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THE FLOW OF FINANCIAL RESOURCES:
AN INEVITABLE PART OF SUPPLY CHAIN DESIGN ACTIVITIES

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Summary:
Supply chain managers do not only face the challenge of designing material and information flows. They also need to arrange the flow of financial resources. The financial side of supply chain design comprises all the economic aspects that result from collaborative concepts and applications. This paper provides an introduction into the field of cash flow organization in supply chains by presenting a collaborative payment model and its common instruments.

Keywords:
Financial resources, cash flow, shareholder value, cash-to-cash cycle, netting, pooling, factoring.

1 Introduction

As the current publications on logistics and supply chain management continue to focus on material and information flows, the flows of financial resources in supply chains offer a new perspective and undiscovered potential for supply chain optimizations. Many authors agree that future competition will take place between supply chains rather than between single companies.¹ Still, in practice the financial flows between supply chain-members (such as suppliers, manufacturers, customers and logistics-service-providers) on the one hand and banks, financial-service-providers and investors on the other hand is still largely uncoordinated and unexplored.² Though theory is lately starting to examine this new area of research, there is still a lack of literature exploring quantitatively or qualitatively the nature and the size of the effects of supply chain design on shareholder value. Furthermore there are the following open questions: How should the flow of financial resources in supply chains be modeled? Which financial instruments could a supply chain manager use to govern the flow of financial resources? And finally, is there a link between the newly modelled financial flows and shareholder value?

By addressing this gap, this paper aims at removing some of the deficits that exist in contemporary literature. The objective therefore is to uncover the potential that lies within the financial side on supply chain design and to show its impact not only on the (shareholder-) value of the collaborating organizations but ultimately also on the competitiveness of the supply chain as a whole. The results of this exploratory research may serve as a starting point for further deep-dive research into the topic and also as a basis for experimental and explanatory approaches.

The objective of the research project is to build a framework that does not only uncover tools and areas of improvement in designing the flow of financial resources, but also allows an assessment of these tools in terms of the value created for the participating parties. The economic reasoning provided by capital market theory in general and the free cash flow-approach in particular is especially well suited to serve as a framework for assessing value creation in the financial domain. This is a new approach to supply chain management since the

literature has traditionally availed itself of frameworks originating in strategic management, logistics, marketing, organizational behavior, relationships/partnerships or best practices.³

To gain a complete and sound coverage of a specific field of research, a triangulation or multi-method-approach should be followed.⁴ Triangulation can be referred to as “[…] the use of multiple methods to measure a single construct for the purpose of seeking convergence or confirmation”⁵. Following the reasoning of a triangulation-approach, the capital market-perspective taken in this work will deliver another valuable piece for adequately mapping the term “supply chain design” and its implications for business theory and practice. In other words, the results obtained from this new perspective will reveal where conventional approaches to supply chain management and capital market theory are aligned, hence confirming conventional wisdom and showing opportunities for integrated, multi-dimensional approaches, and where they contradict, thus showing areas where further research and even different approaches will be necessary.

Based on this conceptual approach, the paper first provides an introduction to the flow of financial resources from a single-company and a supply chain-oriented perspective. Second, some selected instruments to influence the financial flow in supply chains will be discussed in detail. Third, this paper closes with some statements, showing the relations between the design of financial flows and the shareholder value creation.

2 The flow of financial resources in supply chains

2.1 Understanding the flow of financial resources

Apart from allowing an assessment of a company’s liquidity, the flow of financial resources, or shortly the cash flow, is a balance of payments

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⁴ A methodological discussion about triangulation as a research method can be found in Oppermann (2000) and in parts in Morgan/Stuart (2002).
representing an organization’s internal financing power that results from its operations. Confusingly, the term cash flow is also increasingly used to describe a balance of payments in general or to depict a figure resulting from specific calculations based on the balance sheet. While the limitations of the latter interpretation will be discussed later, the former is apparently not useful due to its broadness. We therefore stick to the first definition, using the terms cash flow and internal financing synonymously from here on.

A main advantage of the cash flow concept in general and of the payment-based method in particular is the fact that it is largely resistant to accounting manipulation. Different accounting practices will only lead to reallocation of different positions within and not change the result. This is probably the main reason for its increasing popularity with external analysts and investors as the concept allows a realistic assessment of a company’s financial health and a comparison among different firms. Despite its wide usage, there is still a considerable lack of standards and definitions about cash flow, which can be seen as its main disadvantage.

2.2 A single company-based view on the flow of financial resources

The presented model of the flow of financial resources follows an approach that provides an introduction to cash flow management from a payment perspective. It tries to cover all payment transactions that occur between an organization and its environment. To reduce some of the complexity of the real corporate environment in our model, the main institutions and actors that the organization interacts with are grouped into five categories. The buying market represents all institutions and actors providing input factors the company needs for its operating activities. In addition to cash outflows that occur on a regular basis (most important to purchase production material, to pay wages, rent, and other frequent expenses directly resulting from the operating process), the company also obtains its investment objects needed to keep up or improve the operating

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6 See Pföhl et al. (2003). The total cash flow, on the other hand, is generally understood as the difference between all cash inflows and cash outflows in a given period. See Shrieyes/Wachowicz (2001), p. 35.

