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## Transaction costs, logistics and the spatial-functional dynamics of supply chains

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# Transaction costs, logistics and the spatial-functional dynamics of supply chains

Paper to be presented at the European Regional Science Association (ERSA), 29-31 August 2001, Zagreb

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## Summary

External consumer market, technological and policy trends drive on inter-firm division of labour and the “logistification” of economies and international business. Over the last decades, manufacturing firms initially outsourced inbound and outbound logistics, and sometimes went so far as to include internal logistic functions. More recently, the client/supplier linkages start developing into strategic partnerships, with logistic service providers working their way up from the level of performing operational tasks to the tactical level of subcontracting and orchestrating a supply chain, while also providing strategic advisory services to their client on how to reconfigure a supply chain so as to enhance its performance, in terms of costs and customer service.

Despite the many good (competitive) reasons to do so, the above trends towards client-specific logistics is *not simply taking place* in reality. Shippers of goods (or “business owners”) fear competition of their subcontractors, have to rethink their core competence, and may be reluctant to make themselves too dependent on a few logistic service providers. These last, in turn, may have trouble upgrading their operational work of transshipping, transport and storage, while also fearing the loss of large client-specific investments.

In this paper, we propose to apply transaction cost economics to analyse these developments or the lack thereof—the delays, drawbacks and other problems that are part of partnership development. Taking a static and dynamic perspective, two case studies are presented of partnerships between business owners in the electronics industry and their lead logistic service providers. The results indicate that transaction costs and long-term benefits of a transaction relation matter for the stability, direction and results of a partnership, next to the well-known issues of chain power, market structure and external factors to the supply chain..

## Introduction

In a setting of a long-term, ongoing and dynamic process of division of labour within and between manufacturing and service firms, *logistics* has become an important function. Over the past decades, the inter-firm division of labour comprised the outsourcing of non-core activities by manufacturing firms, giving rise to 3<sup>rd</sup> party logistic providers who are responsible for inbound and/or outbound logistics. More recently, these client-supplier linkages develop into strategic partnerships, inducing 4<sup>th</sup> party logistic service providers to act as a lead logistic service provider for the producer, helping the latter to design, develop and implement new logistic concepts. Logistics has become a client-specific function (Peper and van Goor 2001).

These developments take place in a supply-chain context, in which logistic service providers face the task of connecting all parties, from the raw material supplier to the final consumer, integrating

information and physical flows, and maximising customer service at the lowest possible costs for the supply chain as a whole. ICT can enable data exchange between the parties, but more complex information problems remain to be solved in the contact, contract and control stages of transactions. In this setting, logistic companies have the opportunity to upgrade their services from an operational to the tactical and strategic level, developing into 4<sup>th</sup> party logistic providers that subcontract executive (manufacturing, transport, transshipment, storage) operations and co-ordinate the subcontractors, design supply chains for clients, and advise these last on how to further optimise their supply chains (Vermunt en Binnekade 1999, Van Klink et al, 1999). Such logistic companies orchestrate supply chains and develop new logistic concepts and strategies for their clients.

*Transaction-cost economics* (TCE) is a branch of economics concerned with the co-existence of firms, markets and hybrid forms of governance of exchange transactions (Coase 1937, Williamson 1985). More specifically, it is used to analyse the make-or-buy decisions of firms (Nooteboom 1994). In its static form, TCE is a framework for studying risk management in economic transactions. Williamson's work gave rise to a debate on the role of trust and opportunism in the coordination of exchange, more in particular in networks—a hybrid form of governance between the market and the firm. Also, attempts have been made to dynamise the transaction-cost framework, by focusing on the long-term benefits, e.g. learning and innovation, of developing relations between two or more parties (Nooteboom 1992, Visser 2000).

In this paper, the focus is on the use of TCE and related approaches for the explanation of certain development patterns in logistic systems that are based on outsourcing and strategic interaction between partners in a supply-chain context. The following questions will be considered: (1) to what extent does transaction-cost efficiency stimulate or hinder the rise of these systems, and to what extent are the dynamic benefits of long-term transaction relations important? (2) what is the role of regional variables in economising on transaction costs and thus stimulating logistic service development; (3) do regional differences in the institutional setting, trust, proximity, knowledge, skills, quality of life, accessibility and connectivity act as pull factors for the development of 3<sup>rd</sup> and 4<sup>th</sup> party logistic service providers?

To answer these questions, the first section presents Williamsonian transaction cost economics. Section 2 addresses some key points of criticism of TCE. Then, in Section 3, we look at the relation between transaction costs and regional development. Section 4 connects TCE with logistic system development in a supply-chain setting. Section 5 contains empirical evidence on emerging partnerships between producers and logistic service providers. Two exploratory case studies serve as a basis to develop hypotheses for future research—our task for Section 6. The last section presents conclusions.

## 1. Transaction cost economics

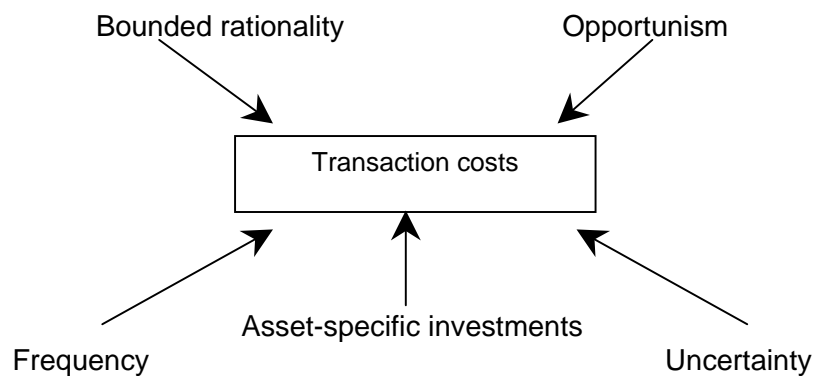
The origin of TCE is to help explaining the co-existence of various forms of organisation and mechanisms of co-ordinating economic transactions. Hence, Coase (1937) asked himself why business organisations exist, with entrepreneurs making decisions on resource allocation independently, next to markets where buyers and suppliers allocate resources on the basis of the price mechanism. Williamson (1985) dealt with the question of which governance structure is most suitable for transactions that differ as to the specificity of the investment, the frequency of transactions, and uncertainty. Williamson's analysis has often been used to choose the most suitable (i.e. transaction cost-reducing) form of economic organisation: the 'make-or-buy' decision. Below, we summarise Williamson's approach.

Transactions take place between firms, but also within firms. Williamson (1985) refers to the transfer of goods or services over a technologically separable interface. Transactions do not necessarily involve payment for the transfer of ownership rights, but may also involve the transfer of user rights without payment. Nooteboom (1998) stresses that a transaction is part of an exchange process, with a history of events taking place before and after that moment at which an agreement is reached and property or user rights are in fact being transferred. The production of the goods involved, or the actual transfer and delivery may well take place after some time.

The time factor thus plays an important role in the transaction process. Transaction costs emerge in a world in which time, expectations and uncertainty about concerning these expectations are important. Therefore, it is not so much the costs of administration or other direct costs of transactions that matter, but rather the *costs of managing behavioural risks during the transaction process*. These costs are being made so as to make sure that the expectations concerning the future transfer (production and delivery) actually come true. Transaction costs will rise with increasing uncertainty about possible deviations between expectations and realisation of these expectations (e.g. because of turbulence and unpredictability of demand, technology, competition or the policy environment).

The transaction cost framework implies a farewell to some key assumptions of the neo-classical analysis of competitive markets, including complete and symmetric information, rational choice, homogenous products, the number of buyers and sellers and the prospects of price co-ordination. Williamson (1985) introduces two new behavioural assumptions: bounded rationality, and opportunism (in the sense of 'seeking self-interest with guile'), as well as three basic features of transactions: the degree asset-specificity of an investment, the frequency of transactions, and the level of uncertainty in the environment. Here we will not deal in detail with the analysis. However, it is important to see that asset-specific investments are of no value outside a certain relationship with a client. The investment will be lost if this client behaves in an opportunistic manner, e.g. by not living up to the agreement as to the quantity of products to be purchased, while the supplier made a considerable and above all client-specific investment in order to make the delivery possible.

