

Complementary theories to supply chain management

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Abstract

Purpose – The paper seeks to discuss and develop SCM as a scientific discipline using different theories from non-logistics areas to explain inter-organizational phenomena. It also attempts to establish a frame of reference that allows us to mitigate the gap between the current SCM research and practice and the theoretical explanations of how to structure and manage supply chains.

Design/methodology/approach – The paper introduces three different perspectives that together will contribute to a broader understanding of SCM in practice: an economic perspective; a socio-economic perspective; and a strategic perspective. The theoretical framework is applied to two important research topics within SCM: third party logistics (TPL); and new product development (NPD).

Findings – There is no such thing as “a unified theory of SCM”. Depending on the concrete situation, one can choose one theory as the dominant explanatory theory, and then complement it with one or several of the other theoretical perspectives.

Research limitations/implications – The way the four theories complement one another is explored on a conceptual basis, but further research into this direction may explore more deeply how these alleged complementarities occur in practice, and how managers mould their decisions by these ideas.

Practical implications – The four theories can provide normative support to important management decisions in supply chains, such as outsourcing, safeguards against opportunism, and alignment of incentives.

Originality/value – The main contribution is that one cannot rely on one theoretical explanation when analyzing phenomena in SCM. It is necessary to consider several theories and how they may complement one another in order to provide a more comprehensive view of SCM.

Keywords Supply chain management, Product development

Paper type Research paper

1. Introduction

1.1 Starting-point of considerations

The practical field of supply chain management (SCM) is constantly changing, as the competitiveness of international companies is more and more dependent on their capability to produce and deliver customized products and services fast and efficiently all over the world. At the same time, an increasing percentage of the value creation takes place outside the boundaries of the individual firm (see, for example, Bruce *et al.*, 2004). This induces higher complexity and diversity into management decisions regarding the structure of the operations, the positioning of activities and processes, the role and power of the participants, and the most efficient forms of collaboration between all members in a transformation chain between production and consumption, which we call a supply chain. These issues also impact on research in the field of

operations management. In order to understand and to explain decision-making and practices in a complex network of collaborating firms (see also Rudberg and Olhager, 2003), we need to draw on several behavioral and organizational theories and frameworks in combination. Our approach is therefore important, as this coupling of organizational theories with SCM is not often discussed within the audience of this journal.

Lamming (1996) introduces the theory of SCM as an extension of logistics, though referring to the extended need of relationship issues to be considered in the theory of SCM. However, the notions still remain on a more applied than theory-building level. Larson and Halldorsson (2004) discuss four unique perspectives on the relationship between logistics and SCM. Tan *et al.* (1999, 2002), as well as Akkermans *et al.* (1999), recognize the customer orientation as one important ingredient as well as the simultaneous integration of upstream, downstream and internal performance systems. Also here we can identify implicitly an organization's behavioral backbone, which is not explicitly presented. This also applies to Romano and Vinelli (2001), who try to distinguish SCM from logistics, but fail to discuss the theoretical ground for this type of inter-organizational management. The importance of interactions between different parties is presented and discussed by Salvador *et al.*

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(2001). However, these interactions were rather accepted as a given status than critically scrutinized.

We presume the necessity of presenting and discussing organizational theories for managing supply chains and will therefore combine in this article four different theories:

- 1 the principal-agent theory;
- 2 transaction cost analysis;
- 3 the network theory; and
- 4 the resource-based view.

We will show that our choice is based on the assumption that there might be no “right” theory for the management of supply chains.

1.2 The research problem and objective of the paper

This paper looks into *how* theories from other disciplines can be applied within SCM and ultimately used to develop SCM. We follow Maaloe's (1997) classification of theories, later discussed in the context of logistics by Arlbjoern and Halldorsson (2002), that explain a problem:

- grand theories (particular science with specific concepts, e.g. philosophy of science);
- middle-range theories (worked connections between a set of concepts represented by socio-economic theories applied in various managerial disciplines); and
- small-scale theories (limited number of concepts presented as propositions, e.g. the “fit” model of products and supply chain by Fisher, 1997).

In this paper, we will focus especially on Maaloe's (1997) suggestion that middle-range theories can be used to reflect connections between a set of concepts that represent key decisions of SCM. Only few contributions demonstrate how to deal with the phenomena of SCM from a middle-range theoretical perspective (New, 1997; Mears-Young and Jackson, 1997; Olavarrieta and Ellinger, 1997; Handfield and Melnyk, 1998; Logan, 2000; Arlbjoern and Halldorsson, 2002; Ketchen and Guinepero, 2004; Cousins, 2005).

The objective of our article is to develop and discuss a middle-range theoretical foundation of SCM based on different notions of socio-economic theories trying to explain inter-organizational phenomena. We use these theories because we are interested in answering two questions:

- 1 How to structure a supply chain when it is perceived as a collaboration of institutions?
- 2 What is needed to manage a particular structure?

To gain insights into the institutional set-up of SCM arrangements, we have established a frame of reference that allows us to look at SCM from an institutional and socio-economic perspective. We have chosen transaction cost analysis (TCA) and the principal-agent theory (PAT) to answer the first question, as these theories are typically used to identify the best structure of and within institutions (e.g. Croom, 2001; Eisenhardt, 1989; Williamson, 1985, 1999; Coase, 1937). The second question will be answered by adapting the RBV and the network perspective (NT), because these theories look at institutions' use of resources to stay competitive and the dynamics of inter-organizational relationships. All the selected approaches are well recognized in non-logistics disciplines, such as organization economics (TCA, PAT), marketing and purchasing, and strategic management (RBV), but so far their explanatory force has been sparingly applied in SCM (see Croom, 2001;

Logan, 2000; Skjoett-Larsen, 1999). All four theories, each of which touches upon specific issues related to SCM, have a much longer history in business management than the concept of SCM itself.

