

CRANFIELD UNIVERSITY

SCHOOL OF MANAGEMENT

CENTRE FOR LOGISTICS AND TRANSPORT

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**The role of Third Party Logistics providers in Europe -
A combined network and systems approach**

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Abstract

Third party logistics is a concept that is widely accepted as an alternative to vertical integration. The degree to which it is applied in practice varies considerably.

The focus of this research is the role of TPLPs in existing logistics systems, and how they themselves can influence this. This is influenced by the strategic position with which a TPLP is trusted by a shipper, and to some extent by a TPLP's competence and entrepreneurial behaviour towards logistics management. Logistics competence is sourced externally up to the level at which a shipper recognises this to be advantageous. TPL involvement might be influenced by TPLPs' initiatives towards innovative ideas in logistics management.

The objectives of this research were to explore different roles that TPLPs can assume in the management of their clients' logistics systems, and the impact of their contribution on logistics performance. This research aims therefore to provide further and better understanding of third party logistics, and to develop a general framework for evaluating the effects of the logistics competence and entrepreneurial behaviour (with regards to their clients' logistics requirements) of TPLPs on logistics outsourcing, and thus the strategic role assumed by TPLPs.

At a scholarly level the prevailing contribution of this research is to create further understanding of the TPL phenomenon by examining it from a new perspective.

On a practitioner or managerial level this research adds knowledge about the strategic significance of logistics outsourcing, which is directed at shippers and TPLPs.

Existing categories of Third Party Logistics providers could be identified according to different degrees of TPL involvement (or logistics outsourcing). Furthermore a positive relationship between TPL resources and skills and TPL proactive behaviour was empirically verified. It was also found that the degree to which TPL providers are involved in their clients logistics systems is in positive relationships with logistics performance.

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Chapter 1 Introduction

1.1 Introduction

This thesis describes research into the issue of third party logistics (TPL), which from a shippers' point of view is seen as the strategic decision to outsource logistics, and from a third party logistics provider's (TPLPs) point of view, the competence to fulfil its clients' logistical needs. More specifically, this research investigates whether or not TPLPs' *competence* in logistics, and their ability to act in an entrepreneurial manner, or proactively on behalf of their clients, can influence the degree of logistics outsourcing, and subsequently logistics performance. Furthermore, the thesis investigates whether different patterns of TPL can be identified in relation to the degree of logistics outsourcing.

The outsourcing of logistics functions to partners, known as third party logistics providers (TPLPs), has increasingly become a powerful alternative to the traditional, vertically integrated firm. The development of logistics outsourcing has been largely based on the pressures that companies are under to obtain cost savings and to concentrate on their core competencies. According to Hamel and Prahalad (1990), two of its most important protagonists, the latter issue has sparked new ways of strategic thinking. They postulate the competence-based approach as an effective way of sustaining competitive advantage. In addition, increasing competition in a geographically growing marketplace has led companies to seek new ways of reducing costs and time to market. Adopting the concepts of supply chain management (Christopher, 1992) and business process engineering (Hammer and Champy, 1993), many companies started to re-examine their collective position in the supply chain, and to restructure their business processes throughout the value chain (Porter, 1985), which span across organisational boundaries.

These developments have led to a growth in the number of outsourcing partnerships, and as a consequence have contributed to the development of more flexible organisations. More companies regard logistics as not being core to their business,

and rely on the logistics competencies of companies that specialise in this trade, and with whom they form longer-term and mutually beneficial relationships. These logistics partnerships are emerging in business contexts that are determined by process and supply chain thinking, and put increasing demands on the providers of logistics services. In response to this demand, but also by recognising the need for strategic changes in logistics management, TPL providers have developed skills in other non-traditional areas like IT and change management to widen their portfolio of logistics and value adding services. Their involvement in logistics systems is reflected in the degree to which their clients are outsourcing their logistics processes to them.

Research on third party logistics focuses to a great extent on the outsourcing of logistics functions, typically related to transport and warehousing. Most research offering theoretic reasoning revolves around the justification as to why organisations outsource. In addition, research that has investigated the degree of outsourcing in this sense is mainly function, rather than process oriented, and is, moreover, mostly descriptive. Thus further research is required to investigate TPL within the context of logistics processes, adhering to the principles of core competence and supply chain thinking.

This chapter explains the concept of third party logistics (TPL) and logistics outsourcing, and outlines briefly the history and current characteristics of third party logistics providers. It furthermore outlines the focus and approach of this research, and its intended contribution. It finally provides a structural overview of the thesis.

1.2 Background

Since this thesis revolves thematically around the issue of third party logistics (TPL), it is logical to begin with a definition of the term, and to explain what is meant by it.

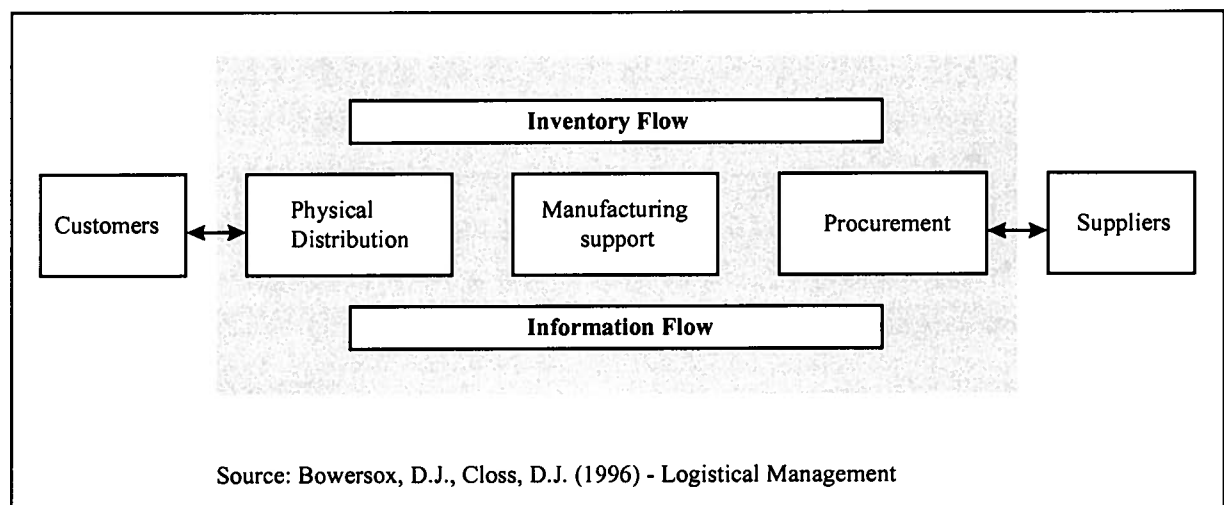
The neologism ‘third party logistics’ has been derived from two different concepts. The first, logistics, refers to the logistics management process. The second describes the stance of a person towards two others, who are in a contractual relationship with

each other. Both components of the term third party logistics will be explained in the following paragraphs.

1.2.1 Logistics Management

Bowersox et al (1996) give a coherent description of the operational functions and management processes that are integrated in the *logistics management* process (Figure 1.1). Logistics is viewed here as the competency that links an enterprise with its customers and suppliers. Information from and about customers flows through the enterprise in the form of sales activity, forecasts, and orders. The information is refined into specific manufacturing and purchasing plans. As products and materials are procured, a value-added inventory flow is initiated that ultimately results in ownership transfer of finished products to customers. Thus the process can be viewed in terms of two interrelated efforts; inventory flow and information flow.

Figure 1. 1: Logistical Integration



Peter Drucker (1963) characterized logistics, as "distribution", as "a cost area and purely a cost area". During the 1980s and 1990s the strategic potential of Logistics was discovered (Shapiro, R.D., 1984; Sharman, G., 1984; Ballou, R.H., 1992;). Its scope is external and encompasses the value adding activities involved in the process of bringing a product to market (Lambert & Stock, 1993; Bowersox & Closs, 1996; Christopher, 1998; Stock & Lambert, 2001). An article by John Tracy (1993) argued that logistics managers, and hence logistics itself, does add value. He stated that the notions of place and time are essential and must occur just to compete in a market. He

reasoned that if an activity is essential, then it must add value. Finally, he states that accountants define most logistics activities as "non-value-adding". Most logistics professionals and academics today consider logistics as a process that creates value (Ruttner & Langley, 2000).

The European Logistics Association (ELA) and the (American) Council of Logistics Management, the biggest logistics associations in the world, provide definitions of logistics management that claim general applicability. They are very similar and convey the same message.

The ELA's definition of logistics reads:

"The organization, planning, control and execution of the goods flow from development and purchasing, through production and distribution, to the final customer in order to satisfy the requirements of the market at minimum costs and minimal capital use."

European Logistics Association, 1997

The definition of the CLM reads:

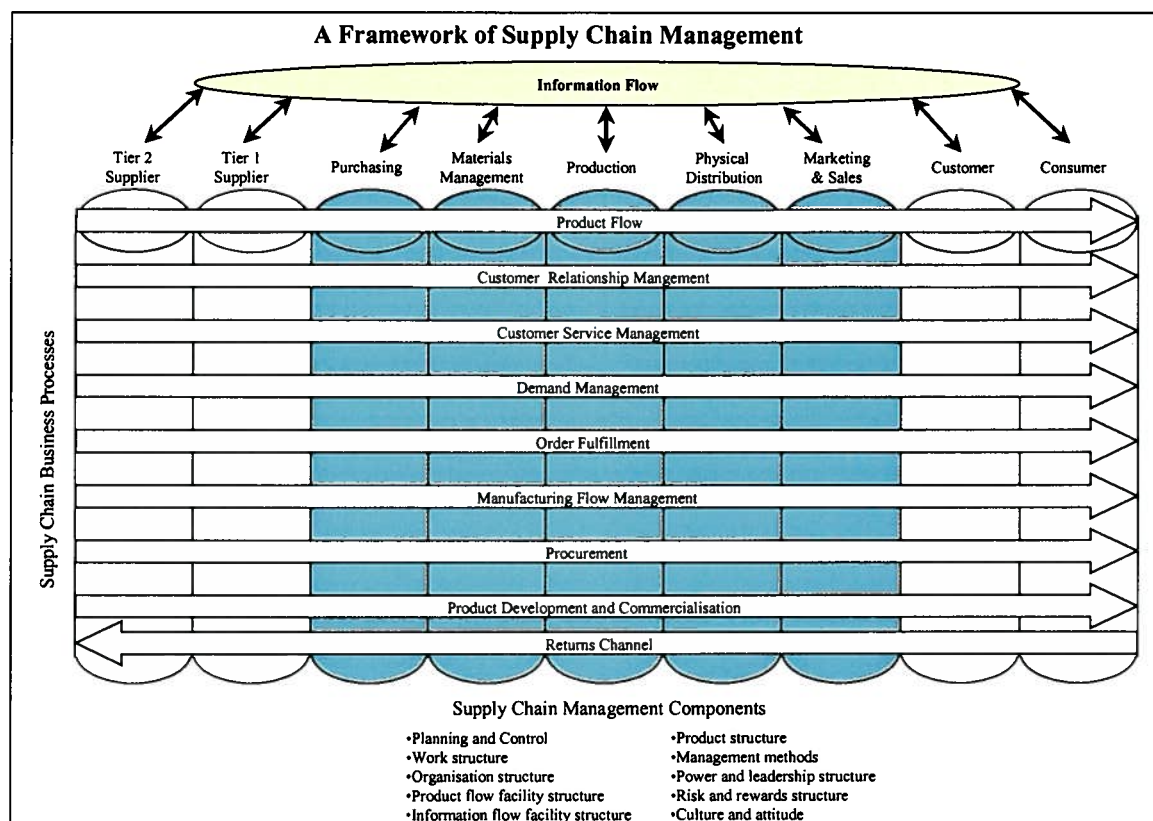
"Logistics describes that part of the supply chain process that plans, implements, and controls the efficient, effective flow and storage of goods, services and related information from the point of origin to the point of consumption in order to meet customer requirements."

Council of Logistics Management, 1999

1.2.2 Supply Chain Management

If all firms involved in a particular supply chain optimise their logistical systems independently of other firms in that chain the management of product flow across the whole chain, or 'pipeline', is likely to be sub-optimal. Attempts to overcome this problem have resulted in the creation of '*supply chain management*', in which the logistics activities are synchronised over enterprise boundaries.

Figure 1. 2: A Framework of Supply Chain Management



source: Cooper et al, (1997): Supply Chain Management: More Than a New Name for Logistics

Oliver and Webber (1982) outline four fundamental aspects of SCM: First, it views the supply chain as a single entity rather than relegating fragmented responsibility for various segments in the supply chain to functional areas such as purchasing, manufacturing, distribution and sales. Second, SCM calls for strategic decision making. 'Supply' is a shared objective of practically every function on the chain and is of particular strategic significance because of its impact on overall costs and market share. Third, SCM provides a different perspective on inventories: these are used as a balancing mechanism of last, not first resort. Finally, SCM requires a new approach to systems: Integration not simply interface, is the key. Cooper *et al.*(1997) propose in their conceptualisation of SCM that it includes 3 elements: business processes, management components, and the structure of the chain (see Figure 1.2).

Supply chain management extends thus the principles of logistics management across the various tiers of customers and suppliers, crossing geographical and organisational

boundaries. For the purpose of this thesis the following definition of supply chain management is used:

“Supply Chain Management (SCM) extends the principles of logistics across enterprise boundaries.”

1.2.3 Logistics Competence

Lambert, D., et al (1998) recognises effective logistics management as a key competence to improve both the profitability and competitive performance of a firm. Bowersox (1996) refers to the strategic importance of logistical management by describing logistics as the competency that links an enterprise with its customers and suppliers. Christopher (1992) discussed logistics competence in the same manner with regards to supply chain management. Gagnon (1999) argues that it might be necessary to adopt the view that the primary goal of an operations strategy is to develop and leverage resources in order to create new market qualifiers and order winners. This content of a strategy would be supported by logistical capabilities deeply anchored within business processes and organisational routines (Nelson *et al*, 1992; Stalk, et al, 1992). In a similar manner the outsourcing of logistics activities to TPLPs must also be seen as part of an overall logistics strategy and thus the means of acquiring better *or* non-existing logistics resources and skills (Bowersox, D. 1996; v. Damme *et al*, 1996 Gentry, J.J., 1996).

Logistics management is thus the management of integrated, or at least connecting processes, that would ideally span from the beginning to the end of a supply chain (i.e. from the source of raw materials to the final point of consumption, the consuming customer). In practice, however, this situation cannot yet be found. The diversity of industries, the competition amongst businesses and the difference in product flows with regard to time, cost and quality requirements, have led to more or less closed systems with specific logistical requirements (Gattorna, 1990). These logistics systems apply either to a part of the primary flow of goods - from raw material to end customer - and / or the reverse flow of goods resulting from this, or else they apply to the goods and reverse flow of the after-sales market. Most logistics systems span over

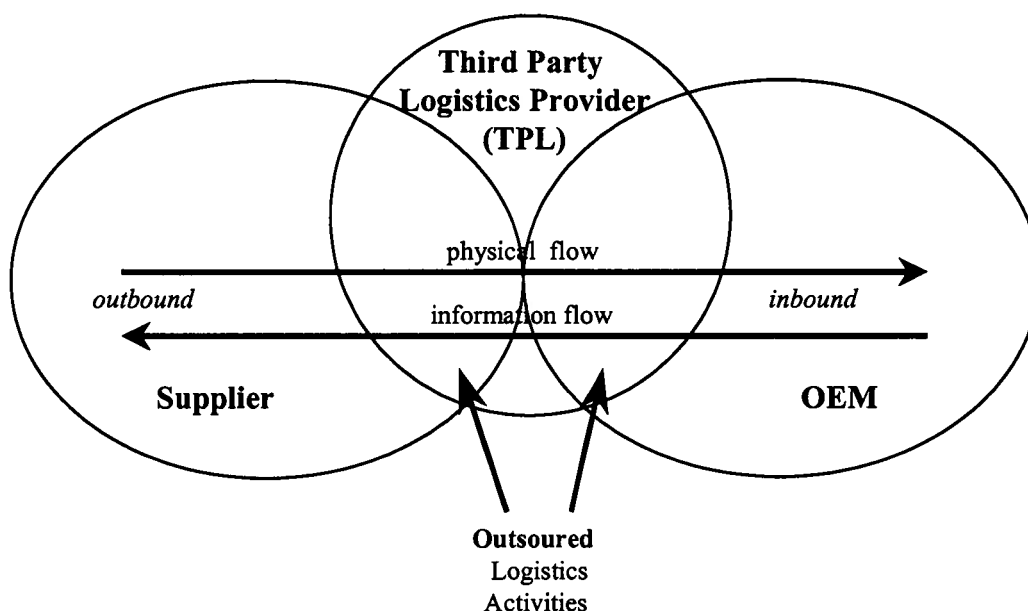
two, and sometimes more than two, entities of the supply chain. They have a certain geographical scope and are designed to convey a certain product or product range. The logistical requirements stipulated by such systems can either be provided by those entities of the supply chain that are thereby connected or someone else, a 'third party'.

1.2.4 Third Party Logistics

In general the term 'third party logistics' describes the phenomenon resulting from the tactical or strategic decision of a shipper to buy logistics services rather than producing (or performing) them in-house. 'Shipper' is the commonly-used term for any buyer of logistics services. It should be noted at this point that the buyer of logistics services does not have to be a sender (or consignor). Many buyers of logistics services are in fact consignees, but are in control of the inbound flow of goods. The term 'shipper' is traditionally used to denote the service buyer, due to the once dominating distribution focus in the logistics literature.

The crucial component of the term 'third party' refers to the position that the provider

Figure 1. 3: Relationship between 'shippers' and a TPL provider



of logistics services assumes in the supply chain. He usually provides services that facilitate and/or support the physical flow of goods and the necessary information to

facilitate the planning, initiation and control of the flow of goods between two supply chain entities, e.g. a supplier and an OEM (Figure 1.3). The dictionary defines a third party as a person other than two main people concerned in an agreement, contract law case etc. Analogous to this, a third party logistics provider is contractually not concerned with either the goods or the information flow between a shipper and a consignee. He is a facilitator to either or both of them, depending on their contractual situation.

The phenomenon of *third party logistics*, which is mostly seen as a consequence of *logistics outsourcing*, has been documented over the past twenty years under a number of different terms. Each of them carries the same basic message of buying a logistics service from a vendor of such services. Terminologies like *contract distribution* (Wilson et al, 1989) or *contract logistics* (Africk et al, 1994; A.T. Kearny, 1995) emphasise the contractual, and thus the defined relationship between the buyer and contractor. The term *logistics alliances* (Bowersox, 1990; Bagchi et al, 1998) places distinct emphasis on the close relationship between the buyer and provider of logistics services. By far the most common term used in the logistics literature is *third party logistics* (Virum, 1993; Lieb et al, 1993; Peters et al, 1998). It can mean almost anything, from a one-time purchase of a transport service, to complex logistics solutions. The term third party logistics is often used as an overall term that combines various characteristics that have been attributed to the phenomenon, which evolved from the outsourcing of logistics. Accordingly, different writers have described what they mean by third party logistics, and providers of such services. Moreover, it seems that the term is on the brink of outliving itself, since Anderson Consulting introduced the term 4PL™ (Gattorna, 1998). For this thesis, however, the term third party logistics will be used and subsequently defined after reviewing definitions used by other authors.

Bowersox (1996) refers to third party logistics as new type of service, which emerged from service providers, which formerly offered, warehousing and transport services and extended their basic competitiveness by adding new and unique value-added services. Sheffi (1990) and Semeijn Vallenga (1995) even refer to the emergence of *mega carriers* which offer virtually 'one-stop shopping' for transportation and

logistics needs, including consulting and analysis. According to them these companies have developed logistics expertise and systems, which many shippers lack.

Coyle, Bardi and Langley (1992) define third party logistics as purchasing logistics services from a service provider outside the company. Lieb et al (1993) defines third-party logistics as *"the use of external companies to perform logistics functions, which have traditionally been performed within the organisation. The functions performed by the third-party logistics firm can encompass the entire logistics process or selected activities within that process"*.

The definition given by Sink is *"...multiple activities provided by an external party, assuming no ownership of inventory to accomplish related functions that are not desired to be rendered and/or managed by the purchasing organisation"*.

Jan Africk of A.T. Kearney (Bradley, 1994) focuses more on the complexity of TPL and includes within his definition references to the management system: *"...multiple logistics services provided by a single vendor on a contractual basis, who offer at least two services that are bundled and combined, with a single point of accountability using distinct information systems that are dedicated to and integral to the logistics process."*

Van Laarhoven, Berglund and Peters (1999) define TPL as follows: *"Third-party logistics are activities carried out by a logistics service provider on behalf of a shipper and consisting of at least management and execution of transportation and warehousing. In addition, other activities can be included, for example inventory management, information related activities, such as tracking and tracing, value added activities, such as secondary assembly and installation of products, or even supply chain management. Also, the contract is required to contain some management, analytical or design activities, and the length of the co-operation between shipper and provider to be at least one year, to distinguish Third-party logistics from traditional "arm's length" sourcing of transportation and/or warehousing"*.

Berglund (1997, 2000) also uses the following definition of third party logistics: *"Organisations' use of external providers, in intended continuous relationships*

bound by formal or informal agreements considered mutually beneficial, which render all or a considerable number of the activities required for the focal logistical need without taking title."

Virum (1993) uses the following definition: *"3PL are the services offered by a middleman in the logistics channel that has specialised in providing, by contract, for a given time period, all or a considerable number of the logistics activities for other firms."* However, Virum's definition is not complete without the following information: *"...consists of a long term relationship between two parties which regard each other as partners. The logistics solution is worked out in co-operation specifically for each shipper. The goal for the relationship should be to develop into strategic alliances with win-win for both parties"*. This leads to logistics alliances, which can be defined as *"a long-term partnership arrangement between a shipper and a logistics vendor for providing a wide array of logistics services."* (Bagchi and Virum, 1996).

Sink (1996) distinguishes between two types of third party logistics. The first involves limited acquisition of tactical services requiring large capital investments or being labour intensive (e.g. a contract transportation services, fleet management, warehouse pick and pack labour). The second is the procurement of an integrated or bundled logistics services pack under the management of a single provider.

Almost correspondingly, Ruigrok and Knippenberg (1994) describe two levels of decision-making in the context of TPL-managed logistics systems. They distinguish between *operational logistics services*, by which a TPLP performs according to the shipper's instructions, and *logistics chain management*, by which a TPLP is responsible for optimising a client's logistics process.

To define TPL appropriately it seems necessary to adhere to the latter of these definitions, and take into account the provision of logistical services by a third party, as well the tactical or even strategic nature of the outsourcing decision. Only when both elements are taken together is the comprehensiveness of the third party relationship, with which third party logistics is associated, implied. For the purpose of this research project the following definition is adopted:

Third party logistics (TPL) is the concept by which an external company provides multiple logistics services to a shipper in order to manage logistics processes or parts of them on his behalf. These services are provided in a repetitive manner as an integral part of the management of a logistics system and have a continuous long-term relationship between shipper and third party logistics provider (TPLP) as basis.

The concept of third party logistics entails two corresponding organisational aspects. It implies that shippers are willing to outsource chunks of their process chain, and trust an outsider, a third party, to make decisions on their behalf, which makes it a strategic decision. It further implies the willingness, and perhaps more importantly, the ability to carry out these processes and make the right decisions in the interest of their clients, which legitimises the TPL industry in the first place. The degree to which they develop and offer these abilities to clients is a strategic issue for any provider of TPL services. Third party logistics must therefore be seen from two perspectives; that of the outsourcer or shipper, and that of the TPLP.

1.3 The management practice of outsourcing and its application to logistics

1.3.1 Outsourcing

A major development in western economies in the 1990s has been the increasing use of outsourcing. Lonsdale and Cox (1998) define outsourcing as “*the process of transferring an existing business activity, including the relevant assets, to a third party*”. The practice has been undertaken as part of a re-evaluation of attitudes towards vertical integration.

According to Bendor-Samual (1998), the reason why companies choose to outsource lies in the fact that outsourcing provides certain leverage that is not available to a company's internal departments. This leverage can have many dimensions: economies of scale, process expertise, access to capital, access to expensive technology, etc. The

combination of these dimensions creates the cost savings or performance enhancement inherent in outsourcing. The outsourcing 'seller' specialises in a particular non-core business function, and has the economies of scale, the expertise and the capital investments in the leading technology to perform the same tasks more efficiently and better than the internal departments of the outsourcing 'buyer'.

An outsourcing decision is made after comparing internal capability with external capability (McIvor, 2000). If comparable quality can be achieved outsourcing can lead to superior returns solely by re-allocating resources to other more value-creating activities (Fill and Visser, 2000).

Goolsby and Writer (2002) even point to the fact that companies occupying the topmost positions in their business arenas share one characteristic that keeps their market share positions secure, and keeps shareholder value growing. They join forces with outsourcing service providers. But instead of using outsourcing just as a tactical means of driving costs and inefficiencies out of a business process or function, they use outsourcing relationships to strategically enhance their capability of doing business better than their competitors. Because of the value that can be achieved through such a strategic impact, outsourcing is now an essential element in leading companies' business models. Outsourcing enables a company to maintain agility as it grows, especially through mergers, acquisitions and divestitures.