7 See Bitz/Terstege (2002). Though calling the balance between a cash inflow and a cash outflow “cash flow” would make sense, in order to avoid confusion we will refer to it as a payment balance or simply as payment.

8 See Pföhl et al. (2003).

9 See Bitz/Terstege (2002).
activities in this market. The purchasing of goods and services from the buying market naturally entails cash outflows, specifically for material (O_M), wages (O_W), other regular operating expenses (O_O), and investments (O_P). The products, goods, or services created in the company’s operating processes are then sold on its sales market, leading to a cash inflow (I_S). The government, more precisely the tax department, is the third entity that the company financially interacts with by paying its taxes (O_T). “Taxes” in the payment-based model refer to all cash outflows that have been paid for taxes during the given period. Whatever positive difference there is between the cash inflows and the cash outflows of a given period will contribute to the company’s liquidity. This basic model theoretically reflects the elementary payments that are inseparably linked to a company’s operating activities. In reality though, the company could not be sustained without financial markets. This becomes very obvious when considering that the cash outflows for purchasing input factors typically precede the cash inflow resulting from sales. Without external financing, the company could file for bankruptcy right after starting its operations due to the lack of funds. Financial markets therefore provide an extra cash inflow that is tied to the obligation to pay interest on the provided funds. The two main ways to acquire external funding are the increase of equity or the issuance of debt, each resulting in cash inflows (I_E and I_D, respectively). In return, shareholders ask for dividend payments (O_D), while creditors have a claim on interest payments (O_I) and ultimately the pay-off of the granted loans (O_L). After its basic financing needs are covered, the company might choose to acquire financial assets (stocks, derivatives, etc.) on its own behalf, either for extra returns or strategic reasons. This interaction with financial markets is assumed to be a cash outflow (O_IF) on an irregular basis. The selling of these assets will consequently lead to a cash inflow (I_IF). Apart from this, financial markets also provide an opportunity for the company to steer the cash inflows from the sales market, basically transforming their timing and risk, by using financial contracts. Of course, this cash inflow from financial contracts associated with operating activities (I_F) stands in a reciprocal relationship to the “direct” cash inflow from the sales market (I_S). The complete payment model for a single company is illustrated in figure 8-1.\footnote{See Hofmann (2003), p. 67.}
2.3 A supply chain-oriented view on the flow of financial resources

Even though the cash flow method is drawing ever more attention from theory as well as from practice, especially within the context of the shareholder value discussion, the area of financial management examining it – cash flow management – seems to be rather neglected so far by the supply chain management literature. The lack of thorough theoretical coverage in this area is reflected in the widely varying and partly even contradicting definitions and usages of the terms “cash flow” and “free cash flow” in contemporary finance.
Cash flow management can therefore be understood as the entirety of all financial strategies and measures directly or indirectly aiming at improving the cash flow of an organizational entity. Cash flow, as the notion arguably reveals, is a flow figure. Taking a “payment-based view” to identify and analyze the underlying instruments and levers for optimization the liquidity stock or shareholder value creation therefore appears only logical.

Figure 8-2: A supply chain-oriented view on the flow of financial resources.

The payment model has identified the building blocks of cash flow – the cash inflows and outflows – that have an immediate impact on the outcome in general of a company. To identify the collaborative impact though, we first need to link complementary value creation processes of the companies involved at the same time.

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11 See Pföhl et al. (2003).
12 See Bitz/Terstege (2002). Despite its resemblance to the more widely used term “cash management,” the two terms should not be confused. Cash management focuses on the net working capital, scrutinizing the underlying mechanisms for an optimization of the collection and disbursement of cash. See Hines et al. (2000). Cash flow management on the other hand also considers measures that lie outside this scope. Cash management might therefore be considered as one part of cash flow management. Both concepts are clearly to be distinguished from liquidity management, which deals with the optimal quantity of liquid assets a firm should have available.
the supply chain members’ individual payment models. A sample for a supply chain-oriented view on the flow of financial resources is provided in figure 8-2, illustrating a (vertical) supply chain consisting of three consecutive supply chain echelons, e.g., a raw material supplier, a manufacturer, and a retailer. In this “base” model that does not contain any collaborative measures yet, the only financial link between the echelons is the identity between the cash outflow for material and the cash inflow from sales among two consecutive parties \( I_s = O_M \). Since cash inflows from other markets are not considered part of the cash flow balance, they are omitted due to reasons of lucidity.\(^{13}\)

