

# Towards an integrated conceptual framework of supply chain finance: An information processing perspective

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## ABSTRACT

Based on a systematic review of SCF literature and the information processing theory, this paper builds an integrated conceptual framework to illustrate how SCF providers deal with uncertainties, develop capabilities and further achieve whole financial supply chain (SC) integration. It shows that uncertainties faced by SCF providers (including SCF task characteristics, SCF task environment and SCF task independence) delineate the information processing requirements. To meet these requirements, SCF providers could improve information processing capacity by enabling some mechanisms (i.e., organisation structure design, coordination and control, and information technology). The fit between SCF providers' information processing requirements and capacity could further improve SCF capability, which would help to achieve integration of the whole financial SC. Building on this framework, seven future research directions are provided.

## 1. Introduction

Since the financial crisis of 2008, firms and their supply chain (SC) partners have been facing constrained cash flows and have found it difficult to get financing from banks. To handle this adverse situation, SC actors are trying to reduce their working capital, cut interest expenses, and decrease their debt ratios through financial mechanisms, such as factoring, trade financing (Schäfer and Baumann, 2014) and inventory financing (Basu and Nair, 2012). Hence, supply chain finance (SCF) practices are gradually emerging (Gelsomino et al., 2016). The objective of SCF is to align financial flows with product and information flows in order to improve cash-flow management from a SC perspective (Wuttke et al., 2013a, b). SCF practices have not only optimised working capital in the SC but have also paved the way for better integration of the three flows in the SC by reducing supplier default risk and simplifying processes (Liebl et al., 2016; Martin and Hofmann, 2017). The past ten years have witnessed a growing interest in this topic, which can be seen in the growth of scholarly literature on SCF. Specifically, there are four main research areas identified, i.e., the deteriorating inventory model under trade credit policy, the inventory

decisions made with trade credit policy, the interaction between replenishment decisions and delay payment strategies, and the roles of financing service in the SC (Xu et al., 2018).

However, we find that there are only four papers that partially review SCF developments in the literature. Seifert et al. (2013) review the trade credit literature and derive a detailed agenda for future research. Liu et al. (2015) investigate SCF issues in China based on a sample of 45 leading Chinese journals. Gelsomino et al. (2016) put forth what may be the first comprehensive review of SCF based on 119 papers published from 2000 to 2014, which identifies the research gaps and highlights future directions. Recently, Xu et al. (2018) further adopt a systematic literature review combined with bibliometric, network and content analyses based on 348 identified from mainstream academic databases. Although these literature reviews can provide some insights into the topic of SCF, they tend to be descriptive, focus on some specific aspect of SCF and provide little theoretical explanation for a deeper understanding of SCF. Additionally, as Templar et al. (2012) and Gelsomino et al. (2016) state, the current SCF literature lacks theory, which causes the disparity between SCF theory and practice and impedes the development of SCF research. Thus, there is a need to create a

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deeper analysis and work towards an integrated conceptual framework of SCF based on some proper theory.

To fill this research gap, this study aims to propose an integrated conceptual framework building on Information Processing Theory and based on a systematic literature review. Different from Gelsomino et al. (2016) and Xu et al. (2018), we will not pay much attention to classify the state-of-the-art SCF literature according to the main themes and methods by content analysis, but rather focus on building an integrated conceptual framework based on information processing perspective. Although the importance of applying theories to study SCF has been underscored (Gelsomino et al., 2016), to date, the literature shows that studies using proper theory to explore the mechanism of SCF remain scant. To address the “no general theory of SCF” gap proposed by Gelsomino et al. (2016), building on the IPT, this paper synthesises the literature to explain the mechanism of SCF integration. The framework can also help SCF providers consider how to systematically develop their information processing capabilities and promote integration of the whole financial SC. At last, seven future research directions are provided.

Information flow is the foundation of any effective SC and can reduce the uncertainty that can make a SC reactive (Ellram et al., 2004). SCF information includes order transactions, debt, and liabilities management (e.g., cash-to-cash-cycle) (Gomm, 2010), as well as information on the market, politics, and technology of the environment. This information can be used to decrease investment risks and capital costs of financing projects within SCs, improve financial decisions, and optimise financing (Gomm, 2010; Pfohl and Gomm, 2009). Therefore, after carefully assessing the theories used in the existing literature, we chose the information processing theory (IPT) as our theoretical foundation. This theory posits that firms are information processing systems, which are intrinsically programmed to mitigate environmental uncertainties through increasing their capabilities in gathering, processing, and acting on information from the environment (Daft et al., 1987; Daft and Weick, 1984; Tushman and Nadler, 1978). Congruently, SCF providers face an uncertain environment, and insufficient management of information processing challenges may jeopardise the integration of the whole financial SC.

The rest of this paper is organised as follows. The procedure of data collection is presented in section 2, and theoretical descriptions are given in section 3. Based on collected papers and theories, we provide an integrated conceptual model and related propositions for SCF in section 4. This is followed by future research directions for SCF. The last section is the conclusion, which presents the main contributions and limitations of this paper.

## 2. Methodology

To better build a framework, we first conduct a systematic literature review.

### 2.1. Determining suitable search terms and databases

Based on the SCF definitions provided (Blackman et al., 2013; Meijer and Bruijn, 2013; More and Basu, 2013; Pfohl and Gomm, 2009; Silvestro and Lustrato, 2014; Wuttke et al., 2013a, 2013b), we found that SCF focuses on “Supply Chain” and “Finance”. Thus, we determined keywords based on these two aspects (See Fig. 1). We chose three of the most common databases in the management and finance fields, including WoS, EBSCO and Scopus, and used the advanced search function.

### 2.2. Selection procedure

To ensure replicability, we followed three steps: data collection, title and abstract evaluation and content evaluation. Detailed search information for the procedure and criteria are shown in Fig. 2. After

inserting the search terms into the search boxes of three databases, we further confined the subject area and source type. We found 3238 titles in WoS, 1453 titles in EBSCO and 3311 titles in Scopus. After excluding conference papers and duplications, 4322 papers remained. After evaluating the title and abstract of 4322 papers and applying inclusion and exclusion criteria (Figs. 2), 3705 papers were excluded. We further reviewed the full text of the remaining 617 papers from an IPT perspective, and included only papers that focus on financing behaviour from a SC perspective. Finally, 71 papers were retained for final review. The detailed search procedure and criteria are shown in Fig. 2.

### 2.3. Search results

The 71 SCF papers published from 2000 to 2018. Fig. 3 shows that the number of SCF papers increases gradually. There are only 3 papers from the years before 2007, and the number of papers published from 2008 to 2018 accounts for 95.8% of the total reviewed papers.

Table 1 shows the journals' contributions to the SCF literature, each having published two or more articles in our sample. We found that three journals (*International Journal of Physical Distribution & Logistics Management*, *Journal of Payments Strategy & Systems*, *Supply Chain Management: An International Journal* and *International Journal of Logistics-Research and Applications*) are ranked the first (5 papers), second (5 papers), third (4 papers) and fourth (4 papers), respectively.

Then, we further analysed the distribution of research categories for these papers (Fig. 4) and found that conceptual and empirical papers are published most, accounting for 77%. However, SCF papers conducting literature reviews are scarce. Only 4 papers, as previously mentioned, are literature reviews (e.g., Gelsomino et al., 2016; Liu et al., 2015; Seifert et al., 2013; Xu et al., 2018). In addition, 6% of papers are conceptual and use modelling simultaneously and thus fall into the mixed method category, which indicates the use of two or more methods in one paper. It is easy to see that theories are seldom adopted in these papers, with only 25% adopting theories.