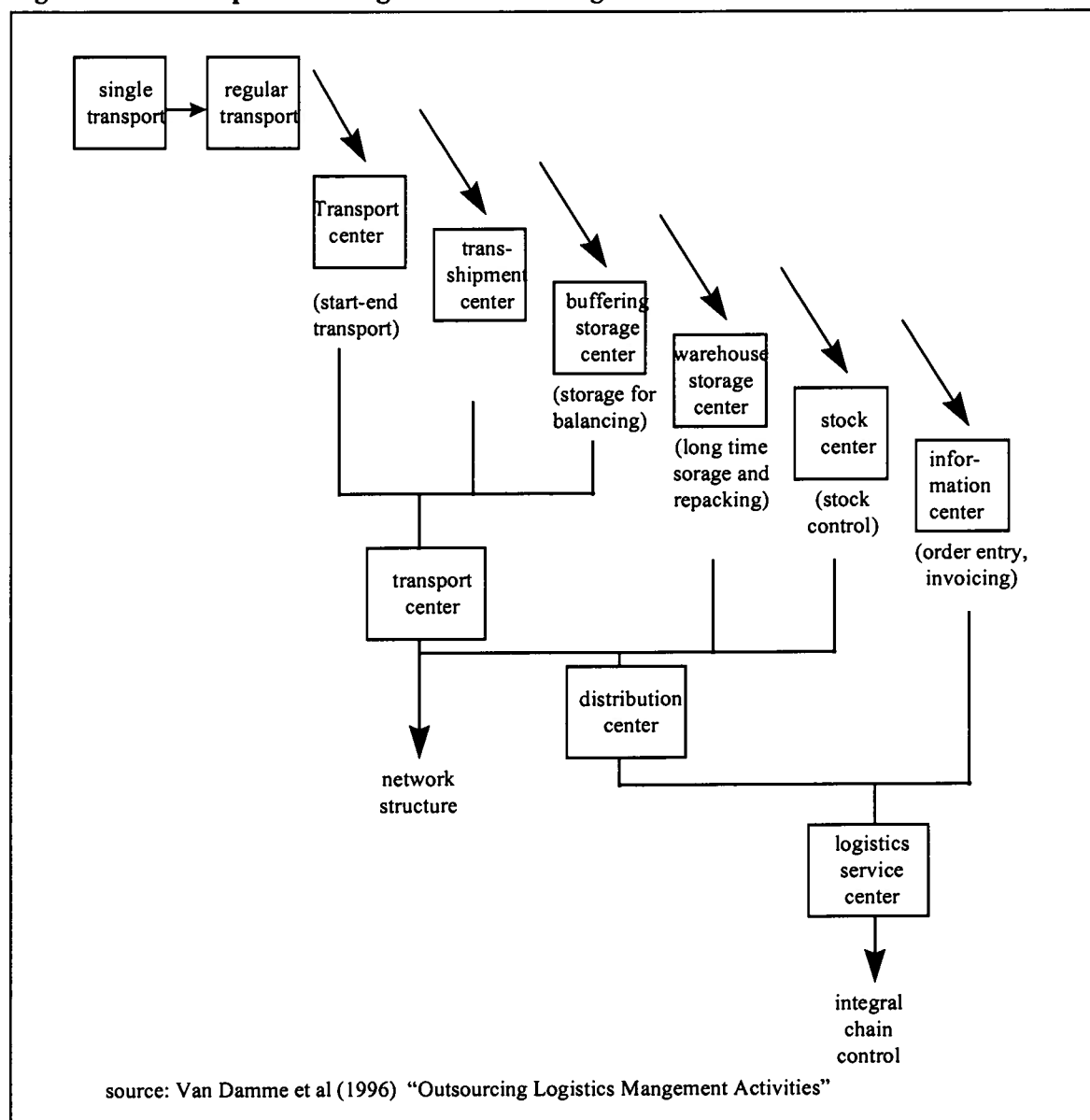
Outsourcing today has become an integral part of corporate strategy (Lankford and Parsa, 1999), and is the fastest way to improve a company's ability to compete in a fast-changing environment, as Zhu et al (2001) point out. It is one of the strategies that can lead to greater competitiveness (Embleton and Wright, 1998).

1.3.2 Outsourcing of logistics

Outsourcing of logistical activities by a manufacturing or commercial organisation can be regarded as a logical consequence of the vertical differentiation process. Firms adopting this approach employ an outside company to perform some or all of their logistics activities. As indicated by Van Damme and Ploos Van Amstel (1996), the market and firm characteristics influence the decision to contract multiple

combinations of third-party logistics services. Outsourcing of logistics to third party logistics providers (TPLPs) is not a new phenomenon. Some traditionally in-house performed logistics functions such as transport have in many cases become commodities in the sense of being available in different, but standardized packages from a number of suppliers. In-house logistics functions of this kind have long since been reduced in favor of buying transport services from professional providers. The development of logistics outsourcing can be said to have occurred during the last fifteen to twenty years (Sheffi, 1990).

Figure 1. 4: Development of Logistics Outsourcing



The list of logistics services that can be purchased from TPLPs has been increasing throughout this period ever since. These services range from single transportation

activities to integrated warehousing, distribution, and information management activities. In fact, there seem to have been significant developments in the extent to which TPLPs are involved in their clients' logistics systems. Co-operation between the parties has become more long-term in nature, more mutually binding, and is often combined with changes in both organisation and information systems. Solutions are tailored to specific services, and often include value-adding services such as final assembly, packaging, quality control, and information services, to name a few. The degree of logistics outsourcing must thus be seen as a measure of its complexity and duration. Van Damme and Van Amstel (1996) visualise this spectrum in a very comprehensible way (Figure 1.4). They see a stepwise evolution from the outsourcing of single transports to the outsourcing of logistical processes that include value-added services, resulting finally into logistics service centres. They thus illustrate the evolutionary path from the operational to the strategic role of TPL in shippers' logistics systems.

1.4 Third party logistics providers

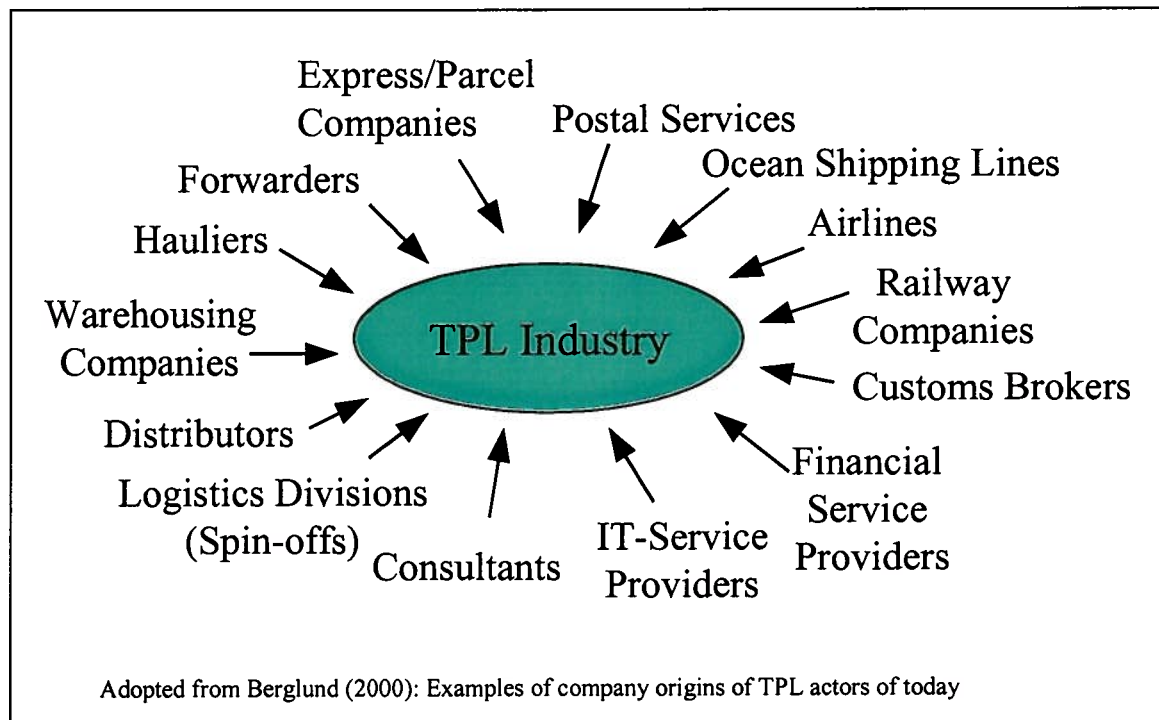
Some observers of the industry, such as Leahy et al (1995), point to the fact that the development of the TPL industry must be seen as the logical consequence of the development in logistics and the growing trend in outsourcing. But it could also be reasoned that the developments in logistics outsourcing are at least partly rooted in the development of the TPL industry. Sheffi (1990) suggests that the ongoing revolution in information processing and communication technology is a major driving force behind logistics outsourcing, because the TPL industry has been one of the leaders in developing information systems that enable the central planning and control of the logistics function.

The actors in the TPL industry have developed into the role of an integrated service provider from a related business area. Historically, TPLPs have their roots in different original service offerings. Berglund et al (1999) refer to three waves of entrants in the TPL market. In the 1980s, traditional logistics service providers entered the TPL market. These providers are companies that have emerged from a traditionally strong position in either transportation or warehousing. These providers of transportation,

warehousing and other logistics services involved in the collection, consolidation, storage, handling, reloading, tracking, and controlling the movement and storage of goods represent a significant part of the economy. In Europe, they are smaller than the food, automotive, chemicals, electronics, and machine sectors, but larger than textiles, pharmaceuticals, and paper (Burckhardt et al, 1998).

In the 1990s, network players started as TPLPs. These actors are mainly parcel and express companies. They share a strong functional capability in warehousing and transportation-related activities, but have a particularly strong foothold in information technology.

Figure 1. 5: Examples of company types in today's TPL industry



In the late 1990s actors from non-traditional logistics areas such as information technology, management consulting and financial services, started entering the market. These companies build their strength on skills in IT, business consulting and finance.

Today the TPL industry can be characterised as a conglomeration of heterogeneous participants that are asset or non-asset based, and offer different sets of skills (Figure 1.5). They all offer some form of integrated logistics services to clients, which have different logistics requirements. This may be because of industry or product specific requirements, or simply because of their position in the supply chain.

Skjoett-Larsen (2000) notes that in the last few years there has been a pronounced change in shipper-logistics provider arrangements. While the primary driving forces previously were to reduce costs and release capital to alternative purposes, the driving forces today have a more strategic thrust: to increase market coverage, improve the level of service, or increase flexibility towards the changing requirements of customers. TPL protagonists like William C. Copacino (1998) now see the range of capabilities that the third party logistics (TPL) players have continued to develop as dominant driving behind logistics outsourcing. Many are sharpening their skills, offering shippers their deep industry insights and industry-specific solutions. They are developing a track record of success, which increases the comfort level and reduces the perceived risk for new and potential customers. Finally, the increasing level of sophistication that is required to implement effective logistics and supply-chain management programmes will fuel demand for logistics outsourcing. Many companies are finding that they do not have that level of expertise in-house, and therefore need to purchase the increasingly complex knowledge, IT capabilities, and talent required to excel.

In 1999, Langley et al gave a more comprehensive view of what they understand by the term third party logistics provider (TPLP): *“A company that provides multiple logistics services for its customers, whereby the Third-party logistics provider is external to the customer company and is compensated for its services... One desirable attribute of a Third-party logistics provider is that the multiple logistics services be integrated as opposed to being performed on a stand-alone basis. By providing integrated solutions the provider can solve its customer’s business problems more effectively”*.

In seeking to establish a definition of third party logistics, this definition comes close, but overemphasises the problem-solving competencies of TPLPs that can (at least at

this stage) only be hypothesised. It furthermore misses the long-term aspect of TPL relationships. For the purpose of this thesis third party logistics providers are defined as:

“Organisations that are external to their clients and to which they provide multiple logistics services as an integral part of their logistics systems on a long term basis.”

The third party logistics industry has shown a strong growth over the last twenty years, and during the same period the associated outsourcing of logistics has increased its strategic importance (Berglund et al, 1999; Berglund, 2000; Cass, 2000). For some customers TPLPs might provide a spectrum of services that covers the design, engineering and implementation of a customised supply chain solution, and subsequently also the management of the operation. For others they might only provide operational functions. They can do that in a highly customised way with dedicated equipment and facilities, or service their customers with a standard package using shared facilities and equipment. In some TPL relationships the provider manages the assets required for a particular solution using its own existing assets, or purposely bought or built ones. In other TPL relationships the provider might subcontract not just the provisions of necessary assets, but also the management of those. However far-reaching the involvement of a TPLP is depends on its capabilities, but on its ability to convince its clients of those capabilities.

1.5 Research Outline

1.5.1 The Research Focus

Logistics is a primary activity in the value creation process, which in systematic form requires decisions in terms of strategic, tactical, and project management, as well as operational issues. Logistics management encompasses value-adding activities involved in the process of bringing a product to market. It is an external process, and is a part of overall enterprise strategy (Christopher, 1992; Bowersox and Closs, 1996; Lambert, Stock and Ellram, 1998). Thus logistics competence contributes to the way in which a company is trying to achieve competitive advantage. In a similar manner the outsourcing of logistics activities must also be seen as part of an overall logistics

strategy (Bowersox, 1996; van Damme et al, 1996; Gentry, 1996). Logistics competence is sourced externally up to the level at which a shipper recognises this to be advantageous. TPL involvement in this sense might be influenced by TPLPs' initiatives towards innovative ideas in logistics management. Writers like Langley (1999) and Berglund (2000) see third party logistics providers as a major source for future developments in logistics.

The focus of this research is the role of TPLPs in existing logistics systems, and how they themselves can influence this. It is thus strategic in its perspective of logistics outsourcing, as well as in its perspective of TPLPs.

1.5.2 Research Objectives

The objectives of this research are to explore different roles that TPLPs can assume in the management of their clients' logistics systems, and the impact of their contribution on logistics performance. In accordance with the definition of third party logistics, any intervention of a third party logistics provider means the provision of a certain competence and the ability to make business decisions on behalf of the client. It is a further objective of this research to find one explanation for the different roles of third party logistics providers in their level of competence and their entrepreneurial stance towards their clients' logistical aims or proactive behaviour.

The requirements for TPL development reflected in the definitions presented above seem to introduce new concepts. This research aims therefore to provide further and better understanding of third party logistics, and to develop a general framework for evaluating the effects of the logistics competence and entrepreneurial behaviour (with regards to their clients' logistics requirements) of TPLPs on logistics outsourcing, and thus the strategic role assumed by TPLPs. The purpose of developing such a framework is to provide a setting from which further work on TPL development can proceed, from the perspective of both the shipper and the TPLP.

In particular, it explores from a shipper's point of view issues concerning different degrees of logistics outsourcing with regard to the strategic importance of TPLPs, as

well as operational performance. In addition, this research explains the issue of TPLP influence on the degree of logistics outsourcing through their logistics competence and proactive approach to logistics management. The overall aim of this research can be summarised as follows:

“To identify the different roles of third party logistics providers in logistics management, the influence of their competence and entrepreneurial stance and the effect on clients’ logistics systems’ performance.”

The following steps towards the achievement of the aims of this research are necessary:

1. To identify a hierarchy of processes and sub-processes in logistics design, implementation and operations in the framework of an existing logistics system and measure the level of outsourcing or *TPL involvement* in this. By way of determining the participation of TPLPs on a sub-process level it is possible to determine their level of involvement in the design, implementation and operation of logistics systems, and thus their role in managing this.
2. To examine whether the decision of shippers to outsource and the TPL industry in general are in line with the development of TPLPs’ competence and their ability to understand the logistics needs of their clients. This research takes a dyadic perspective and looks - at a strategic level – at third party logistics from a shipper, as well as from a TPLP stance. It looks at the role TPLPs can assume in a shipper’s logistics system, as well as at the competence and entrepreneurial behaviour of TPLPs that can eventually lead to a particular role in a logistics management system.
3. To identify and clarify the different roles that third party logistics providers can actually play in managing their clients’ logistics systems. Based on the degree of outsourcing the objective is to identify a pattern of TPL across Europe and match this with profiles of TPL that have been prognosticated and already found in single cases.

4. To determine the impact of different TPL roles on logistics performance. The intention is not to elaborate on the effects that outsourcing, and thus also different degrees of outsourcing can have, because they free resources that can be allocated to other activities. It is moreover the intention to examine whether TPLPs influence logistics efficiency and effectiveness differently in different roles.
5. To identify and explain the influence of TPL competence on the degree of logistics outsourcing. Logistics outsourcing must be considered as the strategic intention of a shipper to buy a service rather than producing it in-house. Logistics outsourcing also reflects the confidence of a shipper in a TPLP's competence. Different levels of logistics competence that are assumed by shippers in their TPLPs might thus influence the degrees of outsourcing.
6. To identify and explain the influence of TPLPs' entrepreneurial stance *or proactive behaviour* within their clients' logistics management systems on the degree of logistics outsourcing. As expressed in the objective above, logistics outsourcing also reflects the confidence of a shipper in a TPLP to manage logistics, or parts of it, on its behalf. Thus the degree of entrepreneurial or proactive behaviour assumed in a TPLP might influence the degree to which shippers outsource logistics.
7. To identify and explain the influence of the degrees of outsourcing on logistics performance. In contrast to identifying the impact of different roles of TPLPs as expressed in Objective 4, the purpose is here to examine different degrees of outsourcing in design, implementation and operation of logistics systems in relation to logistics performance, disregarding patterns of outsourcing degrees in these areas of logistics management.

1.5.3 Methodology

This section presents an outline of the approach adopted; a more detailed explanation and justification is provided in Chapters 5 and 6.

The method used to achieve the overall aims and objectives can be described as having an explanatory building nature. It follows in part the principles of the case study method, trying to find patterns that can be explained by the use of theory. Yin (1989) postulates the pattern matching logic as most desirable, because it compares an empirically based pattern with a theoretical predicted pattern. A particular type of pattern matching, according to Yin (1989), is that of explanation building. In this context the aim is to build an explanation of different degrees of outsourcing and the different roles of third party logistics providers. The reason for this approach is rooted in the fact that the conceptual ideas that were used to investigate the TPL phenomenon are new in their application to third party logistics, and at the outset there were no clear-cut models or hypotheses to be tested. The research started therefore with the formulation of a proposition, and was at a later stage complemented by some testable hypotheses. This approach is in line with Yin (1989) and Eisenhardt (1989), who both postulate a formulated focus as the starting point of any exploratory research in order to avoid the researcher being overwhelmed by the volume of data. The research presented started off in an explorative direction and led in a second step to the analysis of possible causal relationships.

Thus, in the first stage, data was collected in the setting of single case study in order to elaborate a tentative theory using qualitative methods.

At the second stage the original intention was to conduct further case studies, and by means of iteration and cross case analysis, identify different patterns of TPL provision. However, the award of a three year research project initiated by the European Commission, as part of the Fifth Research Technological Development and Demonstration Framework Programme, meant that from this stage on, the research could be continued as a part of this project. The synergy of both projects was facilitated by their common goal of investigating the role of third party logistics providers in Europe, and the fact that author of this thesis was also responsible for the design of the European research project. Moreover, this was an opportunity to explore conceptual, and at this stage validated ideas, on a European level across different industries. Furthermore, the resources employed in the project allowed a sample of

organisations that exceeded by far that of case-based research. This larger sample size allowed the employment of statistical techniques for testing hypotheses.

The explanation building approach to third party logistics research, and the combination of qualitative and quantitative methods is not new. It has been advocated and used by Sink (1995, 1996) and by Andersson (1997). They also built their research on *a priori* assumptions that were rooted in a theoretic framework. This research relies conceptually on principles that are taken from different schools of thought. These are in particular Network theory (NT), Resource-based theory (RBT) and entrepreneurship (ES), and Systems theory (ST).

1.6 Contribution

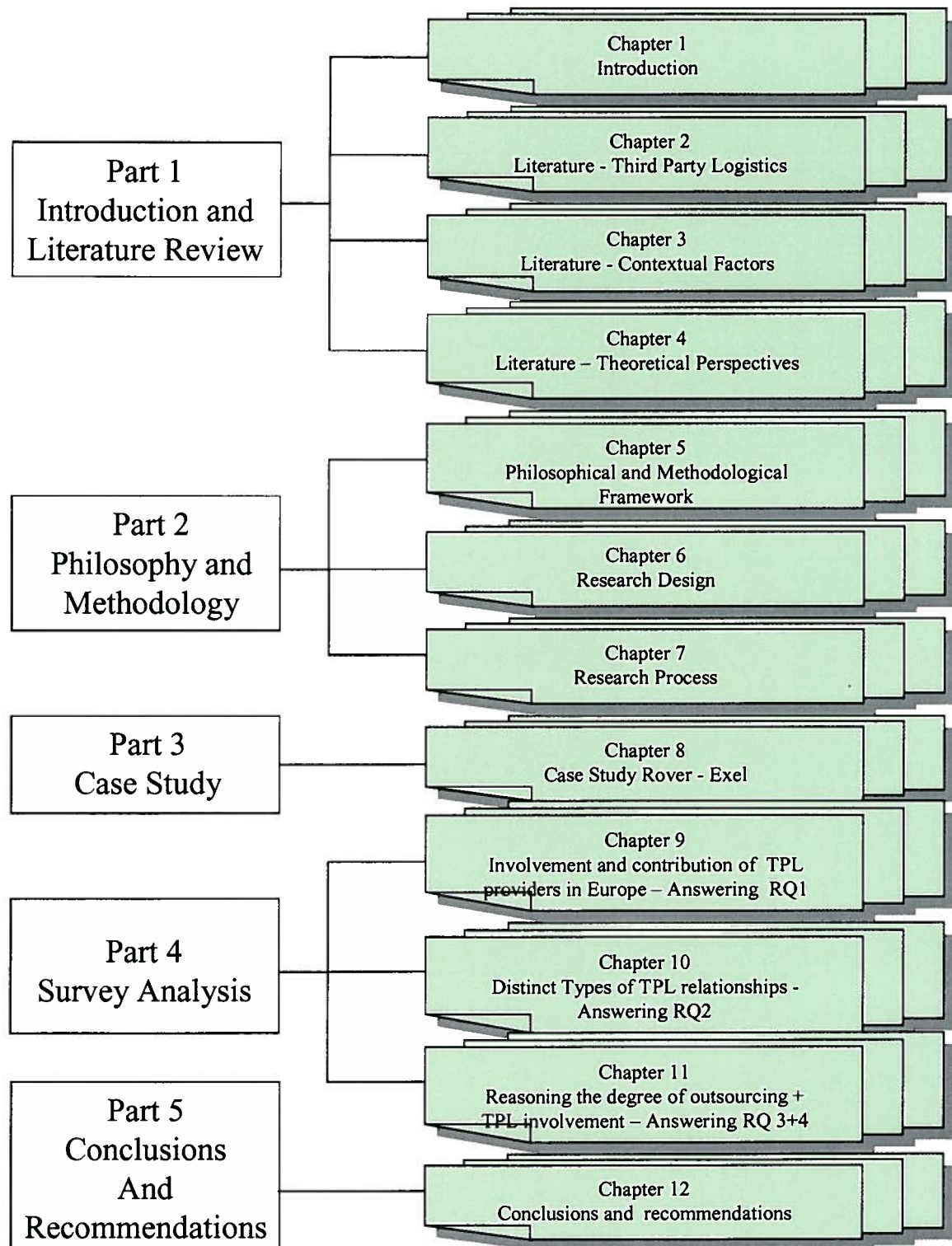
On a managerial or practical level this research adds knowledge about the strategic significance of logistics outsourcing, which is directed at shippers. For shippers it will be important to know the different degrees of outsourcing that are feasible, and what this can mean for logistics performance. Secondly, this research adds knowledge that is directed at TPLPs. For them it will be important to learn whether their perceived competence and their entrepreneurial approach could influence the degree to which shippers are prepared to outsource logistics.

At a scholarly level this research first of all adds knowledge to the area of logistics management in the sense that it explores and explains, to some extent, why shippers outsource in different degrees, rather than outsource the entire logistics function. Secondly, knowledge is added by looking at the TPL phenomenon from a new perspective. Much previous research in this area has utilised the principles of transaction cost economics (TCE) to investigate the drivers for logistics outsourcing and the TPL phenomenon. At this point it is important to acknowledge that outsourcing decisions are made to a large extent because of TPLPs' ability to achieve better economies of scale. The intention of this research is not to present an opposing view, but rather to provide a broader perspective by exploring the influence of logistics competence and entrepreneurial behaviour of TPLPs on logistics outsourcing decisions and performance.

1.7 Structure of the Thesis

The thesis is presented in five parts comprising of twelve chapters (see figure 1.6).