3 Instruments to design the flow of financial resources in supply chains

3.1 Managing cash-to-cash cycles in supply chains

The essential lever to reduce tied-up working capital is the elimination of non value-adding time in the supply chain.\(^{14}\) This key proposition has to be considered while configuring the supply and demand networks.\(^{15}\) The indicator to measure how long cash is tied up between procurement and sales is the cash-to-cash cycle, defined as the elapsed time between the payment of cash for materials or components up to the receipt of the cash for sale of the finished product.\(^{16}\) It can be calculated as indicated in the following formula.\(^{17}\)

\[ \text{Cash-to-Cash Cycle} = \frac{\text{Material Cost}}{\text{Daily Cost of Sales}} \times 365 \]

\[^{15}\] To detect value-adding and non-value-adding time in a supply chain, a mapping of supply chain processes is necessary. Only by this flowcharting can non-value-adding activities be identified and consequently eliminated. See Christopher (1998).
\[^{17}\] See Timme/Williams-Timme (2000). The inventory conversion period is defined as inventory over daily cost of sales which is equal to 365 over inventory turnover. An identical calculation is used to obtain the accounts payable period. The accounts receivable period is accordingly calculated as accounts receivable over daily sales or 365 over accounts receivable turnover. If the company wishes to take other deferred payments in addition to accounts payables into account, it can use the payables deferred period instead. This figure is obtained by adding wages, benefits, and taxes
Inventory conversion period
+ Accounts receivable period
- Accounts payable period
= Cash-to-cash cycle

From an individual perspective, a company will seek ways to keep its cash-to-cash cycle time as low as possible. In ideal cases, the cash cycle time might even be negative, indicating that the company is actually using its customers and suppliers as a source of interest-free financing rather than having cash tied up in the process.\(^{18}\) The three levers to reduce the cash-to-cash cycle are visible in the formula: while the lower two originate from the financial realm (both aiming at improving the payment period) reducing inventory clearly is a different matter, belonging to the operating realm. Examined individually, we would expect companies to try having less capital tied up in non-productive inventory, to shorten the collection period for accounts receivables and to stretch cash payments for accounts payable as far as possible.\(^ {19}\) The downside of these efforts to reduce net working capital (NWC) is a potential deterioration of customer and supplier relationships. Shortening the accounts receivable period might harm supplier goodwill and eventually lead to a reduced quality and service level on the supplier side while extensive use of prolonged accounts payable periods can have negative effects on the organization’s reputation and credit rating.

A widely-used incentive to speed up the cash collection from accounts receivable is the granting of cash discounts for early payment.\(^ {20}\) Just how much cash discount a company should grant depends on its opportunity cost of cash that is the financing of this cash from other sources. For the customer, the decision to pay earlier and receive a cash discount or to delay payment until the last possible day, consequently giving up the discount, is a similar trade-off.

Materials, goods or services that are sold or delivered but not yet invoiced represent dead capital. Improving this part of the order-to-cash process can further reduce the accounts receivable period. Here, the trade-off is between the

\(^{18}\) See The computer manufacture DELL is an example therefore. Farris/Hutchison (2003).

\(^{19}\) See Farris/Hutchison (2003).

\(^{20}\) At the same time, cash discounts could also be seen as interest punishing for a late payment.
gains resulting from a faster cash collection and the increased cost of introducing and maintaining new processes. Similar considerations apply to the shortening of the accounting period for trade discount-reimbursements.

While an appropriate usage of these instruments for a single business definitely seems advisable, the supply chain-oriented view sheds a new light on them. The intertwining relationship between the supply chain members regularly leads to situations where an improved cash-to-cash cycle of one party can only be gained at the expense of another party. Yet, the supply chain management literature has taught us that real value for the supply chain (and ultimately for the customer) can only be generated by creating win-win situations for the collaborating members. The complexity of this issue becomes apparent when considering the payment model for a multi-entity supply chain, as is shown for a three echelon vertical value chain in figure 8-3.\textsuperscript{21} As is indicated by the bold arrows, the cash cycle approach focuses on the payments between the echelons and between the collaboration and outsiders.

But as we know, the payments are not the only point considered in the cash-to-cash cycle. Like in a traditional single entity cash-to-cash cycle, the two levers to reduce cycle time – shortening the inventory period and shortening the time allowed for payment – still exist.\textsuperscript{22} Quite differently though, reducing the accounts receivable period of Company 1 will automatically reduce Company 2’s accounts payable period, thus increasing its cash-to-cash cycle, and vice versa. The same holds true for the relation between Company 2 and 3 or any other consecutive members in supply chain collaborations. The collaborative cash-to-cash cycle time, which we define as the sum of all participants cycle times, will therefore not change with any of these measures. As far as the time allowed for payments is concerned, apparently only a reduction in Company 3’s accounts receivable period or a stretching of Company 1’s accounts payable period will help to shorten the collaborative cash-to-cash cycle time.