## 3. Theories used in SCF and coding strategy

Table 2 shows the different theories used in these SCF papers. We found that the resource dependent theory and the agency theory are used most. Theories adopted by SCF papers can be divided into two broad categories: financial and organisational theories. The papers that used financial theories mainly concentrate on the specific financing target (or collateral) (e.g., pecking order theory) and channels (e.g., diversion theory). Studies applying organisational theories are more focused on inter-organisational relationships (e.g., principle-agent theory, bargaining power theory, resource dependence theory, systems theory and task interdependence), intra-organisation issues (e.g., transaction cost theory and inventory theory) and the process of adopting SCF (e.g., innovation process). However, we find that no theory has been presented that explores SCF practices from both financial and organisational perspectives, and the existing theory studies generally ignore the importance of information management. This lack tends to impede a more comprehensive understanding of SCF.

We believe that the IPT provides a grounded base for us to further understand SCF. This theory reveals the process of improving organisations' ability to cope with various uncertainties (i.e., task characteristics, task environment and task independency) (Tushman and Nadler, 1978). The information processing model is presented in Fig. 5. Information processing capacity should be enough to deal with the requirements formed by these uncertainties (Tushman and Nadler, 1978). The focal idea of this perspective is that organisations differ in their requirements for information processing, and they subsequently use different mechanisms to achieve integration (Trautmann et al., 2009).

IPT has been widely used in other fields, such as organisation strategy (Rogers et al., 1999; Trentin et al., 2012), global sourcing (Trautmann et al., 2009), inter-organisational information integration

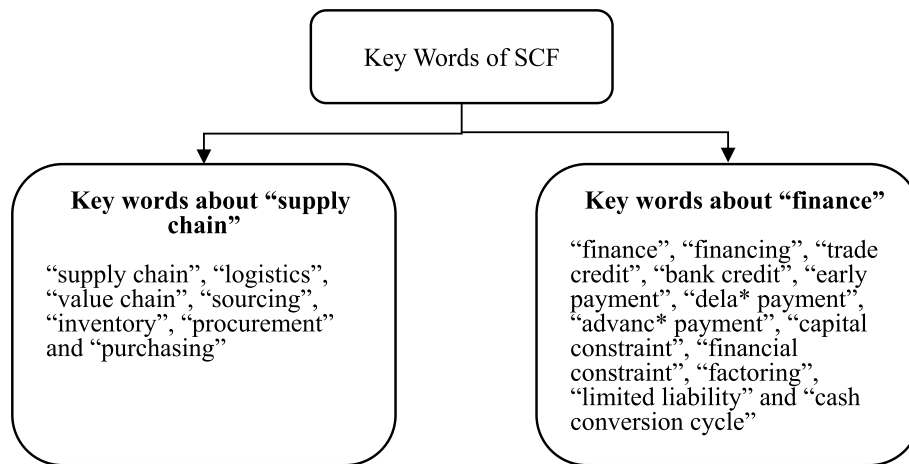


Fig. 1. Combination of SCF keywords.

(Wong et al., 2015), production control system (Gong et al., 2014), sustainable SC management (Busse et al., 2017), and SC risk management (Fan et al., 2017), but, to the best of our knowledge, it still has not been applied in a SCF context. We believe that this theory has significant implications for understanding SCF for two reasons. First, although previous studies have identified a number of different ways to manage the financial SC, such as management of cash flows (Brealey et al., 2007) and trade credits (Chauffour and Malouche, 2011), few of these studies look at it from the information management vantage. Second, prior research has realised the important role of information management in SCF (e.g., Pfohl and Gomm, 2009; Song et al., 2018), but the research is highly descriptive, and theoretical explanations are largely under-represented.

Hence, we coded the papers based on the IPT, i.e., information processing requirements (affected by SCF task characteristics, environment and inter-dependence) and information processing capacities (affected by mechanisms of organisation structure design, coordination and control and information technology mechanisms). SCF capabilities emerged from the review as an outcome of fit between information processing requirements and capabilities.

#### 4. Discussion

In this section, we will develop an integrated conceptual framework building on information processing theory and linking various themes identified in the literature review. We propose that the SCF task characteristics, environment and inter-dependence determine information processing requirements for SCF providers; the fit between information processing requirements and information processing capabilities affects the SC capabilities of a SCF provider, which in turn affects SC integration.

##### 4.1. Uncertainties faced by SCF providers and information processing requirements

According to IPT, uncertainties include task characteristics, the environment and inter-dependence.

##### 4.1.1. Task characteristics

The uncertainty of task characteristics can be reflected by the task predictability (Tushman and Nadler, 1978). The predictability of SCF practices is mainly reflected by collateral management, which plays a pivotal role in financing transactions (Gundogdu, 2010). Collateral is a

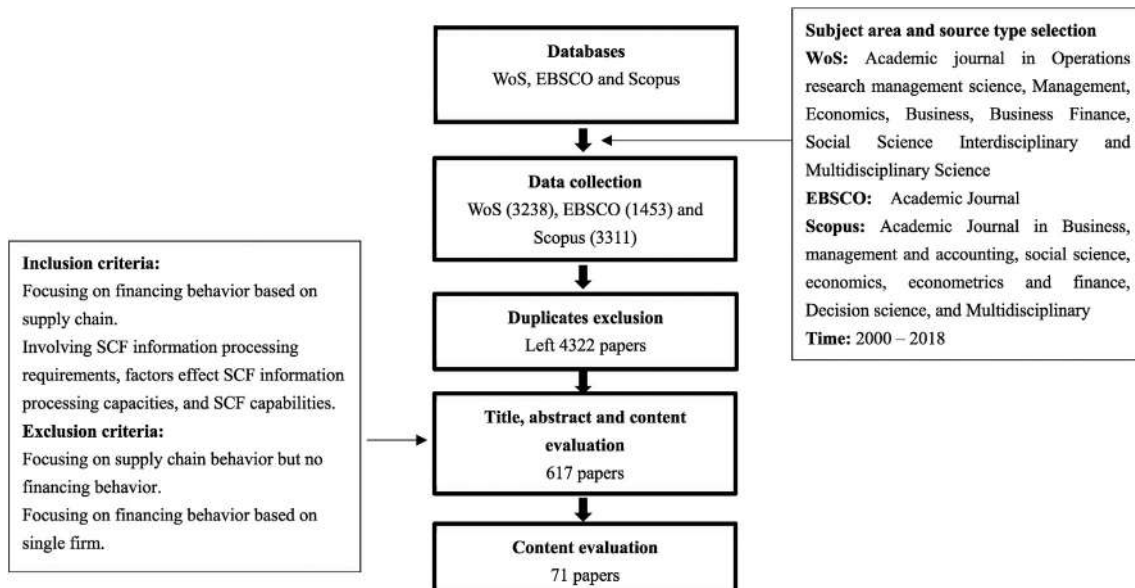


Fig. 2. Selection procedure.

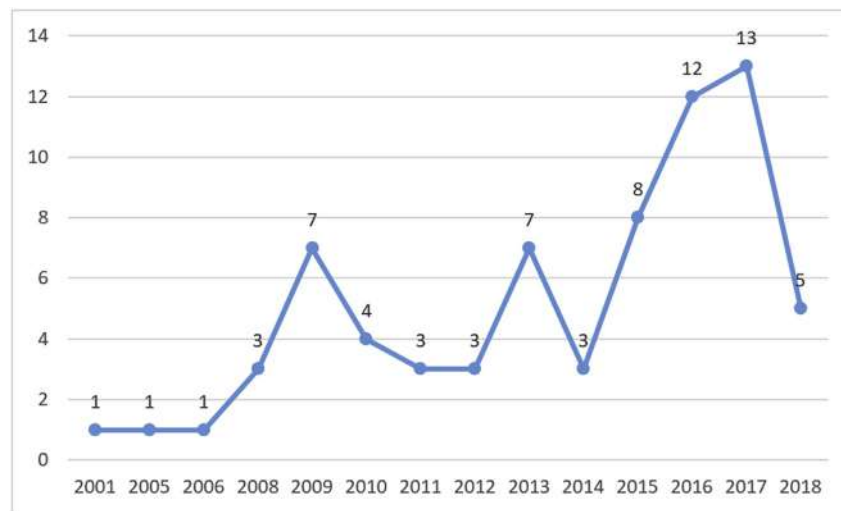


Fig. 3. The trend of SCF papers.