**Figure 1: Standard TCE**



Source: Williamson 1985

Transaction costs can be conceived as the costs made by a firm to prevent such a loss (here again, risk-management is central to the definition). This can be done by drawing up an explicit contract according to legal rules. A second possibility is to rely on the implicit contract, i.e. an almost tacit expectation that, at some point in the future, the other party will live up to the agreement. The difference is a gradual one. For example, a labour contract seems to be an explicit contract, with legal definitions of mutual obligations and labour conditions. However, this contract is incomplete, in the sense that it does not provide for the monitoring of the employee's behaviour after the appointment, nor does it take into account extra effort, motivation, pride and extraordinary performance. Informal expectations, norms and values can be more important for the effectiveness of a labour contract than the contract itself. Then, the labour contract acts like a loan that is being repaid in instalments. If the creditor is dissatisfied with the repayments, he can always decide to close the credit line, shut off the money tap and, if possible, fire the employee concerned.

Transaction costs consist of the costs of gathering information, negotiating contracts, and monitoring. This tallies with the three phases of transaction processes: contact, contract, and control (Nooteboom, 1998). The contact phase consists of searching, comparing, matching, consulting, evaluating and selecting a product. The contract phase is about negotiating conditions, drawing up a contract, and looking ahead at the future so as to take into account as many events as possible when drawing up the final contract text. In the control phase, monitoring and enforcement are important. In case of problems (deviations between expectations and realisations), parties may haggle (in or out of a court), impose sanctions, adjust contracts, recur to third-party mediation (arbitration), or simply enforce a deal, possibly involving legal costs. Both suppliers and buyers make these costs (cf. Table 1).

In standard TCE, transaction costs can be reduced by choosing the right co-ordination mechanism. For Coase, the choice is between the invisible hand of the market (price co-ordination of transactions) and the visible hand of the business manager or entrepreneur (co-ordination based on strategic, tactical and operational decisions within companies). Williamson (1985) distinguishes between bilateral and trilateral governance of transactions.

The transaction costs framework can be generalised assuming asymmetric information (when one party withholds strategic information) and products that differ from each other as to the possibility of verifying their quality. In this regard, we can distinguish between search products, experience products and trust products (apples, second-hand cars, and business consultancy, respectively).

**Tabel 1: Stages and activities in the transaction process**

Phase	Activity	Buyer	Supplier
Contact	Searching	Becoming aware of a need and of possibilities to fulfil this need	Considering manifest or potential needs of potential clients
	Matching	Alternative products	Considering the (relative) capability of the firm to fulfil these needs
	Evaluation	Alternative products	Determining product specifications, finetuning with the needs of customers
Contract	- Negotiating, drafting contracts, looking ahead and incorporating more details		
Control	<ul style="list-style-type: none"> <li>- Monitoring, haggling, imposing sanctions, adjusting contracts, calling for third-party mediation</li> <li>- Reducing the risk of opportunistic behaviour, e.g. making use of omissions in a contract, abuse of power in a relation (with negative effects for the quality of goods services)</li> </ul>		
3 x C	- Prevent inefficiencies caused by misunderstandings, mistakes and misspecifications, incomplete finetuning, incomplete application		

Source: Nooteboom 1998, 32-33

## 2. Criticism

Williamson received criticism concerning the choice between market and hierarchy, which excludes other forms of organisation between these two 'extremes'. In the real world, many 'hybrid' forms of economic organisation can be observed: loose, selective and almost casual forms of co-operation, joint R&D ventures, as well as well-designed and strictly managed subcontracting and information-sharing systems. These hybrid forms can be called 'networks'. For this third way of economic organisation to be accepted, a question to be answered is whether a network consists of co-operative relations between (legally independent) firms, with coordination of resource allocation and co-operative exchange taking place on the basis of some form of trust. Hence, we obtain price-coordination, entrepreneurial authority and managerial decisions, and trust as three alternative principles of coordination of economic exchange.

Another question concerning networks is whether this third way of economic organisation, next to being efficient from a transaction-cost point of view, is also a more appropriate form of economic organisation for coping with modern market and competitive requirements. This last question is

interesting, as it shifts the emphasis of the debate from static advantages concerning transaction costs (Coase, Williamson) towards dynamic benefits of long-term transaction relations (Nooteboom 1992, Visser 2000). Co-operation between firms can be an important setting for entrepreneurs and other decision-makers to face a diversity of information and views, to promote the exchange and assimilation of these ideas and views, and thus to foster innovation.

Beyond TCE, a lot of work has been done on issues related to the above debate, e.g. in the Swedish School with the well-known names of Johansson and Håkansson. These theoretical elaborations on economic transactions and relations have been developed separately, but Nooteboom (1998) devoted a book to connect the two strands. In his view, the two approaches are complementary (cf. Table 2).

**Table 2: TCE, criticism and current elaborations**

<i>Criticism of TCE</i>	<i>Current elaborations</i>
Transactions as 'events', without past or future, involving individual actors	Transactions are part of a <i>process</i> with the time dimension and the social context being important in offering scope for the social embeddedness of actors, and for networks
Emphasis on <i>opportunism</i>	<i>Trust</i> as a possible factor counteracting opportunism, and as a coordination principle related to inter-firm co-operation in networks
<i>Static perspective</i> : industrial organisation as a structure in equilibrium; with more than one form of organisation being observed, the main research method is comparative statics	<i>Dynamic perspective</i> : organisations are changing structures, based on relations between actors that adapt to each other and the environment, which learn, etc.
<i>Focus on costs and efficiency</i> : minimising transaction costs as the principal driving force behind economic organisation	<i>Development, change, building up competence, learning and innovation</i> are important elements of competitiveness and drive on changes in economic organisation

Source: Nooteboom 1998: 64

The points of criticism in Table 2 refer to the nature of: transactions, actors, organisations and competition. In our view, both standard TCE and ongoing elaborations offer insight in the purpose of economic organisation and organisational change. Efficiency is important, including transaction cost reductions. But so is the challenge of adapting and innovation in a dynamic environment, which implies a focus on the dynamic benefits of long-term transaction relations.

### 3. Transaction costs and regional development

The role of the region in transaction cost minimisation and transaction benefit maximisation has also been explored in the literature. In economic geography, Alan Scott (1983) was the first to use TCE, laying the foundations for the 'Californian School of Economic Geography'. He observed many small firms in the Los Angeles region, more than expected on the basis of the—then still common—argument that economies of scale drive on the size of businesses in modern economies. Scott explains the predominance of small firms with the help on transaction costs (while for another part using agglomeration advantages). Following this argument, it is firstly efficient to outsource activities and break up the production process in multiple vertical pieces, which is secondly also feasible in those regions (e.g. metropolitan areas like Los Angeles) where transaction costs are kept in check. This enables small firms to specialise and survive in a highly competitive and dynamic market and technology environment.

There are several reasons for regional differences in the size and composition of transaction costs associated with the coordination possibilities of markets, hierarchy (firms) and networks. From a static point of view, *proximity* of economic actors is important. In that it facilitates communication while also reducing the costs of switching between partners in case of opportunism (assuming that the investment can be used for another client). Next, it may increase the frequency of transactions between parties. Repeated transactions enhance the knowledge of users about their suppliers, thus reducing information problems and mitigating bounded rationality. In turn, the suppliers may strategically invest in a good reputation, working more, harder or better than specified in the contract. For them, it is a way of showing their reliability and reduce the perception of opportunism. For their client, it reduces transaction costs.

A related factor varying across regions and potentially reducing transaction costs is the *institutional setting*—defined as a set of formal and informal rules that act as constraints on human behaviour. Institutions are a product of experience, and thus of history. Institutional economics implies a recognition of the role of social norms and values in limiting the perceived range of possible behaviours, including risks of opportunism, and thus reducing uncertainty and transaction costs. Here, we may thus also mention the importance of the social environment in reducing perceptions of opportunism and uncertainty, thus increasing trust in a society.