\textsuperscript{21} The figure only illustrates the payments between the parties, not the business relationships which exist additionally.

\textsuperscript{22} See Ester/Baumgart (2000), p. 150.
3.2 Netting and pooling in supply chains

Netting and pooling both aims at reducing the number of transactions between the collaborating supply chain parties. When netting their payments, the supply chain members count up their mutual payments and only pay the balance in the
If this approach is consistently followed throughout the supply chain, it allows a reduction in the necessary cash holdings for all members. Assuming that each payment transaction is associated with transaction costs, it also reduces variable costs.

Pooling in a supply chain context refers to the bundling of all payments from the networking members to outsiders in a so-called “master-account”. This not only leads to a greater transparency in the payment transactions that the supply chain conducts as a whole with its environment, it also puts it in a better bargaining position in negotiations with outsiders (figure 8-4).

Clearly, both netting and pooling are only feasible with the proper IT-systems in place.

Figure 8-4: A supply chain-oriented view on netting and pooling.

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23 Traditionally, cash pooling in a single-entity context refers to bundling all cash “locations” within an organization in order to allow a central disposition of cash.
24 The advantages of cash pooling are also mentioned in Hartley-Urquhart (2006).
25 From an individual viewpoint it is further advisable to pool cash because the resulting better control over cash receipts allows the company to maximize the interest earned on short-term cash balances. See Hines, Hurt/Langsam (2000), p. 17. The same holds true for the general pooling of cash balances within supply chain collaborations.
3.3 Factoring in supply chains

Financial contracts are increasingly gaining ground in practice as an alternative to traditional financing tools. They provide a form of short-term financing by either postponing cash outflows (as is the case for trade bills) or generating forward cash inflows, thus accelerating cash flow and reducing risk. We consider factoring in this context since the obtained findings are easily transferable to non-recourse (export) financing, trade bills, as well as all other comparable forms of financial contracting.

Factoring is the purchase of receivables for goods and services by specialized financial institutions – the so-called factor – that pay the client immediately in cash. By purchasing the receivables, the factor also assumes the full credit risk. Other services include debt management, i.e. sales ledger accounts, credit rating, collection, and dunning. The main functions fulfilled by factoring are therefore threefold: it exerts a financing function (due to the immediate payment), a “del credere” function (transfer of credit risk), and a service function (due to the optional extra services just mentioned). Due to the immediate cash inflow, the client has the opportunity to make use of granted cash discounts by suppliers, which is generally believed to more than offset the factoring costs. Additionally, risk insurance on the client side is no longer required, thus leading to cost reductions. Further potential advantages of the factor are seen in better services because of core competency and knowledge of foreign markets.

Looking at factoring options from a supply chain perspective, the involvement of a factor at different points seems possible. First, it is plausible that the uncoordinated financial contracting of any supply chain member alone runs contrary to the collaborative approach. Making use of financial contracts should only occur in concerted actions; otherwise unsought friction within the collaboration’s financial processes is likely to occur. It therefore makes sense to either use the same financial institutions (in this case a factor) either for all

27 Note that the factor never bears risk for flaws in the product or service though. See Soufani (2001). Interestingly, studies indicate that buyers are more willing and reliable to pay banks and financial institutions than paying their suppliers.
28 For a more detailed introduction to factoring, especially in the context of logistics, see Soufani (2001) and Klapper (2006).
30 See Klapper (2006).
31 This statement obviously also holds true for employing financial or logistics service providers.
network members, or not to use it at all. Based on this consideration, two factoring models appear possible. The factor can either only be used for handling payments that occur between supply chain actors and “outsiders” (that is customers in the sales market who do not participate in the collaboration). Assuming that, first, most collaborating partners sell their goods and services to the subsequent supply chain party and, second, only the supply chain members at the “borders” have cash inflows from the outside sales market, this model is very close to the conventional factoring idea, not promising large additional gains. 

Additionally, using a factor as an intermediary for supply chain-internal payments on the other hand seems to provide considerably more value. In this model, the factor will essentially function as the collaborating clearing centre where all payments are managed. The factor can assume responsibility of the collaboration-wide debtor management and all associated services. Not only will the pooling of all payments on the factor lead to transparency of internal as well as external collaboration payments, it also guarantees immediate payment for every supply chain member. Therefore, this approach could also be considered as one way to efficiently control the supply chain-wide cash-to-cash cycle. Figure 8-5 illustrates how the implementation of this factoring model effects the collaboration-wide payments for a supply chain of three organizations plus the factor.

Notably, the cash inflow from sales that would usually be paid by the next supply chain echelon is now replaced by a cash inflow from financial contracts ($I_f$) from the factor. The payments that occur between two subsequent supply chain echelons and the factor are similar to the basic factoring model. What used to be a cash outflow to the preceding supply chain member has now become the abstract payment of the receipt to the factor. Additionally, the factor can add value to the supply chain by rating outsiders and taking over credit risks. The information flow on the payments might optionally occur between the collaborating members directly (as is illustrated here) or alternatively it could also be managed by the factor.