Table 1

Journals contributing two or more papers to SCF from information processing theory.

Journal	The number of papers
International Journal of Physical Distribution & Logistics management	5
Journal of Payments Strategy & Systems	5
Supply Chain Management: An International Journal	4
International Journal of Logistics-Research and Applications	4
Journal of Business Logistics	3
Enterprise Development and Microfinance	2
International Journal of Applied Business and Economic Research	2
Journal of Banking and Finance	2
Journal of Corporate Finance	2
Journal of Corporate Treasury Management	2
Journal of Finance	2

(e.g., stocks, real estate), and capital cost rate (percentage/time), the product of which decides the cost of capital (Gomm, 2010; Pfohl and Gomm, 2009). This indicates the amount of assets (volume of financing) that needs to be financed, for how long (duration of financing) and at which capital cost rate (Pfohl and Gomm, 2009).

First, to confirm the duration of collaterals, three factors should be considered further: the cash-to-cash-cycle (cash-to-cash-cycle = average turnover period + period of receivables – period of payables) (Martin and Hofmann, 2017), the cycle of production and the attributes of collaterals. The reason to consider the cash-to-cash-cycle is that it can indicate the current working and circulating capital in companies who own collaterals (Pfohl and Gomm, 2009). SCF practices are more necessary for companies who have poor working capital performance. The cycle of production also drives the demand of financial services. For example, the production cycle in the computer chip industry is long (up to 120 days). To provide SCF services for companies in this industry, SCF providers should calculate the cycle of production accordingly (Gomm, 2010). Furthermore, the demand for financial services can be affected by the attributes of collaterals (Chen et al., 2016; Middelberg, 2017; Son et al., 2017). For example, some collaterals such as agricultural goods (Birtal et al., 2017; Karyani et al., 2015, 2016; Middelberg, 2017) and automotive products (Caniato et al., 2016; Schäfer and Baumann, 2014) have different durations (Soundarrajan and Vivek, 2015). All of those financial collaterals that have short durations are hard to predict and thus should be determined to have the longest credit period before implementing SCF practices (Chen et al., 2016).

Second, the volume of collaterals is another important element to consider before implementing SCF practices because objectively sizing the associated collateral plays a vital role in controlling financial risks (Hofmann and Johnson, 2016). SCF practices provide financial services for two types of collaterals: potential collaterals and existing collaterals. Potential collaterals are materials that do not currently exist. Take the agricultural SCF, for example. Financial institutions provide the financing amount according to the production capability, such as the number of trees or the size of the herd or land (Karyani et al., 2016; Middelberg, 2017). Therefore, those who demand financing and have significant production capability can get more financing amount because they are likely to produce plentiful returns (Birtal et al., 2017). Compared to potential collaterals, financing for existing collaterals is much easier. The SCF provider just needs to calculate the existing amount of financing collaterals. SCF practices, such as reverse factoring (Liebl et al., 2016; Martin, 2017), trade credit and delayed payment (Cowton and San-Jose, 2017; Ng et al., 1999; Stern and Chew, 2003), are all used to

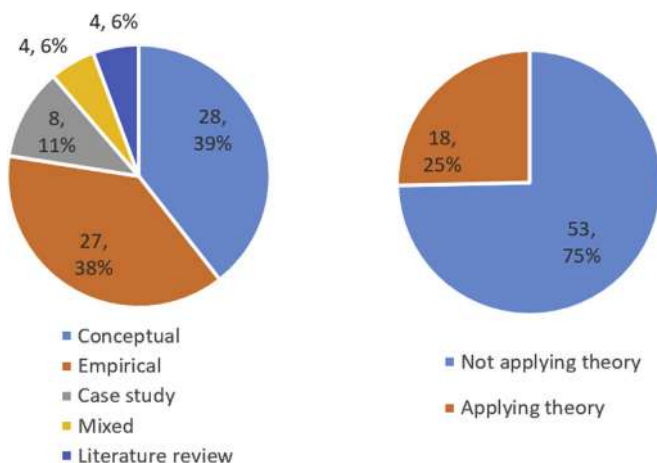


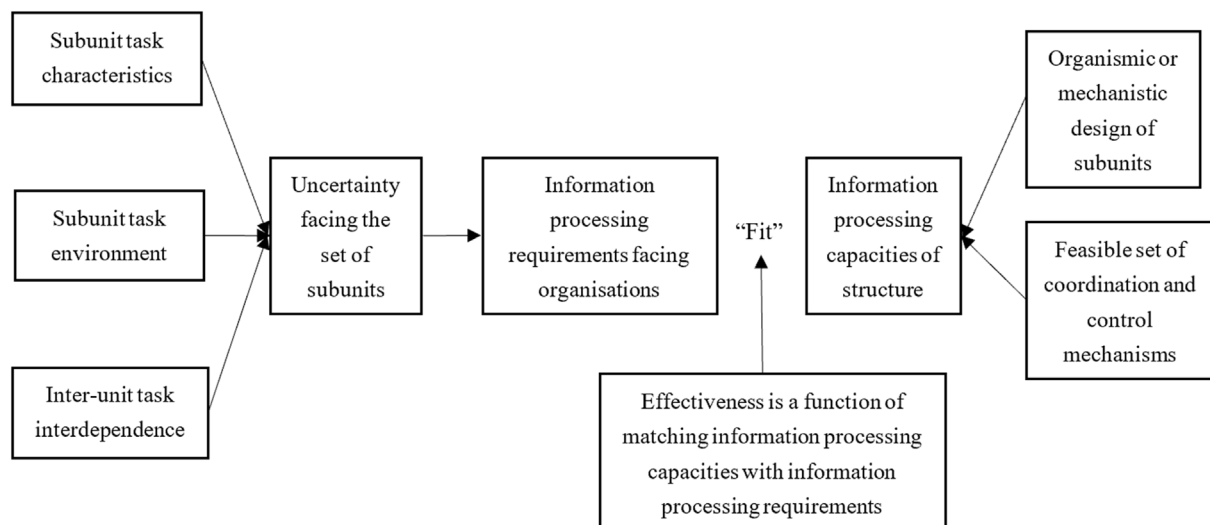
Fig. 4. Distribution of papers by research method and theoretical application.

property or other asset that a borrower offers as a way for a lender to secure the loan; it plays the role of a signalling device for borrower quality, may lower the agency costs of debt by preventing the problem of asset substitution, and limit borrower's moral hazards (Coco, 1999; Voordeckers and Steijvers, 2006). Three generic levers are used to calculate the capital cost of collaterals: duration (e.g., days), volume