What is important is to see that the trust required for co-operation varies across locations, in line with the business experience accumulating in the memory of business parties. Here, we may distinguish between "experience-based" trust—a result of business experience being built up by frequent transactions between the same partners, and "structural" trust—a stock variable that is also referred to as embeddedness in structural characteristics like religion, ethnicity, gender or age.

From a dynamic perspective, proximity, institutions and the associated transaction-cost reductions may enable organisational change: a transition from one to another governance structure, e.g. from large and vertically integrated conglomerates to vertical networks of specialised firms. Such may fuel economic growth and innovation. The role of strategy also needs to be taken into account to explain external organisational development; economic agents may recognise the need to co-operate and combine resources for joint learning and innovation in an unpredictable market and technology environment. Dynamic uncertainty induces (a perception of) mutual dependence of transaction partners (Camagni 1991).

In the long run, these factors give rise to differences in the regional-economic structure and growth. Physical proximity can be important for co-operation and competitiveness (at least as an interaction effect), but it also implies dynamic risks of lock-in or entropic death (Camagni 1991). This last is due to spatial differences in path dependence, with certain locations being characterised by specific industrial experience and learning processes. This can induce a form of path dependence hindering adjustment, especially where entrepreneurs are being led by strong local or regional traditions and mental models of how to successfully run a business. This can be conceived as collective 'bounded rationality'.

So, development can induce lock-in, and vice versa—in case a situation of lock-in leads to a crisis of the dominant mental paradigm and after some time induces a breakthrough, so that new information is being collected (not rejected) and assimilated, so that the mental model of how to successfully run a business changes, enabling the rise of other forms of economic organisation, e.g. networks, with

possibly favourable static and dynamic effects for the competitiveness of firms. Hence, regional and national differences occur in the degree and the pace of economic development (North 1994). It is not easy to see what (combination of) factors make for the difference between growth and stagnation. Italian industrial districts are known for benefitting from the possibilities of co-operation between small firms and with local institutions, more than in the many regional clusters of small firms in developing countries (Nadvi and Schmitz 1999).

To sum up, transaction-cost reducing and transaction-benefit enhancing mechanisms vary across regional settings. In some regions, especially regional clusters, the dynamic benefits of networking between firms and other organisations add to static advantages that are due to favourable institutional and physical factors causing transaction costs to fall and transaction benefits to increase.

## 4. TCE and logistics

In his 'Wealth of Nations', Adam Smith considers the division of labour to be the major driving force behind increased labour productivity and economic growth. Ongoing division of labour, within and between businesses, changes the organisation of work in such a way that logistics is becoming more and more important. Here, we define logistics as the function of connecting in time and space the value-adding activities of the actors in a supply chain—from the purchase of raw materials and manufacturing to the final step of distributing a product to the final consumer—with the goal to meet the requirements of the market at the lowest costs possible. Just-in-time management implies that the logistic function involves making sure that the right quantities arrive at the right spot and the right moment so as to minimise stocks.

Chandler already pointed out that large corporations, in order to optimise their scale and scope, require a different logistic and spatial organisation. The finetuning of purchasing, storage, production and deliveries induces the integration of internal and external logistics. Hence, large firms could realise 'economies of scale and scope' in the associated costs. In modern economies, the unit of analysis is not the firm but its multiple functional units. Firms locate various functions and departments (manufacturing, marketing, administrations, distribution, R&D, or call centres) in various parts of the world. Hence, the problem of coordinating flows of goods, services, information and finances extends to various departments.

Increasingly, the division of labour involves separate and independent firms. This is a result of firms seeking and defining their core competence, specialising in what they consider to be the key activity, and outsourcing the other operations. With this organisational process, firms aim at improving efficiency, flexibility and innovativeness. It should also be noted that inter-firm division of labour often involves an international network of businesses.

Hence, there is not only a coordination problem within the enterprise but also with (departments of) other firms and with consumers, at various geographical levels. In this setting, logistics as an effective logistic organisation is a necessary condition for inter-firm division of labour to develop, and more so in a rapidly internationalising business environment. Recently it has become clear that logistics is crucial in fulfilling customer orders in B2C e-commerce. It also explains the failure of dot.com sellers to meet the e-fulfilment requirements.

Chandler assigned the large corporation the task of technological development and permanent adaptation in processes, products, production structure, organisation and cost structures. In modern economies, this task is also being performed in a network setting: supply chains, subcontracting systems, regional clusters. The constant technological and organisational changes enhance the importance of transaction cost analysis in making the choice for the optimal organisation (including logistics) and a suitable governance structure. As stated before, this choice can not just be made on the grounds of static effects (efficiency, costs), but also needs to be based on the dynamic implications (learning, innovation) of a network or supply-chain reconfiguration.

### ***The wider context***

'Logistification'—the increasing importance of logistic relations between companies, is a result of long-term developments in consumer markets, technologies and the policy environment, ongoing changes in the division of labour within and between firms, the appearance of the supply chain as a major actor



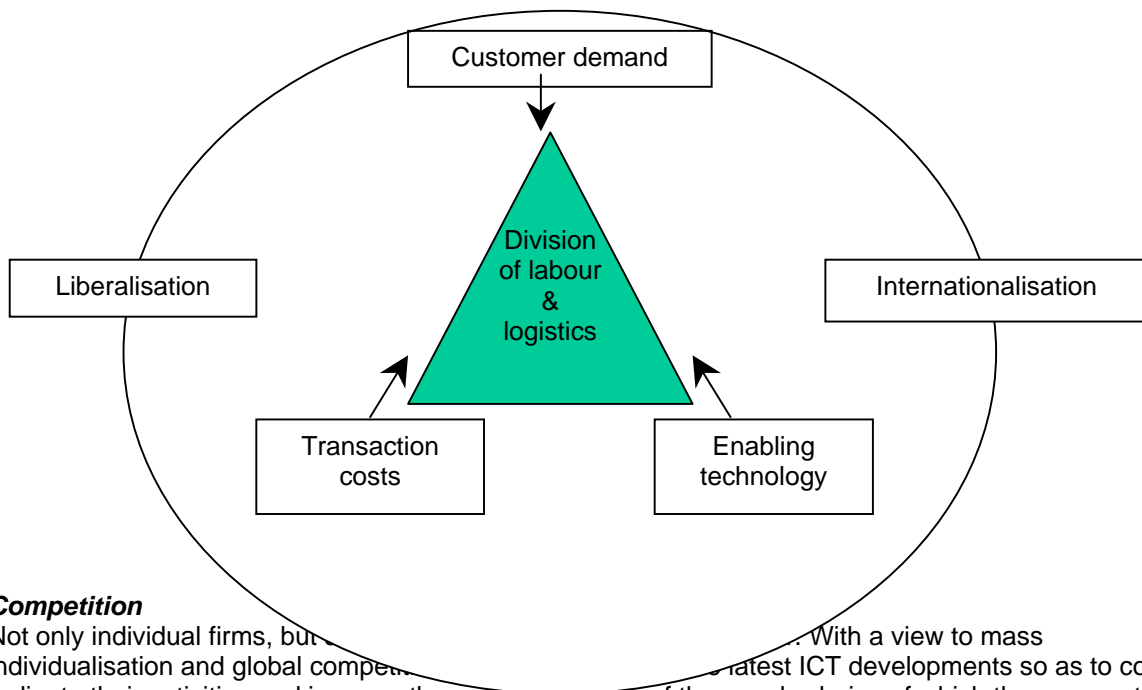
in the competitive environment, and the need to reduce transaction costs associated with these external organisational developments (figure 2). Below, we briefly explain these points.

Three external trends in the general business environment act as driving forces behind the increasing importance of logistics:

1. Demand: increasing diversity and volatility of consumer preferences, trickling down the supply chain: *mass individualisation* or *mass customisation*;
2. Technology: fast developments in information, communication and transport technology: *time and space-shrinking technologies*;
3. Policy: privatisation, deregulation and trade liberalisation induce the globalisation of product markets, increasing world trade and *global competition*.