Figure 1. 6: Structure of the thesis



Part 1 introduces the research problem and in the light of logistics outsourcing and the TPL phenomenon (Chapter 1) and introduces the literature review, which is split across three chapters. Chapter 2 reviews the literature on third party logistics. Chapter 3 reviews the literature of the logistics management context from a systems and a competence perspective. Chapter 4 reviews the literature on the theoretical concepts that are used in this research.

Part 2 presents the philosophical and methodological considerations, and is split into three chapters. Chapter 5 presents the philosophical and methodological framework to which the researcher adheres, and Chapter 6 presents the research design and chapter 7 describes the research process.

Part 3, which comprises Chapter 8, presents the analysis and results of the case study.

Part 4 presents in three chapters the analysis and findings of the survey. Chapter 9 reveals the position of TPL in Europe seen from a shipper and a TPLP perspective. Chapter 10 presents different TPL clusters, and Chapter 11 corresponds to the hypotheses that have been put forward with regard to cause and effect of different degrees of outsourcing.

Part 5, the final chapter, presents conclusions that can be drawn from the overall findings of case study and survey, and also presents recommendations to the managerial and academic world.

1.8 Summary

Third party logistics is a concept that seems in general widely accepted as an alternative to vertical integration. The degree to which it is applied in practice varies considerably. This seems to be influenced by the strategic position with which a TPLP is trusted by a shipper, and to some extent by a TPLP's competence and entrepreneurial behaviour towards logistics management. Both issues are reflected in a particular level of outsourcing. This demands the application of new conceptual ideas and the use of a methodology that enables the exploration of their validity and

the identification of patterns that match these *a priori* assumptions. The methodology used in this research adheres therefore in principle to the case study method, but also uses survey data collected in personal interviews.

Chapter 2 Literature – Third Party Logistics (TPL)

2.1 Introduction

This chapter presents the literature review issues that relate to Third Party Logistics (TPL). The review of this literature has lead to the identification of the knowledge gap, which justifies this research and the approach to it. This chapter ends thus with a summary critique of the literature, which entails the formulating of research questions.

The literature on Third Party Logistics is quite diverse. Earlier attempts to summarise the literature on TPL concentrated either on the outsourcing (*or shippers*) perspective (e.g. Razzaque, et al, 1998) or the perspective of TPL providers (Berglund, 1997; 2000;). Very rarely has the literature on TPL been reflecting both perspectives examined and summarised. One exception is the work of Andersson (1995; 1997;). Apart from the different perspective the literature on Third Party Logistics can be grouped into four categories that differ in content and approach. These categories follow a chronological order reflecting the development of managerial and academic interest in Third Party Logistics (TPL). They comprise contextual descriptions of TPL, conceptual and theoretic reasoning for outsourcing, an inter-organisational and a strategic perspective of TPL.

Management research into Third Party Logistics was sparked in the late 1980s almost simultaneously in the United States of America and Europe through some key articles by some early protagonists in this field. In the US Yosef Sheffi (1990) presented his views on the present and future prospects of TPL and Donald Bowersox (1990) postulated the strategic benefits of logistics alliances. A year earlier Fernie (1989) had elaborated on the phenomenon of contract distribution, as TPL was called then in the UK retail industry. Since then numerous researchers have embarked on the topic.

A lot of literature describes the TPL phenomenon in a geographic and/or industrial frame. Within this body of literature the outsourcing (i.e. shippers' perspective) is mostly adopted, although some, more recent publications look also at the TPL market from a provider's perspective. These studies started in the early 1990s and have since

continuously revealed the current position and developments in TPL in the US, Australia, Asia and Europe.

A second body of literature conceptualises the TPL phenomenon as a consequence of shippers' decisions to outsource and embarks on the theoretic reasoning for logistics outsourcing.

In a third wave TPL researchers have started to take an inter-organizational perspective on TPL. This body of literature embarks on the behavioural nature of TPL relationships, the best way of managing these, and identifies the advantages of alliance/partnerships style relationships from various angles.

The fourth wave of TPL research focuses on the strategic value of TPL. It conceptualises outsourcing as a strategic element of logistics management and also acknowledges the strategic positioning of TPL providers. This body of literature is mostly conceptual and lacks empirical evidence, particularly with regards to the latter issue.

This research uses the current status quo of TPL research as a starting point and aims to contribute to it (as outlined in chapter 1) at a strategic level.

2.2 Descriptions of state and developments in TPL¹

2.2.1 Outsourcing Practices in Logistics Management

An extensive literature exists about the use of third-party logistics. It covers the US, Australia, Asia-Pacific and Europe.

2.2.1.1 USA

In the US several researchers have contributed to knowledge about the status of TPL usage, some in a repetitive manner. Bardi, and Tracey (1991) described the

¹ Some credit for summarising the literature on TPL practices goes to Magnus Lindskog of Linköping Institute of Technology, Linköping, Sweden

outsourcing of transportation activities amongst various industrial sectors. Their focus was on outsourced functions, reasons for outsourcing, problem areas and characteristics of outsourcing providers. Lieb et al (1993, 1996, 1998, 2000, 2002) studied in continuous work the experiences of American manufacturers on Third Party Logistics services. They acknowledge the application of outsourcing on a wider spectrum of logistics rather than just transport. They described the extent of use, the decision making process and the impact of TPL. Sink et al (1996) took a similar approach by examining buyer observations of the US TPL market. Murphy and Poist (1998) looked at the demographics of users and non-users of TPL. They found that firm size was a determinant of TPL usage, but couldn't identify any other difference between users and non-users. Three years before they studied the determinants of successful TPL relationships on a more general level (Leahy, et al, 1995) from a TPL point of view. They found that customer orientation in a clients' sense was the most important factor for successful co-operation in TPL relationships. In a later study Murphy and Poist (2000) examine the most commonly provided TPL services, key success factor in TPL relationships and user satisfaction. Their study is the only one that takes into account shippers' as well as TPLPs' views concerning the state of outsourcing in the US. The following points summarise key points about the latest known state of TPL in the US based on surveys that have been conducted in 1997 and 2000 (Millen, et al, 1997; Lieb et al (2002):

Service usage and provision²

- 70% of users have used TPL services for more than three years.
- Decision to outsource is more commonly taken at corporate (49%) and divisional (36%) level than at local level of firm.
- US firms mostly use TPL for both domestic and international operations (64% of users) as opposed to domestic only
- Five most commonly outsourced services are warehouse management (56%), direct transport services (49%), freight forwarding (44%) , freight payment (43%) and freight consolidation (43%).

² cited use

Satisfaction, implementation considerations, commitment and outlook

- 57% of users are satisfied, 30% very satisfied with provider.
- 85% consider moderately increasing usage, 5% substantially.
- 39% report moderate commitment to TPL services, 7% extensive.
- 73% report 20% or less of total logistics expenditures spent on TPL services, 5% reported 81% of spending or more.
- 29% needed retraining of logistics personnel for implementation.
- 33% of contracts contain performance incentives, 47% penalty clauses.
- 95% report positive or very positive impact on logistics costs and 100% on logistics performance.
- 78% have eliminated 0-20% of full-time logistics positions due to TPL usage, none have eliminated almost all or all positions.
- Over 50% reported problems in bringing TPL providers on-line. Common problems were merging IT-systems, provider's lack of product knowledge, insufficient time for implementation and unclear responsibilities.

2.2.1.2 AUSTRALIA

The state of Third Party Logistics in Australia was examined in 2 surveys in 1995 and 1999 (Dapiran, 1996; Sohal et al, 2002). Before that only Gilmour (1994) reported trends in TPL as part of future directions for logistics in Australia. On an academic level little else is known about the state of TPL in Australia. Like in the Lieb surveys (1993,1993, 1996, 1998, 2000, 2002) the focus in the 2 surveys was on the extent of use, the decision-making process and implementation towards/of logistics outsourcing, the impact of TPL and some considerations concerning future developments. The status of TPL according to these two surveys is indicated below.

Service usage and provision

- 70% of users have used TPL services for more than three years.
- Decision to outsource roughly equally common on corporate, divisional and local levels of firm respectively.
- Australian firms mostly use TPL for domestic operations (65% of users).

- Five most commonly outsourced services are fleet management, warehouse management, shipment consolidation, order fulfilment and product returns.

This picture is in general unchanged from 1995 to 1999 (Sohal *et al.*, 2002, 1999 survey).

Satisfaction, implementation considerations, commitment and outlook

- 63% of users satisfied, 33% very satisfied with provider.
- 64% can consider moderately increasing usage, 20% substantially.
- 34% report moderate commitment to TPL services, 22% extensive.
- 50% report 20% or less of total logistics expenditures spent on TPL services, 16% reported 81% of spending or more.
- 50% needed retraining of logistics personnel for implementation.
- 54% of contracts contain performance incentives, 52% penalty clauses.
- 88% report positive or very positive impact on logistics costs and 89% on logistics performance.
- 59% have eliminated 0-20% of full-time logistics positions due to TPL usage, none have eliminated almost all or all positions.
- Over 50% reported problems in bringing TPL providers on-line. Common problems were merging provider's lack of product knowledge, insufficient time for implementation and unclear responsibilities. None reported problems with merging IT-systems.

(Millen *et al.*, 1997, 1995 survey)

2.2.1.3 ASIA-PACIFIC

Whereas some writers have reported on current practices in logistics (Millen, *et al.*, 1996) and Supply Chain Management (McMullan, 1996) or on future directions of both management practices (Kim, 1996) there is little academic literature that examines that state of TPL in the Asia-Pacific region. The only known work with this focus is that of Bhatnagar *et al.* (1999), who exemplify the state of TPL in Pacific-Asia onfor the case of Singapore. Considering the importance of the trading place

Singapore, the results of this survey can be seen at least as indicative and trend reflecting for the Asia-Pacific region. They adopted the same methodology as Dapiran (1996) for Australia or Lieb (1993,1993, 1996, 1998, 2000, 2002) in the US. Thus the indicators below reflect the use, management and impact of TPL.

Service usage and provision

- 84% of users have used TPL services for more than three years.
- Decision to outsource roughly equally common on corporate, divisional and local levels of firm respectively.
- Singaporean firms mostly use TPL for both domestic and international operations (59%).
- Five most common services used are shipment consolidation, order fulfilment, carrier selection, freight payment and rate negotiation.

(Bhatnagar *et al.*, 1999)

Satisfaction, implementation considerations, commitment and outlook

- 86% of users satisfied, 8% very satisfied with provider.
- 71% likely or very likely to increase service usage.
- 76% report moderate or extensive commitment to TPL services.
- 50% report 30% or less of total logistics expenditures spent on TPL services, 20% reported 70% of spending or more.
- 24% needed retraining of logistics personnel for implementation.
- 73% of contracts contain performance incentives, 42% penalty clauses.
- 93% report positive or very positive impact on logistics costs and 89% on logistics performance.
- 16% have eliminated 0-20% of full-time logistics positions due to TPL usage, 5% have eliminated almost all or all positions.
- Over 70% reported problems in bringing TPL providers on-line. Most common problems were teaching provider about client requirements, overcoming internal resistance to change, lack of co-ordination and integration between client and provider and pricing/billing problems.

2.2.1.4 WESTERN EUROPE

Fernie (1989) identified a growing trend towards outsourcing in the UK retail industry and forecast the increased use of contract distribution, which means the use TPL particularly in areas of warehousing and transport. He repeats his survey in 1998 (Fernie, 1999) and reports the views on the outsourcing of logistical services to third-party contractors in the UK retail industry. He also highlights factors that influence the choice of logistics service providers and the degree of satisfaction with them. Randall, (1991) examined outsourcing practises in Europe and realises the advanced stage of TPL in comparison to the US. In the same year Cooper et al (1991) published a comprehensive compendium on European Logistics highlighting the strategic potential for Third Party Logistics and the increasing use of it. Lieb et al (1993) looks at European logistics outsourcing practices to compare them to those in the US. Virum (1993) conducted various case studies in Holland and Sweden, examining TPL practises, the driving forces for the strategic possibilities of TPL. He identifies a growing demand for TPL services and also predicts a strong strategic potential for TPL in Europe. Laarhoven and Sharman (1994) are the first to conduct a comprehensive survey across Europe and a diverse set of industries. They focus on the use of services, the implementation of partnerships and key success factors for this. They also evaluate shippers' motives to outsource and try to quantify the impact of TPL partnerships. Millen et al (1997) repeat this exercise of comparing European and American outsourcing practices and includes his experiences from Australia. In a similar comprehensiveness Peters et al (1998) report their findings of a Pan European survey sampling various industries. Laarhoven et al (2000) report the results of a repeated survey carried out in 1999 to establish a new status quo of knowledge in European TPL and to compare their findings with those of five years before. They identified a marginal growth rate in TPL use but also identified a stronger position of TPL providers rooted in high success rates of TPL partnerships. Their results are, for the first time in a European study, based on shippers' as well as TPLPs' perceptions of the TPL phenomenon.

Comprehensive surveys that reveal the current state of TPL in Europe across different industries and European countries are only those carried out by Laarhoven et al (1994,

2000) and Peters et al (1998). In a similar manner as those carried out in the US by Lieb (1993,1993, 1996, 1998, 2000, 2002) they focus on the use, implementation process and impact of TPL. The state of TPL in Europe according to these surveys is summarised below.

Service usage and provision

- 92% of users have used TPL services for more than three years.
- Decision to outsource most common on corporate (57%) and divisional (29%) of firm.
- European firms mostly use TPL for both domestic and international operations (74% of users).
- Five most commonly outsourced services are warehouse management, shipment consolidation, information systems, fleet management and rate negotiation.
- 82% of users satisfied, 15% very satisfied with provider.
- 76% can consider moderately increasing usage, 17% substantially.
- 21% report moderate commitment to TPL services, 48% extensive.
- 36% report 20% or less of total logistics expenditures spent on TPL services; 18% reported 81% of spending or more.
- 25% needed retraining of logistics personnel for implementation.
- 37% of contracts contain performance incentives, 46% penalty clauses.
- 88% report positive or very positive impact on logistics costs and 92% on logistics performance.
- 50% have eliminated 0-20% of full-time logistics positions due to TPL usage, 11% have eliminated almost all or all positions.
- Over 50% reported problems in bringing TPL providers on-line. Common problems were merging IT-systems, provider's lack of product knowledge, insufficient time for implementation and unclear responsibilities.

2.2.1.5 Comparing the regions

Table 2. 1: Summary of outsourcing practices in the U.S., Australia, Asia-Pacific and Europe

Parameter	Country	US (% of re- spondents)	Australia (% of re- spondents)	Asia-Pacific (% of re- spondents)	Europe (% of re- spondents)
<i>Service usage/provision</i> - More than three years		70%	70%	84%	92%
<i>Decision making level</i> - Corporate - Divisional - Local		49% 36% 15 %	33% 34% 33%	33% 34% 33%	57% 43%
<i>Use of domestic and intl. services</i>		64%	35%	59%	74%
<i>Most commonly outsourced services</i>		Warehousing Transport Freight Fwd Freight payment Freight consolidation	Fleet mgt Warehousing Shipment consolidation Order fulfilment Product returns	Order fulfilment Shipment consolidation Carrier selection Rate negotiation Freight payment	Warehousing Shipment consolidation Information systems Fleet mgt Rate negotiation
<i>Satisfaction with TPL services</i> - Satisfied - Very satisfied		57% 30%	63% 33%	86% 8%	82% 15%
<i>Consider to increase outsourcing</i> - Moderately - Substantially		85% 5%	64% 20%	71%	76% 17%
<i>Commitment to TPL</i> - Moderate - Extensive		39% 7%	34% 22%	76%	21% 48%
<i>Proportional expenditure on TPL (of total logistics expenditure)</i> - Low (less than 20%) - High (more than 80%)		73% 5%	50% 16%	50% 20%	36% 18%
<i>Training needed as consequence of TPL implementation</i>		29%	50%	24%	25%
<i>TPL Contracts</i> - Performance incentives - Penalty clauses		33% 47%	54% 52%	73% 42%	37% 46%

Positive impact of TPL - On logistics cost - On performance in general	95% 100%	88% 89%	93% 89%	88% 92%
Elimination of full time positions due to TPL - Less than 20% - More than 90%	78%	59%	16% 5%	50% 11%
Problems encountered - Bring TPLPs on-line - Other most commonly reported problems:	50% Merging IT systems TPLPs' lack of product knowledge Not enough time for implementation Unclear responsibilities	50% TPLPs' lack of product knowledge Not enough time for implementation Unclear responsibilities	70% TPLPs knowledge of customer requirements Internal resistance to change Lack of co-ordination Pricing/Billing problems	50% Merging IT systems TPLPs' lack of product knowledge Not enough time for implementation Unclear responsibilities

Comparing the number of respondents who have been using TPL for more than 3 years it can be noted that most companies in Europe (92%) are used to TPL usage as long term alternative to 'in-house' production of logistics services, where as fewer companies in the US (70%) and Australia (70%) seem to have adopted TPL usage as viable long term solution for logistics service provision. Long-term commitment to TPL points to a strategic or tactical rather than operational level of the outsourcing decision. Comparing the organisational level for the outsourcing decision of the examined regions it becomes apparent that Europe is the region where logistics outsourcing decisions are most made at corporate (strategic) level, followed by the U.S., where 49% of organisation reported that the logistics outsourcing decision is made at corporate level. Australian and Asian companies seem to be equally divided in acknowledging the strategic, tactical and operational value of TPL services. In the use of TPL services with an international as opposed to purely domestic geographic scope European companies (74%) seem also to be ahead of all other regions (U.S. – 64%, Australia, 34%, Asia Pacific – 59%). The reason for this might be the different sizes of the domestic markets in the examined regions. With regards to the most commonly outsourced services the regions only differ in the priority in which

respondents have reported those. The orientation is mostly functional (e.g. warehousing, transport, freight forwarding) and set either a priority in efficiency (e.g. shipment consolidation) like in the U.S., Australia and Europe or in effectiveness (order fulfilment) like in Asia. An exceptional pattern of outsourced logistics services becomes apparent in Europe. Here respondent reported information systems as being subject to logistics outsourcing. This points vaguely to a higher internalisation of logistics outsourcing.

Overall European companies seem to be more committed to TPL -48% of respondent report extensive commitment. In contrast only 7% of U.S. respondent and 22% of Australian respondent reported extensive commitment to TPL, none in Asia. This is also reflected in the expenditure on TPL in relation to the total logistics budget. The highest proportions of TPL expenditure occur amongst Asian and European companies, where 18%/20% of respondents report that their TPL expenditure represents more than 80% of their total logistics budget. The lowest proportional TPL expenditure occur in the U.S., where 73% of companies reported a proportion of TPL expenditure on total logistics cost of under 20%. With the exception of Australia, where 50% of respondent reported additional training needs as a consequence of TPL usage relatively few respondents (on average 25% in all other regions) reported the need for extra training as a result of TPL implementation. This is as a fact that on its own might be relatively meaningless. Considering though the different depth of TPL involvement as well this becomes a qualitative indicator for TPL development in a region. If one were to consider the need for organisational training, as consequence of TPL implementation, as an indicator of general TPL acceptance, then areas in which companies on average report more far reaching TPL applications reveal a higher development status in Third Party Logistics. Europe is the only region in which respondents classified Information Systems as one of the most commonly outsourced logistics services, which is an indicator for a development of TPL that is faster in Europe than anywhere else. Another interesting difference between the examined regions can be found in the way companies manage their TPL contracts. Where as companies in the U.S. and Europe overall prefer penalty clauses to safeguard TPL provider performance, companies in Asia for example use performance incentives. Amongst Australian companies there is no clear preference to either form of TPL provider management identifiable. With regards to the impact of TPL in operational

performance as well as the problems that have been encountered during the implementation of TPL services respondents reports don't differ very much between the examined regions. With regards of TPL impact on capital investment in people European companies report the highest rates of rationalisation. 11% of respondents reported the elimination of more than 90% of full time logistics positions in there companies, 50% reported under 20%, the rest being somewhere in-between. In comparison, 78% of U.S. reported an rationalisation factor of less than 20%, and in Australia 59% of respondents. None of the respondents in the U.S. and Australia reported a reduction in logistics personnel of 90% or more. Asia as a region becomes second in reporting benefits in capital investment resulting from TPL. Only 16% of respondent reported human resource reductions of below 20%, 5% of above 90% leaving the rest of respondent somewhere in the middle.

The above has shown that with regards to Third Party Logistics Europe is in many aspects the leading region in world. Many (Sheffi, 1990; Cooper, 1991, 1993, 1994; Lieb, 1991, 1993, 1996, 1998, 2000, 2002; Browne. 1994, 1995, 1999; Virum, 1993; O'Laughlin, 1993, McKinnon, 1999a, 1999b; Skjoett-Larsen, 2000; Bagchi, et al 1995, 1998; Stone, 2001, 2002;) see this as a logistical consequence of the European process of economic integration. The elimination of frontiers, trade barriers, and not at least the advanced implementation of the monetary union is meant to ease trade between the nations and the free flow of goods. The TPL industry should consequently be one of the beneficiaries of this development

2.2.2 The TPL industry in Europe

2.2.2.1 A growing TPL market

The TPL industry in Europe is of a substantial size and is experiencing fast growth. Recent research by the German Hypovereinsbank (2001) suggests (Figure 6)³ that the total expenditure, outsourced or not outsourced, on logistics in Europe will grow annually between 3.5 and 3.8 % until 2005. This is more than the expected growth

³ The important aspect of the projections, which are based on several sources, is not their absolute number but the expected growth rates of the individual sub-segments

rates for European GDP. This puts a value to the logistics market in 2001 of 506 billion Euros expecting to grow to 585 billion Euros in 2005. The market for Third Party Logistics providers is reflected in the outsourcing ratios of transport, handling, storage and called value added services. This was calculated for 2001 at 197 billions Euros and is forecasted to be 250 billion Euros in 2005. It is also forecasted that the outsourcing ratio of value added services in Europe would grow above average from its level of 28% in 2001 to 35% in 2005. The figure that is currently (2001) put this market for TPL service providers is 50.4 billion Euros and is expected to grow between 11% and 12% per annum. The real segment growth come thus from the acquisition of a growing variety of production related and administrative functions, which migrate from industry to service providers and which are commonly called Value Added Services. According to Berglund et al (1999) the stimulus for the rise of the TPL industry can be found in developments on both the demand and the supply side of TPL services. Laarhoven and Sharman (1994) found in addition to rather generic reasons, i.e. competitive pressure, globalisation, etc., following drivers for outsourcing in Europe:

- *On the demand side:* strategic reduction of asset intensity; restructuring of the distribution structure, triggered by a restructuring of the production structure; and, potential reduction of labour costs by switching to a non-unionised labour force.
- *And on the supply side:* deregulation of the transportation industry, which made it possible to provide TPL services more competitively; declining profit margins in basic services (i.e. freight transport); and, availability of capital to TPL service providers.

Similar figures and trends are reported annually by reputable consulting companies (Anderson, 2000; PriceWaterhouseCoopers, 2001), by Banks like LBBW (2000) or Hypovereinsbank (2001), by financial analysts like Bear Stearns. The attention the TPL market has been receiving during the past 5- 10 years can be assumed to be rooted in two factors: First, the euphoria of the new Economy has triggered a number of IPOs⁴ of traditional and new TPL companies. Whilst big American TPL providers

⁴ Initial Public Offering

like FedEx or UPS have been listed on the market for quite some time, companies like Kuehne and Nagel representing the segment of traditional forwarders or Microlog Logistics as a representative of recently found logistics companies have found their way to the public listing only in the late 1990s. Secondly, a wave of consolidation that is has been sweeping over Europe's logistics market has drawn the attention to 'Logistics

Table 2. 2: Economic growth and logistics outsourcing

ECONOMIC ENVIRONMENT: MACRO LEVEL

	1999	2000	2001e	2002e	2003e	2004e	2005e
Growth rates in %							
GDP OECD	3.6	3.3	2.8	3.1	3.4	3.4	3.4
GDP Euroland	2.5	3.4	2.1	2.4	2.5	2.5	2.5
Transport, handling, storage	1.9	2.4	1.6	1.9	2.2	2.2	2.3
Value-Added Services (VAS)	5.9	6.5	6.5	6.5	6.5	6.5	6.5
Logistics overall	3.2	3.7	3.2	3.5	3.7	3.8	3.8
Amount in EUR mn							
GDP Euroland	5,806.9	6,002.6	6,128.7	6,275.7	6,432.6	6,593.5	6,758.3
Transport, handling, storage	321.1	328.8	334.1	340.5	347.9	355.6	363.9
Value-Added Services	152.0	161.8	172.3	183.4	195.3	207.9	221.3
Logistics overall	473.1	490.6	506.3	523.9	543.1	563.5	585.2
Outsourcing ratios in %							
Land transport	40.0	40.7	41.3	42.0	42.7	43.3	44.0
Storage	45.0	46.0	47.0	48.0	49.0	50.0	51.0
VAS and logistics management	26.4	27.8	29.3	30.7	32.1	33.6	35.0

Sources: Datamonitor; Die "Top 100" der Logistik, Company data, HypoVereinsbank Research

Mega Companies. Exceptional impetus came in the late 1990s from the privatisation of National Post Offices. The TNT Post Group and Deutsche Post have risen since to become the biggest European logistics companies. This trend is even believed to be ongoing (Logistics Europe, 2002), as the just recently approved expansion plans of Deutsche Bahn show. With their acquisition of the Stinnes Group they will purchase also € 6.4 billion worth of TPL business.