On this basis, we will show how the developed frame of reference can be applied to two SCM research domains:

- 1 third party logistics (TPL); and
- 2 new product development (NPD).

These two areas have been chosen for several reasons. First, both are of strategic importance for managing the supply chain. Second, both are important elements in the SCM concept. Third, both areas imply the creation of a long-term, inter-organizational arrangement that not only aims to promote operative improvements, but also to guide or lead the strategic direction of companies. Fourth, they represent two distinctive functional streams in a supply chain that are gaining increasing importance, both within academia and companies:

- 1 service; and
- 2 research and development (R&D).

Although the strategic impact of NPD has always been a part of SCM, only recently has it received more attention in the literature, especially under the topics of early supplier involvement in NPD (see Dowlatshahi, 1998; Wynstra *et al.*, 2001; Ragatz *et al.*, 1997; Wasti and Liker, 1997), mass customization (see Duray *et al.*, 2000; Salvador *et al.*, 2002; Pine, 1993; Mikkola and Skjøtt-Larsen, 2004), and postponement (see van Hoek, 2001; Pagh and Cooper, 1998; Feitzinger and Lee, 1997; Ernst and Kamrad, 2000). This is not surprising, as many high-tech industries are facing increasing challenges imposed by shorter product life cycles, increasing customization of products, and supply chain integration. Not only are these firms contemplating outsourcing their NPD activities, they also have to maintain sustainable growth and stay profitable. Many firms, such as Volkswagen, Lego, Sony and Philips, are coping with these challenges through platform strategies to meet their customers' needs while protecting their core competencies. When product innovation is perceived as the source of competitive advantage, product architecture design strategies through modularization and related outsourcing decisions become a central issue in SCM. Component and NPD outsourcing decisions are typically made concurrently with the decomposition of product architectures, from which recombining, substitutability, commonality, and distinctiveness possibilities are determined (Mikkola, 2003b). The success of NPD activities depends on the amount of transaction costs incurred, resource allocation, power propensity among the members of the supply chain, and inter-organizational dependencies shared between all members in the supply chain.

TPL is also progressively representing multiple facets that share some important features of SCM relationships. More importantly, its managerial practice consists of logistics operations performed by a TPL provider on behalf of their customers. According to Berglund *et al.* (1999), TPL represents a “separate industry” creating value for their customers, not only in terms of costs but also in terms of developing the customer's business processes. These companies are often themselves organized in a network of operators with various skills representing multiple locations (Hertz and Alfredsson, 2003). TPL, or outsourcing of

logistics activities, is increasing both in terms of number and type (see, for example, Larson and Gammelgaard, 2001). In addition to conducting the make-or-buy decision, the process of purchasing logistics services, which includes acquiring resources and competencies, may take years to conduct (Andersson and Norrman, 2002). Beyond the acquisition of services and development of the particular solution is the management of relationships between buyers and logistics providers, which often takes the form of a close, long-term relationship in which trust may serve as a coordination mechanism in addition to the formal contract (Skjoett-Larsen, 2000). Empirical evidence demonstrates that TPL arrangements have become an important feature of the buyer's attempt to exploit, leverage, and develop logistics resources and competencies through inter-firm relationships (see, for example, Halldorsson and Skjoett-Larsen, 2004).

The article is structured as follows. After an introduction, which includes an argument for the need of this research, we present our understanding of SCM and theory building. In the third section, we introduce the four theories that are developed outside SCM thinking and practice, but which nevertheless can be useful in structuring and analyzing management decisions in supply chains. The paper concludes with a summary of our efforts and a critical outlook on future research.

2. The theoretical foundations of SCM

The supply chain encompasses organizations and flows of goods and information between organizations from raw materials to end-users (Handfield and Nichols, 2002). The supply chain is a meta-organization built up by independent organizations that have established inter-organizational relationships and integrated business processes across the borderlines of the individual firms. A supply chain can also be characterized as a borderless organization (e.g. Picot *et al.*, 2001), a value net (Bovet and Martha, 2000), a virtual supply chain (Chandrashekar and Schary, 1999), an interactive firm (Johansen and Riis, 2005), a multi-organization/single-site coordinated operations network (Rudberg and Olhager, 2003), or an extended enterprise (Davis and Spekman, 2004; Boardman and Clegg, 2001). Management of such an arrangement refers to inter-organizational relationship management with the objective of improving the overall profitability of the activities and/or organizations involved. The current literature on SCM seems to agree on the nature of the phenomena (e.g. Persson, 1997).

Although SCM has existed for almost 25 years, it still lacks a socio-economic theoretical basis that may be used to explain and understand this particular form of inter-organizational arrangement. Initially, two consultants from Booz, Allen and Hamilton (Oliver and Webber, 1982) introduced the SCM concept. Several authors have traced the theoretical foundations of SCM. Thus, Svensson (2002) found that the theoretical foundation of SCM and Alderson's functionalist theory (Alderson, 1957) have many similarities. Mentzer *et al.* (2004) presented a unified theory of logistics based upon logistics capabilities as a source of competitive advantage.