**Table 2**  
The application of theories in SCF papers.

Theory	Definition	Application	Reference
Resource dependence theory	Resource dependence theory (RDT) examines how the external resources of organisations affect the behaviour of the organisation (Barney, 1991; Pfeffer and Salancik, 2003a).	This theory can be used to identify factors which contribute to export competitive advantage (Ling-Yee and Ogunmokun, 2001), the mechanism of trade credit (Lorentz et al., 2016) and the financial benefits and risks of resource dependency of suppliers and customers in supply chain triads (Kim and Henderson, 2015).	Li and Chen (2018); Ling-Yee and Ogunmokun (2001); Lorentz et al. (2016); Kim and Henderson (2015); Schwieterman et al. (2018)
Principle agent theory	Principle agency problem occurs when one person or entity is able to make decision on behalf of another person or entity (Eisenhardt, 1989).	This theory is used to explain the role of principals and agents in financing a buyer-supplier dyad (Pfohl and Gomm, 2009; Wandfluh et al., 2016), the value of co-operative financing models (Gomm, 2010) and the factors of late payment of trade credit (de Carvalho, 2015).	Gomm (2010); de Carvalho (2015); Gomm (2010); Pfohl and Gomm (2009); Wandfluh et al. (2016)
Barging power theory	Barging power is the relative ability of parties in a situation to exert influence over each other (Kuhn et al., 1983).	This theory is used to explore the impact of the bargaining power on financing behaviour, such as financing leverage (Oliveira et al., 2017) and the access to trade credit (Breza and Liberman, 2017; Fabbri and Klapper, 2016).	Breza and Liberman (2017); Fabbri and Klapper (2016); Oliveira et al. (2017);
Pecking order theory	The financing sources of a firm include internal funds, debt and new equity. A company firstly prefers internal funds, then debt and lastly equity (Myers and Majluf, 1984).	This theory is adopted to investigate the determinant factor of supply and demand for trade credit.	de Carvalho and Schiozer (2015); Lee et al. (2018)
Transaction cost theory	Transaction cost theory explores how an entity uses different organisational forms to coordinate transactions (Coase, 1937).	TCE can be used to set theoretical context for SCF (Wuttke et al., 2013b) and explain the use of trade credit (Ferris, 1981).	Wuttke et al., 2013b; Ferris (1981)
Diversion theory	By forming a free trade agreement, trade can be diverted from a more efficient exporter to a less efficient one (Lipsey, 1957).	Compared to firms purchase more standard inputs, firms which buy a higher proportion of differentiated inputs have more trade credit.	Mateut et al. (2015)
Innovation adoption theory	Innovation process can be divided into initiation and implementation. Initiation includes agenda setting and matching. Implementation includes redefining, clarifying and routinizing (Rogers, 2010).	The innovation process can be used to account for the upstream SCF innovation.	Wuttke et al. (2013b)
Inventory theory	It is used to design production/inventory system to minimize costs (Arrow, 1958).	This theory can be used to illustrate firms' SCF benefits.	Huff and Rogers (2015)
Task interdependence	Task interdependence can be pooled (Using standardised coordination to discrete contribution), reciprocal (inputting and outputting mutually) and sequential (one unit's output is another one's input, but the dependency is not reciprocated) (Thompson, 1967).	Task interdependence and resource dependence theory can be combined to explore the determinants of trade credit in supply chain.	Lorentz et al. (2016)
System theory	Stove-piped decision aimed at maximising a particular transaction in a single function can result in sub-optimised outcomes that influence overall firm performance negatively (Drucker, 1962).	System theory can be used to study inter-firm flows of cash.	Randall and Theodore Farris (2009)



**Fig. 5.** The information processing model (Source: Tushman and Nadler (1978)).

finance these types of existing collaterals.

Third, capital cost rates are different among financial institutions. Although financing directly through banks has an acceptable interest rate, this service is not available to small companies or farmers. Microfinance is accessible to these subjects, but it provides short-term loans at very high interest rates (Son et al., 2017). Thus, SCF practices (e.g., trade credit and reverse factoring) are ideal choices for small business (Breza and Liberman, 2017; Chen et al., 2016). However, a reasonable capital cost rate is still essential to the success of SCF practices (Pfohl and Gomm, 2009). To set proper capital cost rates, some elements such as fluctuations in market price, moral risk and repayment terms should be considered. Chen et al. (2017) and Hermes et al. (2016) claim that the maximum interest rate should be enough to cope with fluctuations in the market price and guarantee that the financing side has enough room to profit to avoid the moral risk that the financing side could scrap the contract. Interest rates are also related to repayment terms. In Zambian agricultural SCF, loan payment terms used by financial institutions vary with interest rates, and long terms usually have high interest rates (Middelberg, 2017).

The bundle of the duration, volume and cost of capital rate forms the cost of capital (Gomm, 2010; Pfohl and Gomm, 2009). SCF business can be the most beneficial when the cost of capital is significantly higher than the fees for refinancing. The possibility of reducing the Cash Conversion Cycle (CCC, which reveals the duration of task characteristics, motivates suppliers to set up financial activities and co-ordination systems (Liebl et al., 2016). In other words, without the need to reduce CCC, setting up SCF practices is unnecessary. In addition, whether the volume of collateral is enough determines the setup of SCF activities (i.e., financial business processes) and the coordination mechanism (i.e., the financial information system). As Liebl et al. (2016) have illustrated in their case study, high purchasing volume gives SCF practices space to drive down the cost, which encourages customers to engage in SCF business. Finally, the interest rate determines the revenue of SCF services. The SCF business can be properly set up only when the profit is abundant. Therefore, if the revenue cannot cover the cost of the coordination system (e.g., IT-infrastructure mentioned by Liebl et al. (2016)), it is impossible to set up a business process and establish the information system accordingly. Thus, we came up with the first in a set of propositions:

**P1a:** SCF task characteristics related uncertainties increase the SCF providers' information processing requirements.

#### 4.1.2. Task environment

A tough business environment can have a great impact on existing business activities (Lorentz et al., 2016). Through reviewing existing SCF papers, it is clear that environmental uncertainties may come from the SC and the macro environment. The uncertainties that come from the SC can be classified into partners' credit-related factors and operational factors.

Credit-related factors include accounting quality (Chen et al., 2017), creditworthy expectations (e.g., Sousa and Flippen, 2005), supplier credit (Fisman, 2001), payment history (Howorth and Reber, 2003) and bankruptcy (Houston et al., 2016), among others. Credit-related factors can influence the information system. For example, the untainted tracking record of suppliers can promote the establishment of an information system because firms with low credit ratings are less likely to be included in the information coordination system (Liebl et al., 2016).

Operational factors comprise the richness of firms' resources (Kutsuna et al., 2016), firm size (Breza and Liberman, 2017), the cost or level of inventory (Bougheas et al., 2009; Holdren and Hollingshead, 1999), profit (Deari, 2015) and sales growth (Carvalho and Schiozer, 2015). Contrary to credit-related factors, operational factors influence SCF activities (i.e., financial business process). For example, when companies face a liquidity issue (e.g., seasonal reasons), these companies will delay the payment time for suppliers (Bougheas et al., 2009; Caniato et al., 2016; Chen et al., 2017). While this behaviour could

cause the suppliers to be badly off the money for purchasing raw materials and affect the supply for other companies, increasing risks in the SC. To avoid the risk of liquidity and disruption, SCF providers are expected to provide financing services for these cash-constrained suppliers (Boissay and Gropp, 2007).

Uncertainties from the macro environment, including political, economic, technological, natural and legal, are more unpredictable. First, political factors have a great effect on the availability of financial resources for firms (de Blasio, 2005; Guariglia and Mateut, 2006) and transaction costs in SCF practices (Middelberg, 2017; Son et al., 2017; Swamy and Dharani, 2016). SCF can only develop well when policy makers have the will to flourish it, formulating the regulations and setting up infrastructure for SCF (e.g., storage) (Son et al., 2017). Among various regulations, tax is the main barrier to implementing SCF practices due to its great influence on the cost of transactions (Liebl et al., 2016). In addition, industrial policy also plays an important role in SCF practice because it can influence the basis of SCF practice (Birtchal et al., 2017).

Second, economic factors occur on the macro level and the industrial level. At a macro level, the effects of financial crises (Bastos and Pindado, 2013; Casterman, 2012; Filbeck et al., 2016; Lorentz et al., 2016) and exchange rates (Blackman et al., 2013; Delk, 2000) on SCF practices have been widely investigated. At an industrial level, industrial competitiveness could affect financing demand because firms in competitive industries must avoid customer switching (Hermes et al., 2016) and need more financing ways to attract customers (Adjapong and Ernest, 2017).

Third, technologies in SCF can make modern finance faster, more complex, more global, more interconnected, and less human (Tsai and Kuan-Jung, 2017). For example, the explosive growth of e-business promotes new requirements for timeliness, security, and quality. To promote the efficiency of distribution and the stability of the SC, SCF providers should reconstruct existing SCF business processes through combining branch storage and warehouse financing (Jiang et al., 2016).

Fourth, although agricultural SCF can facilitate traditional forms of lending (Milder, 2008) and improve farmers' production and profit (Kopparthi and Kagabo, 2012), its effectiveness is greatly affected by natural environmental uncertainties. For example, natural environmental conditions (e.g., poor soil quality and harsh climate) in Cambodia leave few sources for the development of its agriculture, which puts pressure on the development of SCF services (Son et al., 2017). Therefore, natural factors that affect crop quantity and/or quality should be taken into consideration in the risk management of agricultural SCF practices (Angelucci and Conforti, 2010).