2.2.2.2 Growing TPL providers

The expansion of TPL providers in Europe has become a research interest in itself. It has been recognised by several writer that the increasing movement towards outsourcing by European manufacturers and retailers is leading to the expansion of European TPL providers (McKinnon, 1999a, 1999b; Bagchi et al, 1995;). Cooper

(1991) and O’Laughlin et al (1993) also found that European TPL providers usually expand by acquisition rather than organic growth. The formation of strategic alliances between service providers has been identified as another strategy for growth of TPL providers in Europe (Peters, et al, 1998; Berglund et al, 1999;). Stone (2001, 2002) studied different expansion strategies of UK TPL providers and how successful they were. Stone found that European logistics is being organised intra-country rather than inter-country, thus demanding a network of offices and facilities. Stone also showed that European expansion for most UK TPL providers started with Piggybacking, i.e. following an existing customer into other geographical regions. In a second phase TPL providers have tried to either buy themselves into existing local businesses or formed alliances with local TPL providers. Organic growth seemed for most of the surveyed organisations not a viable option. Peters et al (1998) found, after surveying 16 CEOs of European TPL providers, that the most significant developments in the 1990s included foreign expansion as a means for improving network capabilities, and the opening up of Eastern Europe. They also noted the potential for concentration in the European TPL industry through acquisition and mergers, a notion that was also highlighted by Jockel et al (1998). Developments towards the concentration of the TPL industry in Europe have already been detected in the early 1990s (Cooper et al, 1991). They (Cooper et al, 1991) predicted the 1990s to be the era of ‘freight mega carriers’, with the European freight industry coming to be dominated by a few, very large, companies. Recent developments, like the rise of TNT Post Group and Deutsche Post to the top of European logistics companies, or the expansion plans of Deutsche Bahn AG seem to confirm this. The sheer financial power of these ex-monopolists enables them to acquire the necessary resources and skills in order to become dominant players in the market. TPL providers of small and medium size are thus facing fierce competition and are running risk to be either ‘swallowed’ or ‘extinct’. Some seek therefore alliances with other TPL providers to realise synergetic effects with regards to economies of scale and to enable a wider scope of services (Klaus, 1999). This tendency has also been reported by Peters (1998) and Berglund (1999). The recent report from the 11th Logistics Forum in the UK (Tulip, 2002) reveals that many participants see collaboration amongst TPL providers as the most viable solution for further TPL penetration of European Supply Chains. This would require a higher degree of standardisation, but would offer shared risk and investment

in capital-intensive projects and bigger leverage to develop clearer strategies for supply chains.

2.3 Reasons for outsourcing

The literature on TPL reveals that researchers have tried to answer the question as to why companies outsource logistics activities at 3 different levels. At a macro economic level researchers have focused on the *driving forces* that are behind the TPL phenomenon. Literature at this level relies mostly on expert opinions and observations of the TPL market. On a microeconomic level researchers have described the *perceived benefits* that are connected with logistics. This kind of research relies typically on key informants (i.e. logistics managers) who might have attributed certain benefits ex ante or reported actual experiences. Also on a microeconomic level some researchers provide *analytical explanations* of those benefits and thus the theoretical justification as to why organisations outsource.

2.3.1 The Driving Forces for Logistics Outsourcing

The most prominent driving force behind outsourcing logistics has been viewed by many as the ‘globalisation’ of businesses and increased competition on global markets (Sheffi, 1990; Virum 1993; Rao 1993;), which are enhanced by economic integration and the deregulation of transport markets as in North America and in Europe (Sheffi, 1990; Cooper, 1993; Bagchi and Skjott-Larsen, 1995;). This has resulted in an increasing demand on the logistics function and a growing trend for firms to focus on core activities (Bardi, 1991; Virum, 1993; Bagchi et al, 1995;). Shippers are confronted with increasing customer requirements and process complexity, whereby the control over supply segments which vertical integration can offer the firm is increasingly being rejected as an advantage, which is too costly and inflexible. Many companies therefore qualify logistics management for outsourcing (Van Damme, 1996). Lynch (1996) opinionated that with the intense competition of today, streamlining and downsizing are virtual necessities, and logistics partnerships afford a convenient and cost-effective vehicle to carry them out. It has also been suggested that an integrated co-operation between the provider and the buyer of logistics

services could be one way for the buyer of the services to obtain a high service performance and thereby achieve a competitive advantage (Anderson, 1995, 1997).

2.3.2 Impact of Third Party Logistics

2.3.2.1 Perceived benefits

Most of the research that identifies the benefits of logistics outsourcing is descriptive and not analytical. It provides some understanding of the circumstances under which a firm qualifies logistics for outsourcing, but doesn't give a further insight into what the actual outputs of this process are, or explains why these outputs are perceived as being beneficial to a firm.

According to Gentry (1996) the positive effect of the use of TPL and in particular partnership type relationships seems to be undisputable though. The perceived benefits from outsourcing logistics TPL providers are described by many (Bardi, 1991; Sarel and Zinn, 1992; Schmitz Whipple, 1996; Gentry, 1996; Gentry and Vellenga, 1996;).

Following surveys exemplify the typically cited benefits attributed to logistics outsourcing.

- Bardi (1991) surveyed 137 US companies which outsource logistics activities
- Schmitz Whipple (1996) surveyed 1224 members of the Council of Logistics Management encompassing US manufacturers, merchandisers and service suppliers.

Bardis survey revealed that the most popular reasons for outsourcing logistical function as

- | | |
|-------------------------|-----------------------------------|
| 1. Labour cost savings | 5. Transportation cost reductions |
| 2. Specialisation | 6. Expanding workload |
| 3. Reduced asset use | 7. Lack of flexibility |
| 4. Inadequate resources | |

The survey conducted by Schmitz Whipple the motives to form closer relationships to providers of logistics services are

- | | |
|-------------------------------------|--------------------------------|
| 1. Achieving Competitive Advantage | 6. Supplier/Demand Stability |
| 2. Improved Quality | 7. Exploiting Core Competency |
| 3. Leadtime Performance Improvement | 8. Technological Access |
| 4. Inventory Reduction | 9. Market Access/Globalisation |
| 5. Increased Customer Involvement | 10. Leveraging Capital |

Other surveys that focus on the use of TPL services in the US, Europe and Australia (Peters *et al*, 1998a; Peters *et al* 1998b; Lieb *et al*, 1996; Dapiran *et al* 1996; Lieb *et al*, 1993; Sink *et al*, 1996; Laarhoven, 1999) reveal similar results.

Berglund (1997) categorises the benefits resulting from logistics outsourcing in

- Operational benefits
 - access to operational /logistical production factors
 - performance improvement
- economic/financial benefits
 - economies of scale/scope
 - transparency of cost structure – fixed costs become variable costs
- managerial benefits
 - access to managerial skill
 - reallocation of internal resources to other (core) business functions
- strategic benefits
 - flexible access to geographic regions
 - concentration on core business activities

Andersson (1993, 1997;) groups the benefits of logistics outsourcing into *cost effects* (economies of scale, scope, and/or learning) and *intangible effects* (access, risk reduction, shaping of competition).

From a logistics management point of view the perceived benefits of logistics outsourcing can be described as operational and strategic/tactical impact. Most writers seem to emphasise the operational. The reason for this could be that these are usually better measurable, mostly as cost. This strengthens of course the meaningfulness of any research. Strategic issues like competitive advantage or the exploitation of core

competences are far more difficult to measure. It is therefore not surprising that even more analytical approaches to research problems in the field of TPL are mostly adopting an operational perspective.

2.3.2.2 Analytical explanations

Most empirical studies that have tried to explain the outsourcing decision have focused on operational benefits resulting from Third Party Logistics. These researchers (Ellram, 1991, Schary and Coakley, 1991, Pfohl and Large, 1992, Virum, 1993; Cooper et al, 1993, Aertsen, 1993, Maltz, 1994, Ojala, 1995, Skjott-larsen 1995, Cox, 1996, Anderson, 1997) have used transaction cost analysis as a platform for discussions on the outsourcing decision and the governance structure in logistics. For example Pfohl and Large (1992) argue that any one form of logistics management depends on the kind of costs and benefits each form creates. Andersson (1997) shows that TPL partnerships can affect logistics costs, service, restructuring of logistics systems/supply chains and governance and transaction costs.

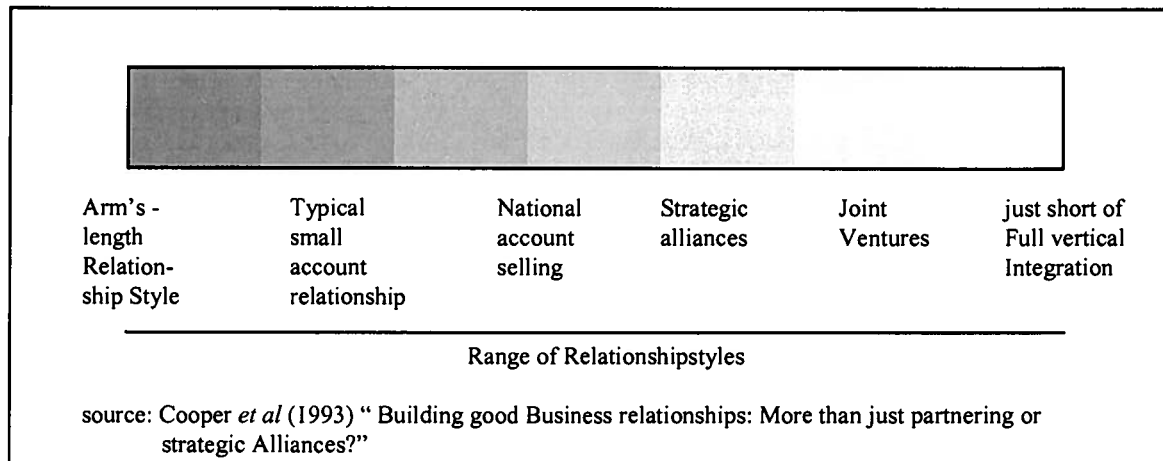
Ellram (1990) conducted a survey amongst US firms representing a wide variety of industries and US carriers and warehousers. Building on the concept of synergy that is associated with Supply Chain Management she identified potential managerial, economic and strategic benefits that arise from TPL partnerships. She found that companies with closer partnering relationships were able to make more use of synergetic effects than companies that maintained arm's length relationships with TPL providers. Based on their survey of American TPL users McGinnis et al (1995) report, that the attitude towards outsourcing affected a firm's competitive responsiveness. He found that companies with high rating in TPL usage and stringent selection processes reported more competitive responsiveness than companies with lower ratings in these areas. Leahy (1995) sees evidence for the strategic value of the outsourcing decision in the appearance of new outsourcing models, which emphasise the move away from traditional, function specific outsourcing towards longer term commitments and the TPL management of multiple functions and thus leading to cross functional logistics/supply chain processes. Boyson et al. (1999) suggested that the *strategic outsourcing* of integrated functions across the supply chain will be more

effective than the gradual or piecemeal outsourcing of logistics and/or supply chain activities. They found that the success of outsourcing agreements depends heavily on the management skills of the firms engaging the services of third-party logistics providers. Skjoett-Larsen (1999) highlighted also the fact that the benefits of TPL today have a more strategic thrust, than 10 years ago. He exemplifies this on 3 cases of TPL relationships in Sweden. Bolumole (2002) finally examined various cases in the UK food retail industry and concluded that perceived operational cost benefits *and* strategic benefits like building of higher competences can influence on the outsourcing decision.

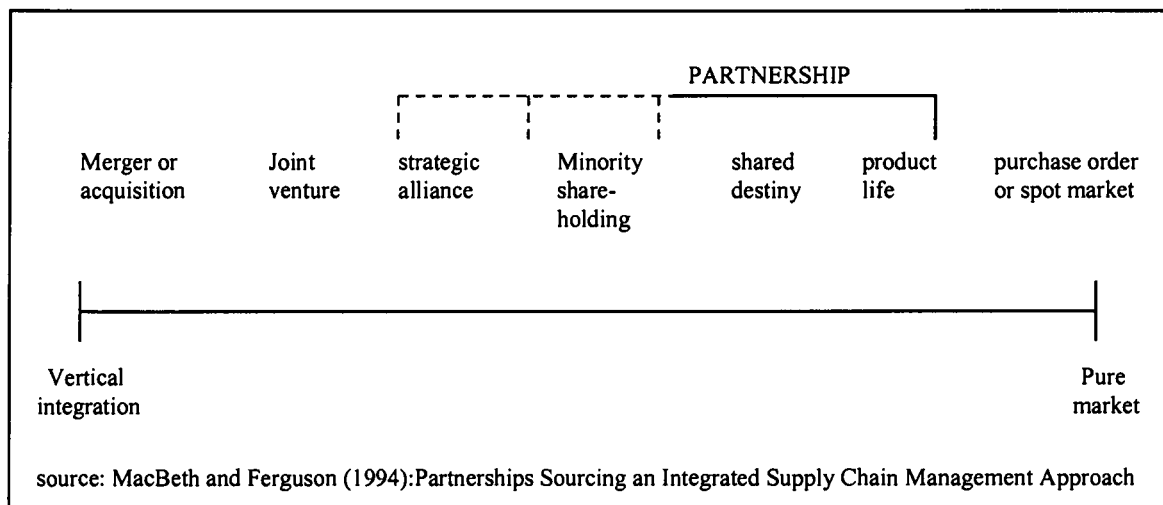
2.4 Third Party Logistics from an inter-organisational perspective

2.4.1 Arm's length vs. partnership/alliance relationships

Some fundamental work in this area (Cooper and Gardner (1993)) explains different forms of TPL relationships, which range on a spectrum from arms length to 'close to vertical integration' – partnerships (Figure 2.1). They present a possible continuum of relationships, which is at one end anchored in relationships characterised by distant, formalised relationships in which there are no expectations beyond what is spelled out in the negotiations or communications, so-called 'arm's length' style relationships. At the other end of the continuum would be two firms carrying out a long series of transactions with such close co-ordination and understanding that the firm work together virtually as one. Six points on this continuum suggest the range of possible relationships. Dimensions of interorganisational relationships that are receiving increasing attention are partnerships between TPL providers and the organisation(s) they support (Bowersox, 1990; Cooper *et al*, 1993; Macbeth *et al*, 1994; Gardner *et al* 1994;). Macbeth and Ferguson (1994) use the phrase partnership

Figure 2. 1: Continuum of Relationship Styles

to refer to intermediate types relationship ranging from life partnership to strategic alliances (Figure x). Cooper and Gardner (1993) refer to a degree of partnerships whereby they attribute elements of partnership on a growing scale to any possible relationship that exceeds an 'arm's length' relationship.

Figure 2. 2: Partnerships Style Relationships

According to Bowersox (1990) and Gentry (1996) the heightened emphasis on achieving customer satisfaction in a global environment has elevated logistics competency to a position of high priority within leading organisations. In recognition of the philosophy of Supply Chain Management with the concept of partnering as a central element, they suggest that the same strategic advantages of 'partnering' efforts achieved by providers of goods can be realised by developing partnerships with

transportation and other logistics services providers. Triggered through the European integration process Bagchi and Virum (1998) see particularly in Europe a strong tendency towards logistics partnership/alliances formation between shippers and TPL providers.

Partnering on an inter-organisational level assumes that relationship formation is based on reciprocity (Oliver, 1990). Motives of reciprocity emphasise co-operation, collaboration and co-ordination among organisations, rather than domination, power and control. In addition successful partnering relationships rely heavily on social exchange behaviour, such as trust and relationship commitment (MacNeil, 1980, Parkhe, 1993, Ring and Van de Ven, 1994).

Ellram (1990) discusses the relationships between supply chain management and partnership ventures and developed a framework for classifying and understanding the risks and rewards of partnerships in logistics from the perspective of both shippers and third parties. Gentry (1996) adopted also a supply chain view and examined strategic partnership dimensions on triads between buyers, supplier and third party logistics providers. She found following key elements of these partnerships:

- the sharing of risks and rewards of the relationship
- co-operation on cost reduction programs and continuous improvement
- exchange of information and open communication
- long term commitment

Studies of a similar nature were conducted by Leahy, Murphy and Poist (1995), Ellram (1995), Daugherty, Stank and Rogers (1996), and Tate (1996). She conducted a case study on the long term relationship of a US manufacturer of healthcare products and a US based warehousing company looking at “ the ingredients of this relationship” and found the following: These include

- compatibility
- a deep understanding of a partner's business needs
- open communication
- commitment
- fairness
- flexibility
- trust

In 1994 Gardner and Copper picked up on their earlier studies and conducted a large survey and 10 case studies amongst members of the Council of Logistics Management in the US in order to gain a deeper understanding of the Shipper - carrier and shipper-warehouser relationships (Gardner J.T., Copper, M.C., Noordewier, T., 1994) conducted. They identified 5 behavioural elements of partnership

- Extendedness
- Operational Information Exchange
- Operating Controls
- Sharing of Benefits and Burdens
- Collaborative Planning

Moore (1998) pointed out that trust and commitment are essentials to logistics alliance formation. Moore and Cunningham (1998) found from a survey amongst American shippers that social exchange behaviour (i.e. trust and commitment) between shippers and TPL providers was more influenced by the effectiveness of the relationship than by the type of relationship itself.

2.4.2 The effect of TPL partnerships

Many researchers have acknowledged the positive effects of partnership type inter-organisational relationships or alliances (e.g. Johnston & Lawrence, 1988, Ohmae, 1988, Baum & Oliver, 1991, Hagedoorn, 1993, Parkhe, 1993, Moss-Kanther, 1994, Saxton, 1997).

In logistics the benefits of TPL partnerships have been equally recognised (e.g. Ellram 1990, 1992; Bowersox, 1990, Rogers, et al, 1995, Frankel, et al 1996, Gentry, 1996 a,b,c;). Ellram (1990, 1992) and Bowersox (1990) concluded that

partnerships in logistics bear potential for synergetic effects, which can lead to managerial, economic and strategic benefits for shippers and TPL providers. Rogers and Daugherty found that alliances between TPL providers and shippers resulted into a higher use of IT. Frankel and Schmitz Whipple (1996) found that logistics alliances led to more flexibility for the shipper. Schmitz Whipple et al found that inventory reduction and leveraging capital where prevailing results from alliance formation with TPL providers. Gentry (1996a,b,c,) found that logistics partnerships can lead to operational performance improvements.

2.4.3 Managing TPL relationships

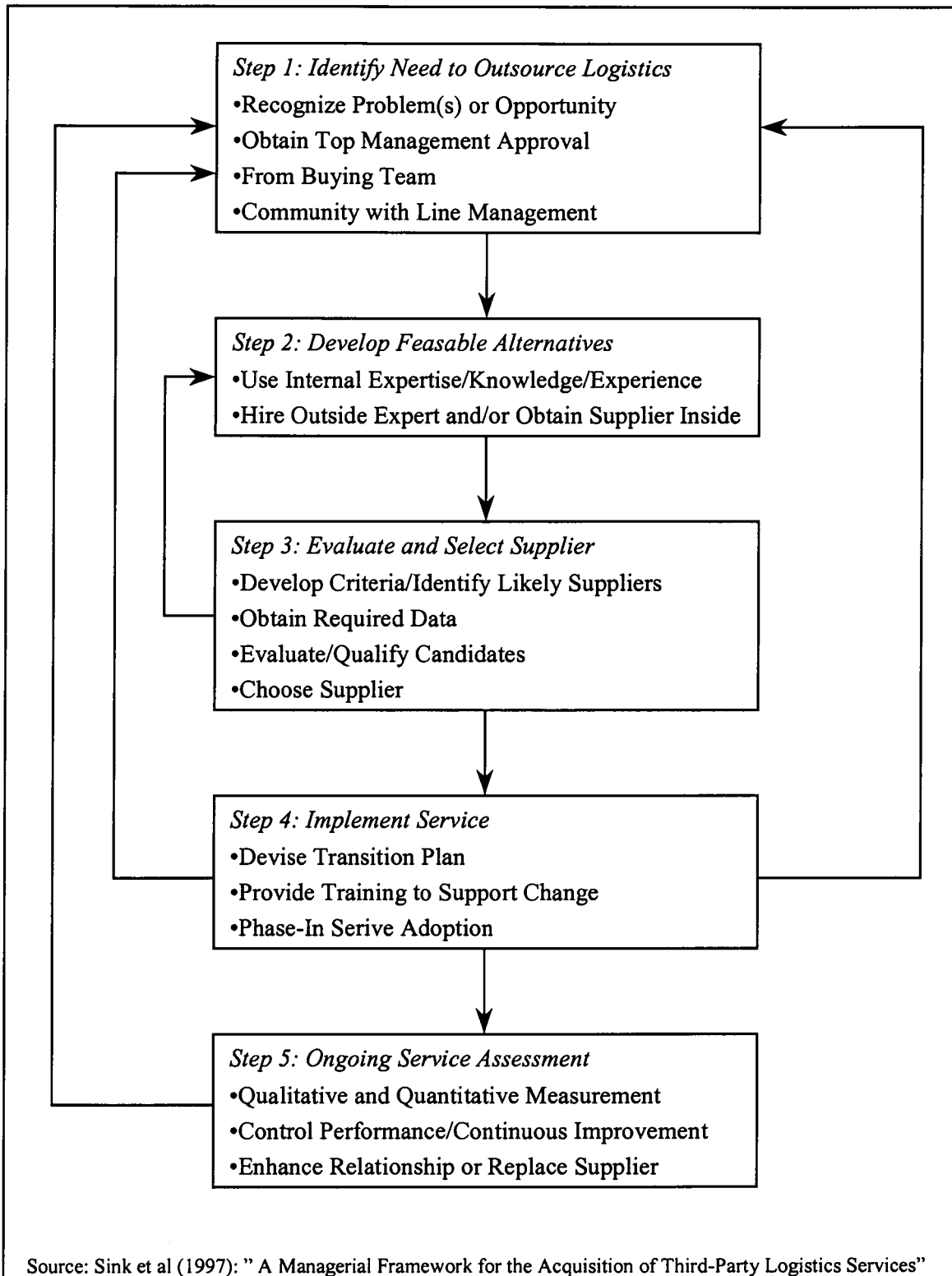
The growing tendency towards far-reaching partnerships in Third Party Logistics is reflected in the number of research projects that revolve around this topic. Research in this particular area of TPL reflects mostly a shipper perspective.

Kleinsorge *et al* (1991) develop a tool of performance evaluation for an ongoing TPL partnership. They developed measurable variables that are transaction-oriented and relationships oriented and measured the relative efficiency of each variable over time. Their evaluation model was innovative for the fact that it used benchmarking data as basis for performance evaluation. However, they tested only its application to freight carriers.