Recently, academics have presented valuable contributions, enhancing our understanding of the concept of inter-organizational management of different flows of products and/or information (e.g. Ballou *et al.*, 2000; Heikkilä, 2002; Monczka and Morgan, 1997; Srivastava *et al.*, 1999; Frazier,

1999; New and Westbrook, 2004). The majority of contributions focus on definitions and concepts from a functional point of view (e.g. logistics, operations, marketing, and purchasing), providing pragmatic recommendations on how to improve a firm's performance and implementation of postponement by supply chain reconfiguration. Prominent examples of such approaches can be found in Mentzer *et al.* (2001), Cooper *et al.* (1997), Cigolini *et al.* (2004), Lambert *et al.* (2005) and Croxton *et al.* (2001). Current frameworks of SCM present solutions on how to design and manage particular relationships between various stages in a chain, but they do not address the economic, strategic, and socio-economic theoretical rationales behind them (e.g. Min and Mentzer, 2004; Chen and Paulraj, 2004a, b).

The next section discusses SCM from the four chosen inter-organizational theories, and makes a cross-comparison based on specific characteristics of the theories.

3. Developing a middle-range theoretical base for SCM

3.1 Fundamental issues of SCM

The literature supports the view that the integration of key business processes within and across companies that add value for customers and other stakeholders can be called SCM (see Cooper *et al.*, 1997; Bechtel and Jayaram, 1997). Definitions of SCM originate from the operations management literature referring to issues such as NPDP, customization and distribution of goods, including the balancing of demand needs and capacity requirements in the transformation of raw materials into final products delivered to customers (e.g. Lee, 1993). Within the logistics discipline, Cooper and Ellram (1990, p. 2) define SCM as an "integrative philosophy to manage the total flow of a distribution channel from supplier to the ultimate user". Both Harland (1996) and Christopher (1998) reach another conclusion. Instead of managing flows, SCM is seen as the management of a network. Harland (1996, p. 64) defines SCM as "the management of a network of interconnected businesses involved in the ultimate provision of product and service packages required by end customers". Rather than looking at SCM as the management of a vertical pipeline of inter-linked firms, Harland (1996) considers SCM as management of a complex network of organizations involved in exchange processes. Christopher (1998) argues that the word "chain" should be replaced by "network", since the total system normally includes multiple suppliers and customers as well as multiple suppliers to suppliers and customers' customers. Some scholars (e.g. Christopher, 1998; Heikkilä, 2002) also suggest that "supply chain management" should really be termed "demand chain management" to reflect the fact that the chain is driven by the marketplace to satisfy the needs of the end-users. Another argument is that within marketing SCM is presented as one of the core business processes, which includes purchasing and physical distribution activities (e.g. Srivastava *et al.*, 1999).

However, all attempts refer to one specific "setting", which is the management of relations of independent organizations in a particular structure. Consequently, we understand such management as the coordination and interaction of decision makers (i.e. human beings) from economic institutions within a system based on division of labor (Göbel, 2002). In that sense, we develop a middle-range theoretical frame of

reference to explain SCM based on TCA, the PAT, the RBV and the NT. We do not claim that these theories are the only ones that can be used to establish a theoretical framework of SCM. But since we understand supply chains as interconnected socio-economic institutions, we argue that these theories are most useful to explain both structure and management issues of supply chains. Other theories and frameworks that focus on other aspects of SCM include relational contracting theory and resource dependency theory from the organizational sciences (e.g. MacNeil, 1980; Pfeffer and Salancik, 1978), the political economy frameworks (e.g. Stern and Reve, 1980), the dynamic capabilities framework (Teece *et al.*, 1997; Eisenhardt and Martin, 2000), and the evolutionary theory of economic change (Nelson and Winter, 1982). These supplementary aspects include power regimes in supply chain relations (Cox *et al.*, 2001), dynamic design, redesign of the firm's chain of capabilities (Fine, 2000), and the importance of path dependence and organizational routines (Nelson and Winter, 1982). However, it is beyond the scope of the current paper to discuss these supplementary aspects.

3.2 The logic of the selected set of inter-organizational theories

3.2.1 SCM mitigating agency problems – the principal-agent theory (PAT)

Based on the separation of ownership and control of economic activities between the agent and the principal, various agency problems may arise, such as asymmetric information between the principal and the agent, conflicting objectives, differences in risk aversion, outcome uncertainty, behavior based on self-interest, and bounded rationality. The contract between the principal and the agent governs the relationship between the two parties, and the aim of the theory is to design a contract that can mitigate potential agency problems. The “most efficient contract” includes the right mix of behavioral and outcome-based incentives to motivate the agent to act in the interests of the principal (Eisenhardt, 1989; Logan, 2000).

The alignment of incentives is an important issue in SCM. Misalignment often stems from hidden actions or hidden information. However, by creating contracts with supply chain partners that balance rewards and penalties, misalignment can be mitigated (Narayanan and Raman, 2004; Baiman and Rajan, 2002).