Fifth, legal factors contain some rules about the rights and duties of debtors (Dunham, 1949) and thus have a great impact on SCF practices. In the early years, the Financial Accounting Standards Board in the US addressed standard principles about inventory financing, avoiding the treatment of inventory financing as "sales" (Anonymous, 1981). However, with the passage of time, the view on developing regimes to regulate SCF has changed. Tsai and Kuan-Jung (2017) claimed that a flexible, principles-based regulatory regime that balances financial stability, consumer financial protection, and the improvement of financial access is essential at the initial stage of SCF development (Tsai and Kuan-Jung, 2017).

Hence, based on the previous discussion, we derive the following proposition:

**P1b:** SCF task environment related uncertainties will increase the SCF providers' information processing requirements.

#### 4.1.3. Task interdependence

SCF practices focus on the coordination of financial flows within and between companies (Hofmann and Belin, 2011); therefore, task interdependence in SCF practices can be divided into two dimensions: intra-organisational collaboration and inter-organisational collaboration (Berza and Liberman, 2017; Silvestro and Lustrato, 2014;

Wandfluh et al., 2016).

Intra-organisational collaboration means that departments' members should share mutual interests and targets in order to foster the exchange of information in an informal manner (Wuttke et al., 2013a). The reason to promote cooperation among different functional departments is that different functional departments have different targets, which could negatively affect the effectiveness of SCF practices. For example, the sales department only concentrates on orders but neglects advanced payment, and resolving the problems caused by misalignment of this cross-functional objective requires intra-organisational collaboration (Martin and Hofmann, 2017). Some empirical studies have proven the effectiveness of inter-organisational collaboration. Fischer and Himme (2017) found that intra-organisational collaboration can effectively reduce the risks in SCF since it allows each functional department to exchange knowledge efficiently and understand its counterparts better. Wuttke et al. (2013b) adopted a case study approach based on six European firms and found that the speedy acceptance of SCF practices can be promoted by logistics/procurement-financing alignment.

Inter-organisational collaboration is also essential to SCF practices (Chen and Birtal, 2015; Downing and Harper, 2008). Through reviewing relevant definitions of SCF (Meijer and Bruijn, 2013; More and Basu, 2013; Pfohl and Gomm, 2009), it is not difficult to find that inter-organisational collaboration can affect customers' access to financial services and free up working capital (Sugirin, 2009). Take the agricultural SCF as an example. Banks play an un-ignorable role in the agricultural value chain because they are the main financing sources (Swamy and Dharani, 2016). However, isolated small farmers cannot get financial support due to their high cost and risk of transactions (Birtal et al., 2017). Through building relationships with relevant organisations (e.g., the Conservation Farming Unit (CFU), agribusiness or the Dairy Association), smallholder farmers can get financial support from banks (Middelberg, 2017; Patil and Jha, 2016). The reason that small farmers succeed in getting financial resources is that information asymmetry is resolved through the monitoring mechanism formed by inter-organisational cooperation (Chen et al., 2017). With the help of this monitoring mechanism, small farmers' transactional costs and lending risks can be reduced (Miller, 2008). The role of inter-organisational collaboration has also been revealed by empirical studies. For example, using household-level data from the Indian state of Punjab, Birtal et al. (2017) supported the argument that the cooperation between financial institutions and other participants in agricultural SCF can significantly improve the financial performance of farmers. Wandfluh et al. (2016) found that buyer-supplier financing alignment and buyer-supplier information sharing are important in implementing SCF practices because they positively affect overall SCF performance. Inter-organisational collaboration also serves a moderating role. Reverse factoring (a SCF instrument) is used to extend day's payable outstanding, reduce default risk and simplify business processes. However, the collaboration between suppliers and their buyers strongly influences the accomplishment of these goals (Liebl et al., 2016).

Previous studies have stated that intra-organisational or inter-organisational relationships positively affect SCF providers in optimising financial processes (Caniato et al., 2016; Goel and Kaur, 2008), increasing the efficiency of information coordination systems (Wandfluh et al., 2016), and establishing the business process and information coordination system (Liebl et al., 2016). Uncertainties from task interdependence mainly come from SCF providers' willingness. If the inter-organisational or intra-organisational relationship is good and the terms of the relationships are long, SCF providers are more willing to consider the optimisation of business processes and information systems, and therefore, we derive the third proposition accordingly:

**P1c:** SCF task interdependence related uncertainties will increase the SCF providers' information processing requirements.

#### 4.2. Mechanisms for improving the information processing capacity

The information processing capacity can be derived from a number of mechanisms (Bensaou and Venkatraman, 1995). Following Bensaou and Venkatraman (1995), we classify these mechanisms in terms of organisational structural design, coordination and control, and information technology.

First, Tushman and Nadler (1978) note that the organismic-mechanistic nature of the organisational structure affects the information processing capacity of an organisation. Compared to a mechanistic structure, an organismic (highly connected) structure can cope with more uncertainties. The reason for that is that highly connected networks are more independent from individuals and are less sensitive to information overload or saturation than more limited networks. On the contrary, Wang (2003) found that firms tend to maintain a more rigid structure with higher levels of centralisation and formalisation when facing greater information requirements, which can result in better performance. We hold the view that in the SCF context, an appropriate organisation structure design of SCF providers would affect the SCF information processing capacity. Specifically, an organic or connected structure that is characterised by a more decentralised and less formal structure give less attention to rules and regulations, and emphasise greater peer involvement in decision making, so that it tends to promote information processing capacity (Tushman and Nadler, 1978).

Second, coordination and control mechanisms concentrate on linking together or coordinating activities of interdependent subunits (Tushman and Nadler, 1978), including rules and procedures, planning and control systems, and specific coordinating units such as product teams or task forces (Tushman and Nadler, 1978). To deal with information processing requirements, SCF providers should coordinate different internal SCF business units' activities in financial business processes (Blackman et al., 2013; Dyckman, 2011). Mechanisms for coordinating activities can effectively reduce credit risk, which is an important strategy used in SCF practices (Chen et al., 2016; Swamy and Dharani, 2016). In general, more complex, elaborate, and comprehensive coordination and control mechanisms tend to promote greater information processing capacity (Tushman and Nadler, 1978).

Third, information processing capacity is also derived from information technology mechanisms. To meet the information processing requirements, SCF providers should have a higher level of information technology mechanism, which is determined by the scope and intensity of IT use (Bensaou and Venkatraman, 1995). The scope of IT use means whether data are exchanged in electronic form among organisation in the process of planning, purchasing, production, transportation and payment (Bensaou and Venkatraman, 1995). In the SCF context, the greater scope of IT adoption contributes to SCF providers' business efficiency improvement and administration cost reduction (Hofmann et al., 2017). As for intensity for the use of IT, it refers to whether a specific document (i.e., material release and shipment schedule) is exchanged in electronic form among firms (Bensaou and Venkatraman, 1995). SCF providers can benefit from greater intensity of IT usage to promote the information sharing among SCF participants, thus reducing the information asymmetry among participants (Hofmann et al., 2017). As a result, information processing capability will increase with advanced information technology mechanism generated from greater intensity and scope of IT use (Bensaou and Venkatraman, 1995).

Therefore, based on the previous discussion, we derive the following proposition:

**P2:** In general, the more highly connected the structure, the more comprehensive the coordination and control mechanisms, as well as the greater the intensity and scope in the use of information technologies, the greater the SCF providers' information processing capacity is.