Rinehard (1992) examined the bargaining strategy of various shippers and found that shippers seeking a collaborative relationship with TPL providers employ a bargaining strategy that reflects a higher extent of communication and information exchange than those shippers that adopt a more adversarial view of their relationship with TPLPs. He uses the concepts of *environmental constraints* and *strategic objective* together with the concept of *bargaining* to develop a Model of Global Logistics Partnership Negotiation. In inter-organisational relationships (IOR) the concept of bargaining is usually linked with the potential to exercise power or control over another organisation (Oliver, C. 1990). Partnerships though emphasise usually co-operation, collaboration, and co-ordination rather domination, power and control. Gardner et al (1994) also see contract negotiation as an essential element of logistics partnerships

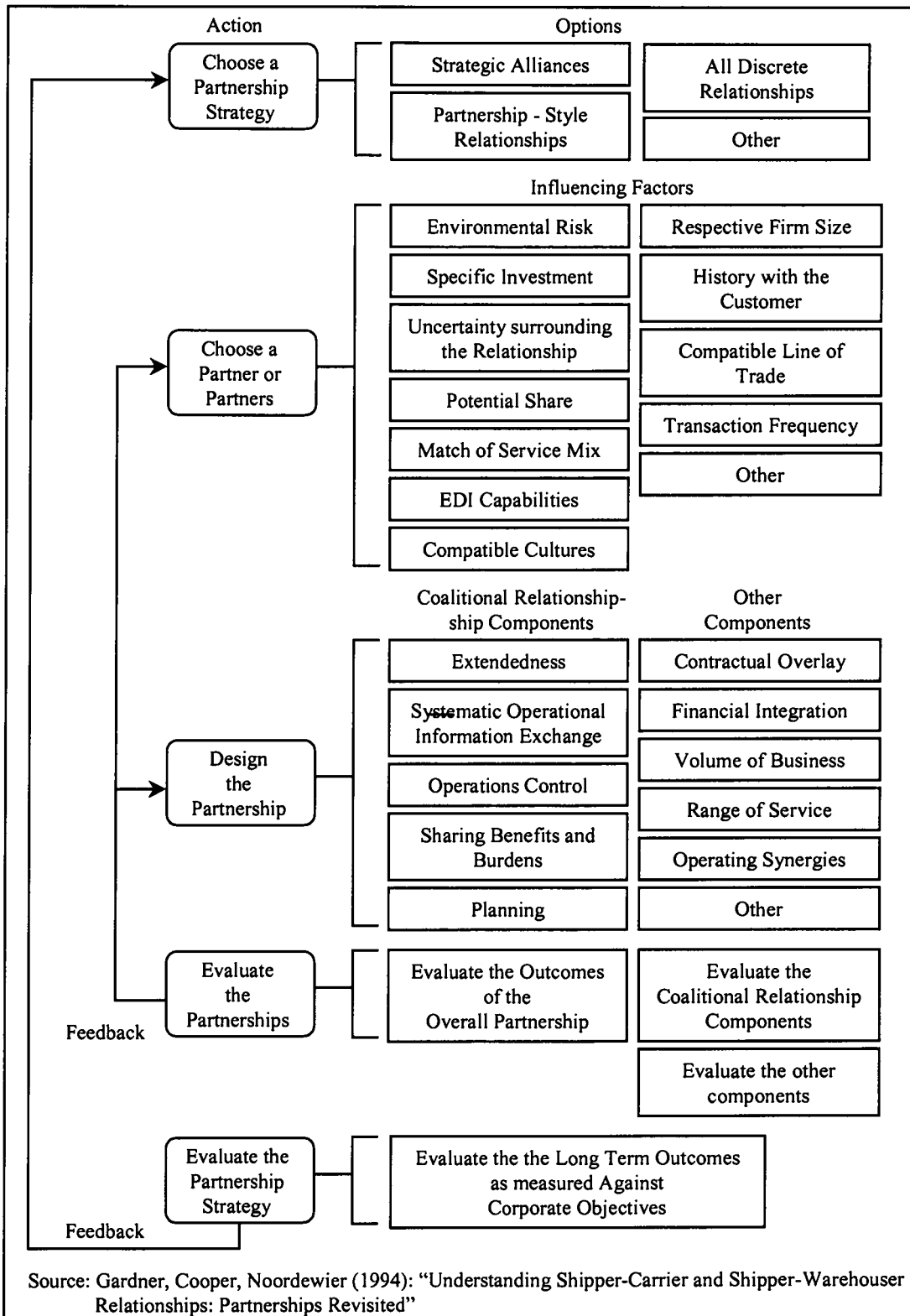
and management. Gibson et al (1993) focused on the *selection criteria* for TPL acquisition and developed a “Conceptual Model of Transportation Purchasing

Figure 2. 3: A managerial framework for TPL service acquisition



Strategy” which displayed a continuum of shippers ’purchasing strategies ranging from a transaction based philosophy to relation based philosophy. They tested this

Figure 2. 4: A Strategic Model of the Partnership Building Process



model during a three-phase research effort on US shippers and international carriers employing the survey method and found that shippers are moving from an exclusive price focus towards a continuous improvements focus based on long term partnership. Sink *et al* (1997) developed a “Conceptual Model of the Third Party Logistics Buying Process” (Figure 2.3). This is based on research into a cross-section of industries in the US and Europe whereby their methodological approach entailed the use of interviews with an industry focus group, case studies and a mail survey. Although their model provides an insight into the whole outsourcing process, based on their observation, it reveals what decision process takes place at each stage and who is participating in this. Figure 2.4 depicts the strategic model for the partnership building process provided by Gardner, Cooper and Noordewier (1994). Van Hoek (2000) found that the transactional context of governance for purchasing and control of Third Party Logistics services does not represent a market environment. He postulates the complementary role of relationship co-ordination through discussion and information exchange with regards to the management of TPL relationships.

2.5 The changing role of Third Party Logistics providers

2.5.1 Logistics outsourcing is gaining strategic importance (the shippers' perspective)

Some protagonists of logistics outsourcing in large shipper organisations like, SmithKline Beecham or in consulting companies like Mercer Management Consulting or Accenture have been postulating the strategic value of TPL as a source of innovation and thus competitive advantage (Coppachino, 1998, Foster, 1999). Academic researchers (e.g. Bowersox, 1990, Sharman, 1994, Skjoett-Larsen, 1999) have also recognised the strategic importance of logistics outsourcing. Outsourcing has in this sense become crucial element of a logistics strategy.

Writers like Bowersox (1990) and Sharman (1994) have stressed the important link between logistics and marketing strategy and see the potential to increase logistics competence through the formation of logistics alliances with TPL providers, hence also the potential to increase competitive advantage.

Skjoett-Larsen (1999) stated the following: *“While the primary driving forces (for logistics outsourcing) previously were to reduce costs and release capital to alternative purposes, the driving forces today have a more strategic thrust: to increase market coverage, improve the level of service or increase flexibility towards the changing requirements of customers.”*

But there is only little empirical evidence that supports this strategic explanation of the outsourcing decision.

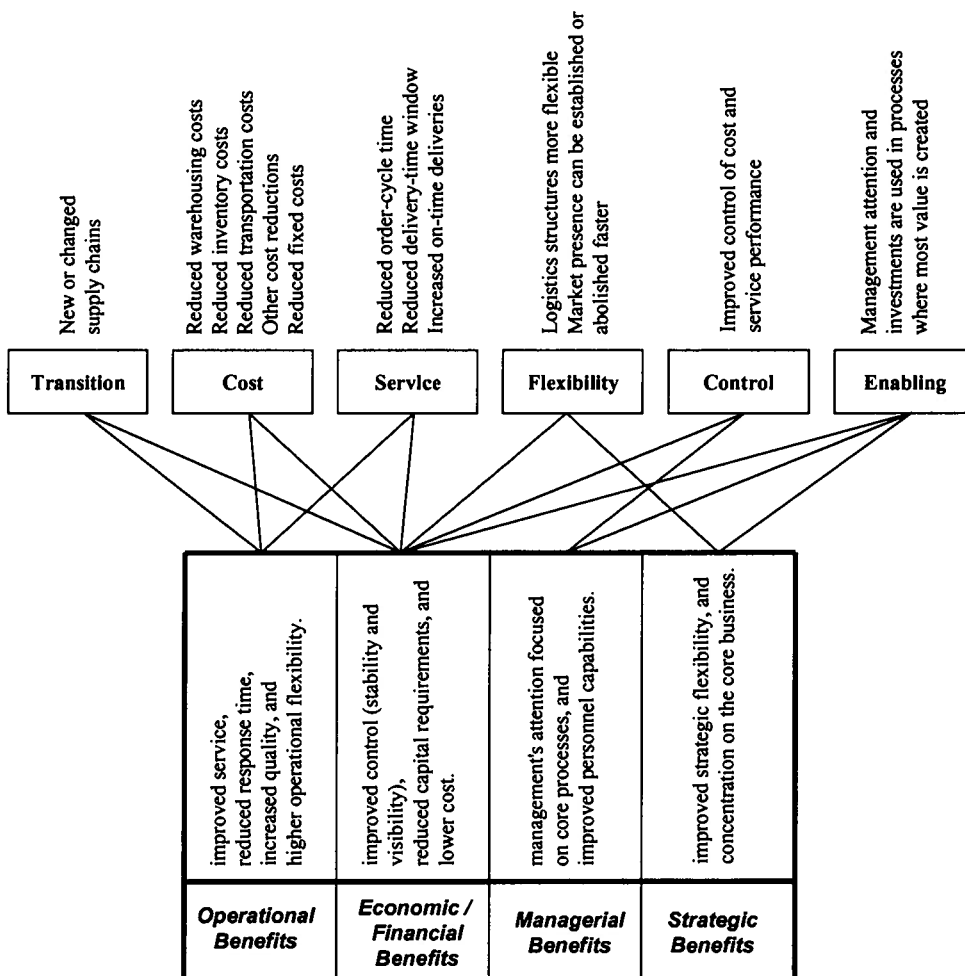
Some researchers (Maltz and Ellram, 1997) have found evidence that the outsourcing of integrated processes allowed firms to not only streamline their flows of goods and information, but also to reduce costs associated with asset ownership, the monitoring of performance and the hiring, management, and training of personnel. In essence, companies outsource clusters of non-core activities that create strategic sub-systems. These have a joint impact on what customers perceive as important product attributes. Venkatesan (1992) has found that the outsourcing of bundled activities as opposed to single functions can lead to better economies of scale. Boyson (1999) also found that companies that outsourced bundled activities to Third Party Logistics providers were doing so in order to achieve potential economies of scale. He also found though that these companies were also aiming to achieve more flexibility, but were outsourcing in order to compete in increasingly uncertain environments. Further research in this area by and Rabinovich (1999) supports this notion. They also found evidence that firms increasingly outsource integrated processes (across information and material flows within each logistics functional area) in order to gain better logistics performance.

Some researchers have conceptualised the strategic value of the outsourcing decision in logistics management as the logical consequence of the strategic value added by logistics (Keeber et al, 1999, Slack et al, 2001, Stock & Lambert, 2001) and supply chain management (Stevens, 1989, Cooper, 1993, Christopher 1998). Bathnagar et al (1999) highlight the opportunities for strategic alliances between shippers and TPLPs with respect to supply chain re-engineering. They found in the exemplifying case of Motorola that TPLP competence lead to a substantial increases in performance, particularly in lead times and long term probability of high service levels. Bolumole (2002) also examined the role Third Party Logistics providers in Supply Chain

Management. She found that the strategic orientation of the outsourcing organisation perception of the service providers' role within the logistics strategy, the resulting TPLP/shipper relationship influence and the extent to which logistics processes are outsourced have an influence on the role of TPL.

Berglund (2000) synthesises previous research on Third Party Logistics and refers to different dimensions of TPL value creation from a shippers perspective. Figure 2.5 depicts the spectrum of TPL effects on various management levels and links those to different means by which these effects are achieved. He (Berglund, 2000) explains that operational benefits affect the operational structure of a shipper.

Figure 2. 5: TPL value creation dimensions from a shipper perspective



logistics system, and hence must be seen as having an effect on service and cost as well as sparking transitional change in logistics structures. On the contrary, the economical and financial benefit from changing from a ineffective logistics structure

full of stored product to a cost effective lean one, the transition effect, might be the triggering effect that result in a TPL relationship (managerial benefits – transition effects). Continuing on the main effects connecting to managerial benefits, positive effects in terms of cost and services by accessing high skilled logistics managerial capability through TPL relationships could be envisioned. In relation to managerial benefits it is more likely that it is the enabling effects, i.e. the clients ability to use their limited management resources on other more value creating activities than the outsourced logistics process, that drives logistics outsourcing from a managerial perspective (managerial benefits – enabling effects). Connecting to this effect is the increase of control that occurs when using external suppliers. Management is much about controlling activities in accordance to stated objectives. By introducing an organizational border the control aspect becomes impossible to treat lightly, thus the managerial benefits from increased control (managerial benefits – control effects). Strategic benefits could potentially be connected to all of the outlined effects, however, most strongly to flexibility and enabling. Strategic flexibility means for example letting clients enter and leave different markets at short notice, or restructuring logistics operations within existing geographic areas (strategic benefits – flexibility effects). The strategic benefits of enabling is about shifting focus away from logistics processes to others that are considered more important for the clients organization (strategic benefits – enabling effects).

2.5.2 The changing face of TPL providers

2.5.2.1 Function and process related service offers

Complementary to the geographic growth TPL providers also seem to grow in terms of the scope of services they offer and in the level of integration that results from the way they are providing these services (Rabinovich et al, 1999). In a survey of 21 international TPL providers based in Europe Berglund (1997) found that the offered and/or provided services can be categorised according their functional focus. He distinguishes between

- Different kinds of full logistics services
- Services referring to the functional activity warehousing

- Services referring to the functional activity transportation
- Services referring to logistics information systems
- Different kinds of value-adding service
- Consultative or design/engineering types of service

Similar listings and categorisations have been provided and interpreted by other writers like Leahy (1995), Lieb (1996), Dapiran (1996), based on surveys in the US and Australia. Most TPL providers in the before mentioned studies stated the offering of 'full logistics services'. But TPL providers were still adhering to logistics functions rather than cross-functional processes. This means their service offerings are mostly functionally oriented (e.g. transport, warehousing) than process oriented (e.g. order fulfilment, warehouse replenishment). On a lower level, within the noted categories TPL services seem to be process oriented. Berglund (2000) notes that integrating a number of activities produces TPL services. This reflects a certain functional (logistics) competence (see chapter 4 for further elaborations on 'competence'). Armstrong and Associates (1998) also refer to TPL activities that are potentially carried in different areas of logistics. The functional integration i.e. the process oriented offering of logistics services is only just emerging, according to a recent report of a leading trade magazine (Lewis, 2002). This is a consequence of more complex logistics demands and the growing competence of TPL providers.. These are integrated logistics services offerings are based on management, information and value-adding services. Berglund (2000) detected this development . Reporting on the TPL industry's experience and forecasts Peters et al (1998), and similarly Berglund et al (1999), note that the biggest segments of growth for TPL services are value added, information and management services. Berglund (2000) sees particularly in the increasing provision of value-added services a trend to more integrated TPL services offerings, because they mostly entail information and management services accordingly. He further sees the development of a segment of TPL providers concentrating on non-asset management activities, which subcontracts the asset-based provision of the fundamental logistics service, like transport or storage to a second tier. Similar distinctions have been made in the beginning of the 1990s when TPL providers started to offer dedicated distribution services, which combined and integrated the transport and warehousing function in logistics. Van Dorp et al (1992)

separated in that sense logistics companies offering their clients generic logistics services and companies offering interface management - dedicated logistics services. Ruygrok and Knippenberg (1994), distinguished between two types of logistics service provision:

- Transport logistics and
- Product logistics

Transport logistics involves the organisation and control of transport activities and transport networks. Product logistics involves the organisation of supply, storage, handling and distribution for specific good flows. Some protagonists (Copacino, 1998; Foster, 1999) now see the development of another tier or category of TPL provider. They see the emergence of Fourth-Party Logistics companies that offer analytic and decision-support capabilities, cutting edge information technology, and capabilities in change management, organizational development, and alliance management in addition to logistics management services.

2.5.3 The strategic posture of Third Party Logistics providers

Researchers in the beginning and mid 1990s have seen the future of TPL in the way that some providers of service would become a source for 'one-stop shopping' (Sheffi, 1990, LaLonde, 1991, Vallenga, et al, 1991, Semeijn, et al, 1995). The increase in service offerings by TPL provider has been outlined extensively above. Surveys amongst American and European shippers and TPL providers (e.g Lieb, 1996, 2000, Peters 1998, Laarhoven 1999, Berglund, 2000) also show that that many TPL companies offer '*full*' or '*integrated*' logistics services. The prevailing notion at the turn of the century seems to be that a segmentation of TPL providers is taking place (e.g., Abrahamsson et al, 1998, Langley, 1999, Berglund 2000, Hastings, 2002, Lewis 2002). On one end we will see the emergence of TPL providers that concentrate on the provision of management, information and knowledge based services and on the other end of the spectrum providers of logistics will concentrate on service offering that are asset based. This development actually follows a pattern of the TPL industry that has been recognised already in the early 1990s as the most prevailing difference of TPL providers' historical roots (Sheffi, 1990). However, there

seems to be an overall trend amongst leading TPL providers to position themselves in 'solution provider' end of the market. The CEOs of leading TPL providers in Europe like P&O TransEuropean, Tibbett & Britten, Schenker, Kuehne & Nagel or UPS propagate their ability and aspiration to be or become 4PLs TM (Hasting, 2002, Lewis, 2002), regardless of their historic roots.

Academic research has also acknowledged this development. Berglund (1997, 2000) refers to the production of logistics services that can be divided into a number of tiers, which are TPL providers, traditional suppliers, and sub-suppliers of logistics services, as well as providers of infrastructure. Wandel and Ruijgrok (1995) introduced this approach as a structural multiple-layer model to describe the supply of transportation activities. Abrahamsson and Wandel (1998) developed the model further to a multi-tiering model for logistics alliances. They see TPL providers offering operation and development of logistics management as the first tier below shippers. In a 2nd tier traditional suppliers, like Express companies or hauliers supply their services to TPLPs. These are services again by sub suppliers like carriers and the last tier finally contains suppliers of infrastructure like airports or rail etc.

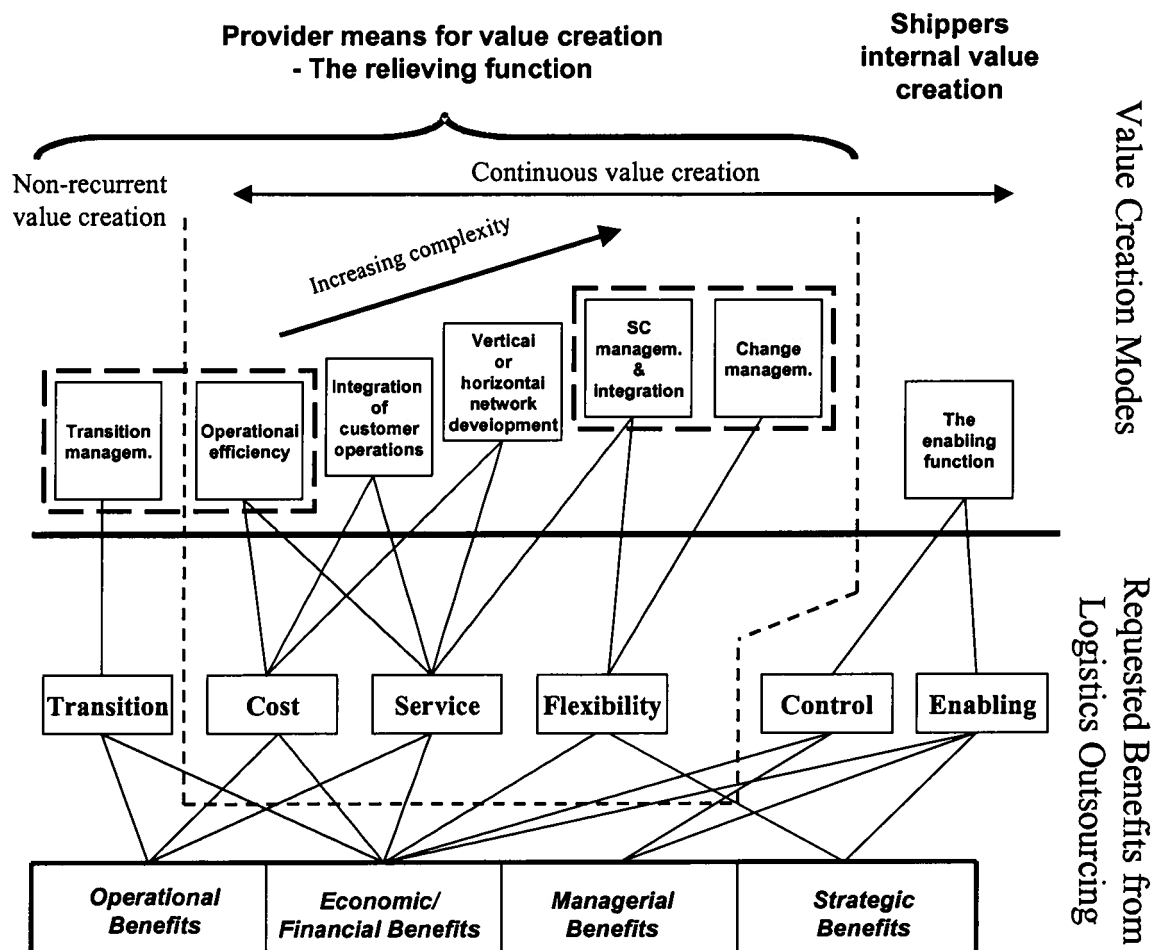
Figure 2. 6: Taxonomy of core value creation by TPL providers

Mode	Operational efficiency	Integration of customer operations	Vertical or horizontal network development	Supply chain management & integration
	Factor costs	Economies of scale by: Indivisible costs, Increased dimension, and Massed resources	Factor costs Asset reduction	Development of customer business process
Drivers	Economies of scale by: Specialization, Techniques or Organization, and Learning	Economies of Scope	Economies of scale by: vertical and horizontal integration	Economies of Scope
	Operations (IT)	Operations IT	Operations IT (Conceptual)	Operations IT Conceptual

Source: Berglund (1997)

Berglund (1997) also recognised the developments in the TPL industry and combined the concept of the value chain (Porter, 1985) and of core competences (Hamel & Prahalad, 1990) to explore how TPL providers create value. He presented a taxonomy of core values that can be created by TPL providers (Figure 2.6). He identifies 4 different modes (which must be rather interpreted as logistical objectives) ranging from 'operational efficiency' to 'Supply Chain Integration', the driving forces (better interpreted as the means of TPL provision) and the necessary skill to enable these means and subsequently the set objectives. In a later study Berglund (2000) combined his observations of the shippers' perspective outlined under 2.5.1, and his taxonomy of TPL value creation and deduces a model of a TPL Value Creation System (see figure 2.7).

Figure 2. 7: The TPL value creation system



Source: Berglund (2000)

In this model he connects TPL benefit categories to effect dimensions and value creation modes. The non-recurrent value creation mode transition management is clearly connected to the transition effect dimension. The enabling function, which is a continuous value creation mode connects to the TPL enabling effect dimension of the shipper perspective, but also to the control effect dimension as it creates value by the TPL client's, i.e. the shippers', internal processes. The continuous operational efficiency value creation mode represents relatively low complexity and is connected to the cost and service effect dimensions. The same connections are also the most important for the integration of customer operations and the vertical or horizontal network development modes, which are ways of value creation with an increasing degree of complexity. The flexibility effect dimension is not strongly connected to the previous discussed modes as the supply chain management & integration and the change management modes of value creation mainly influence it. These two final modes are both much about abilities connected to changing the clients business system in a wider perspective than just an outsourced logistics process. Nevertheless the connection between supply chain management & integration and the service effect dimension ought to be recognized, as well.

Although Berglunds model is not empirically verified it represents a framework for future research on TPL that integrates the shipper as well as the TPL perspective.

2.6 Summarising the critique of the TPL Literature: Research Gap and Research Questions

The review of the available literature on Third Party Logistics revealed that the TPL phenomenon still lacks sufficient explanation, particularly from strategic point of view. Although various writers have conceptualised the strategic importance of TPL and TPL alliances (e.g. Bowersox, 1990, Sharman 1994,) empirical evidence to which extend TPL providers are creating value in the management of logistics systems and how they do that is still missing. A second issue that legitimises the need for further research is the fact that existing research took either a shipper or a TPL perspective. Research that combines both stances is rather rare. Berglund (2000) offers a framework that combines both perspective. He conceptualises various potential modes

of TPL value creation, but does not investigate them empirically. The question of how TPL providers facilitate these modes remains unanswered.

A further conclusion drawn from the review of the literature is that analytical studies are rooted in organisational theory and in particular Transaction Cost Economics (TCE) based on the seminal work of Coase (1937) and Williamson (1979). Researcher who applied this theoretic approach (Ellram, 1991, Schary and Coakley, 1991, Pfohl and Large, 1992, Aertsen 1992, Maltz, 1994, Ojala, 1995 Skjott-Larsen, 1995, Cox, 1996, Anderson, 1996) have been able to explain the operational benefits arising from differences in operations and/or transaction/governance costs. They have thus provided a general explanation for the outsourcing decision.

Yet there is no explanation as to why companies outsource logistics at different levels, i.e. companies outsource sometimes only one functional element of their logistics system, sometimes the responsibility for complex integrated processes. Given the nature of the profit oriented organisation and the insight that logistics outsourcing bears economic advantages one should expect that logistics outsourcing would appear in more or less the same form everywhere. This is not the fact though. Between different geographical or industrial context and even within them we find major differences (Lieb, 1993, 1998, Peters et al, 1993 1998, Laarhoven 2000,). One possible explanation for these differences can be seen in the differences between TPL providers themselves. This argument is supported by Sheffi (1990), who observed a developing division between asset and non- asset TPLPs and Berglund (2000) goes further in segmenting the TPL market according their service offerings. The differences in TPL provision are reflected by different levels of involvement of TPL providers in the logistics system of his client. To understand the reasons behind these different degrees of outsourcing and their effects, we need to look at concepts and/or theories that are perhaps new to logistics research, but have been applied elsewhere in management science.

2.6.1 Shipper expectations on TPL services- A TPLP vs. shipper perspective

The literature review highlighted logistics as a key competence in the value chain with a growing importance of TPL contributing to this. Ongoing research in the US (Lieb, et al, 1996, 1998, 2000) and in Europe (Peters et al, 1998; Laarhoven et al, 2000) indicates that TPL provider are becoming more involved in the management of their clients' logistics processes. This growing trend towards outsourcing is reflected in increased TPL service offerings. The possible scope for logistics service provision nowadays ranges from operational involvement on a transactional basis to customised logistics solutions that are designed and implemented with varying degrees. Secondly examining the degree of TPL involvement across different countries and industries in Europe might give us some valuable insights into the actual scope TPL provision. Taking further into consideration that the TPL phenomenon reflects the intentions and expectations of shippers as well as of TPL providers gives rise to the following research question:

RQ 1: How do European shippers and TPL providers perceive the current role of TPL providers?