3.2.2 SCM as coordination of transferred rights of disposals – transaction cost analysis (TCA)

TCA offers a normative economic approach to determine the firm's boundaries and can be used to present efficiency as a motive for entering inter-organizational arrangements (Williamson, 1975, 1985, 1996). A company may reduce its total transaction costs (*ex ante* and *ex post* costs of contact, contract, and control) by cooperating with external partners. The key question is: why do firms exist? In the context of SCM, this question is addressed as: which activities should be performed within the boundary of each firm, and which activities should be outsourced? SCM relationships are represented by the hybrid mode of governance between markets and hierarchies. Asset specificity (limited value in an alternative application of, for example, physical, site, human, and dedicated assets) is the most influential attribute of the transaction (Rindfleisch and Heide, 1997). Behavioral assumptions of bounded rationality and the risk of being

subject to opportunistic behavior from a partner also influence the transaction costs. Bounded rationality may result from insufficient information, limits in management perception or limited capacity for information processing. Mechanisms for mitigating the risk of opportunism include safeguards and credible commitments such as long-term contracts, penalty clauses if a partner fails to fulfill the contract, equity sharing, and joint investments. According to Williamson (1996), trust between the parties is based on “calculated risk” and not on personal trust between individuals.

TCA has often been used in make-or-buy decisions in supply chains. Examples are outsourcing of logistics activities (Maltz, 1993; Andersson, 1997; Halldorsson, 2002), buyer-supplier relationships (Mikkola, 2003b; Bensaou, 1999; Stuart and McCutcheon, 1996), and restructuring of supply chains (Croom, 2001). In essence, TCA is a useful instrument to decide whether a transaction should be performed in the marketplace or in-house.

3.2.3 SCM as reciprocated interactions between institutions – the network perspective (NT)

The performance of a firm depends not only on how efficiently it cooperates with its direct partners, but also on how well these partners cooperate with their own business partners. NT can be used to provide a basis for the conceptual analysis of reciprocity (Oliver, 1990) in cooperative relationships. Here, the firm's continuous interaction with other players becomes an important factor in the development of new resources (Haakansson and Ford, 2002). Relationships combine the resources of two organizations to achieve more advantages than through individual efforts. Such a combination can be viewed as a quasi-organization (Haakansson and Snehota, 1995; Haakansson, 1987). The value of a resource is based on its combination with other resources, which is why inter-organizational ties may become more important than possessing resources *per se*. Thus, the resource structure determines the structure of the supply chain and becomes its motivating force. The network theory (NT) contributes profoundly to an understanding of the dynamics of inter-organizational relations by emphasizing the importance of “personal chemistry” between the parties, the build-up of trust through positive long-term cooperative relations and the mutual adaptation of routines and systems through exchange processes. Through direct communication, the relationships convey a sense of uniqueness, ultimately resulting in supply chains as customization to meet individual customer requirements. The parties gradually build up mutual trust through the social exchange processes. A network does not seek an optimal equilibrium, but is in a constant state of movement and change. Links between firms in a network develop through two separate, but closely linked, types of interaction: exchange processes (information, goods and services, and social processes) and adaptation processes (personal, technical, legal, logistics, and administrative elements) (Johanson and Mattsson, 1987).

NT is descriptive in nature and has primarily been applied in SCM to map activities, actors, and resources in a supply chain. The focus has been on developing long-term, trust-based relationships between the supply chain members. Examples of issues include buyer-supplier relationships (Gadde and Haakansson, 2001), third party logistics

(Halldorsson, 2002), and management roles in supply networks (Harland and Knight, 2001).

3.2.4 SCM as coordination of relational assets – the resource-based view (RBV)

Only a few articles have applied the resource-based view (RBV) to the field in focus in order to obtain the sources of competitive advantage through SCM (Lewis, 2000; Pandza et al., 2003; Rungtusanatham et al., 2003; Carr and Pearson, 2002) or to analyze the structure of chains and industrial clusters (Miller and Ross, 2003; de Olivera Wilk and Fensterseifer, 2003).

The RBV deals with competitive advantages related to the firm's possession of heterogeneous resources (financial, physical, human, technological, organizational, and reputational) and capabilities (combination of two or more resources) (Grant, 1991; Penrose, 1959; Prahalad and Hamel, 1990). These resources and capabilities constitute the core competence of the particular firm and serve ultimately as its source of competitive advantage. The static stream of research focuses on attributes that contribute to the heterogeneity of resources and capabilities. Four barriers may prevent competitors from imitating a firm's resources and capabilities:

- 1 durability;
- 2 transparency;
- 3 transferability; and
- 4 replicability (Prahalad and Hamel, 1990).

These attributes may also apply to inter-organizational arrangements (Jap, 2001). The more dynamic aspects of the RBV consider a firm's core competence to be its ability to react quickly to situational changes and build further competencies (Prahalad and Hamel, 1990) or dynamic capabilities (Eisenhardt and Martin, 2000). Hence, a firm's competitiveness is associated with the configuration of resources and capabilities as the markets evolve. However, inter-organizational relationships may also facilitate and advance the learning processes of individual firms. As such, relationships are not only output-oriented but also learning-oriented. Efficiency may not only be explained in terms of productivity or operational measures, but also in terms of the opportunity to access another firm's core competencies through cooperative arrangements as an alternative to building such competencies in-house (Haakansson et al., 1999).

The RBV is an implicit assumption in many supply chain decisions. Often, outsourcing decisions are based on the idea of focusing on core competencies and outsourcing complementary competencies to external partners. TPL and outsourcing of standard components and processes to subcontractors are examples. However, outsourcing of design, NPD, or software development is often a way to gain access to other supply members' core competencies through inter-organizational collaboration.