These trends are largely beyond the scope of control of individual firms, including large ones. However, businesses adapt to changes in the external environment, according to some general principles or patterns that will be explained below.

**Figure 2: Driving forces behind 'logistification'**



**Competition**

Not only individual firms, but also industry branches, are competing. With a view to mass individualisation and global competition, companies use the latest ICT developments so as to coordinate their activities and improve the competitiveness of the supply chains of which they are part. Of course, competition remains relevant at the level of industry branches, between suppliers of raw materials, components, transport services or final products. However, a chain is as strong as its weakest link. Hence, companies look for ways to integrate their processes from the “sand to the customer”, thus improving the performance of the entire supply chain. In this setting, private organisations develop models to analyse supply-chain performance, such as the Supply-Chain Operations Reference (SCOR) model of the Supply-Chain Council.

This means that also in research focusing on logistics, supply chains are to be the unit of analysis. A supply chain can be defined as a set of flows and relations between businesses serving the needs of their subsequent customers and final consumers. Supply chains involve physical flows (goods and people), flows of information, and financial flows. Information and people move in two directions; products move downstream, while financial flows go the opposite direction: upstream. Supply chains are vertical networks of businesses that are involved in the provision of raw materials, the making of components, the assembly of products, physical transport, trade and logistic functions, and the marketing of products. In the past, supply chains have also been called commodity chains. Presently, there is increasingly talk of ‘demand chains’, so as to stress the importance of customers in the steering and execution of value-adding processes throughout a chain.

In supply-chain research, we can focus on: (a) activities—at various levels of the supply chain; (b) actors, undertaking these activities; (c) the nature or type of linkages between the actors; (d) spatial patterns of communication, transport and travel, associated with the preceding three aspects; and (e) decision-making within the supply chain, concerning e.g. the location of certain establishments or to use a certain transport modality for moving information, products, money and people.

### **Customer service**

From a supply-chain perspective, competitiveness is a sum of typical manufacturing concerns, such as a product's technical quality, reliability, form and fashion; marketing issues, like the company's reputation or the product's image (brand); and logistic requirements, where a key concept is 'customer service'. This concept refers to: (a) the availability of a product; (b) reliability of delivery; (c) lead times—in the manufacturing process, and speed of delivery—in the distribution process; (d) customisation of products for specific clients; (e) fast and effective customer information before, during and after a transaction; (f) fast and effective learning in the sense of elimination of errors and improved procedures; and (g) after-sales service—repair, components and technical advice.

### **Supply-chain competitiveness**

Strategy refers to a few basic questions: what are we going to produce, for whom, with whom and where? In line with these questions, we discern four starting points for reconfiguring supply chains to enhance competitiveness:

1. Regarding the "what?" question, firms focus on their *core competence*, specialising in a few activities and outsourcing non-core operations. We already indicated the implications for inter-firm division of labour, business networks and supply chains. Here, we observe an enhanced role of logistic service providers in taking over the responsibility of carrying out executive logistic tasks in a specific supply chain of the client (3<sup>rd</sup> party logistic providers); and in designing, orchestrating and further developing a supply chain (4<sup>th</sup> party logistic providers. 3<sup>rd</sup> party logistic providers often work in a setting of a traditional client-supplier relationship, whereas 4<sup>th</sup> party logistic suppliers operate in a strategic partnership with their client. The former is involved at the operational level of logistics; the latter moves towards the tactical and strategic level. 4<sup>th</sup> party logistic providers subcontract executive tasks to other companies, expand their network so as to cover an entire continent or the whole world, and specialise in specific industries so as to build up the know-how required to play their part in orchestrating supply chains and developing new logistic concepts for their clients.
2. The "for whom to produce?" question is also prominent. We refer to *supply chain reversal* so as to indicate that customer preferences and service requirements are being used more and earlier in supply-chain activities. This implies moving the customer-order decoupling point (CODP) up the chain. We may also say that demand-pulled activities replace supply-pushed activities.
3. Regarding the question "with whom do we work so as to fulfil customer needs?", the concept of *supply chain integration* applies. This means that businesses co-ordinate information, physical and financial flows (EDI, JIT, B2B e-commerce), and co-operate to improve the performance of the entire chain. Co-operation may go as far as delegating control over key operations to a partner, e.g. allowing a logistic service company or a supplier to monitor inventories and make the purchasing decision. The relatively new concept of supply-chain management (SCM) is also used to denote the importance of a supply-chain perspective and strategic co-operation to realise economies of scale (in core business activities) and scope (flexibility driven co-operation).
4. Regarding the question "where to produce?", ICT and worldwide deregulation promotes the internationalisation of supply chains, although companies still seek the benefits of strongly localised activities, e.g. centralisation of production at locations where companies specialised in a certain (branch of) industry and have proven to be highly efficient and innovative (e.g. Silicon Valley). We refer to the '*glocalisation*' of supply chains that are designed so as to take benefit of the advantages of centralising an activity (economies of scale and experience, low prices of inputs, innovativeness) and of decentralising other activities (increased speed, flexibility and responsiveness through customisation: assembly, packing, addition of labels, instructions, compliance with local regulation).

To sum up, four strategic starting points obtain for enhancing supply-chain competitiveness: core competence, customer service, co-operation and glocalisation. These starting points drive on emerging logistic systems such as postponed manufacturing and e-commerce, which build on earlier

logistic developments such as information-driven integration of purchasing, materials handling and distribution logistics (1970s), outsourcing of logistic activities to 3<sup>rd</sup> party logistic providers (1980s), and the emergence of supply chain management and 4<sup>th</sup> party logistic providers (1990s).

### **Emerging logistic systems**

*Postponed manufacturing* is a supply-chain concept matching the starting points of customer service (supply-chain reversal) and glocalisation. It seeks to combine global efficiency and local responsiveness (van Hoek 1998). Standard components are produced at a central location, while the final—diverse and variable—steps in the supply process are performed in a decentralised manner. Postponement refers to the delaying of value-adding activities in time and space. The company waits until an order is received and performs the final stages of the supply process close to the customer. The CODP moves upstream, enabling the customisation of the entire supply chain from the design of products, sourcing of inputs, manufacturing and distribution processes. Delaying activities in time enables the customisation of product form and content to specific requirements of customers, while delaying activities in space improves the speed and reliability of product delivery. The concept may reduce inventory levels beyond the benefits of centralised (European) distribution, while it has the potential of fulfilling the promise of B2C e-business: fast response and delivery of individual orders.

Postponed manufacturing considerably changes the spatial-functional configuration of international supply chains: the actors, their functions, relations and locations, as well as the flows of goods, services, people, information and money. It tends to move previously globalised activities back into Europe, and potentially increases local sourcing, induces the upgrading and involvement of logistic service providers, and may lead to a modal shift from road transport to other modalities (van Hoek and Visser 2001). Regarding the location of activities, the issue is where postponed manufacturing activities take place: in which country, within existing transport nodes, or at new locations?

Another recent logistic concept is the centralisation of distribution on the basis of a hub and spoke transport system, such as is the case in Europe with the emergence of *European Distribution Centres* (de Ligt and Wever 1998). The distinguishing feature of these centres is the focus on reducing the costs of international transport, transshipment, storage and stocks, i.e. an efficiency focus, at the expense of certain aspects of customer service.

*E-commerce* is a business concept focused on customising products and enhancing ease and speed in the contact and contract phase of transactions. It is an application of ICT enabling businesses and households to engage in transactions by electronic and computerised means. The B2C variant would enhance supply chain reversal while B2B e-commerce would stimulate supply chain integration and associated cost reductions. E-commerce can have many impacts on the various flows within a chain, which are still largely unknown. The outcomes will, however, affect the accessibility of places as well as the transport-modality and location choices of firms:

- At the level of physical supply (purchasing of inputs), e-commerce can take the form of B2B electronic marketplaces (extranets)—open standards allowing for the worldwide sourcing of standard components and other inputs. This may be part of a postponement scheme (in which global sourcing of standard parts is important).
- At the level of physical distribution logistics, e-commerce stands or falls with the capacity to organise back-office activities and fulfil the promises of front offices (aspects of customer service). The further development of B2C e-commerce crucially depends on e-logistics.