To answer this question for the European logistics market the degree to which TPL providers get involved in managing logistics processes of an entire logistics system must be examined (ie the meaning of their role). Research into TPL has traditionally focused on the operational aspects of logistics. Some writers (Coyle, Bradi, Langley, 1992; Ruigrok and Knippenberg, 1994;) however, realised that a further understanding of TPLPs could only be made by examining their involvement in clients' decision making processes. Following this line of thinking Andersson (1997) examined the potential of TPL involvement in process design and operational activities. An examination of TPL involvement with regards to the whole scope of logistics management has not been undertaken.

2.6.2 Clustering TPL providers

To further understand the varying degrees of TPL provision one would have to look for factors, which are rooted in the capabilities of TPL providers. These could once be segmented into broad categories like warehousing, transport or forwarding for example, reflecting the core business of a TPL provider and largely the specific assets that formed a basis for this. Some writers even see the asset base of TPL provider as most influential for their further development (Sheffi, 1990; Virum, 1993; Leahy *et al*, 1995; Bowersox, 1996; Berglund, et al 1999). Today, however, TPL providers of all '*couleurs*' offer the full scope of possible logistics services. A tendency of players in the TPL logistics market to position (or sometimes rather promote) themselves in the 'high end' of logistics service provision regardless of their historical roots or former core businesses can be observed. The providers of 'high end' logistics services promote themselves usually with terms like Supply Chain Integrator (Berglund, 2000), Fourth Party Logistics TM or Solution Provider (Berglund, 2000).

As a next step in understanding varying degrees of TPL provision rooted in TPLPs capability one would have to look for patterns in TPL involvement across a sample of various industries and countries. The next question to be asked would thus be:

RQ 2: Can TPL relationships be categorised according to their degree of TPL involvement?

2.6.3 Reasoning outsourcing from a TPL point of view

Previous research into TPL has also provided a rough outline of the possible scope of TPL involvement within a functionally or process oriented framework (Damme, 1996; Berglund, 2000). RQ 1 aims to explore this in further detail. Striving to understand various degrees of TPL involvement consequently leads to the question, what is causing these different degrees. From a shippers point of view researchers have tried to explain the underlying reasons behind logistics outsourcing decisions with the growing trend of firms to focus on core activities (Bardi, 1991; Virum, 1993; Bagchi et al, 1995;) and the perceived benefits from using TPL providers (Sheffi, 1990; Virum 1993; Rao 1993;). Little to no research has explained the reason for TPL involvement from a TPL point of

view. Laarhoven et al (2000) sees a TPLP as an enabler of logistics processes that are still left though at the discretion of shippers to outsource. Anderson (1997) and Berglund (2000) see TPL providers as a source for service and cost improvement as well as innovation and supply chain restructuring, thus providing a framework for the possible provision of TPL services. To fully understand TPL relationship more research is needed that adopts a TPL provider point of view.

RQ 2 aims to established different patterns of TPL provision, which would give some indication of the reasons for outsourcing that can be presumed in the characteristics of TPL providers. To further investigate these reasons from a TPL providers point of view one needs to look for factors that are attributable to TPL providers and can be put into relation with TPL involvement.

2.6.3.1 Linking TPL involvement with TPL Resources and Skills

The application of core business strategies (Hamel & Prahalad, 1990) by which organisations concentrate their competences on core activities seems plausible as an explanation for logistics outsourcing in general. From a TPL providers' point of view Sheffi (1990) sees TPL providers' assets as most influential on the specific involvement in a client's logistics system. The terms 'competence' and 'assets' are in the quoted context rather vaguely used. They point though undoubtedly to a body of literature that is commonly referred to as Resource Based Theory,. Drawing on the concepts of Logistics Management and Resource Based Theory, logistics can broadly be regarded as a key competence, which requires certain capabilities to carry out logistics processes. A mixture of different skills and resources constitutes these capabilities. A TPL relationship can thus be characterised by the resources and skills, which are necessary to carry out logistics processes, and are from the shippers' point of view considered non-core. From a TPL provider point of view this implies that the degree to which outsourcing takes place is somehow related to and at least limited through the availability of Third Party resources and skills. One explanation for different levels of TPL involvement could thus be found in differing levels of TPL resources and skills relevant to the various logistics processes. Analysing these over a cross section of TPL relationships could thus offer additional insight into the nature of TPL relationships.

2.6.3.2 Linking TPL involvement with TPL providers pro- or re-active behaviour

Another aspect that seems to offer some explanation for different extents of TPL provision in different TPL relationships is that of inter-organisational behaviour within the relationship. Protagonists of these 'soft issues' (Gardner J.T., Copper, M.C., Noordewier, T., 1994; Gentry, 1996) have explained difference in success of TPL relationships by different modes of bilateral behaviour between shippers and TPL providers. They have tried to explain the benefits arising from TPL/Shipper relationships through the adoption of different forms of Inter-organisational behaviour on a spectrum ranging from 'arms length' relationships to 'partnering' relationships. They have proven that behavioural aspects play a vital role when it comes to the success of TPL relationships. Researchers, who examined organisational behaviour aspects in TPL relationships, have focused though on behaviour that is mutual between two organisations, i.e. Operational Information Exchange, Operating Controls, Sharing of Benefits and Burdens, etc. They have, however, not made any comment on how inter-organisational behaviour influences the degree to which shippers outsource (*or* the level of TPL involvement), and how behavioural prerequisites of TPL providers are influential in this respect.

From a shipper's point of view some writers (Langley, 1999; Berglund, 2000;) see TPL as a major source for future developments in logistics, because of their initiative towards innovative ideas in logistics management. It reflects moreover a certain entrepreneurial stance of TPL providers with regards to the logistics management objectives of their clients. Hence TPL providers can either act rather proactively on their clients behalf as postulated by TPL protagonists (e.g. Copacino, 1998, Foster, 1999, Berglund, 2000) or assume a more (traditional) reactive position in carrying out logistics services. In the opinion of the aforementioned protagonists proactive behaviour of TPL providers in logistics management offers significant potential for improvements in a shippers logistics system and may also be influential on the degree of TPL involvement (Andersson, 1997). There is however, no empirical evidence that supports this assumption.

With a view on the arguments laid out in the previous to 2 paragraphs, it can be argued that the availability of TPL resources and skills and the degree of pro-active behaviour of TPL providers could offer some explanation to the cause of the different levels of TPL involvement in logistics system. This gives rise to the following research question:

RQ 3: What is the influence of a) a TPL provider's level of pro-activity in managing logistics processes and b) his resource and skill base on the degree of involvement in managing logistics processes?

2.6.4 Reasoning outsourcing from a shippers point of view

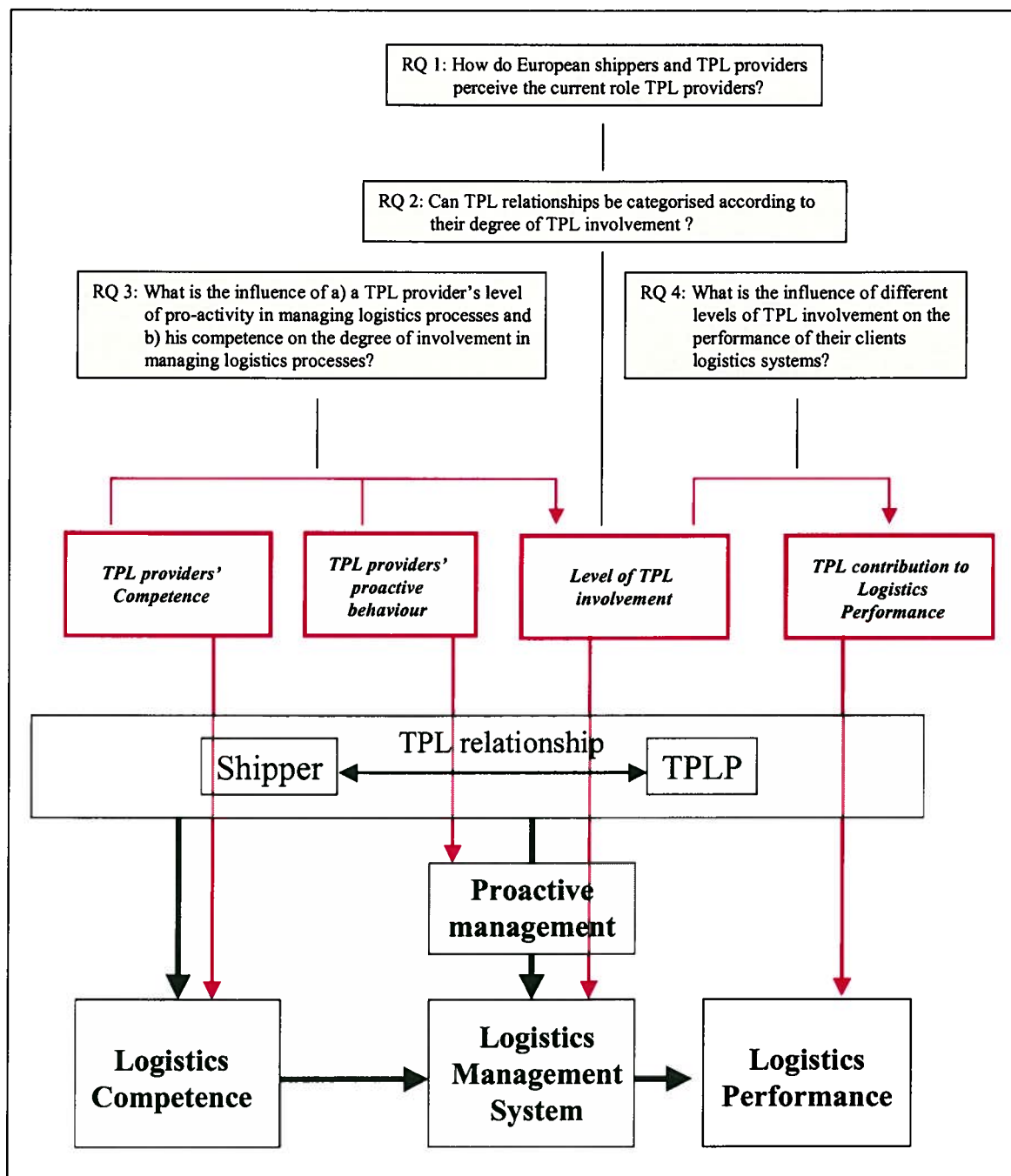
The literature review revealed that TPL is influencing logistics performance (Bardi, 1991; Maltz ,1992, 1994; Virum 1993). Using mostly Transaction Cost Analysis they demonstrated that TPL involvement can minimise logistics cost in clearly defined areas of logistics operations. Anderson (1995,1997;) also points out that TPL can have positive effects on the logistics effectiveness as in service improvements (defined as order cycle time, delivery time window, on time delivery;). No research, however, addresses the question of how different degrees of TPL involvement affect logistics performance. The fourth research question that consequently arises is:

RQ 4: What is the influence of different levels of TPL involvement on the performance of their clients logistics systems?

2.6.5 A Conceptual Research Model for Third Party Logistics

The research questions can be integrated into a theoretic model (Figure 4) which lines out the concepts that are to be used in the research and the particular areas of interest with the corresponding research questions. The red coloured box represents the possible scope of TPL relationships relating to RQ 1 + 2. The arrows shown in red represent potential causal relationships between Resources/Skills and TPL involvement (RQ 3) and TPL involvement and Logistics Performance (RQ 4) that are investigated in this study.

Figure 2. 8: Conceptual Model of Third Party Logistics Provision



Chapter 3 Contextual Factors

3.1 Introduction

The research objective outlined in chapter 1 defines the context of this social enquiry as logistics management and logistics performance. The involvement of Third Party Logistics providers in Logistics Management ('TPL involvement') is a central theme in this research. In order to measure TPL involvement in logistics management it is therefore necessary to carefully describe and define the processes in which TPLPs can potentially get involved. 'Logistics Management' forms thus the contextual framework in which this inquiry takes place. This chapter explains logistics management as system of integrated processes. These are grouped into design, implementation, and operational processes. In the following the logistics process categories are explained and defined through the allocation of a set of sub-processes processes. Furthermore logistics performance is explained and defined as a set of indicators that measure logistics efficiency and effectiveness. This process hierarchy will be the basis for further explorative investigation to clearly identify another subset of activities or tasks within these sub-processes, the execution of which can be clearly allocated to either a shipper or a TPL provider, or equally to both.

3.2 Logistics Systems

To capture the full magnitude of logistics management and hence a wide spectrum of possible TPL involvement a holistic view of logistics management activities in logistics system has to be adopted. The systems approach simply states that all functions or activities need to be understood in terms of how they affect and are affected by, other elements and activities with which they interact (Churchman, 1979, Ackoff, 1973 Merback, 1994). The idea is that if one looks at the actions in isolation, it is not possible to fully understand the larger picture or how such actions affect, or are affected by, other activities. In essence, the sum, or the outcome of a series of activities is greater than its individual parts. Looking at logistics management with a systems view means to look beyond the operational aspects of logistics, hence at design, implementation and operational processes. This means also that the

performance of a logistics system although measured at an operational level is also influenced by the way it has been designed and implemented. Logistics is therefore widely seen as a system of related and hierarchically structured processes and activities that as a whole is based on certain performance objectives (Bowersox, 1996, Lambert, 1998, Gattorna, 1999). And in any service driven logistics system these objectives must be derived from the customers' service needs (Christopher (1992).

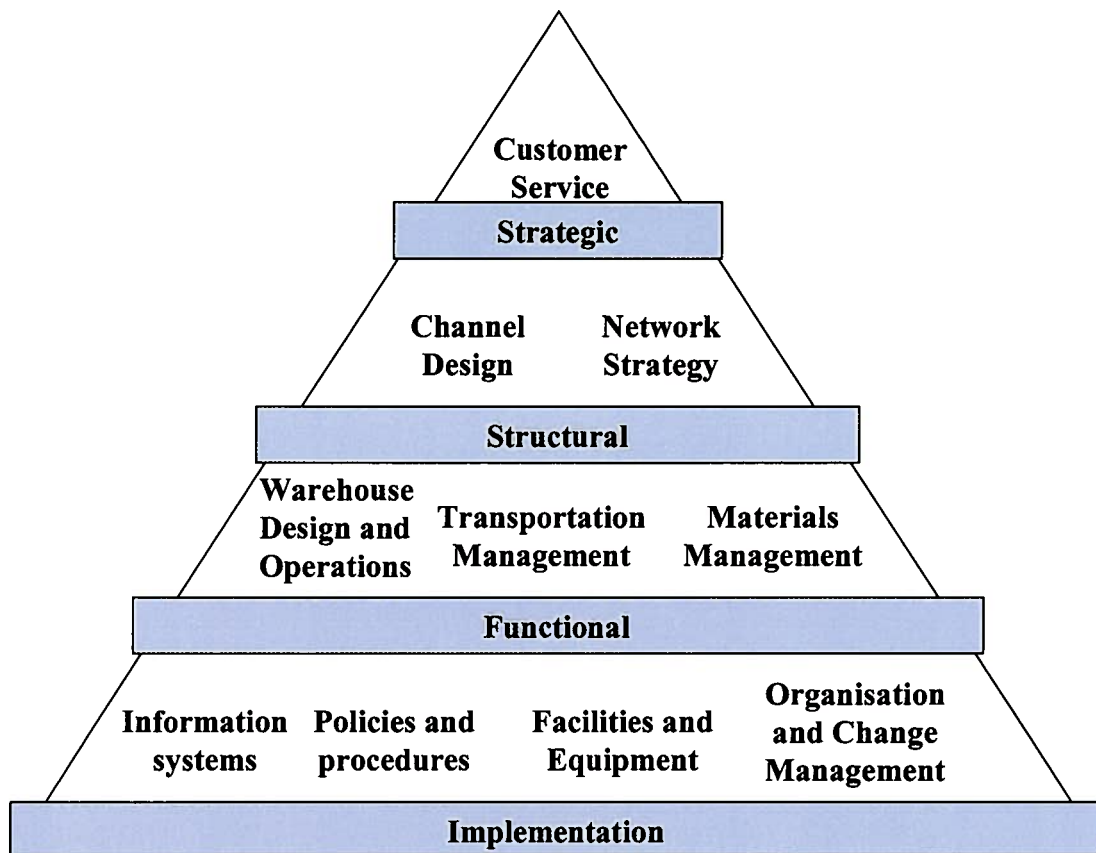
Coyle, et al (1992) acknowledge that activities of designing and implementing logistics systems are equally, if not more, important for an efficient and effective operation, as the day-to-day running of a logistics operation. They present a three-layer framework (table 3.1) that intends to provides the entire organisation's basic structure and operational activity and clarify the types and levels of decision-making in logistics.

Table 3. 1: The three layer framework

Rank	Activity
Master planning	Audit overall system and change plans when needed
	Refine system design
	Appraise system and sub-system performances
	Co-ordinate policies and actions with other functions in the firm
	Translate environmental forces into logistics policies and actions
	Administer change in the system
	Establish specific cost and service standards for the system
Programmed management	Administer warehouse, order processing, materials handling and shipping functions in Center A
	Translate top management policies into specific guidelines for each sub-system to produce desired goals and missions
	Act on variances in each of the responsible sub-system components
	Summarise and report performance and exceptions to top management
Operations management	Supervise the traffic function: order shipments, trace, expedite, handle claims and billing, and so on
	Act on shipments whose performance is out of line
	Report trends of exceptions to programmed level
	Operate system within time and cost constraints established by programmed management
	Report listing of complete time and cost performance to programmed level

At the bottom are the *operational (or physical)* systems components, the most elementary system activities. Each of these tasks (a sub-system) has one or more very limited goals. The actual management here is repeating routine in that it covers only specific control and administrative activities. Each problem has a defined method of

Figure 3. 1: Key components of a Logistics Strategy



Source: Service Mark by Anderson Consulting

approach or solution. The second layer of management encompasses the person or group of persons who control and administer two or more individual sub-systems. This level, which would include the management of an entire distribution warehouse or the management of a whole production line, is referred to as the *programmed level of management*. The logistics top management is the master planning level. Output is the decisions and orders for correcting subsystem actions; new policies and overall system guidelines.

O’Laughlin and Copacino (1994) present another coherent view of logistics design and implementation processes. In their discussion about logistics strategy they

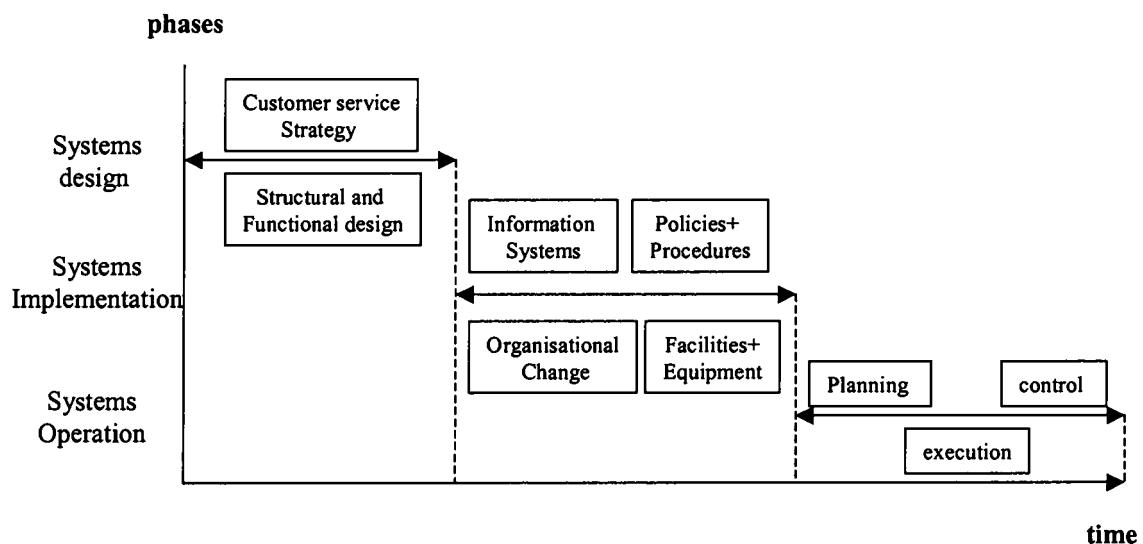
propose a stepwise approach to erect a logistics systems. They describe ten key components of designing and implementing a logistics system organised on four hierarchically ordered levels of strategic and tactical decision-making. Leaning on a model by Anderson Consulting (Figure 3.1) they postulate that the building blocks pictured apply whether one is (re-) designing an inbound or an outbound logistics system.

3.3 Elements of a Logistics Management System

A logistics system must thus be seen as a hierarchical and timely order of processes (Figure 3.2) with three phases.:

- σ The *design phase* is characterised by strategic decision making towards a **customer service strategy**, a **channel** and a **network structure** of a logistics system. It also comprises strategic and tactical decisions about the **functional elements** of the system.

Figure 3. 2: Hierarchical and timely order of logistics processes



- σ The *implementation phase* is characterised by project management decisions making towards required **information systems, policies and procedures, installing facilities and equipment, and changing organisational structures** (includes project management and hiring and training employees).

- σ The *operational phase* includes the **planning, executing and controlling** order and replenishment.

To capture the involvement and impact of TPL providers one must thus examine their whole spectrum of potential involvement, i.e. design, implementation, and operational processes. The following sections examine these elements in greater detail.

3.1.1 Logistics Systems Design

3.1.1.1 Customer Service Strategy

Lambert (1994) points out that effective and efficient management of a logistics system can only be accomplished by considering customer service objectives and the overall logistics objective of minimising total cost. Customer service requirements also drive the structure of the entire supply chain, including manufacturing, marketing, and logistics (Christopher, 1992, Bowersox, 1996, Lambert et al, 1998). For this reason it is essential to start with a clear understanding of what customers demand and to develop a customer service strategy that can meet those expectations (O’Laughlin, et al, 1994).

LaLonde et al (1976) and Christopher (1992) define Customer service as “*the interaction of all those factors that affect the process of making products and services available to the buyer.*” They further refer 3 elements of customer service:

- Pre-transaction elements
- Transaction elements
- Post-transaction elements

Pre-transaction elements relate to corporate policies or programmes, i.e., written statements of service policy, adequacy of organisational structure and systems flexibility. The transactional elements are those variables directly involved in performing the physical distribution function; i.e. product availability, order cycle time, order status information and delivery reliability. The post-transaction elements are generally supportive of the product in use, for instance, product warranty, parts

and repair service, procedures for customer complaints and product replacement (Christopher, 1999).

At the core of deciding on a customer service strategy are the acknowledgement of related marketing objectives and the resulting service/cost trade offs (Christopher, 1992, Lambert, 1993). Too high a customer service needlessly reduces corporate profits. It is therefore essential that a firm adopts a customer service policy that is based on actual customer needs, is consistent with overall marketing strategy, and advances the corporation's long-range profit objectives. Lambert and Zemke (1982) postulate the customer service audit to evaluate the levels of service a company is providing and as a benchmark for appraising the impact of changes in customer service policy.

3.1.1.2 Channel Design

Stern & Ansary (1992) point out that the major focus of marketing channel management is on delivery. They postulate: *"It is only through distribution (i.e. logistics) that public and private goods can be made available for consumption. Producers of such goods (including manufacturer of industrial and consumer goods, legislators passing laws, educational administrators conceiving new means for achieving quality education, and insurance companies developing unique health insurance coverage, among many others) are individually capable of generating only form of structural utility for their 'products'. They can organise their production capability in such a way that the products they have developed can, in fact, be seen, analysed, debated, and perhaps by a select few, digested. But the actual large-scale delivery of the products to the consuming public demands different types of efforts that create time, place, and possession utilities."*

Channel design is the second strategic element of Designing a Logistics systems. It involves determining what activities and functions need to be performed for a desired customer service level and which players in the channel will perform them (O'Laughlin, 1994). It requires careful analysis and vision because the structure, once

implemented, often cannot be changed. Stern & Ansary (1992) propose a 10 step 'blueprint' for channel design (Figure x).

Step 1 involves the identification of products or services that have real value. If the end-users do not perceive it as useful or meaningful, logistics – no matter how well thought through – will not save it.