Table I summarizes and compares the specific characteristics of the four selected theories, which should be viewed as complementary and not mutually exclusive. The PAT stresses issues of inter-firm contracting and ultimately the notion of supply chain transparency. The TCA considers hybrids such as integrated supply chains as the result of a market failure, whereas the NT and the RBV see the supply chains as a means to access resources and competencies outside the focal firm (Skjoett-Larsen,

1999). Easton and Araujo (1993) assert that the RBV poses a “narrow conceptualization of the firm as a business entity” indicating that this stream of research may benefit from both the network approach (NT) and the vision of SCM.

In the following sections, we demonstrate how the four theories can contribute to answering our two questions adapted to two selected fields of application within SCM:

- 1 third party logistics (TPL); and
- 2 new product development (NPD).

4. The theoretical framework applied to third-party logistics (TPL)

Within the realm of SCM, the case of TPL illustrates the efficient governance structure for the “make-or-buy” decision depending on the characteristics of the transactions. Table II provides an overview of how the four theories can be applied to TPL. The four theoretical approaches increase our understanding of TPL by offering a complementary view of why TPL relationships exist (TCA), just as they guide inter-firm interactions based on contracts (PAT) into long-term relationships (NT) supporting a firm's core competence (RBV).

4.1 The principal-agent theory and TPL

Balancing the need of the shipper and the capability of the TPL provider is a well-known managerial issue (e.g. Hertz and Alfredsson, 2003) that explicitly implies the risk of agency problems. The PAT suggests an “inter-firm contracting perspective” on TPL, focusing on the design of an efficient contract between the buyer and seller of logistics services. The idea is to develop the most efficient combination of outcome and behavioral incentives in the contract between the shipper and the TPL provider. The extent to which the TPL provider's performance can be measured and controlled has a great effect on whether the provider is paid by actual performance (e.g. number of orders picked, packed, and shipped to the customers) or according to behavioral outcomes (e.g. salaries, hours, and/or miles). Not all aspects can be covered *ex ante* in the contract. Therefore, the issue of contracting should be a revisiting issue in TPL relationships.

4.2 Transaction cost analysis and TPL

By reducing the supplier base of transport firms and entering into close and long-term cooperation with a few key operators, a firm may reduce the transaction costs related to collecting information about numerous suppliers, the costs of negotiating and writing a contract, and the enforcement costs after the negotiation of a contract. However, close cooperation also involves the risk of opportunistic behavior. Therefore, it might be necessary to incorporate “safeguards” and “credible commitments” into TPL agreements, such as penalty clauses related to poor delivery performance, joint investments in dedicated warehouses or equipment, joint training programs, and exchange of employees between the firms.

4.3 The network perspective and TPL

To TPL, the NT presents openness and trust between the parties as a condition for gaining the best possible results from cooperation. Over time, mutual adjustments improve

Table I Comparison of the principal-agent theory, transaction cost analysis, the network perspective, and the resource-based view

Characteristics	PAT	TCA	RBV	NT
Behavioral assumptions	Bounded rationality Asymmetric information Goal conflicts	Bounded rationality Opportunism	Bounded rationality Trust	Bounded rationality Trust
Problem orientation	Contract design: what is the most efficient contract?	Efficient governance structure: why do firms exist?	Internal competence development: why do firms differ?	Dyadic relationships embedded in networks
Time dimension	Static	Static	Static/dynamic	Dynamic
Primary focus of analysis	Contracts and incentives	Transaction attributes (e.g. asset specificity)	Resource attributes	Inter-firm relations
Function of relationships	Efficient division of labor (ownership/control)	Market failures	Access to complementary resources	Access to heterogeneous resources
Primary domain of interest	Alignment of incentives in dyads	Exchange and transaction	Production and firm resources/capabilities	Exchange and adaptation processes

Source: Adapted from Skjoett-Larsen (1999, p. 46) and Madhok (2002, p. 540)

Table II The theoretical framework applied to third-party logistics

Characteristics	PAT	TCA	RBV	NT
Behavioral assumptions	Asymmetric information between shipper and TPL provider Goal conflicts	Calculative trust Safeguards, specific investments or long-term contracts	Personal trust Joint learning Transfer of knowledge	Personal trust Information-sharing Win-win situation
Problem orientation	Performance measurement ABC costing, open-book, incentives	Which activities should be outsourced to TPL provider?	Development of competencies internally and between shipper and TPL provider	Development of relations Communication and interaction
Time dimension	Static	Static	Dynamic	Dynamic
Unit of analysis	Formal TPL contract	TPL services Transaction costs Logistics performance	Resources and capabilities shared by shipper and TPL provider	Relations between shipper and TPL provider
Nature of relations	Adversarial relations Contract influences both the number and nature of outsourced activities	Arm's-length relations Regular tenders to test the TPL market Focus on cost-efficiency Short-term contracts	Complementary resources Creating new competencies through TPL relations	Voice relations Access to resources possessed by TPL firms Evergreen TPL contract
Primary domain of interest	Alignment of behavioral and outcome-based contracts	Investment in specific assets (warehouses, IT, personnel) Minimizing transaction costs	Development of new competencies (e.g. batch-monitored shipments, merge-in-transit, track-and-trace)	Mutual adaptation of IT systems, processes, routines

administrative and logistical systems, making them more efficient. Examples of adjustment processes might be an electronic data interchange (EDI) connection between the client and the TPL operator or the implementation of a quality control system. By entering into close cooperation with TPL providers who possess complementary competencies, the individual firm is able to utilize resources and skills controlled by other players. In close and long-term cooperation, the parties are able to establish mutual and strong relations of trust, which may result in the disappearance of cost-consuming, contractual safeguards. Thus, firms with efficient, cooperative arrangements might gain competitive advantage over firms that have to bear transaction costs to prevent their transport firms from acting in an opportunistic way.