#### 4.3. The relationship between "fit" and SCF capabilities

According to the IPT, information processing capacity should match

information processing requirements of the structure to improve effectiveness (Trautmann et al., 2009). Previous research has highlighted the importance of fit between these two (e.g., Busse et al., 2017; Trautmann et al., 2009; Tushman and Nadler, 1978). Mismatch is associated with lower organisational performance. For example, when the information processing capacity is not sufficient to handle requirements, it will lead to integration and coordination difficulties, make the decision making suboptimal, and accentuate the firm's organisational inefficiencies (Bergh, 1998; Tushman and Nadler, 1978). Furthermore, the low information processing capacity hurts the capability to share a financial information system with SC partners. If left unaddressed, the need for information processing would reach a point where it is difficult and costly for management (Premkumar, 2000; Wong et al., 2015). Under such a circumstance, Galbraith (1977) present two broad solutions to deal with the issue. One is to modify the environment in order to reduce the amount of information processing requirements. The other is to increase the capacity of information processing. For example, if SCF task environment uncertainty increase and are no longer absorbed by rules, goal setting, and the hierarchy at the time, the SCF providers can either reduce the information processing requirements by reducing their goal diversity, customer diversity, or service diversity, or increase the information processing capacity by redesigning the organisation structure.

On the contrary, more information processing capacity than required brings about redundancy and unnecessary cost in terms of time, effort, and control (Tushman and Nadler, 1978). In this case, SCF providers can direct their resources towards expanding their portfolios (Hill and Hoskisson, 1987). Following on that, it will trigger more uncertainties, which is a key driver for SCF providers to collect and process relevant information (Kreye, 2017). Therefore, as the level of uncertainty and ambiguity increases, the SCF providers need to continuously increase their information processing capabilities to fit with their information processing requirements. In the process, SCF providers are gradually familiar with the environment and their financial SC, so they will expand the management from intra-organisation into inter-organisation. Based on their previous experience in structure design, cross-function coordination, and IT use, they are better able to map financial network structure, design financial business process, and share financial information system in the whole financial SC. That's to say, SCF capabilities increase. Hence, proposition 3 is derived:

**P3:** In the continuous pursuit of the fit between SCF providers' information processing requirements and information processing capacity, the SCF capabilities (mapping financial network structure, designing financial business process, and sharing financial information system) gradually increase.

#### 4.4. The relationship between SCF capabilities and financial SC integration

##### 4.4.1. Map financial network structure and operational integration

Through reviewing the existing literature, we tease out four types of SCF-centred financial networks structure: manufacturer-centred financial networks (Akgün and Gürünlü, 2010; Blackman et al., 2013; Hofmann, 2011), bank-centred financial networks (Camerinelli, 2009; Cavenaghi, 2014; Dyckman, 2011), third-party logistics (3 PL)-centred financial networks (Hofmann, 2009) and SC orchestrator, e.g., e-platform SCF provider-centred financial networks (Jiang et al., 2016; Kumar, 2008).

First, manufacturer-centred financial networks mainly concentrate on the optimisation of the whole Cash-to-Cash Cycle (CCC) in the SC. To shorten the cash conversion cycle, the SC should shorten the receivable turnover period and inventory period and extend the payable turnover period (Akgün and Gürünlü, 2010; Hofmann and Kotzab, 2010). To do that, small and medium-sized suppliers who lack the resources should get support from the manufacturer (Hofmann, 2011). For example, to improve the performance of cash flow, suppliers need to get financial data from the manufacturer (Blackman et al., 2013).

Second, bank-centred financial networks evolve in the context of banks needing to innovate financial products in order to be competitive in the financial market (Camerinelli, 2009). In the bank-oriented financial network, banks concentrate on developing products based on certain collaterals, such as payables and receivables (Cavenaghi, 2014; Seifert and Seifert, 2011), thereby making members in the SC improve their liquidity (Dyckman, 2011).

Third, to satisfy customer needs with a short delivery time, firms need to either be holding high levels of inventory or possess an efficient means of transport (Hofmann, 2009). However, after sending out goods, firms cannot receive their payment immediately, which increases firms' financial burden (Liebl et al., 2016). This dilemma gives 3 PL an opportunity to expand existing services by providing inventory financing (Martin and Hofmann, 2017).

Fourth, SC orchestrators are those companies who bridge the gap between subjects with little credit and financial institutions. For example, by including agribusiness corporations, agricultural SCF can help smallholder farmers get loans to buy tractors and rippers (Son et al., 2017). In other fields, through evaluating customers' purchasing data and network behaviour data, some e-commerce companies (e.g., Amazon's lending program) can help small suppliers get financing (Demertzis et al., 2017).

SCF providers need to construct and map the financial network structure with other supporting organisations, including financial institutions, credit insurance, inspection and logistics companies, etc. (Yuan, 2007). Adapting the definition provided by Blackman et al. (2013), we consider the financial network structure as the organisational arrangement of business relationships that connect the SCF providers with other SCF participants through multiple tiers of the SC, which uncovers important details of financial processes, information flows and the inter-organisational relationships. The change in financial network structures usually transforms the SCF activities and coordination mechanisms. For example, allowing the provision of capital to a higher number of suppliers at a lower rate requires an information coordination system to be simple and cost efficient, which demands that the SCF providers provide a platform or standardised Electronic Data Interchange (EDI) system (Caniato et al., 2016; Liebl et al., 2016). Mapping financial network structure is pivotal in defining, modelling and improving the understanding of how a SCF system works (Blackman et al., 2013). Clear financial structure consciousness helps to understand the status and roles of every firms in the financial SC and improve collaborative relationship among SC partners and strategic alliances, which can be called operational integration (Morash and Clinton, 1998). Therefore, we propose:

**P4a:** The enhancement of mapping financial network structure helps to achieve financial SC operational integration.

##### 4.4.2. Design financial business process and process integration

According to Blackman et al. (2013), the financial business process is the set of activities involved in the coordination of financial transactions within and between the SCF providers and other SCF participants. This includes invoices, domestic and international payments, foreign exchange transactions, remittance advice and so on. The financial business process is in tandem with the manufacturing and logistical processes; hence, the capability of designing this process is important because it enables high levels of quality in a high-volume transaction environment. It can not only reduce the administrative and banking costs but also enable a much more refined and focused approach to strategies such as just-in-time (JIT) payments (Blackman et al., 2013). For example, to increase financial volume, the SCF providers need to incorporate more financial institutions (e.g., multiple banks) to ensure enough liquid funds. To provide customised service, the number of SCF customers should be limited (Liebl et al., 2016). Especially in the global SC, the financial processes are more important because it not only concerns with payments and visibility of the financial processes, but also relates to foreign exchange and risk



management. Designing financial business process involves modelling of the activities concerned with the coordination and management of financial transactions between SC partners (Blackman et al., 2013). It helps to establish the collaborative and synchronized processes with SC partners, which is called process integration (Huo et al., 2013). As such, we propose:

**P4b:** The enhancement of designing financial business process helps to achieve financial SC process integration with SC partners.

#### 4.4.3. Share financial information systems and information integration

A financial information system is another indispensable element as it is used to enable and connect financial business processes (Blackman et al., 2013). The capability of sharing financial information systems, which is used by SCF providers to coordinate subunits' activities in the SC (Blackman et al., 2013), plays a decisive role in the success of SCF (Pfohl and Gomm, 2009). For example, the use of Enterprise Resource Planning (ERP) systems allows companies to have real time visibility and better control over their operations (Gargeya and Brady, 2005). EDI systems electronically transmit business documents, such as orders, invoices, and contracts (Ghobadian et al., 2013). Some other more sophisticated electronic business standards such as RosettaNet are designed to create and implement industry-wide, open e-business process standards that facilitate the electronic business interfaces used between participating SC partners (Geerts and O'leary, 2015). Such information sharing requires frequent and intense communication between SC partners, which constitutes high levels of cooperative behaviour and high degree information flows between them (Prajogo and Olhager, 2012). Eventually, financial SC information integration, which means the extent to which firms electronically link and deploy information technology for financial information sharing across SC partners (Liu et al., 2016; Rai et al., 2006) can be achieved. Thus, we present the final proposition:

**P4c:** The support of sharing financial information systems helps to achieve financial SC information integration.

The reviewed 71 papers provide insights into some details on SCF information processing requirements, factors effect SCF information processing capacities, and SCF capabilities, which lays the foundation of building the whole conceptual framework (Fig. 6), which vividly show all the propositions discussed in this section.