Step 2 in the channel design process involves thorough research to find out what end users want from the buying process, beyond a first rate product, and secondly how these preferences can be used to group end users into discrete segments. Bucklin (1966, 1978) differentiates in this sense between four generic types of service outputs:

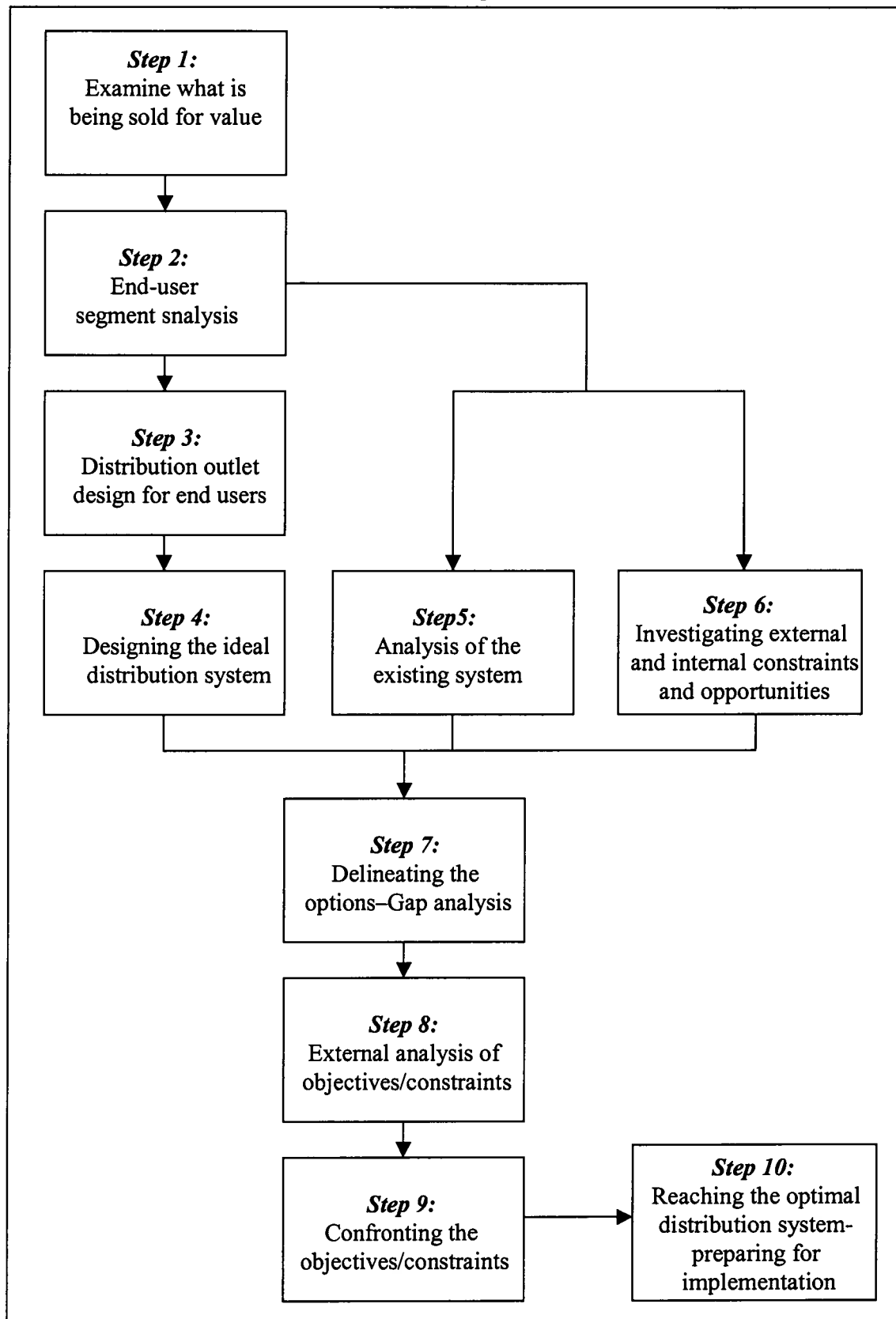
- Lot size
- Level of Market decentralisation
- Delivery or waiting time
- Product variety (does the end user value one stop shopping for associated products?)

Step 3 involves the process of clustering shopping attributes or service outputs that define a segment. This analysis is based on the differences of customers' willingness to trade off the amenities of upscale service and close-in convenience for very low price.

Step 4 comprises the enumeration of the kinds of effort required to assure that the service output can be delivered to relevant segments by the set of feasible outlets. It includes a cost analysis for each clustered marketing flow.

Step 5 involves the analysis of the existing distribution system concurrent with the search for the 'ideal' distributions systems, described in step 3 and 4. It also involves an analysis of the existing channels used by competitors and by the industry at large.

Figure 3. 3: Stepwise approach to channel design



Adopted from Louis W. Stern & Adel I. El-Ansary (1992)

In Step 6 the external and internal constraints and opportunities to channel (re-) design are investigated. This includes an assessment of environmental/external drivers and the building of a risk profile of the focal company's management (i.e., are they risk-takers or risk-avoiders?).

In step 7 three different logistics systems are contrasted:

- An ideal (customer-driven) system
- The existing System
- A management bound system (i.e. the ideal system reconfigured by management objectives and constraints)

A comparison and gap analysis of the three systems is the basis for any further analysis and hence corrective action in a logistics system i.e. occurring problems in logistics management can be allocated to design or operational management of the system.

Step 8 represents a check on the validity of management's prejudices. The objective and constraints of management must be presented to individuals outside a company and to selected inside individuals within it to assess management's preferences and perception.

Step 9 requires management to confront the gap between its position and the ideal position. By doing so the affected senior management is brought together and participants are forced to engage in self-reflection and sometimes profound change in their points of view.

The final step (10) in the process of channel design is to pass the ideal distribution system (from step 4) by the set of objectives/constraints still retained by management at the completion of step 9.

3.1.1.3 Network Design

According to O’Laughlin (1994) a network strategy should provide answers to such questions as:

- How many facilities are needed, where should they be located and what should be the mission of (e.g., full-stocking facility, cross-dock operation, or surge inventory facility)?
- Which customers and/or product lines should be served from each facility?
- How much inventory should be maintained in each facility to satisfy specified service levels?
- What transportation services should be used to meet customer service expectations?
- How should return flows (e.g., equipment return for repair or packaging material returned for disposal) be managed in the system?
- Should a Third Party Logistics provider manage all, or any part of the operation?

O’Laughlin and Copachino (1994) also point out that a network strategy must be integrated with the channel strategy in a way that maximises value to the customer. The co-ordination and integration of channel participants plays an increasingly important role in overall logistics system performance.

According to Chapman (1994) the logistics network is the overall physical channel by which material are transformed into finished products and placed in the hands of customers. He suggests three fundamental reasons why logistics network are challenging to manage:

- Logistics networks are frequently large and complex
- Logistics networks must effectively meet market need
- Logistics networks must be cost-efficient

Chapman (1994) also suggests Logistics Network Modelling as indispensable tool to meet these challenges. These computer-based tools facilitate better design and management of logistics networks by providing concise information and insight into the best alternative for meeting emerging logistics network needs. These tools can be used to design a network structure for inbound logistics flows (materials management) or outbound logistics (distribution). Some recently developed tools enable network modelling across a whole supply chain.

3.1.1.4 Functional elements of logistics systems design

Following the Andersen pyramid (1989) the functional elements of any logistics systems are specifically transportation, warehousing and materials management. On this tactical level, companies must decide on how to enable functional performance goals that were determined through the previous strategic decisions on channel and network structure. These primary decisions with regards to transportation, warehouse (management) and materials management design enable the achievement of operational target. To assess these tactical considerations companies can take a variety of approaches. Benchmarking has been often described as useful approach (Bowersox, 1996, Gattorna, 1998, Lambert et al, 1999) in transportation. Expert advice is another (O’Laughlin, 1994).

Transportation Management

Transportation moves products to markets that are geographically separated and provides added value to customers, when the product arrives on time, undamaged, and in the quantities required (Lambert, 1998). It is characterised by different modes each having different features affecting its suitability for distributing of particular products. The choice of transport mode is influenced by product related factors like volume/variety and delivery characteristics and market-related factors like relative

importance of delivery speed, delivery dependability, possible quality, deterioration, transport costs and route flexibility (Slack, 1998). According to Bowersox (1996) there are two fundamental principles guiding transportation management and operations. They are economies of scale and economies of distance.

Economies of scale refers to the characteristics that transportation cost per unit of weight decreases when the size of the shipment increases. *Economies of distance* refers to the characteristic that transportation cost per unit of distance decreases as distance decreases.

The five basic transportation modes are road (motor), rail, air, water, and pipeline. In addition, intermodal combinations, i.e. combinations of two or more modes are possible in transportation (Bowersox, 1996, Lambert, 1998, Gattorna, 1999). Within Europe most goods are transported by road and road transport will most likely increase over proportionally in comparison to all other modes, e.g. rail, barge, short-sea shipping vessels (Schneider, 1999).

The benefits of *motor transport* are speed and reliability (Taff, 1984, Sampson, 1990, Bowersox 1996), and versatility and flexibility (Lambert, 1998). A network of millions of miles of road enables flexibility, and versatility is given by the varying sizes and weights that motor transport is able to facilitate over any distance. Motor transport can thus enable door-to-door services⁵.

Rail lacks the versatility and flexibility of motor transport because it is limited to fixed track facilities. As a result railroads - like air, water, and pipeline transport- provide terminal-to-terminal service rather than door-to-door service.

The advantage of *air transport* lies in the speed with which a shipment can be transported. The prohibitive aspect of it is the comparatively high cost (Jedd, 1996, Bowersox, 1996, Lambert 1998).

⁵ Door-to-door service refers to a single transport mode picking products up at origin and delivering them to their final destination (Lambert, 1996).

The main advantage of *water transportation* is the capacity to move extremely large shipments. Water transport employs two types of vessels. Deep-water vessels, which are generally designed for ocean or (in the U.S.) Great Lakes use, are restricted to deep-water ports for access. In contrast, towed barges, which generally operate on rivers and canals, have considerably more flexibility (Eno Transport foundation, 1991).

Pipelines are unique in comparison to all other modes of transport, because they are normally limited to products that have a viscosity that allows their natural flow (Wood & Johnson, 1993). They operate on a twenty-four-hour basis, seven days per week, and are limited only by commodity changeover and maintenance (Bowersox, 1996).

The providers of transport can be many. Single-mode operators (e.g. railways, motor carriers, airlines, shipping lines) offer services utilising only one transport mode. Intermodal combinations offer specialised or lower cost services that might not be generally available when a single mode is used (Bowersox, 1996). They use multiple modes of transportation to take advantage of the inherent economies of each and thus provide integrated service at the lowest total cost. Specialised carriers like parcel post or air express companies offer package services (i.e. small-shipment transportation). Technically they belong to the category of Intermodal operator, because packages usually travel by rail, motor, and air. Intermediaries (e.g., forwarders and brokers), offer shippers lower rates for movement between two locations than would otherwise be possible.

Warehouse management and warehouse design

Lambert (1998) defines warehousing as the part of a firm's logistics system that stores products (raw materials, parts, goods-in-process, finished goods) at and between point of origin and point of consumption, and provides information to management on the status, condition, and disposition of items being stored. The term *distribution centre* is sometimes used; *warehouse* is the more generic term.

Warehouses can be used for different purposes. The most generic ones are manufacturing support, processing/postponement, outbound consolidation, break bulk/cross docking, storing/stock piling (Bowersox et al 1996, Lambert, 1998,).

In its function as *manufacturing support* warehousing has the function of storing raw material, component parts, and subassemblies until the production process requires them on-site, that is, at the point of manufacturer (Sherman, 1996). If a JIT system is utilised – materials are delivered on an ‘as needed’ basis by a just-in-time supplier - the need for inbound warehousing is greatly minimised. To further support manufacturing, warehouses are often used to postpone or delay production by performing processing and light manufacturing activities. A warehouse with packing, labelling or light assembly capabilities allows *postponement* of final production until actual demand is known (Alderson, 1950, Zinn et al, 1988, Perry, 1991).

Breakbulk/cross docking warehouses are facilities that receive large shipments of product, usually as full truck load (FTL) shipments, which are then broken down into smaller shipments, so-called less than a truck load (LTL) shipment. When a product arrives in bulk and is immediately broken down and mixed in the proper range and quantity of products for customer shipment, this is called cross docking. The warehouse serves in this case as a “distribution-mixing centre”. (adapted from Bowersox, 1996, Lambert 1998).

Outbound consolidation is the combination of various shipments into FTL or car load (CL) shipments. The warehouse serves in this case as consolidation point, where products or shipments of LTL size are combined into a single shipment to the next destination in the transport chain (Jockel 1996, 1998).

Storing/stockpiling, the most generic purpose of warehousing, can provide an inventory buffer, to safeguard production efficiency within the constraints imposed by material sources and the customer, can protect environmentally sensitive products, or is simply necessary because of unpredictable demand variations of the market.

After the best geographic position of a warehouse is determined location analysis with regards to potential sites has to be undertaken (Lambert et al, 1998). Specific site

selection factors must be examined (Miller, 1993, Freese, 1994). These comprise various primary cost factors (e.g. cost of land, cost of construction), secondary cost factors (e.g. local tax allowance) and the availability and quality of necessary resources. The optimal warehouse layout and design varies by type of product being stored, its intended capacity in number of stock keeping units (SKUs), customer needs and available financial resources. Lambert (1998) suggests several factors that influence efficient operation and utilisation of warehouses:

Randomised storage – items are placed in the closest available slot and retrieved on a first-in, first-out basis. This approach maximises space utilisation, but can necessitate longer travel times between order picking locations.

Dedicated storage – products are stored in permanent locations within the warehouse.

Compatibility refers to whether products can be stored together harmoniously.

Complementarity refers to how often products are ordered together and therefore stored together.

Popularity relates to the different inventory turnover rates or demand rates of products.

Materials management

Materials management is an integral part of the logistics management process, which encompasses the administration of raw material, subassemblies, manufactured parts, packing materials, and in-process inventory (Cavinato, 1994).

Lambert et al (1998) categorises materials management into 4 basic activities:

1. Anticipating material requirements
2. Sourcing and obtaining material
3. Introducing materials into the organisation

4. Monitoring the status of material as current asset

Demand Forecasting

Demand forecasting is concerned with the projections of demand in the future that are critical to successful logistics management. Demand for products and services by end-users as well as by intermediate supply chain members drive many basic operational decisions (Magee et al, 1985). Demand forecasting thus constitutes the highest order of logistical planning (Rosenfield, 1994).

Inventory Management

According to Lambert (1998) inventories represent the largest single investment in assets for many manufacturers, wholesalers, and retailers. Many argue therefore that inventories are undesirable and should be eliminated entirely (Hall, 1983). Inventory management integrates the management of inventory with its related information flow and supporting activities (e.g. order processing, demand management, supply planning and control) throughout the organisation and within the associated distribution channel. This also includes the policies and procedures used by organisations to set inventory levels, locations, and replenishment rules (Closs, 1989).

Purchasing

Purchasing generally refers to the actual buying of materials and those activities associated with the buying process (Lambert, 1998). The purchasing function is important because it links suppliers with the organisation (Wagner, 1993), through JIT techniques and partnering activities (Ellram, 1991).

Production Planning and Control

Lambert (1998) outlines that production planning and control affects the logistics process in two ways. First production activity determines the quantity and type of

finished goods that are produced. This in turn influences when and how the products are distributed to the firm's customer. Second, production directly determines the company's need for raw materials, subassemblies, and component parts used in the manufacturing process. Therefore, production planning and control decisions are often jointly shared by manufacturing and logistics.

Inbound logistics

Buffa (1988) sees the management of inbound traffic as one of the most important activities in materials management. Like their counterparts responsible for finished goods, materials managers must be aware of the available transport modes and combinations, government regulations that affect the firm's transportation carries, and the evaluation of mode/carrier performance as well as the cost/service trade offs involved in the inbound movement of product. Lambert (1998) explains that the main difference between inbound and outbound transportation is the difference in demand uncertainty. The demand that concerns material management originates with the production scheduling activity and tends to be more predictable and stable.

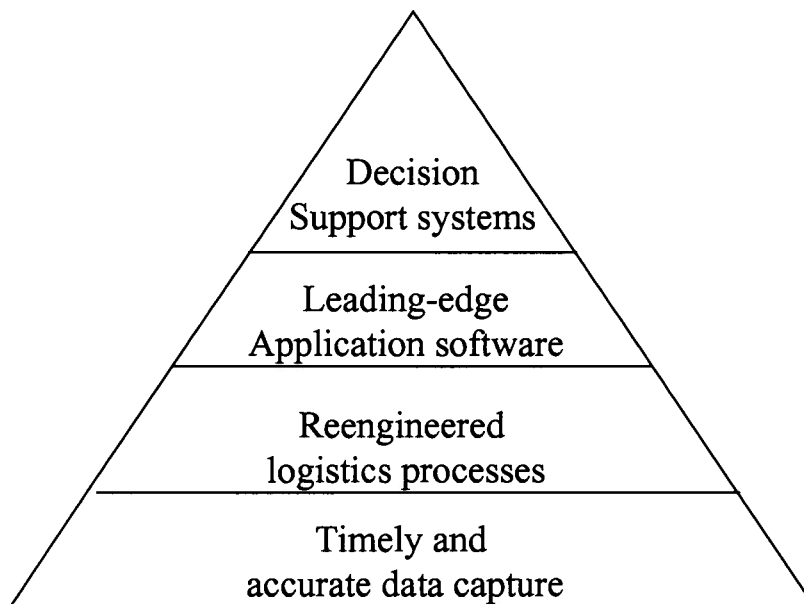
3.1.2 Logistics System Implementation

The implementation of a logistics system includes implementation of information systems to support logistics, of policies and procedures to guide day-to-day logistics operations, the installation and maintenance of facilities and equipment, and organisation and people issues. The activities involved in implementing a logistics system have overall the nature of project management activities. According to Slack (1998) these are among others, complexity, uniqueness, a life cycle and the temporary nature.

3.1.2.1 Information systems

O'Laughlin points out that information systems are the enabler of the integrated logistics concept. They involve timely and accurate information enabling reengineered logistics

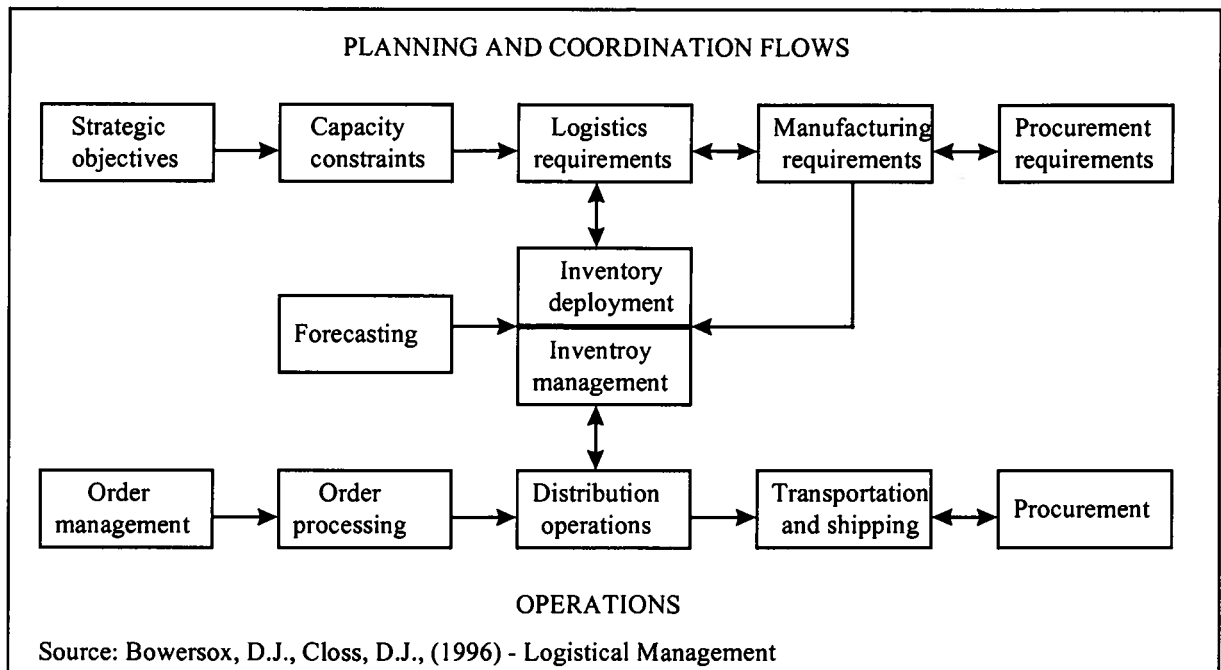
Figure 3. 4: Hierarchy of logistics information system needs



Source: O'Laughlin & Copachino (1994):

processes, leading edge (up-to-date application) software, and decision support systems (see figure 3.4).

According to Bowersox (1996) information flow identifies specific locations within a logistical system that have requirements. Information also facilitates co-ordination of planning and control of day-to-day operations. Information requirements parallel the actual work performed in physical distribution, manufacturing support, and procurement. There are two types of flows: co-ordination flows and operational flows (see Figure 3.5). *Co-ordination* results in *plans* specifying Strategic Objectives, Capacity Constraints, Logistical Requirements, Inventory Deployment, Manufacturing Requirements, Procurement Requirements and Forecasting.

Figure 3. 5: Logistics Information Requirement

Operational information requirements deal with Order Management, Order Processing, Distribution Operations, Inventory Management, Transportation and Shipping, and Procurement.

3.1.2.2 Policies and procedures

According to O’Laughlin (1994) policies and procedures guide the day-to-day operations. They are the fundamental elements of a Quality system and reflect external rules and customer expectations (Taguchi, 1986) and internal performance targets (Crosby, 1979). They have the purpose of ensuring quality development, maintenance, and improvement in a most effective and efficient way (Feigenbaum, 1986, Deming, 1986,), and their implementation requires the involvement and motivation of everyone in an organisation (Ishikawa, 1972, 1985, Juran, 1989). A Company’s approach to quality management today is in accordance with most of these aspects, which are referred to as the Total Quality Management approach (Slack et al, 1998), which consequently extends to logistics management (Langley, et al, 1991). Dale (1993) explains:

“The quality system should define and cover all facets of an organisation’s operation, from identifying and meeting the needs and requirements of a customer, design, planning, purchasing, manufacturing, packing storage, delivery and service, together with all relevant activities carried out within these functions. It deals with organisation, responsibilities, procedures and process...”

Slack et al (1998) points out that policies and procedures should be defined and documented at three levels:

- Level 1 *Company quality manual.* This is the fundamental document and provides a concise summary of the quality management policy and quality system along with the company objectives and its organisation.
- Level 2 *Procedures manual.* Describes the system functions, structures and responsibilities in each department.
- Level 3 *Work instruction, specifications and detailed methods for performing work activities.*

Slack et al (1998) postulates that the implementation of policies and procedures requires top management support which is best organised by a steering group and the establishment of self supporting improvement groups. At the heart of quality improvement though is the training of individuals. This as well as the overall implementation of new processes and quality procedures require a companies special attention to change management.

3.3.2.3 Organisation and Change Management

Organisation

An *integrated* high-performing organisation is key to successful logistics performance (Boxwerson, et al 1994). O’Laughlin (1994) postulates that integrated logistics management requires careful design of three key elements:

Structure. The assignment of the responsibility for operational activities to the marketing, manufacturing, finance or logistics function must be determined.

Bowersox et al (1987) comments on this issue that the notion of structural integration of logistics functions can be seen on three evolutionary levels. The starting point is complete fragmentation, in which logistics activities are dispersed over command and control structures reporting to different organisational functions. On a next higher-level logistics functions are organisationally combined to form the nucleus of materials management and physical distribution group. The highest level of integrated development is envisaged as functionally integrated when material management and physical distribution organisations are combined to create a group responsible for overall logistics.

Roles and responsibilities. This means the co-operation of different logistics relevant functions in an organisation. In an uncertain or dynamic environment, which most companies face today, designing organisational relationships means the development of close working relationships among functions in order to operate in an integrated way. Tactics to achieve this goal include ‘teaming by product’ or operational planning meetings. Bowersox (1987) postulates in this sense the development of process decision making. He also comments that leading edge logistics organisations have gaining responsibility over a wider span of control for both traditional and supplemental logistics functions. These should ideally extend in the sense of supply chain management across organisational boundaries, which requires a strong commitment to partnership and team work.

Performance measures. To have an effective, integrated logistics system, a company must align performance measures with desired results.

Change Management

Thronhill et al (2000) points out that the need for strategic change arises from the formulation and implementation of the strategy that underpins the direction and activity of an organisation. Hewitt (1994) in this sense postulates logistics as an integrating function, that is directed by company strategy and hence naturally sensitive for change. Thornhill et al (2000) elaborates further that alterations to the strategic direction and activity of an organisation clearly affect strategy and change at a lower level including that related to human resources. Changes in organisational structure may thus significantly affect levels of employee morale, the nature of communication between those in the structure, the development of informal, as well as formal, relationships and resulting motivation (Child, 1984, Mintzberg, 1993,). Downsizing as a consequence of structural changes might lead to shift in the thinking of employees (i.e., they cease to believe in the notion of a 'job for life'), which can be used to bring about change in the culture of an organisation, or to introduce a system of performance management (Newell and Dopson, 1996). Recruitment as a consequence of new organisational structures can in itself become an activity capable of supporting organisational change (Scholarios and Lockyer, 1996,).

According to O'Laughlin (1994) the following factors are key to effective change management in logistics:

Visible plan – the logistics leadership group needs to periodically (both formally and informally) reinforce the key directions and goals for the logistics function to the logistics team and the organisation at large.

