables	Crediteuren	Verbindlichkeiten	Kreditor	€	3.000.000,00
Equity	Eigen vermogen	Eigenkapital	Kapital	€	10.000.000,00
Long term liabilities	Lang vreemd vermogen	Langfristige Verbindlichkeiten	Dolgosrochnyye passivy	€	16.700.000,00
	Moody's	S&P	Other	Summary	
Credit rating					

B Data entry balance sheet of the SME in percentages

Description	Omschrijving (NL)	Beschreibung (D)	Opisaniye (RUS)	Relative amount
Revenue (Sales)	Omzet	Umsatz	Dokhod	100%
COGS	Kostprijs omzet	Umsatzkosten	Sebestoimost'realizovannoy produktsii	60%
Contribution margin	Contributie marge	Deckunsbeitrag	Marzihinal'naya pribyl'	40%
Overhead costs	Overhead kosten	Gemeinkosten	Nakladnyye raskhody	30%
Net income (Profit)	Netto winst	Profit	Pribyl	10%
Assets	Activa (Bezittingen)	Aktiva	Aktiv	100%
Fixed assets	Vaste activa	Anlagevermögen	Osnovnyye sredstva	77%
Inventories	Voorraden	Vorräte	Inventar	7%
Accounts receivables	Debiteuren	Konten Forderungen	Debitor	15%
Accounts payables	Crediteuren	Verbindlichkeiten	Kreditor	10%
Equity (ε)	Eigen vermogen	Eigenkapital	Kapital	33%
Long term liabilities	Lang vreemd vermogen	Langfristige Verbindlichkeiten	Dolgosrochnyye passivy	56%

C SCF KPI's of SME XYZ

Equity ratio (ε)	33%				Current ratio	2,1
Debt ratio (λ)	67%				Quick ratio	1,5
Credit rating						
					ROA	0,13
DSO	41,1	days			ROE	0,40
DPO	45,6	days				
DIO	30,4	days				
CCC	**25,9**	**days**				

ROE (DuPont)	NPM	TAT	EM
0,40	0,10	1,33	3,00

Curent Assets	€ 7.000.000,00
Current Liabilities	€ 3.300.000,00
NWC (acc def)	**€ 3.700.000,00**

Inventories	€ 2.000.000,00
Debtors	€ 4.500.000,00
Creditors	€ 3.000.000,00
NWC (SCF def)	**€ 3.500.000,00**

Cash	€ 500.000,00
Other current liabilities	€ 300.000,00

Appendix II Some empirical data for the Quick Scan Supply Chain Finance SMEs (Zheng, 2018)

In the BBA thesis research project (Zheng, 2018) calculated for MNEs the well-known metrics for the Cash-2-Cash Cycle. DPO_{MNE} is an indication for DSO_{SME} in each industry. In the research this was confirmed by only 4 TIER1 and TIER2 suppliers in the automotive industry

Industry (averages)	DSO days	DPO days	DIO days	CCC days
Automotive	27	65	54	16
Beverages (Production/Distribution)	38	133	84	-11
Chemicals	58	63	65	61
Consumer Products	56	87	132	102
Consumer Services	52	43	34	43
Food Chains	15	29	48	35
Manufacturing (Computer/Miscellaneous)	52	55	55	52
Pharmaceuticals	66	102	159	123
Retail	21	47	62	35
Transportation	45	37	27	35