It may be that e-commerce drives on a future in which three main types of firms interact at the resource, information and business level (Vermunt and Binnekade 1999). *Business owners* design the supply chain or network; *fourth-party logistic service providers* orchestrate the activities, primarily by outsourcing executive functions (production, transportation and storage/warehousing) and coordinating these activities—the information function; and *jobbers*—companies with executive functions—do the work. In the same context, co-operative and integrative partnerships become important, and with this, the TCE framework.

### **Connecting logistics and TCE**

The increasing importance of logistics is due to a long-term, ongoing and dynamic process of division of labour within and between firms. Presently, functional interdependencies of businesses develop in the setting of supply chains. Logistics helps to connect people and organisations, and streamline the

flows of information, goods, services and payments between the actors. The complexities and capabilities involved require the outsourcing of logistic services, along with their upgrading from an operational to the tactical and strategic level. At these last levels, 4<sup>th</sup> party logistic service providers design and organise a supply chain for their clients, subcontract executive operations (manufacturing, transshipment, transport, storage, assembly), coordinate the subcontractors, and advise clients in the further strategic supply-chain development (Vermunt and Binnekade 1999, Van Klink et al, 1999).

This involves relation development between logistic service providers, their subcontractors and clients. This is where TCE can be brought back at the forefront, as the transaction-cost framework allows for evaluating make-or-buy decisions from a static and dynamic perspective.

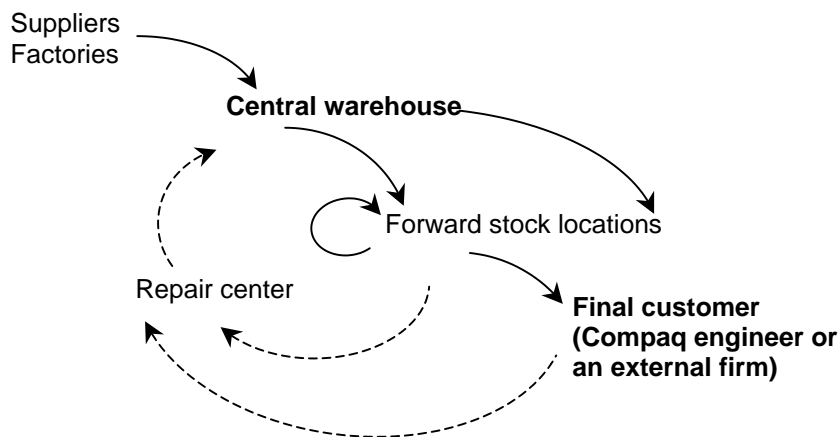
## Empirical evidence

In this section, we present empirical evidence regarding outsourcing and partnership development involving logistic companies, reviewing the connection between TCE and logistic systems development. We focus on the spatial-functional reconfiguration of the supply chains at stake, looking at the development of functions of each party, and changes in the way these parties interact and relate to one another. We also pay attention to locational aspects of these external organisational changes. Two case studies of alliances between business owners and logistic service providers are central, but we also briefly deal with the outcomes of a survey on postponed manufacturing in Western Europe.

### **Compaq and TNT Logistics**

In the course of 2000 and 2001, TNT Logistics gradually took over the Compaq spare-parts supply chain for the EMEA region (Europe, the Middle East and Africa). In doing so, a new multi-user infrastructure has been set up, including a central warehouse facility of 20,000 sq.m. in Bijsterhuizen, the Netherlands, and around 140 forward stock locations (FSLs) in 31 different countries, which 'migrated' from Compaq to TNT. The use of this infrastructure for other TNT clients as well enables the two companies to reap economies of scale and scope while at the same time improving customer service. The network set up by TNT Logistics looks as follows.

**Figure 3: The EMEA multi-user infrastructure of TNT Logistics**



Other TNT clients making use of the new EMEA infrastructure are Ciena en Ericson (EMEA news 5). However, Compaq is expected to remain the largest client of the existing infrastructure, at least until 2005. New central warehouses may be opened for the new clients, at different locations, depending on the availability of skilled labour, the geography of the demand for products of a new client, and the legacy of the existing infrastructure of a client. However, the FSL structure and the central services that TNT Logistics develops to support the network can be used for new clients, enhancing economies of scale and scope.

Strategic goals. As stated above, the benefits of the Compaq/TNT partnership are to realise economies of scale and scope in total logistics costs and to improve customer service. More

specifically, Compaq aims at more flexibility and lower costs, where in the company's recent past internal logistics management meant low levels of flexibility regarding capacity and routing, and high costs—due to the complexity of the logistic task, inefficiencies and also coordination problems. Next, Compaq aimed at bringing down the number of about 450 logistic subcontractors (with which it had worked when distributing Compaq, Digital and Tandem spare parts) back to one global logistic service provider, so as to avoid concluding separate contracts and controlling too many relationships. However, no global logistic service provider is available at this moment. Therefore, Compaq ended up with three logistic companies, each specialised in a macro region in the world economy (see table 4).

**Table 4: Compaq's logistic service providers**

Region	Service provider
EMEA	TNT
North America	UPS
South America	DHL

The reason for selecting these three logistic partners was thus not to spread risks or avoid unilateral dependence, but to bring down logistic and transaction costs, while at the same time ensuring the fulfilment of customer service contracts. Some of these contracts imply a two-hour delivery time of spare parts. The three logistic companies together are able to efficiently (costs) and effectively (customer service) manage the worldwide spare-parts supply chain of Compaq. UPS is best capable to serve the US market; DHL is familiar with Latin America, and TNT commands a larger variety of transport modalities, language and cultural skills in the European market. Of course, the service providers aim at becoming Compaq's one and only global partner for logistic services, and thus expand the geographical area covered as well as the range of functions offered. In practice, optimal service levels still require co-operation between the competitors. So, the paradoxical situation emerges in which logistic companies on the one hand co-operate but on the other compete while aiming at a merger or acquisition. 'Who buys who?' is the only remaining question.

To sum up, Compaq's strategic purposes are to re-establish core competence, to enhance flexibility, to reduce fixed logistics costs (exploiting economies of scale and scope in the multi-user infrastructure, and by making use of TNT's expertise and experience in managing supply chains, to save on transaction costs by means of selecting only one or a few contractors, and to ensure fast and reliable delivery of spare parts. TNT Logistics engaged in the partnership so as to achieve the long-term and strategic goals of becoming a logistics service orchestrator specialised in four industry sectors: electronics, automotive, fast moving consumer goods and pharmaceuticals. TNT Logistics saw that spare parts in the electronics industry was a niche market in which it could quickly build up a leading position. The company also realized that a multi-user infrastructure yields cost advantages, and needed a large customer to accommodate the risk of building a large multi-user network. With their multi-user infrastructure, TNT Logistics and Compaq may be regarded as 'first movers'.

These goals have a relation with developments in the wider demand, technology and policy environment as described earlier in this paper. TNT Logistics specifically perceives a trend towards the outsourcing of logistic activities, a need for "one-stop shopping", demand for new logistics concepts, internationalisation, centralisation of distribution, and increased emphasis on time-sensitivity (EMEA news 4).

**Table 5: Motivations for partnership**

<i>Compaq</i>	<i>TNT</i>
Re-establishing core business	Specialization in electronics sector
Buying flexibility	Upgrading activities, becoming a logistic orchestrator in a global context
Reducing fixed costs (logistics)	Critical mass for building a multi-user infrastructure (indivisible investments). Realising economies of scale and scope.
Reducing Coasian transaction--search and contracting--costs, by outsourcing to one	Reducing transaction costs, related to the Williamsonian risk of opportunism and a

or a few contractors	potential loss of client-specific investments
First mover advantage Enhancing customer service (fast and reliable delivery) And increasing market share, growth of turnover and profits	

Transaction costs: contact, contract and control. Above, transaction costs have been mentioned as an important factor in the decision to externalise logistics and to drastically reduce the number of logistic service providers. Here, we dig deeper into the issue of transaction costs in the course of relation development: search and matching, screening and selection, contracting, monitoring and enforcement. The data are based on ongoing case-study research; hence, below we make indicative remarks that later can develop into a hypothesis for further research.