4.4 The resource-based view and TPL

Similar to TCA, the RBV applies a stringent perception to the firm's boundaries. Resources and capabilities can only be acquired from the market to a limited degree. Under certain circumstances, firms in the supply chain interact closely on a long-term basis exchanging confidential information. Hence, TPL is both a means of improving the logistics services of the TPL buyer and a way to achieve a mutual transfer of logistics experience. A long-term mutual commitment and adjustments as well as a customized rather than standardized solution contribute to the uniqueness and heterogeneity of logistics resources and capabilities. Besides the static dimensions of heterogeneity (inimitable attributes of resources and capabilities), RBV can help us to understand as to how to use TPL to shortcut an upcoming need for

competence configuration (building and development) (Halldorsson and Skjoett-Larsen, 2004). The focal point of discussion is the ability of TPL to create venues through learning, either jointly or from each another, which may support the building of a core competence. This approach is similar to the view of TPL as a means to configure logistics competencies (Halldorsson, 2002).

5. The theoretical framework applied to new product development (NPD)

Within the realm of SCM, we focus our discussion on modularization of product architecture design strategies (see Mikkola, 2003a, b; Momme *et al.*, 2000) and how supplier-buyer relationships impact such NPD decisions (see Wasti and Liker, 1997; Dyer *et al.*, 1998; Hsuan, 1999). The four theoretical approaches provide us with additional insights connecting NPD to SCM, as shown in Table III.

5.1 The principal-agent theory and NPD

Firms' NPD activities are often proprietary in nature, which makes firms reluctant to involve suppliers in their activities. Product architecture designs suggest which NPD tasks might be performed by suppliers and how. Hence, specific assets shared with the suppliers have to be determined. Specialized assets (in contrast to general assets) often have a narrow range of potential applications and are difficult to deploy (Christy and Grout, 1994). Co-specialized investments, on the other hand, increase the principal and agent's interdependence and serve as an economic rationale for cooperative, long-term relationships. Furthermore, shared standards reduce specificity and provide a form of embedded control

(Sanchez and Mahoney, 1996), reducing search, monitoring, and enforcement costs, which allows firms to make efficient exchanges with multiple partners. Such a cost reduction will subsequently lessen a firm's incentive to integrate activities internally and free it to pursue the advantage of flexibility when there are high levels of input and demand heterogeneity (Mikkola, 2003c).

5.2 Transaction cost analysis and NPD

In a TCA perspective, it is argued that modularization reduces transaction costs. Modular systems lower the transaction costs of information about the parts available (for a firm) and imply economies of scale in assembling the package (for a consumer) (Langlois and Robertson, 1992). Product architectures made up entirely of standard component would favor market governance. One incentive to devise modular product architectures is to have components with standardized interfaces to enable competition between suppliers on technology innovation. To reduce transaction costs, firms may outsource product development and manufacturing activities of certain components to qualified suppliers. Firms naturally try to find the optimal trade-offs between switching costs and performance between partners, which will depend on the length of relationships shared between the buyer and its suppliers.

5.3 The network perspective and NPD

In many industries, such as the PC and bicycle industries, there is a large variety of interchangeable components readily available. Interchangeability of components in modular systems encourages vertical specialization, leading to the

Table III The theoretical framework applied to new product development

Characteristics	PAT	TCA	RBV	NT
Behavioral assumptions	Supplier and buyer may have conflicting interests	Calculative trust Safeguards by product architecture control	Trust of key suppliers for co-development of new components	Personal trust and information sharing Win-win situation
Problem orientation	How does product architecture control impact the degree of supplier involvement in NPD?	How many NPD tasks can be outsourced to suppliers?	How are resources related to product architecture designs managed?	How do modular product architectures enhance competition and/or collaboration among the actors of the network?
Time dimension	Normally an <i>ex ante</i> consideration Normally contracts are not drawn up until the product architecture specifications are set	Short-term contracts for standard components Long-term contracts for development of new components	New capabilities are created by combining and reusing existing capabilities	Short-term relationships for standard components Long-term relationships for co-development
Unit of analysis	Formal contracts for development of new components Patents	Number of components Degree of modularization Number of firms	Heterogeneity of inputs required to produce a product architecture Number of components Degree of modularization	Relationship between the buyer and its suppliers
Nature of relations	Adversarial relationships Contract influences both the number and type of outsourced components	Arm's-length relationship for standard components Strategic partnerships for co-development of components	Complementary resources Creating new competencies by collaborating	Strategic relationships for co-development of components Learning
Primary domain of interest	Alignment of behavioral and outcome-based contracts	Investment in specific assets (tooling, patents, technology know-how)	Development of new competencies (modular product architecture, component design, outsourcing)	Mutual adaptation and sharing of information Personal contacts Development of trust

creation of networks. One force speaking for vertical specialization is the dissimilarity among production stages. When resources are recombined in new ways, a number of interfaces with other resources need to be considered. Components and systems have to be designed so they are easy to assemble and transport. Handling this complexity has become increasingly important due to the ongoing changes of activity structures in industries. Furthermore, an increasing reliance on outsourcing leads to substantial interdependencies between the activities of different firms. One way to solve this complexity is through modularization and product platform designs (Mikkola, 2003c).