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32 Otherwise economies of scale and the benefits from supply chain-spanning standards will be foregone.

33 The only mentionable benefit is better transparency of the supply chain member’s interactions with the sales market, since the factor will now pool that information and can readily make it available for all collaborating parties.

34 The additional business relationships existing between the parties are not illustrated for clarity purposes.

35 This is under the assumption that no other financial contracts accept for the factoring are undertaken. Otherwise, there would be additional cash inflows from financial contracts with the financial markets.
Figure 8-5: A supply chain-oriented view on factoring.

3.4 Leasing and asset-shifting in supply chains

Leasing and comparable forms of non-conventional external financing, e.g. hire-purchase and different forms of rental are becoming increasingly popular, especially in the context of financing operating facilities and durables.\textsuperscript{36} Not

\textsuperscript{36} Differences between leasing and hire-purchase or rental are mainly formally-legal in nature. While it is subject to the leasing mode on whose balance the leasing object is accounted, hire-purchasing an object will always force the client himself to account for the object in his balance, allowing no off-balance-sheet financing. See Drury/Braund (1990). Alternative forms of rental are for example “sale and rent back”, “build and rent back”, or “buy and rent back”.

\[\begin{align*}
A &= \text{Payment} \text{ of } \text{receipt} (O_a) \\
B &= \text{Sale} \text{ of } \text{receipt} \\
C &= \text{Credit} \text{ rating} \\
D &= \text{Delivery} \text{ of goods and information}
\end{align*}\]
only have increasingly demanding requirements for credit financing, introduced within the framework of the new Basel II regulations, made debt financing more difficult, especially for small- and medium-sized enterprises; furthermore the optional attachment of additional services to a leasing contract render this alternative especially attractive. The dispersion of leasing is further connected with the insight that not the ownership but the use of an object is crucial. The contractually fixed leasing payments allow the lessee reliable planning as well as off-balance-sheet financing while preserving his capital structure. The prevalent modes of leasing are operating and financial leasing. While operating leasing allows the short-term termination of the contract, leaving all investment risk to the leasing company, financial leasing guarantees a minimum lease time at the end of which the object as well as all side-cost have been amortized. This feature renders financial leasing especially useful for financing non-marketable investment objects, e.g. investments in special logistics fixed assets.

Seen from the viewpoint of our payment model, leasing “transforms” non-regular cash outflows for investments \( O_i \), occurring into regular other cash outflows for operations \( O_o \); compare figure 8-2. Unlike capital investments, cash outflows for leasing are accounted for in the cash flow figure. This aspect as well as the realization of the flows of financial resources at different points of time will have a significant influence on the supply chain’s choice. Complex financing models around leasing are offered by many banks and financial institutions, often involving venture capital firms and public subsidies. To take the optimal decision in this range of choices, it is important to clearly separate the investment from the financing decision for the supply chain configuration, since the company represents a vendor as well as a creditor at the same time in the case of financial leasing. Outsourcing leasing arrangements to a special purpose vehicle company funded by the supply chain members might also be worth considering.

An important aspect of the decision also is the supply chain-wide impact on taxes. This question of optimal asset ownership is sometimes listed under the concept of asset shift ability. Comparable to functional shift ability, which refers to the assignment of a function to the place in the channel where it can be performed most efficiently, asset shift ability seeks to place an asset on the balance sheet of the collaborating partners where it best improves profits for the

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39 Sale-and-lease-back offers the additional opportunity for the supply chain collaboration to realize a one-time cash inflow.
supply chain configuration, that is where cash outflows for taxes are reduced most.\footnote{Note that the full scope of asset shift ability is larger and also denotes the sharing and physical shifting of assets. See Lalonde (2000), p. 12.}