In the *contact* phase, Compaq selected candidates for the position of lead logistics service provider asking to develop a logistics concept for a specific geographical region. A contract would be offered to the 'best of breed'. TNT Logistics regarded Compaq as a very interesting client, and thus invested in developing a concept. After Compaq approved the TNT Logistics concept for the EMEA region, a letter of intent was signed, marking the start of the *contract* phase. The final version of the generally binding contract did not include all EMEA countries; the partnership is too far-reaching and innovative to capture all details, actors and countries in one single contract. Building trust seems to be part of the contracting phase. There are a lot of meetings between TNT and Compaq managers, information exchange, kick-offs, etc. Much attention is paid to communication with the FSLs in the many countries. But also at the central level, great effort is put to word the essence of the relationship: "co-operation", 'the will to make it happen', 'partnership' and even 'harmony' are keywords recurring in a TNT newsletter devoted to inform the various parties involved in the multi-user infrastructure. At the central level, trust-building is an ongoing process facilitated by the common objective of lowering costs. However, there is a discrepancy between the contractual relationship between TNT Logistics and Compaq at the central level, and the operational relationships at the level of individual countries. At the country level, the focus is on maximum customer service and thus on the proliferation of existing FSLs.

In the *control* phase, Compaq and TNT have the difficult task to evaluate TNT's performance. Key Performance Indicators (KPIs) are used to link the processes, financial results and information system, thus tracking the projected benefits. The problem is that comparing the performance of many different countries on the basis of static and multi-interpretable measures is not very precise. Hence, TNT Logistics develops a dynamic information system that bundles and centralizes (partially web based) information flows. The ultimate goal is to make a Supply Chain Management (SCM) Dashboard, which will serve to inform TNT clients about the performance of the entire supply chain and the contribution of each actor to this achievement, on the aspects of costs and service. According to TNT and Compaq managers (EMEA news 7 and 8), this is currently the largest challenge. In the short term, it refers to the completion of the information management (IM) system, which requires that Compaq has to deliver full information to TNT. In the long run, the projected benefits of the EMEA multi-user infrastructure have to be demonstrated.

The contract between TNT Logistics and Compaq expires in 2005. TNT made specific investments in the infrastructure (the central warehouse, the FSLs and the selected locations), which require the presence of a large client such as Compaq. The contract between TNT and Compaq indeed catalysed the investments. The multi-user purpose will accommodate the specificity of the TNT investments, but not completely. Meanwhile, Compaq will organise a new tender in 2005, thus raising the possibility of selecting another logistic service provider for the EMEA region, perhaps the much-desired global player. In this context, the relation is currently still one in which both parties are reluctant to make specific investments, so as to avoid becoming too dependent or in Williamson's terminology, too much prone to the risk of opportunistic behaviour of a partner and losing one's investments.

On the other hand, the relation is developing. The ongoing interaction and co-operation between managers of both companies lead to, what we call, dynamic benefits of a partnership. Through time, the dynamic benefits may exceed the perceptions of risk, dependence, transaction costs and control problems. Indeed, supply chain integration resulting from the implementation of the dynamic information system of TNT Logistics makes that it will know the effects of Compaq's product life cycle

management, inventory planning and replenishment. Hence, it will be able to consult Compaq in areas that are closely related to logistics, but which are seemingly part of the *core activities* of Compaq. The two companies may step up co-operation in planning the supply chain. Together with the managing and orchestrating role of TNT Logistics, these may be enough to warrant a continuation of the partnership after 2005.

Characterising the role of TNT. Fourth-party logistic service providers design and organise the supply chain for their clients, orchestrate and subcontract executive operations, coordinate the activities of the subcontractors, and provide advisory services and research to assist in further supply-chain optimisation (Vermunt and Binnekade 1999, Van Klink et al, 1999). TNT Logistics comes close to the description. The difference with a 'pure' fourth-party logistic service provider is TNT's involvement in carrying out executive tasks: storage, stock control, express services and even some activities that are part of Compaq's core business, such as repair.<sup>1</sup> Concerning spare-parts delivery in the EMEA region however, the company acts as an orchestrator managing physical and information flows, while subcontracting the transport function. As a Compaq manager told us: 'subcontracting is one of TNT's core activities'. TNT Logistics selects transport services on the basis of their price-quality ratio, which goes as far as selecting UPS (and not TNT Express--its independent sister company) for international transport.

The orchestrating, subcontracting and supply-chain management function of TNT Logistics are *tactical* in nature. However, TNT Logistics has a *strategic* task of the further optimisation of the supply chain, trading off the conflicting goals of maximising customer service while minimising total logistics costs. In this respect, the IM system currently under construction will be crucial in enhancing the transparency of the chain, including cost and customer-service related KPIs. Also, TNT Logistics aims at minimising the number of actors in the supply chain (distributors, forward stock locations and control places) and the number of functions that each employs, while centralising the locations of activity as much as possible.

The situation is not unambiguous. Compaq is a large client of TNT, manages a strong trademark, knows the market and its customers, and is thus in the best position to judge upcoming situations. So, Compaq is the powerful party in the chain, making the relevant supply-chain decisions. This power is also due to the extent of competition between logistic service providers, both within and beyond the Compaq global network. On the other hand, TNT is settling itself in the Compaq spare-part supply chain along the lines depicted above. The long-term outcome for the stability of the partnership can not be known, as it depends on the balance between costs and benefits, including the trade-off between transaction costs and the dynamic effects of the partner relation.

Location aspects. Location choice is part of the strategic function adopted by TNT Logistics in the course of time, whereas in the past Compaq would buy this type of advice from consultancy firms. One task of TNT is to optimise the FSL structure. So far, remodeling has taken place on a country-by-country basis, leading to a few changes in the number and/or location of FSLs on the basis of delivery time/cost considerations. However, cross border delivery will in the near future be possible, supported by the IM system. Remodeling will then be done at the supranational level. The optimal location of a FSL is determined by the 'customer base' (size of the market), delivery time, delivery reliability (congestion), and costs. This may imply that in the future, a number of FSLs may be closed and/or replaced by regional warehouses. An important condition is that such will not be at the expense of customer service.

Sometimes, a location choice goes hand in hand with transport modality choice, such as is the case of Athens, where the only way to avoid traffic jams is to use the motorbike. Another possibility is to establish an extra FSL in a high-congestion region, such as happened in Gouda and Amsterdam.

TNT Logistics anticipates the arrival of new clients when creating infrastructure. This may imply a temporary situation of excess capacity. The sudden arrival of a new client may also mean the opposite: shortage. Together with other changes induced by a new client (such as the geography of its

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<sup>1</sup> The range of TNT services exceeds contractual obligations by roughly 40 percent. TNT sources 'techno couriers', which is a service combining transport and simple repair activities.

demand), this may lead to investment in expansion of the infrastructure, relocation or an additional location.

***Hewlett-Packard and Exel***

In this case description, we address the major differences with the previous case, paying particular attention to transaction-cost issues. It should be noted however that this case refers a different logistic context, of two companies (Hewlett-Packard and Exel) involved in a postponed manufacturing scheme. We will first deal with the outcomes of a recent survey on postponement in Western Europe, before describing the case-study information.

*Postponement*

A recent survey regarding postponed manufacturing in Western Europe shows that the Netherlands and France are laggards in postponement applications, while Germany and Belgium are leading. Regions lodging relative concentrations of postponement facilities are Stuttgart, Brussels and Antwerp. The airports of London, Paris and Frankfurt are also attractive. Next, it is notable that manufacturers are mostly involved in the concept, leaving other supply-chain parties—such as logistic service providers—behind (van Hoek and Visser, 2001).