5.4 The resource-based view and NPD

Modularity management of product architectures can be viewed as the management of a firm's resources. It takes time and money to develop the capabilities associated with product architecture designs, and the subsequent market success (or failure) of the firm is dependent on the architecture's configuration (i.e. heterogeneity of resources and causal ambiguity), the extent of certain technologies and components' (i.e. resources and assets) inimitability by competitors, and the management of resources that must be shared with suppliers, especially when complementary assets are involved (Teece, 1986).

6. Frame of reference for SCM

Since supply chain thinking emerged, researchers from different disciplines have been in search of a theoretical foundation for the phenomenon. Chen and Paulraj (2004a, b), Croom *et al.* (2000), Svensson (2002), Mentzer *et al.* (2004), and Ganeshan *et al.* (1998) have pointed to different bodies of literature and management problems relating to supply chain management (SCM). Recently, Cigolini *et al.* (2004) presented SCM as resulting from a specific set of management and supporting tools that may be formed to achieve successful management of different supply chains. But none of these authors have presented a theoretical analysis of the phenomenon SCM.

As we interpret SCM as a network of socio-economic institutions, we have chosen a set of relevant theories that can be applied to the management and structuring of specific SCM arrangements (see Figure 1). The upper part of the figure includes the four different theories that we have combined to answer our two research questions:

- 1 How to structure a supply chain of collaborating organizations?
- 2 How to manage a particular structure?

The lower part of the figure illustrates the managerial arena of SCM, including the key elements (Lambert *et al.*, 1998), the prerequisites, and the outcome.

One of the contributions of the paper is the attempt to mitigate the gap between the current SCM research and practice and the theoretical explanations of how to structure and manage supply chains. The lower part of Figure 1 illustrates the characteristics often related to SCM. The left part lists a number of preconditions, which can be found in most theoretical and empirical studies of inter-organizational relationships, such as trust, long-term collaboration, mutual commitments, and willingness to share costs and benefits. The middle section shows the interactions between structure, processes, and management, which constitute the core of the

SCM concept. The right side shows the expected effect on SCM performance measured in terms of higher cost efficiency internally or in the interfaces between the SCM participants, better customer service, and higher flexibility and responsiveness towards changes in the customers' needs and expectations. The upper part of Figure 1 shows the "missing link" – a theoretical framework to analyze and explain the phenomena in the management arena of SCM.

7. Managerial implications

In this paper, we have proposed four different theories to be applied when making decisions on the structure and the management of supply chains:

- 1 transaction cost analysis (TCA);
- 2 the principal-agent theory (PAT);
- 3 the network theory (NT); and
- 4 the resource-based view (RBV).

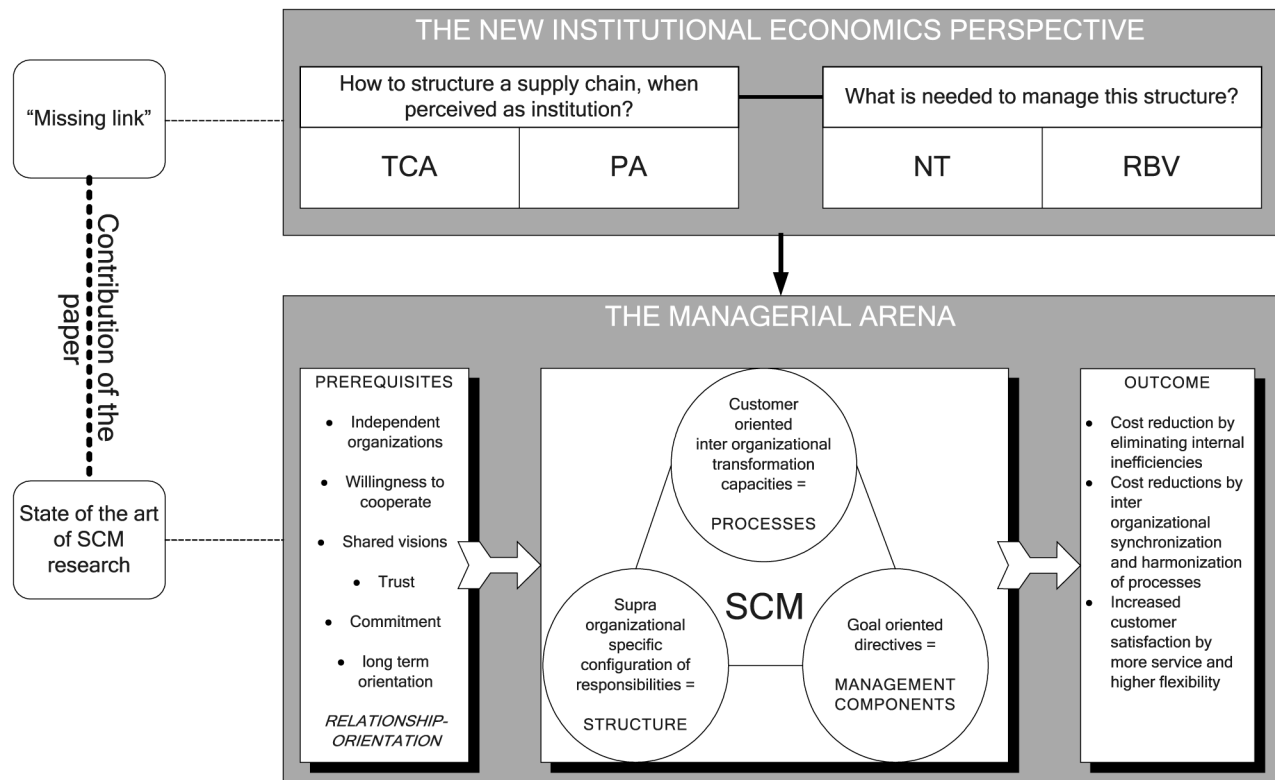
Both TCA and the PAT have their roots in neo-classical economic theory and are especially valuable when it comes to the issue of how to structure the supply chains. Important management decisions include, for example:

- 1 Which activities should the firm keep in-house, and which activities should preferably be outsourced to external partners in the supply chain?
- 2 What should be the roles, positions, and responsibilities of the participants in the supply chain?
- 3 How can the firm safeguard against the risk of opportunism from the other participants in the supply chain?
- 4 How should the incentives be aligned internally and between the participants in order to further the outcomes of the supply chain?

However, TCA and the PAT have limitations due to the embedded assumptions about human behavior and the static view of the firm's boundaries. Therefore, it is necessary to apply complementary theories, which can explain the dynamics in governance structures and inter-organizational relationships. Here, we have examined such challenges with the following two complementary theories: the NT and the RBV. The NT is basically a descriptive theory that examines how interacting companies in a supply network adapt their processes and systems to each other by exchange processes, and how they can develop trust and confidence in inter-organizational relationships over time. Trust is an important precondition in SCM. This is especially true in NPD, which often involves early supplier involvement in order to speed up time-to-market or to gain access to the latest technology. Trust can also serve as a governance mechanism in hybrid organizations, in line with price in the market and authority in the hierarchy (Bradach and Eccles, 1989).

The RBV complements TCA by considering the resources, capabilities, and competencies both inside the individual firm and in the linkages between the firms in a supply chain. The resources and capabilities of the firms play an important role in boundary decisions, as discussed by Barney (1999). Where TCA explains the boundary of the firm by characteristics related to the transactions (e.g. asset specificity and uncertainty), the RBV looks at the capabilities of the firm and the capabilities of potential partners in the supply chains when deciding which activities should be outsourced and which should be kept in-house. Combs and Ketchen (1999),

Figure 1 A middle-range theoretical frame of reference for SCM



however, warns that firms should be careful with the selection of theory used to explain inter-firm cooperation, as they sometimes come up with contradictory explanations. Their empirical findings showed that firms do not simply respond to the logic of only RBV or TCA, but rather react to contingencies identified by both. Barney (1999), for example, argues that the normative implications of TCA and RBV, respectively may differ; despite the circumstances of high asset specificity and risk of opportunistic behavior, in which TCA would recommend a “in-house” solution, while RBV would prescribe circumstances where outsourcing would be necessary. Cousins (2005) discusses this theoretical intersection further and suggests that supply and relationships modes must align with strategies of the firm.

8. Research implications

The research implication of this eclectic approach to SCM is that we cannot rely on one theoretical explanation (e.g. TCA or the RBV) when analyzing phenomena in SCM. We have to consider several theories and how they may complement each other in order to provide a more comprehensive view of SCM. Depending on the concrete situation, we can choose one theory as the dominant explanatory theory, and then complement with one or several of the other theoretical perspectives. The four theories selected in this paper are supported by empirical evidence provided mainly by the literature, both in general and also to some extent within the realm of SCM. The way the four theories complement each other is explored on a conceptual basis, but further research into this direction may explore more deeply how these alleged complementarities occur in practice, and how managers

mould their decisions by these ideas. In so doing, the theoretical development of SCM may reach beyond a mere battle of intellectual territories urging managers to operate in a wider, or almost infinite, domain. The main message in this paper is therefore that there is no such thing as “a unified theory of SCM”.

9. Conclusions

The starting-point of our considerations focused on two the attempt of explaining two research questions:

- 1 How to structure a supply chain?
- 2 How to manage a particular structure?

These questions are important, as many decision makers in business practice as well as in academia address these issues more often than to think of new possible definitions on the phenomena of inter-organizational management of transformation flows between production and consumption.

We have presented an argument that builds on organization theories in order to answer our questions, and this can be seen as an attempt to diminish the gap between current SCM research and practice and existing theoretical descriptive and prescriptive explanations.

We have therefore developed a general framework where we combine the managerial SCM arena with four different organization theories in order to explain our two research questions, and we use our framework for looking at two different problem areas within SCM:

- 1 third-party logistics; and
- 2 new product development.

We find that we cannot rely on one unified theory to explain inter-firm governance structure and management decisions in a supply chain, but have to apply complementary theories.

Furthermore, we can show that building a unified theory of SCM might be difficult, as many problems can occur whose solution might depend on different theoretical backgrounds. In that sense we have shown how our theoretical choice has shown different results depending on the observation perspective.

We suggest that further empirical and theoretical research is needed in order to find out the contingencies for choosing a specific combination of theories that adequately explains management decisions related to configuring and managing supply chains.

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