#### 4.5. A case example to illustrate the conceptual framework

To further illustrate the practicability of the IPT based SCF conceptual model, a practical case of Volvo SCF programme is presented. Multi-national Corporation (MNCs) are the first to adopt a supply chain perspective while internationalising, they tend to pay attention to their suppliers and customers including their financing and are the first to adopt SCF as a tool for the whole supply chain optimisation (Blackman et al., 2013; Goerzen and Makino, 2007). Automotive industry is selected because it is the most complex supply chain and Original Equipment Manufacturers (OEMs) heavily rely on suppliers for innovation and production (Helper, 1991; Johnsen, 2009).

Volvo acts as OEM and SCF provider in its SCs. According to the discussion in 4.4.1, Volvo's SCF programme could be categorized as manufacturer-centred SCF, which stressed the CCC optimisation in the SC. At Volvo, information processing requirement are largely affected by its SCF task characteristics and environment. First, the cost in relation to SCF programme implementation and management is difficult to quantify in such a large organisation as Volvo (Camerinelli and Schizas, 2014). The ambiguous cost estimation makes the task characteristic complex, thus increasing Volvo's information processing requirements. Second, in terms of task environment, for Volvo, because of the existence of the information asymmetry between Volvo and its suppliers, there are problems of comprehensively assessing the suppliers' credit history and their transactional information (Brandes et al., 2013). The incomprehensive evaluation of suppliers' credit factors could raise the possibility of the adverse selection and moral hazard, thus rendering higher uncertainties and information processing requirement for Volvo. Moreover, from the macro environment perspective, in the automobile industry, the political factors could influence the SCF providers information processing requirement. For example, Chinese government's support for the development of new energy vehicles increased the competition intensity within the automobile industry, thus increasing the uncertainty and the requirements of information processing for Volvo. Meanwhile, the economic factors (i.e. oil price fluctuation) have the same effect on the uncertainties for the company.

To satisfy the increasing information processing requirements, Volvo manage to improve their information processing capabilities to match their information process capability with the requirements. Volvo have strictly regulated and controlled the suppliers involving in SCF. For example, Volvo only choose suppliers from whom they

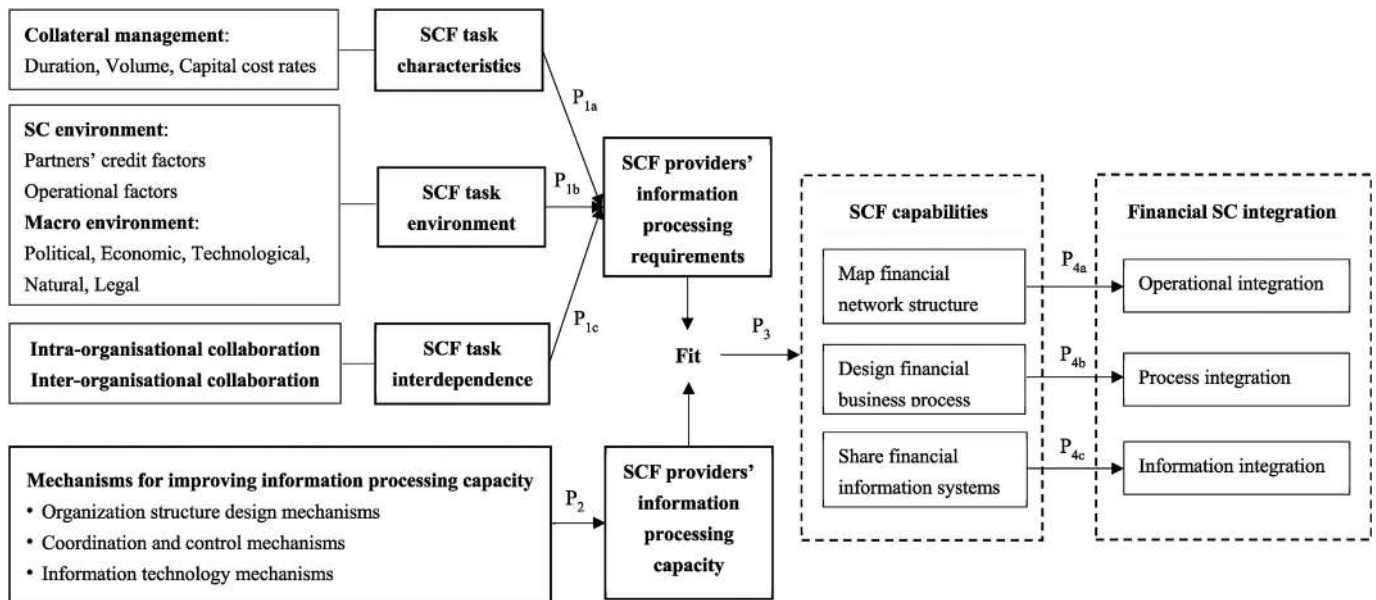


Fig. 6. The conceptual framework of SCF based on IPT.

purchase materials directly rather than those supplier-managed suppliers, to ensure that the credit conditions and operational factors (i.e., turnovers and procurement ratios) are well acquainted. This controlling mechanism helps Volvo identify qualified suppliers in the beginning, thus reducing the problems later and further improving their information process capabilities. Moreover, Volvo tend to have a long-term inter-organisation collaboration with the selected suppliers for SCF to build better information sharing mechanism among SCF participants. The collaboration with the selected suppliers result in uncertainty reduction and information processing capability improvement.

With growing information processing capabilities and controllable uncertainties, Volvo manage to match their information processing capabilities with the information process requirement and accordingly achieve financial SC integration. First, better financial network structure mapping was conducted through collaboration among SCF participants (i.e., suppliers, financial institutions and 3PL), resulting in better operational integration (Global Trade Review, 2014). Second, Volvo manage to involve the procurement department in the supplier assessment and promote intra-organisation collaboration, thus facilitating better cross-function coordination with heightened productivity and connectivity (Fischer and Himme (2017)). With elevated business process designing, the process integration is reached in Volvo's financial SC. Third, better financial information sharing system is achieved through EDI adoption and long-term collaboration between Volvo and its qualified suppliers, thus leading to better information integration in the financial SC (Global Trade Review, 2014).

## 5. Future research agenda

To illustrate the mechanism of SCF practices specifically, a conceptual framework is established to identify SCF themes and the relationships among them. This illustration is based on the integrated framework (see Fig. 6). Some insights are also provided to help identify possible directions for expanding SCF knowledge.

First, task characteristics represented by the duration, volume and interest cost of the collateral in different SCF practices should be investigated further. Although Gomm (2010) and Pfohl and Gomm (2009) provide three dimensions for calculating the financing cost of SCF collateral, the authors did not explore the implications in different SCF practices (e.g., reverse factoring (Liebl et al., 2016; Martin, 2017), inventory financing and payable financing (Gelsomino et al., 2016)). In addition, some research (e.g., Liebl et al., 2016) has explored the objectives, antecedents and implementation barriers of certain SCF practices (e.g., reverse factoring), but they have failed to study the formation of SCF practices based on duration, volume and interest cost, linking collateral management with SCF practices. To outline the role of collateral management, future researchers can specify collaterals in their calculations for different SCF practices. Also, in order to comprehensively investigate the mechanism of collateral management in SCF practices, future research can further explore the objectives, antecedents and implementation barriers of collateral management in SCF. Comparison analysis of existing collateral management models between successful and less successful SCF providers could help reveal the latent factors which influence the success of SCF practices.