Several factors help to explain the differences. One is that postponement requires strict supply-chain planning so as to ensure agreed targets regarding delivery time and reliability, responsiveness and the technical quality of delivered services and components.<sup>2</sup> Postponed manufacturing serves to simultaneously achieve global efficiency and local responsiveness, but it requires close co-operation between companies at the international and national level. The question is to what extent the associated transaction costs may rise so as to continue gaining from this system and avoid trouble (supply-chain failure) for customers. These costs may vary between countries and regions, depending on the accuracy of logistic service providers and path-dependence, which may obstruct or facilitate their flexibility and innovativeness, and thus also the involvement of logistic service providers in postponement schemes.

*The case*

As from 1991, Hewlett-Packard (HP) and Exel are involved in a postponement scheme for laserprinters. However, the two companies initially maintained a typical client-supplier relationship, with HP planning and managing the supply chain while subcontracting simple, low value-added activities to Exel, which until 1998 merely provided personnel to undertake the outsourced operations. A major node in the laserprinter supply chain is the European Postponement & Distribution Centre in Amersfoort, the Netherlands.

In 1998, a crisis situation emerged. HP was unable to control the costs of handling increased volumes and product varieties at an ever higher speed (shortening product life cycles). This induced HP to upgrade its relation with Exel, transferring the tactical responsibility of managing and orchestrating the Benelux supply chain, including the Amersfoort centre. So, Exel no longer merely supplies labour input to a HP planned and managed supply chain, but manages the supply chain and advises HP on aspects of its supply-chain planning. HP in turn selects its service providers no longer on the sole basis of costs, but also takes into account their ideas and logistic solutions proposed to deal with complex logistic situations. Next to Exel, HP also deals with other contract manufacturers in Europe (table 6).

**Table 6: HP's contract manufacturers/logistic service provider**

<i>Region</i>	<i>Service provider</i>
Benelux (Entry to Europe)	Exel
Germany	Kuhne & Nagel + SNS
France	FML

Strategic goals. Since its 'near-to-death' experience in 1998, HP pursues a Contract Manufacturing strategy that aims at balancing risk, lowering total supply-chain costs and enhancing flexibility. The risk

<sup>2</sup> Another one refers to the industry mix of the various countries. Across industries, the automotive and electronic industries are leading in postponement, with other industries applying more (client) specific forms (Van Hoek and Visser 2001).



and cost objective is dealt with by stimulating competition between service providers. Each product group is to be serviced by two contract manufacturers (supply chain disintegration). This also enhances flexibility, as HP is able to switch between contract manufacturers, e.g. in case one runs out of assembly or storage capacity. In 2000, Kuhne and Nagel lacked storage capacity, with Exel taking over by immediately arranging a warehouse in Utrecht for three months. Table 7 summarises the various HP motives for subcontracting and the new functions these bring along for Exel.

**Table 7: Motives of HP and Exel to step up co-operation**

<i>HP</i>	<i>Exel</i>
Request for Concept	Concept development / advice
Back to core business; lowering supply-chain costs	Vendor Managed Inventory
Spreading risk	Contract Manufacturer
Buying flexibility	Making projects

Transaction costs: contact, contract and control. HP diversifies its risks, selecting multiple contract manufacturers within Europe, and outsourcing the distribution of products from the Amersfoort centre to the final market to various logistic service providers within the Benelux. Hence, from a static point of view, Williamsonian transaction costs are limited for HP, while Coasian costs of search and matching are lower than the alternative costs of internal coordination of the logistics and assembly functions. For Exel however, things are different. Exel has invested in a dedicated warehouse in Amersfoort, which is completely finetuned to the needs of HP. This includes personnel and the assembly lines, which in the near future will be owned by Exel. Of course, the costs of operating the centre are being charged to the customer, including a mark-up. But switching costs are significant, turning into a loss for Exel in case HP decides to end the relationship. Such would also affect Exel's investments in special projects and products-in-stock, with which Exel contributes to the flexibility of HP's supply chain.

From a dynamic point of view, Exel's position improves. Of course, HP gains from the experience that Exel has acquired in managing its supply chain for laserprinters. The positive effects, of experience (elimination of errors and failures) and learning (improving the logistics and assembly functions), however enhance HP's dependence on Exel. Next, outsourcing the management and operation of its supply chain implies the sharing of information between HP and Exel, and consulting the latter on issues related to product development. Exel engineers are really able to advise HP on this last matter. This enhanced technical expertise on the side of Exel may be seen as overlapping with HP's core activities. In fact, this cements the relationship between the two parties, making that the parties overcome static problems of contract and control and enhancing the stability of the relation. On the other hand though, Exel aspires to use its know-how for other clients and supply chains as well. HP does not allow, however, that the dedicated warehouse in Amersfoort be used for other customers. It trusts that strategic information is kept confidential, while ensuring this, where possible, with contractual agreements.

Characterising the role of Exel. Using the earlier-mentioned definition, Exel is not a 4<sup>th</sup> party logistic service provider. Exel is not involved in the planning of the supply chain, nor is it allowed to autonomously decide on subcontracting issues. It orchestrates part of the supply chain in the Benelux and advises HP on certain key issues, but only when asked. We would say that Exel aims at making the transition from 3<sup>rd</sup> to 4<sup>th</sup> party logistic provider, but the company meets many obstacles in the relation with HP.

As in the Compaq/TNT situation, HP has superior market knowledge and therefore it is the primary strategic decision-maker concerning its supply chains, deciding when, where and what to produce. Exel is being informed and consulted during the product life cycle, especially in the first phase of a new product introduction. Over the past years, Exel lived up to HP's expectations, making promotion from being a subcontractor to a contract manufacturer with logistic and manufacturing (assembly) expertise. Exel engineers indeed have unique (client, product, process and site-specific) skills.<sup>3</sup>

<sup>3</sup> They are able to adapt assembly lines to changing demand. One change that Exel carried out is the replacement of automated assembly lines by manual ones, which imply higher labour costs but also lowers the cost and time of making adjustments. Next, Exel postpones the completion of a product as

The driving forces behind ongoing and enhanced postponement are increasing product variety and shortening life cycles of HP products. To cope with this, HP asked Exel if it were feasible to split up the Amersfoort site and localise assembly lines closer to final markets. This is not feasible, however, due to—what the parties call—the ‘Cannon’ push: a fixed volume of containers with standard intermediate products arriving from South-East Asia at the port of Rotterdam. The volume of incoming products is determined in six-month contracts between HP and Cannon. This ‘push’ factor makes the supply chain inflexible, e.g. in terms of stock control. Exel apparently solves the problem bearing the stock-related risks. After receiving the contents of the containers from Nippon, a company transporting the goods from Rotterdam to Exel’s overflow locations in Amsterdam and Nijmegen, Exel distributes the products on a flexible-order basis to Amersfoort centre. Hence, Exel absorbs the problem of an inflexible supply chain.

Recently, HP allowed Exel to outsource some activities to third parties, and to introduce a system of Vendor Managed Inventory, in which Exel decides on the frequency and volume of postponement-related deliveries, such as packing materials. Exel also started to offer HP additional space on a project basis, so as to enhance supply chain flexibility and capacity.

It is interesting to contrast the role of Exel in the HP chain with its function for two other clients, Nokia and Motorola. For Nokia, Exel is the lead logistic service provider for Europe, developing 9 vendor hubs for the distribution of components to various plants where mobile phones are assembled. In this relation, Exel is able to use an advanced e-market device, the Supply Chain Integrator (SCI). This device serves to optimise stock control, enhance supply-chain transparency, improve flexibility and adaptiveness, while connecting to the existing IM systems of the various parties involved in the supply chain. Also for Motorola, Exel is able to use its SCI and to outsource key executive activities, such as international transport to UPS.