3.5 Special purpose vehicle companies (SPVC) in supply chains

Though all instruments presented above provide huge potential to accelerate and enhance cash flow as well as to reduce underlying risk, an integrated and coordinated approach that combines these instruments seems even more promising. One way to achieve this is by founding a special purpose vehicle company (SPVC) that explicitly deals with the financial management in supply chains. The idea originates from the project financing approach, which is the structured financing of an economic entity by using a combination of different financing techniques.\footnote{For a brief summary of project financing, refer to Esty (2004).} The outsourcing of all relevant financial functions and processes to the SPVC in form of a spin-off that is legally independent represents a form of off-balance-sheet financing that does not burden the supply chain members’ assets, balance sheet structure or financial ratios. Instead, the collaborating members become shareholders of this non-profit institution that finances itself by charging its founders for the provided financial services.\footnote{To minimize tax payments, the SPVC’s services would ideally be priced at a level that reduce profit to zero, the SPVC effectively being a non-profit organization.} Pooling the financial functions and processes within the supply chain configuration creates a financial institution that has its core competence in this area, while the partner can concentrate themselves on their core competencies, allowing leaner and more efficient processes for all parties involved. The effects of a SPVC on the collaborative payment model for a supply chain collaboration with three echelons are highlighted in figure 8-6.\footnote{For reasons of clarity, the additional business relationships existing between the parties are not illustrated.}
The figure illustrates how cash in- and outflows that were previously handled by each collaborating member on his own are now handled by the SPVC. Instead of having a multitude of payments to and from the SPVC though, the participants only receive net cash inflow from financial contracts ($I_F$), as indicated by the three bold arrows.\footnote{Since the yellow arrow bundles all cash inflows but only non-financial cash outflows, it will, or rather has to be, positive. A negative $I_F$ would indicate that a company actually spends more cash than it receives within a given period (since the other payments apart from the yellow arrow are all cash outflows).} Due to legal constraints, however, cash outflows for taxes still have to be handled by each participant individually. The SPVC further pools the partners' financial power and becomes their only financial intersection to the sales- and buying markets. As indicated by the dashed arrows, matters of equity and debt financing (external financing) might also be handled by the SPVC. Due to the pooled financial power, it seems logical that the SPVC will obtain better conditions on the financial markets (e.g. more capital assets to safeguard credits).

Figure 8-6: A supply chain-oriented view on SPVC.
The cash outflows for financing \( (O_i, O_l, O_d) \) are assumed to be paid directly by the supply chain members, here. Alternatively, these payments could also be handled by the SPVC (given the legal preconditions).

An efficient financial management within the supply chain collaboration requires improvements in three areas. First, the redundancy in financial functions and processes within the cooperation (e.g. financial and liquidity planning, accounts receivable and accounts payable accounting, and audit, just to name a few) needs to be reduced. Second, supply chain-wide processes, especially payments, need to be optimized and streamlined. Last but not least, knowledge and resources should be bundled in order to achieve economies of scale and better bargaining positions when interacting with outsiders, which figure in the capital and money markets as well as among financial intermediaries. The tasks to be fulfilled by the SPVC can be structured according to this categorization, each of them following a clear objective. Comparable to just-in-time strategies inside the flow of goods, materials and information, the SPVC seeks to eliminate inefficiencies that arise when the supply chain members do not coordinate their flows of financial resources. But redundancies do not only exist inside the supply chain configuration: many activities facing outsiders are also redundant, entailing the need of costly human resources and assets to be carried out. For example, the goods and material that flows through the chain are usually secured by each institution. Contracting with a single insurance provider that covers the whole supply chain configuration instead would be very likely to lead to better conditions due to economies of scale. The SPVC could further function as a supply chain-wide clearing center, allowing the usage of net payment flows between the entities, instead of redundant cash inflows and outflows that originate from trade discounts or other reimbursements. This adds transparency to the payment process as well as allows the bundling of financial resources.\(^{46}\)

Depending on the ascribed value creation and preferences, the supply chain members might outsource even more duties to the SPVC. For example, it might be employed as a leasing company, providing financing for the supply chain’s fixed assets. On top of this service, the SPVC might also act as a facility manager for these assets. E-commerce and especially e-payments could be centrally managed by the SPVC. Customer financing offers further potential to tap on the SPVC’s specialized knowledge.

Though the advantages are numerous, the implied risks and drawbacks of this solution require consideration. Once engaged in a SPVC, the exit of supply chain

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\(^{46}\) The bundling of financial resources is considered as a main step towards more efficient financial management in the supply chain. See Hartley-Urquhart (2006).
members from this institution is likely to be considerably difficult and costly. The participants might further be hesitant to effectively give up the control over large parts of their financial system. The concept bears far-reaching consequences for the participant’s financial freedom and independence, requiring long-term commitment and trust. In the near future there are more and more SPVCs in business practice to be expected.

4 Linking the flow of financial resources in supply chains with the shareholder value approach

How does the design of the financial flows in supply chains affect shareholder value creation? Although this imperfection is apparent for practitioners, companies still find it difficult to develop meaningful performance metrics to be used for supply chain management and supply chain design. This is not only due to a lack of supply chain orientation by the companies involved but also because of the complexity of capturing metrics across multiple companies, an unwillingness to share relevant information, and an inability to capture performance at the necessary customer-, product-, or supply chain-level. Many measures identified as supply chain metrics are actually measures of internal logistics operations as opposed to genuine supply chain metrics. For example, inventory turnover, a common indicator for conventional logistics performance, looses its meaning when applied in a multi-company context, since the further upstream the inventory, the lower the cash value attached to it usually is. Therefore, the inventory turnover rate of a supplier is not comparable to the turnover rate of a company further down the supply chain.