Second, interesting research may be conducted on how different environmental uncertainties influence SCF practices. Environmental factors are considered to have a great impact on SCF practices, but most studies only investigate their impact on trade credit (e.g., Afrifa and Gyapong, 2017; Lorentz et al., 2016). Research on the effect of environmental factors on other SCF practices, such as inventory financing (e.g., Hofmann, 2009) and reverse factoring (e.g., Liebl et al., 2016; Popa, 2013), has not been fully conducted. Meanwhile, the existing literature generally focuses on the manufacturer-centred financial network, while the influence of environmental uncertainties on other SCF-centred financial networks, such as 3PL, bank and SC orchestrator, is less explored. This exclusion is not beneficial to the understanding of

how environmental uncertainties in these financial networks be managed. To fully investigating the role of environmental factors in different SC practices and financial networks, researchers can establish an empirical model that connects environmental factors with SCF performance, and then test the built relationships using historical transaction data of SCF providers.

Third, it is possible to further investigate how relationships among intra-organisations and inter-organisations affect different SCF practices. As reviewed above, task inter-dependency is divided into inter-organisational and intra-organisational collaboration. Most conceptual papers (e.g., Birtchal et al., 2017; Chen and Birtchal, 2015; Gomm, 2010; Schäfer and Baumann et al., 2014) solely emphasise the effect of inter-organisational collaboration on SCF practices. Although several papers studying relationships focus on the influence of inter-organisational and intra-organisational collaboration on SCF practices at the same time, they are limited to certain SCF practices (e.g., Lorentz et al., 2016) or unspecific SCF practices (e.g., Caniato et al., 2016; Martin and Hofmann, 2017). The insufficient demonstration cannot highlight the positive role of intra-organisational collaboration, which in turn impedes people's understanding of intra-organisational collaborative mechanism in SCF practices. Therefore, exploring the role of intra-organisational collaboration in various SCF practices has both theoretical and practical implications.

Fourth, although the role of technological innovation in SCF practices has been emphasised, studies that investigate the role of technologies in SCF are still scarce. Hofmann and Johnson (2016) propose that technological innovation, such as blockchain technology, can disrupt existing business models. However, only one paper investigates how the SCF provider can use big data to predict SCF failure (Zhao et al., 2015). Therefore, research that studies how technological innovation affects SCF practices should be explored further. To better understand the role of technological innovation in SCF's evolution, future research should dissect different uncertainties faced by SCF providers and associate them with different technologies. Additionally, to better understand the effects of different technologies on SCF, the comparison of benefits, challenges and the procedure of technological applications in SCF practices among different technological innovations is also necessary. For instance, researchers could explore why (i.e., motivation), when (i.e., timing), which and how technologies should be applied in SCF.

Fifth, it is necessary to establish a performance evaluation system for different SCF practices. Through reviewing SCF papers, we find that existing studies seldom completely investigate the evaluation system of SCF practices. For example, Martin and Hofmann (2017) measure the performance of SCF from three perspectives: financial flow-specific, cross-functional and SC-objective. However, they do not provide a practical index to measure these objectives. Some papers (e.g., Afrifa and Gyapong, 2017; Breza and Liberman, 2017; Lorentz et al., 2016) provide specific indexes to measure the performance of SCF practices, but the indexes are only relevant to trade credit. So, we can see that the existing performance evaluation system for different SCF practices is not practical or complete. This cause the performance among different SCF providers not to be accurately measured or easily compared and this will in turn hinder the establishment of service standard in SCF. To avoid this, future research can empirically identify measurable dimensions for SCF performance using historical SCF transaction data. In this process the reliability, construct validity, discriminant validity and convergent validity for these dimensions should be carefully evaluated.

Sixth, the role of two types of SCF providers (e.g., SC orchestrator and 3PL) in integrating flows in SC can be further investigated. Through reviewing the existing literature, we can see that the role of two other types of SCF providers (i.e., the bank and manufacturer) in integrating the flows in the SC have often been explored (Blackman et al., 2013; Camerinelli, 2009; Dyckman, 2011; Hofmann, 2011). However, two other types of SCF providers (3PL and SC orchestrator) have not been fully investigated. Thus, future studies can further

explore the role of 3 PL and the SC orchestrator in integrating material flow, information flow and cash flow.

Finally, through reviewing existing SCF papers, most papers study SCF practices without a theoretical lens. Theories adopted by SCF papers are mainly associated with relationships among inter- or intra-organisations (see Table 2). For example, Lorentz et al. (2016) adopt the resource dependence theory (RDT) and task independence to explore how the business cycle affects net trade credit and its components in firms on different tiers of the SC. Like Lorentz et al. (2016), Oliveira et al. (2017) use bargaining power theory to illustrate the effect of financial contracts on buyer-supplier relationships. Using transaction cost economics (TCE), Wuttke et al. (2013a, b) investigate the effect of financial SC management on SC performance. We can see that the usage of theories in SCF is limited and only relationship related theories are sporadically used, which could impede the comprehensive understanding of SCF evolutionary process. Thus, future research can study SCF using theories of firm growth, such as classical theory of firm growth, knowledge-based view and organisational learning, which would help people get more understanding of how SCF business should be developed.

## 6. Conclusion

### 6.1. Theoretical contributions

This paper has four main theoretical contributions. First, we have carefully reviewed the SCF literature and symmetrically created a knowledge structure based on the IPT. Specifically, we have expanded the list of existing SCF models. Gelsomino et al. (2016) saw the SCF business models from two perspectives: a financially oriented perspective and a SC-oriented perspective. However, we find that existing SCF business models can be further classified into four models, including a manufacturer-centred model, a bank-centred model, a 3 PL-centred model and a SC orchestrator-centred model. This further deepens the understanding of SCF and opens up new avenues for future research. We have specified three sources of uncertainty faced by SCF providers, which can not only help them formulate the mechanisms to improve information processing capacity but also help them maintain and expand existing SCF capabilities.

Second, although other theories have been adopted in SCF research and some research has also emphasised the importance of information management in SCF, there has been no one who has used the IPT to analyse SCF. IPT is proven to be an effective and valuable framework for SCF research. This theory helps makes sense of the core competency of a SCF provider, i.e., information processing capability. Without this, a SCF provider cannot provide effective service.

Third, our conceptual model advances current understanding of SCF by putting together fragmented constructs (i.e., uncertainties, information processing, SCF capabilities, and financial SC integration), and we propose a number of propositions regarding their relationships. These relationships indicate that there is a need for a fit between SCF information processing requirements and capacity for SCF providers, and the fit can further improve SCF capabilities and achieve integration of the whole financial SC. Furthermore, seven directions for future research are provided in this paper, which will benefit those scholars who are interested in investigating SCF issues.

In sum, based on the IPT, our conceptual framework is one of the first attempts towards looking at SCF from an information processing perspective, and it has significant implications for SCF research in general.

### 6.2. Practical contributions

In practice, this research suggests that managers may need to embrace an information processing perspective to manage SCF. The identified uncertainties faced by the SCF providers will increase the

information processing requirements. To deal with the uncertainties, some mechanisms can help the firms to adjust their information processing capacity. For example, if SCF providers want to increase their information processing capacity, they can make their firms' structure less formal and less centralised, and put greater emphasis on peer involvement in decision making. They can also consider coordinating activities across organisational functions, such as planning, purchasing, production, transportation, and payment.

Second, the proposed framework also offers a key advice of matching information processing requirements with information processing capacity. In practice, SCF provider's low information processing capacity will expose the firms to potential risks. While high information processing capacity will result in redundancy and unnecessary cost in terms of time, effort, and control. It is better to gradually increase the information processing capacity to fit the requirements. With the help of this framework, SCF providers can get an idea about how to develop information processing capacities to fit their information processing requirements.

Third, the conceptual framework also provides SCF practitioners with a list of SCF capabilities, e.g., map financial network structure, design financial business process and share financial information systems. Some detailed mechanisms in relation to these capabilities are also provided.

### 6.3. Limitations

This paper also has some limitations. This conceptual paper is intended to provide researchers and companies with a comparably inclusive guideline for developing SCF. Thus, a detailed procedure of SCF practices has not been provided. In addition, although this framework for developing SCF capabilities has promise, its final effectiveness remains to be established by further practice and empirical research. Finally, we argue that different uncertainties will increase the need for SCF information processing requirements, but this study does not specify how different types of uncertainties affect the implementation of certain patterns of SCF. This may be a topic for future research.

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