Location aspects. A question is why Exel could strengthen its position in the Benelux, while its influence on the international supply chain remains very limited. An answer may be that the operations of Exel are increasingly embedded in an ongoing learning process in which many people (workers, engineers, subcontractors) are involved. Moreover, the know-how that is being built up is specific in terms of the customer (HP), the product (laserprinters), the process (of postponed manufacturing) and the site (the Amersfoort centre). At this location, HP business units were present before HP and Exel started to work together. Daily face-to-face contact and interaction stimulates process-based trust. Also, a dynamic process of mutual learning cements the position of Exel in the chain. True, it took a crisis to trigger HP to translate its trust in Exel into a transfer of responsibilities and to upgrade the relation.

#### ***Evaluative comments on the two case studies***

TNT Logistics aims at becoming a 4<sup>th</sup> party logistic provider, but meets some obstacles: of market information and economic power (Compaq is the business owner), trust (in a still incipient relation), know-how (as TNT is currently *specializing* in its target industries), asymmetric dependence (of TNT on Compaq) that through time needs to be transformed into symmetric dependence between the two companies, and the fact that TNT’s competitors (DHL, UPS) fight to take the position of global logistic service provider. Despite the importance of the other factors, e.g. the power issue, we observe that both the static and dynamic elements of TCE are relevant to explain key aspects of the ongoing relation development between the two companies. More so, we think that the dynamic effects of the relation may overrule static problems of control, dependence asymmetry, and fierce competition with other logistic providers. In our view, TNT should focus on the design, orchestrating and development functions, and show itself to be a innovative partner of Compaq. Better still, TNT would also become a more credible partner for strategic supply-chain development once its profits do not depend on filling its warehouses and other physical infrastructure.

Looking at Exel, we see it taking over more responsibilities in carrying out executive logistic tasks, while the company is not allowed to move in the direction of designing, orchestrating and developing supply chains for HP. Exel maintains a more traditional client-supplier relationship with HP, whereas

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much as possible, standardising as much as possible the production process and only starting up the final assembly, in line with country and client-specific requirements, at the last possible moment, all with the purpose of using space more efficiently.

the Compaq/TNT relation resembles a more strategic partnership. Strategy makes a difference. It was Compaq's conscious strategic choice to work with TNT, while HP had to delegate responsibilities to Exel in the aftermath of an operational crisis. Another factor may be that Exel has not yet acquired the capacities and capabilities of a 4th party logistic service provider, such as an international network of subcontractors or the capacity to develop new logistic *concepts*. Exel certainly has unique technological know-how through its involvement in postponement applications of HP, making that the company faces less competition than TNT in its relation with Compaq. However, the risk of losing specific investments reside on the side of Exel. Within the setting of the Benelux supply chain of HP, there seems to be a situation of symmetric dependence. Here too, a way-out for Exel is show itself to be a innovative partner for HP, so as to overcome the obstacles on both sides of the relation. Exel would also become a more credible partner for HP if the company made a more radical move towards the supply-chain orchestrator function, usings its SCI, as it does for Motal and Nokia.

## Hypothesis

Outsourcing and co-operation are central features of current supply-chain reconfigurations. In a context of enhanced global competition, 'business owners' seek to benefit from the know-how of logistic service providers (orchestrators) and their suppliers (of manufacturing, transport and other physical services). In a setting of postponed manufacturing and e-commerce, 3<sup>rd</sup> and 4<sup>th</sup> party logistic service providers thus work together with their clients so as to cut costs, improve customer service and enhance cross-firm learning so as to cement the relationship.

Considering the available case-study evidence, we may apply TCE to formulate a hypothesis to explain the delays, the problems, the organisational form and the impacts of these ongoing logistic developments. To be sure, ICT facilitates virtual alliances supporting supply-chain and logistical innovations, but transaction costs continue to be important as certain coordination problems and risks cannot be dealt with through the wires and satellites of the internet. Hence, regional differences in the level and nature of transaction costs may imply spatial differentiation in supply-chain developments, business and regional development, location behaviour, land use and spatial transport patterns.

The case studies show that the economic power of business owners, the structure of the market for logistic service companies, the capabilities of these last and various other (external) factors influence the extent to which:

- business owners outsource operational, tactical and strategic activities to logistic service providers, and
- the parties co-operate (SCM).

However, the evidence also indicates that static and dynamic aspects of transaction relations are important. Static transaction-cost optimising plays a role in the decision to outsource logistics in the first place, and the decision to reduce the number of subcontractors in the second. Dynamic considerations play a role in upgrading the linkage between business owners and logistic service providers, so that the latter develop into supply-chain orchestrators and designers of novel logistic solutions. Hence, our next step can be a large-scale research project to test the relative relevance of these dynamic and static aspects in key supply-chain developments. Such a hypothesis should contain a pull factor explaining why a supply-chain reconfiguration is likely to occur, before testing the push and pull impact of transaction costs and benefits.

In the practice of empirical research, it is not easy to use the TCE framework because "transaction costs are hardly separable from other cost types. Measuring costs and attributing these to specific transactions takes [...] an enormous research effort" (Hobbs 2000) . On the other hand, however, specific methods are available to enable transaction-cost based analysis of supply-chain developments:

- Evaluating the impact of transaction costs on vertical coordination and integration on the basis of secondary data;
- Branche-specific research, also evaluating the impact of transaction costs on vertical coordination and integration on the basis of secondary data;
- Branche-specific research, evaluating the impact of transaction costs on vertical coordination and integration on the basis of primary data and analyses (Hobbs 2000, p 168).

The last option is most feasible, considering the attribution problem. This type of research should be comprehensive in taking into account *four* cost types—related to the transformation, logistic, transaction and innovation processes taking place in the business sector (cf. Table 3), next to the benefits of a certain logistic system in terms of 'customer service'. All these factors, one of which relates to the TCE framework, are to be taken into account.

**Table 3: Functions and costs of firms in static and dynamic perspective**

<i>Function</i>	<i>Manufacturing</i>	<i>Sourcing and sales</i>	<i>Logistics</i>
Description	Process of transforming inputs into final output. This process changes the function and form of physical products	Process of buying inputs, transacting throughput and selling output. This process refers to the transfer of ownership and/or user rights of the products.	Material management (inbound logistics) and physical distribution (outbound logistics), related to transport, transshipment, and storage of products. This process changes the time and place of a product
Related costs in static perspective	<i>Transformatie kosten</i>	Costs of search and matching in spot market transactions: <i>Coasian transaction costs</i>	Costs of transport, transshipment, storage and distribution of products: <i>logistic costs</i>
Related costs in dynamic perspective	Costs of research and development (R&D); <i>Innovation costs</i>	Costs of contact, contract and control in the development of long-term co-operative relations between suppliers and clients: <i>Williamsonian transaction costs</i>	Costs of contact, contract and control in the development of co-operative relations between suppliers and clients: <i>Williamsonian transaction costs</i>

## Conclusion

In this paper, the question has been whether TCE is a useful framework for the explanation of specific patterns in logistic service development associated with supply-chain reconfigurations based on outsourcing and strategic partnerships. Case-study evidence indicates that transaction-cost efficiency matters for the decision to outsource and reduce the number of partners, and furthermore suggests that dynamic benefits of the relations between business owners and logistic orchestrators may become an important factor in the development and, in fact, the breakthrough of 4th party logistic service provision.

We also wondered about the role of regional variables in economising on transaction costs, stimulating transaction benefits and thus logistic service development. Do regional differences in the institutional setting, trust, proximity, skills, quality of life, accessibility and connectivity act as obstacles or pull factors for 3<sup>rd</sup> and 4<sup>th</sup> party logistic service development? This question remains open, as cross-section survey data are required to deal with this issue. The case-study evidence bears little information on the link between TCE, logistics and regional issues. This may be due to the fact that we have been paying attention to large multinational firms (such as Compaq and Hewlett-Packard), while so far SMEs have been central in theorising on the relation between TCE and regional development. So, some theoretical work remains to be done. We expect however, that the link between TCE—in its static and dynamic manifestations, logistics and regional issues is a fruitful one when looking at the position of certain key nodes of transport (such as the Rotterdam seaport), international location

patterns as well as the implications for international and national freight transport: modality choices, size, frequency, composition, origin and destination of the flows.

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