Since we are concerned with the financial activities within a supply chain, we should take a closer look at financial performance measures in particular. Return on investment (ROI) and return on equity (ROE) are described as being the most popular performance measure in Western companies, proving even more popular than liquidity or cost indicators or profitability. Yet, the flaws of traditional accounting-based measures, as opposed to cash flow, are apparent:

49 An introduction to supply chain performance measurement can be found in Gunasekaran, Patel/Tirtiroglu (2001).
They are subject to (legal) accounting manipulation and policies, varying across different national boundaries.\textsuperscript{51} They are backward-looking. They are focused on short-term results.

Profitability-based indicators have the additional drawback of not considering the assets that were needed to create the respective profit.\textsuperscript{52} As a result, seemingly profitable companies might actually be destroying value because their post-tax operating income does not cover the true cost of capital.\textsuperscript{53}

In practice, value-based indicators have only recently gained ground in Europe, promoted by a wave of corporate takeovers and the underlying reasoning of shareholder-value maximization that emerged in the U.S. throughout the eighties.\textsuperscript{54} When applied in the right way, they do not have these flaws mentioned here, which renders them particularly attractive for our purpose.

But while the assessment of contributions delivered to each member of the collaboration is essential for their participation, maximizing individual contributions is not likely to generate the highest overall value added. Apparently, the creation of value within supply chain configurations is not a zero-sum game. Unlike other forms of relationships, there is no central authority in collaborations which is concerned with and has the power to push strategies and actions of supply chain design that maximize the overall value. Hence, the supply chain configuration must contain an instrument that aligns the collaboration’s overall benefits with each member’s individual benefits. By translating the collaboration’s overall value added into an individual value added to each member, this instrument also serves as the incentive for supply chain members to participate in the collaboration.

To determine whether the specific design of financial flows in supply chains is advantageous, each entity will consider the cash inflows and outflows that are to be expected. These consist of cash outflows associated with creating the necessary organizational and technical prerequisites, the cash inflows and outflows associated with the day-to-day processes and the potential excess cash

\textsuperscript{51} Accounting-based distortion may result from inflation, the depreciation method, lifetime of the assets, the mix of fixed assets, off balance sheet assets, off balance sheet debt, goodwill, asset revaluations, cross-holdings, retained earnings or consolidated balance sheets.

\textsuperscript{52} Also compare the criticism on earnings as a measure for economic value of a firm brought about by Rappaport (1998), p. 14.


\textsuperscript{54} See Rappaport (1998).
inflows reaped from the collaboration. As already indicated, the incentive sought to align the collaboration’s overall and each member’s individual goals can be provided by transfer payments between the entities. Ideally, these transfer payments are based on objectively measurable criteria. Otherwise the participants will be induced not to reveal the true numbers in order to receive higher transfer payments.

With incremental capital expenditures remaining constant, free cash flow directly increases with cash flow. The area of supply chain design that focuses on the creation of cash flow is what we coined collaborative cash flow design. The second determinant of free cash flow is a period’s incremental capital expenditure. Given a constant level of cash flow, savings in incremental capital expenditures also increase free cash flow.

Obviously, simply reducing the level of new investments cannot be the answer. Although cutting down on investments in a given period will increase the free cash flow of that period, this decision might also lead to less cash flow in future periods, jeopardizing future free cash flow in turn. Thus, savings in incremental capital expenditures can only be realized under the premise that they do not reduce the future level of cash flows. In a functional way of supply chain design, we could term this block “collaborative investment management.” What we want to stress here is the collaborative savings potential that lies in eliminating redundancies. Just as supply chain management tries to eliminate redundant functions and processes that occur at different echelons of the supply chain, collaborative investment management aims at reducing the investment that come along with the supply chain design. For example, instead of having an extra audit system at each collaboration partner, one central audit system that verifies all supply chain invoices could be put into place.

A main instrument for steering the necessary level of incremental investments is capital utilization. It expresses how efficiently a company (or in this case: the supply chain) utilizes its capital. It measures the dollars of revenues generated for each dollar invested in capital. Thus, an increase of its value indicates that either more revenue was generated with the same level of investments or that the same revenues were generated with less capital expenditure, both increasing shareholder value. Finally, special investment plans, often subsidized by

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56 This argument is especially apparent when using a game theory approach to collaboration.
Apart from tax-related decisions and financial contracts, the cash inflows and outflows making up the cash flow balance primarily result from decisions taken outside the financial area of an organization. For example, the size of cash inflows received by customers and cash outflows paid to suppliers depend on many factors such as the company’s overall strategy and competitive position, its marketing activities, its operations and production management as well as its sourcing strategy and non-financial supply chain configurations. When it comes to influencing the company’s basic operating activities, cash flow management only plays a secondary role, which is trying to optimize the resulting cash inflows and outflows under these given constraints. In other words, while it is the scope of outside cash flow management to ensure that these flows occur and to what amount, it can nonetheless influence how they occur and when. By choosing the right mode and timing of cash outflows and inflows, we might not only accelerate them and reduce inherent risks, there will also be opportunities for enhancing these.

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59 To draw a clear line between purely financial and operating decisions is certainly not always possible since the two stands in a mutual relationship. Our argument that a mere financial collaboration without a linkage to the other flows appearing in a supply chain will forego improvement opportunities is very apparent here.
60 Although the determination of rebates, boni and other trade discounts are an issue that have a strong financial touch, they are usually considered to belong to the marketing/sales realm of an organization and are therefore not further analyzed here. It is certainly advisable though to consider the financial and cash flow aspect for all partners when determining trade discounts for supply chain collaborations.
61 Enhancing the residual value of a business seems to be rather related to the company’s long-term strategy and competencies, for example in how far it is able to increase and retain its customer base.
Figure 8-7 shows the most important levers that exist for designing the flow of financial resources in supply chains. Although the cash balance from the supply chain design decisions should be the overriding performance indicator, it is recommendable to use additional indicators for better steering and controlling wherever possible. The indicators are either financial or allow a direct conclusion on the financial performance, revealing the efficiency of the used instruments and areas to work on. Wherever an action’s impact on cash flow is not immediately visible, non-financial performance indicators should further be attached.62

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Beyond improving free cash flow, the modified shareholder value network also shows that the discount rate (WACC) as well as the debt level influence shareholder value. The discount rate is determined by the cost of capital of the supply chain members. This in turn is driven by the cost of equity, the cost of debt, and the leverage. The collaborative impact of these drivers is difficult to quantify, though definitely existent. For example, the coordinated and bundled interaction of the supply chain partner with capital markets can reap economies of scale. By backing up and mutually securing each other, the collaborating parties will have easier and cheaper access to debt financing that might previously have been unavailable to obtain, e.g. due to geographical constraints. On the one hand, this potentially reduces the cost of debt, on the other it provides the parties with more freedom in choosing their optimal capital structure. Last but not least will the combined supply chain improvements resulting from a collaborative approach translate into increased value generated for the customer. The value-based management approach suggests that this improved performance is rewarded by the capital market through an increased share price. Since higher returns on their investments are what shareholders are interested in, the conclusion that lies at hand is that the collaborative facilitates raise equity for the members. This in turn might reduce the cost of equity. All these considerations hint to a further positive impact of supply chain design on shareholder value.

5 Conclusion and outlook

To date, no model exists to appropriately measure the impact of the collaborative design of material, information, and financial flows on shareholder value within supply chains. Starting from the shareholder value network, the measurement of free cash flow needs to be adapted to the special requirements originating from cross- and inter-organizational collaborations. This paper has demonstrated that free cash flow’s direct influence on shareholder value is an appropriate way to measure the performance of a supply chain. To evaluate design of the financial flows, a transfer system of free cash flow needs to be introduced to align individual companies’ and overall supply chain goals. On the way to finding the correct calculation base for free cash flow within supply chains, an important and often misunderstood insight about free cash flow and cash flow management has been made: cash flow is created by financial flows into and out of the

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64 See Hofmann (2006).
company. It is by the steering these flows (only), that a company’s cash flow can be influenced. The present study of a payment model supports this thesis. As a consequence, the flows of financial resources between the collaborating parties and the tools and instruments to influence these flows define the impact of supply chain design on value-creation.

Increasing free cash flow alone is not enough, though. According to the shareholder value-formula, not only the amount of the generated cash flows is important, but also the timing (time value of money). Hence, when identifying levers, the following goal should be kept in mind: Build a greater cumulative cash flow, sooner (the earlier, the better).

After having identified the areas of action and the possible scope for designing the flows of financial resources in supply chains, we developed a reasoning how shareholder value and the creation of free cash flow leads to measure the success of these configurations. We developed and examined tools and instruments to set free the unlocked potential that is lying in successful supply chain design from a financial flow perspective. Though our reasoning is deducted from literature that represents the state-of-the-art, the empiric proof that the identified points will reap the expected benefits in practice has to be made yet. Firstly, no experimental research that supports the results presented here has been conducted so far. In perspective of the triangulation approach, this will be the next important step to unveil the black box of “financial supply chain design”. Secondly, putting supply chain configurations successfully into practice is a matter that will demand the participants’ time and efforts. Many companies still resist to turning away from an inward focus and truly widening their horizon towards the relevant supply chain echelons. No results can be gained without real commitment and initiative by all participants. Even if commitment and initiative do exist, coordinating all participants towards the right decision can still represent a difficult task since no single party within the supply chain usually is powerful enough to lead the way. Therefore, this paper can therefore only be but a first trial to understand the vast potential that still has to be tapped.

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66 Also compare Christopher/Ryals (1999), p. 5, who refer to these two components as enhancing cash flow and accelerating cash flow.
6 References