A champion in the management ranks. – Each logistics project in the logistics plan requires an owner with responsibility and accountability for that activity.

Training and coaching. – Training focuses on developing the needed content knowledge and process skills to operate in a new environment. Coaching is the counselling of the logistics team(s) on how to be more effective, by providing a broad perspective that extends beyond their individual jobs, and by reinforcing the imperatives the organisation must achieve to be successful.

3.1.2.4 Facilities and Equipment

The following activities need high-level project co-ordination with regards to overall timing. On a sub-level they can be seen as single projects, because they are of different complexity, and follow different objectives. They all require financing and involve the management of suppliers. The later activity comprises the tendering process and the contract management process. Specific reference to the most common types of finance is made under 'transport equipment'.

Warehouses and Materials Handling Equipment

Lambert et al (1998) point out that implementation of a warehouses and material handling equipment are closely related, because the size of the warehouse is related to the materials handling equipment used. Material-handling specialists must work closely with the design specialists to develop an integrated system (Bowersox, 1996). Since 'warehouse design' is discussed widely under 3.3.1.4 reference is only made to the implementation of material handling equipment.

According to Bowersox (1996) the ***material-handling system*** is one of the initial considerations of warehouse planning. He classifies MHE as mechanised, semi-automated, automated, and information-directed.

Mechanised systems employ most commonly a wide range of equipment that includes, forklift trucks, walkie-rider pallet trucks, towlines, tractor-trailer devices, conveyors, carousels.

A *semi-automated system* supplements a mechanised system by automating specific handling requirements. It is thus a mixture of mechanised and automated handling. Typical equipment utilised in semi-automated warehouses are automated-guided vehicle systems (AGVS), computerised sortation, robotics, and various forms of live racks.

Automated handling systems intend to substitute capital investment in equipment for labour required in mechanised handling systems. In addition automated systems operate faster and more accurately. Initial efforts directed towards automated handling concentrated on order selection systems at master carton level. Today the emphasis has switched to automated high-rise storage and retrieval systems (ASRS).

Information-directed materials handling combines the control automation with operational flexibility of mechanised systems. Mechanised handling equipment is used and the layout and design of the warehouse facility is essentially the same as any mechanised operation. The difference is that all fork-truck movements are directed and monitored by the command of a microchip.

Transportation Equipment

The type of transport vessel used in a transport operation is to some extent predetermined by the choice of mode. In the following reference is made only to the implementation of road based transport equipment.

The right choice of number and type of vehicles is essential for the efficient running of a distribution operation (Bowersox, 1996,). Woodward (1977) explains the implementation of transport vehicles as two major activities:

- Vehicle selection and design
- Vehicle plan

The first step towards selecting the right vehicle is the decision on whether to opt for custom built or standard vehicle bodies. Depending on the type of product(s) a vehicle is to carry and the type of operation decisions have to be made with regards to chassis type, body, size and body design. The overall aim is choose a vehicle that suites the operation and light enough to allow for maximum payload. A basic choice with regards to the operation is to opt for mounted or demountable bodies, or for trucks that are design to tow trailers. Dependent on the type of product to be transported is the design of interior fittings (in the body). These have the purpose to secure the load while transported and to enable the moving of the load inside the vehicle. Another consideration is whether to specify loading aids, such as tail lifts.

An additional issue to consider today is in-cab technology. Under the heading of 'telematics' (Clancy, 2002) a dispatcher can today use technologies like GPS (Murr, 2002), radio signal (RDS) or phone signals (Feinbaum, 2002) to track and monitor their vehicles.

The vehicle plan stipulates the method of acquiring a vehicle. Woodward (1977) lists a number of options that are still valid today:

Purchase of a vehicle – is usually the cheapest version that meets the required performance of acquisition, but ties financial resource that could be used otherwise. Financing is left to the buyer. The buyer also takes the risk of bearing the costs arising from depreciation over a fixed period of time given by accounting legislation (usually 4 years). These are tax deductible under capital allowance.

Hire purchase – the same as purchasing a vehicle, but puts the burden of finance on the vendor of the vehicle.

Leasing – the ownership or title of the vehicle remains with the company providing the finance. The advantage of a lease is that the fixed costs of a vehicle are predictable over any period of time and are tax deductible in the same way the depreciation is under capital allowance.

Contract hire – same principle as leasing includes the cost of servicing and maintenance. The agreement is usually based on a certain mileage per year with an excess charge after that.

IT (Information Technology) Systems

Computer and information technology has been utilised to support logistics for many years. It grew rapidly with the introduction of micro-(personal) computers in the early 1980s (La Londe, 1996). Organisations of all types are utilising computers to support logistics. A recent study of world-class logistics practices cited logistics information systems as a key to competitive what (Global Research Team, Michigan State University, 1995). Bowersox (1996) outlines that unlike most other resources information technology is increasing in both speed and capacity and declining in cost. He lists five specific technologies that have demonstrated widespread logistics application:

- Personal computers
- Artificial intelligence/expert systems
- Communications
- Barcoding and scanning
- EDI

Personal computers are influencing logistics management in three different ways. First, low cost and high portability bring accurate and timely information to the decision maker, whether in the office, at the warehouse, or on the road (Graff, 1993). Secondly, responsiveness and flexibility offered by decentralised PCs enable more focused service and capability as opposed to large mainframe computers. The use of local area networks (LAN), wide area networks (WAN), and client/server architecture offers the benefits of having data integration throughout the enterprise and decentralised, even redundant processing even at the smallest site or function (Ray, 1994). Third, interactive PCs with graphics capabilities facilitate development of generic decision support applications (Andersen Consulting, 1995).

Expert systems offer an economical and practical way to capture, refine and proliferate management skills. An expert system program captures and stores logistics knowledge as rules (heuristics), policies, checklists and logic, in a 'knowledge base' in much the same way a conventional computer program stores numeric information in a database (Allen & Helfrich, 1990). Logistics Expert Systems are applied where expertise can increase the firm's return on assets. Applications include carrier selection, international marketing and logistics, inventory management, information systems design (Bowersox, 1996).

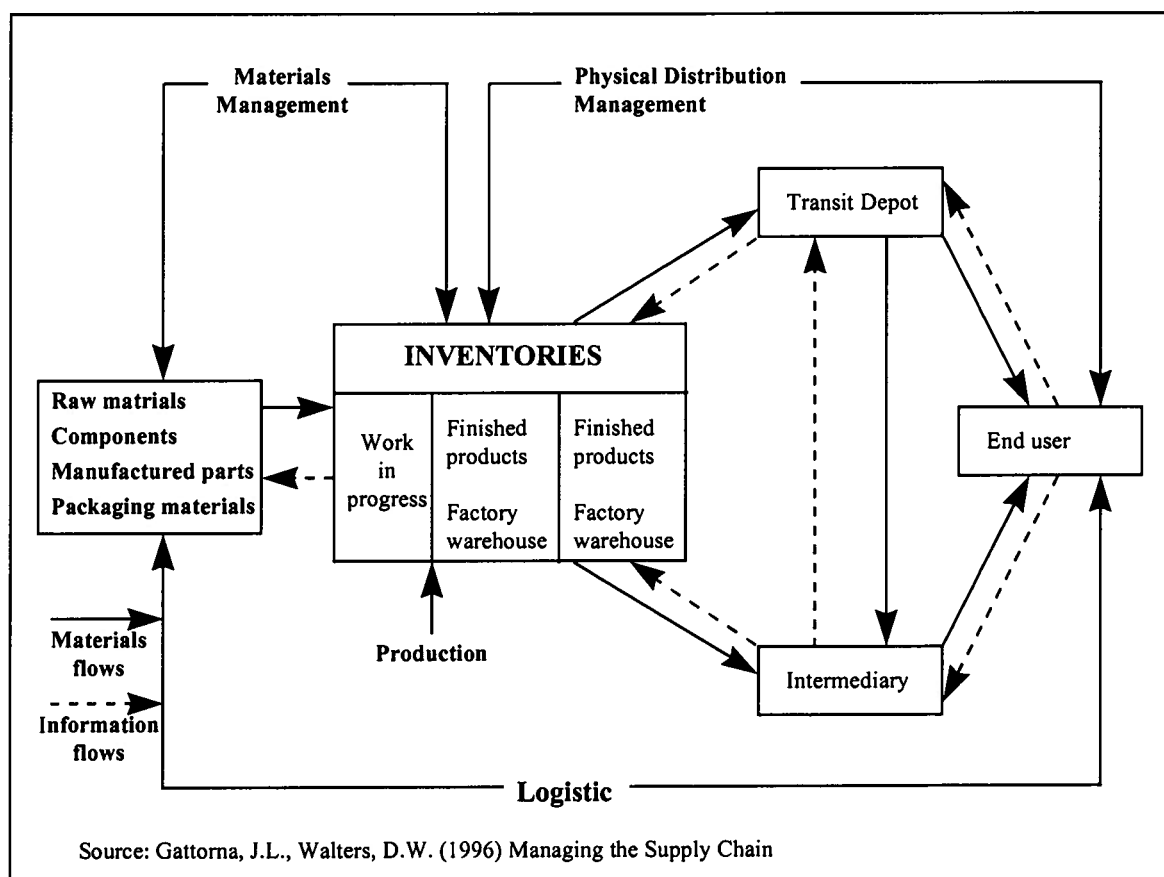
Faster and widespread *communication* can enhance logistics performance (Bowersox 1996). Product movement and geographic decentralisation were historically always a disadvantage in logistics management. Applications of radio frequency (RF), satellite communications, and image processing technologies have overcome these problems.

Barcoding and electronic scanning are identification technologies that facilitate logistics information collection and exchange. Barcoding refers to the placement of computer readable codes on items, cartons, and containers, even railcars (Bowersox, 1996). These auto identification (ID) systems allow channel members to quickly track and communicate movement details with a low probability of error. Another key component of auto ID is the scanning process. A scanner optically collects barcode data and converts them to usable information (Brookman, 1993). Scanner guns are used for materials handling and tracking.

EDI or Electronic Data Interchange is a critical component of logistics information systems today (Emmelheiz, 1988, Bowersox, 1996, Lambert, 1998,). EDI is the electronic, computer-to-computer transfer of standard business documents between organisations. EDI transmissions allow a document to be directly processed and acted upon by the receiving organisation. Ellram (1995) points out that for EDI to function properly, computer language compatibility is required. This means that the users must have common communication standards. Although different standards are generally accepted experts indicate that the most likely migration path is to UN/EDIFACT (United Nations/Electronic Data Interchange for administration, Commerce and Transport) standards, which is used as a more global standard (Harter, 1998). Several

types of EDI systems are in use today. The 1990s were still determined by the use of proprietary systems, (i.e.: EDI systems which is owned, managed and maintained by a single company) or Value-added-networks *or* VANs (i.e.: EDI transmissions go through a Third Party firm). The difference between the two and thus the (dis-) advantage is the higher cost for proprietary systems combined with ownership control versus the lower EDI costs using VANs combined with the lack of ownership. Today using EDI over the Internet is rapidly becoming a reality. In contrast to VANs the Internet is virtually 'free'. Internet taskforces made of prominent companies such as Microsoft, Oracle, Compaq, and Hewlett-Packard have been working to ensure the capability of EDI products on the Internet since the mid nineties (Drummond, 1999). One variation of EDI that is already standardised in its format is electronic mail.

Figure 3. 6: Operational Logistics Management

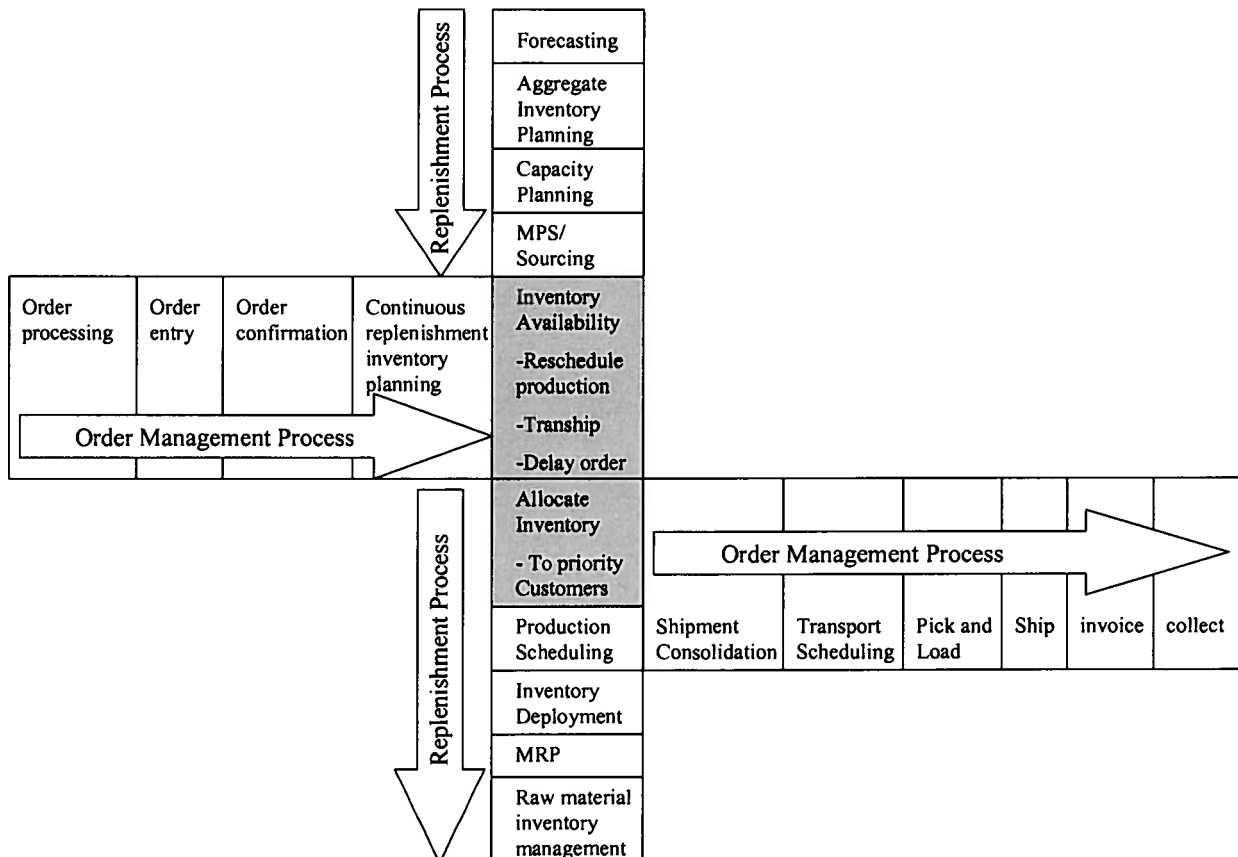


3.1.3 Operations in Logistics

Within the constraints imposed by its design a logistics operation has to be run on an

ongoing basis. Design activities determine the form and nature of the logistics system and the resources it contains, but they are not concerned with the day-to-day running of the system. That is the purpose of planning and control – to ensure that the operation runs effectively and efficiently (adapted from Slack, et al, 1998).

Figure 3. 7: Linkage of order Management and Replenishment Process



Source: O’Laughlin (1994)

Structurally logistics operations encompass distribution and materials management (see figure 3.6). Alternatively the terms inbound and outbound logistics could be used (Bowersox 1996, Jockel 1998, Lambert, 1998,). Both functions include warehouse and transportation management. These have been widely described and explained above. From a process point of view operational management of logistics comprises of the planning, execution and control of the replenishment and ordering process (Figure 3.7). The sub-processes and activities that are carried out within these processes can either be information related or have a physical nature. Replenishment is concerned with the allocation of the ‘right’ quantity and quality of materials (inbound) to the various value creating ‘stations’ within the firm. The order process is concerned with

the allocation of goods (outbound) from the firm to the customer. Both management processes depend on the availability of inventories. Inventory management is thus the key activity that links the processes together Copachino 1994).

3.1.3.1 Operational Planning

Logistics systems planning components define core activities that guide enterprise resource allocation and performance from procurement to product delivery (Bowersox, 1996)

Operational Planning is based on the forecasting of customer demand. This is the prediction of demands by location, stockkeeping unit (SKU) and time period for the purpose of planning logistics operations Lambert, 1998).

Bowersox (1996) explains that demand forecasts are the basis for organisations to establish their logistics, manufacturing and procurement requirements.

Logistics requirements coordinate the facility, equipment, labor and inventory resources necessary to accomplish the logistics mission. This includes the planning of inventory, warehouse and transport capacity, and the scheduling of shipments, and material disposals (reverse logistics).

Manufacturing requirements schedule production resources and attempt to resolve day-to-day bottlenecks within the materials management system. The requirements determine the master production schedule (MPS), and the manufacturing requirements plan (MRP).

Procurement requirements schedule material releases, shipments and receipts. Procurement are based on manufacturing and logistics requirements and demonstrate long term material requirements and release schedules to suppliers.

3.1.3.2 Operations

Operations include activities required to receive, process and ship customer orders and to co-ordinate the receipt of purchase orders and their related information activities. Operations components are order management, distribution operations, transportation and shipping and procurement (Bowersox, 1996).

Order Management is the entry point for customer orders and inquiries. It further encompasses the assignment or allocation of available inventory to open customer orders and replenishment orders. This includes order selection documents, order verifications, and invoicing.

Distribution operations include physical activities including product receipt, material movement, and storage and order selection. It can also include activities resulting from postponement strategies like packaging, late configuration and sequencing, or cross-dock operations.

Transportation and Shipping includes transport and movement activities. These activities include shipment consolidation, notification, documentation, carrier management

Procurement manages purchase order preparation, modification and release.

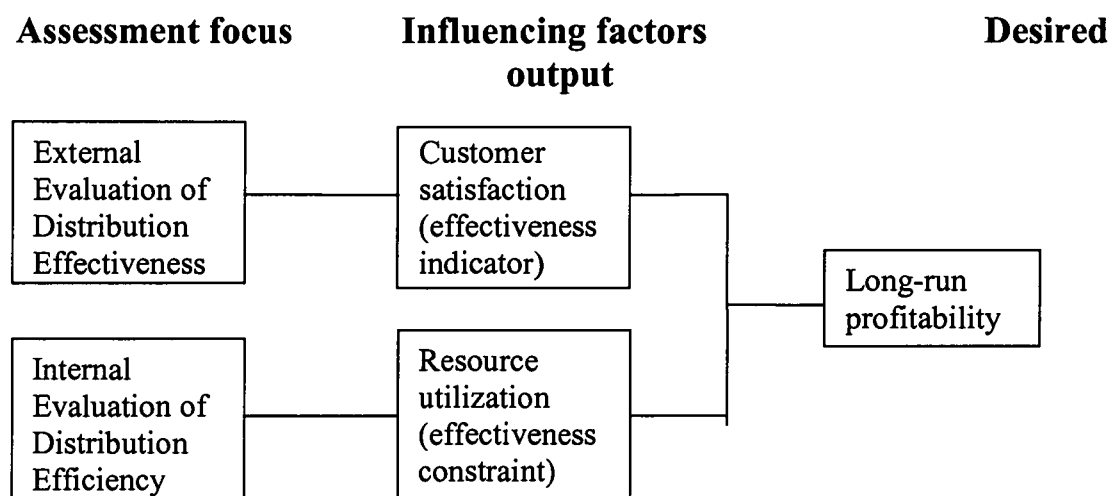
3.1.3.3 Operational Control

Operational control encompasses the functional control activities that secure the replenishment and order processes. It furthermore includes the control of inventories, and operational quality. These activities entail the measurement of logistics performance (Bowersox, 1996, Lambert 1998, Gattorna, 1999).

3.4 Logistics Performance

Mentzer and Konrad (1991) describe performance as the quotient of actual output and standard output. Bowersox (1996) describes the measuring of logistics performance as comparing activities and processes to previous operations and/or goals. As early as 1985 A.T. Kearney Consultants noted that firms engaging in comprehensive performance measurement realised improvements in overall productivity in the range of 14 –22 percent. Abrahamsson et al (1999) note that companies in Europe have increased their monitoring of logistics performance extensively. They argue that increasing internationalisation and channel integration demands that performance of a logistics systems must be measures across its entire structure rather than puntually within and between opertional units. Performance assessments of logistics systems involve an analysis of both effectiveness and efficiency (Langley & Holcomb, 1994). In

Figure 3. 8: Performance factors in a logistics system



Source: Rhea and Shrock (1987)

their discussion on assessing performance of physical distribution systems Rhea and Shrock (1987) relate effectiveness to externally oriented factors that determine the cycle time for a customer order and the quality of order fulfilment. The measurement of Logistics efficiency relates to internally oriented factors that determine the cost per order (Figure 3.8).

3.1.4 Effectiveness

Effectiveness is the extent to which goals are accomplished (Mentzer and Konrad, 1991). Logistics effectiveness is the extent to which Logistics systems satisfy their customers (Rhea and Shrock 1987, Langley, 1991, Bowersox, 1996, Lambert 1998).

3.1.4.1 Examples of effectiveness measurements

Rhea and Shrock (1987) divided effectiveness factors into goods flow related and information flow related factors (see table 3.2 and 3.3).

Table 3. 2: Effectiveness in product flows (based on Rhea and Shrock 1987)

Satisfaction determinants	Satisfaction dimensions
Order cycle time	Average, variability, reliability
Lead time	Length
Inventory	Availability, completeness/fill rate
Order condition	Damage free
Rush orders	availability

Table 3. 3: Effectiveness in information flows (based on Rhea and Shrock 1987)

Satisfaction determinants	Satisfaction dimensions
Order entry	Frequency, convenience, efficiency,
Invoicing	Accuracy, efficiency, timeliness
Customer service policy	formalisation
Order information	Availability, reliability, timeliness,
Inquires/complaints	Ease, responsiveness

Other writers differentiate between quality and customer service measures as performance factors that relate to effectiveness of a logistics system (Byrne and Markham, 1991, Bowersox, 1996). Quality measures are the most process-oriented evaluations, which are designed to determine the effectiveness of a series of activities rather than an individual activity (Bowersox, 1996). Table 3.4 displays two different sets of generic quality measures of logistics performance suggested by Byrne and Markham (1991) and Bowersox (1996).

Table 3. 4: Quality performance measures according to

Bowersox (1996)	Byrne and Markham (1991)
<ul style="list-style-type: none"> – Frequency of damage – Amount of damage – Number of credit claims – Number of returns – Cost of returns 	<ul style="list-style-type: none"> – Accurate and complete orders – On-time deliveries – Undamaged products – Proper communication and documentation

The second set of common effectiveness measures focuses on customer service. These measure the firm's ability to satisfy customers (Bowersox, 1996). Exemplifying measures suggested by Bowersox (1996) and Byrne & Markham (1991) are depicted in table 3.5. An important component of logistics performance is the regular measurement of customer service perceptions on a continuous basis (Byrne and Markham, 1991, Bowersox, 1996, Lambert, 1998). To obtain those measures Bowersox (1996) and Lambert (1998) advocate the use of company or industry-sponsored surveys or alternatively systematic order follow-up.

Table 3. 5: Customer service performance measures according to

BOWERSOX (1996)	BYRNE AND MARKHAM (1991)
<ul style="list-style-type: none"> – Fill rate – Stockouts – Shipping errors – On-time-deliveries – Back-orders – Cycle time 	<ul style="list-style-type: none"> - Invoice accuracy - Speed of response to inquiry - Level of complaints - Damage free delivery - Order completeness - Order cycle time - Case/unit fill rate

3.1.5 Efficiency

Efficiency is in scholarly writing defined in different ways. Mentzer and Conrad (1991) provide by an overall description of efficiency in operational logistics systems. They postulate that efficiency of a logistics system is reflected in the quotient of the actual level of inputs and the standard level of inputs, and also in the relationship between results and resources utilised. Brehmer (1999) adopts an accounting view and describes efficiency as the relationship between actual cost and standard cost. He regards this a useful, but not perfect measure, because recorded costs are not equal to resources consumed and standard costs are only approximations of what consumption ideally should have been (Brehmer, 1999).

The **actual cost** incurred to accomplish specific operating objectives is the most direct reflection of logistics efficiency. Logistics cost performance is typically measured in terms of total expenditure on logistics as a percentage of sales or as a cost per unit of volume (Bowersox, 1996, Lambert, 1998). Abrahamsson et al (1999) advocate the total cost approach, which includes all cost parameters in a system, regardless where they occur in the operational system. They differentiate between costs for administration, warehousing, inventory, transportation, and information systems.

In addition to cost, most scholarly writers in logistics advocate also the measurement of productivity and (asset) utilisation (Christopher, 1971, Lambert, 1994, Bowersox, 1996, Mentzer and Konrad, 1991, Byrne and Markham, 1991) as a useful steering instrument to achieve efficient logistics operations.

Productivity in this sense is the relationship between output (goods and/or services) produced and quantities of inputs (resources) utilised by the system to produce that output (Bowersox, 1996), or simply, the ratio of real output and real input (Mentzer and Konrad, 1991).

(Asset) utilisation measurement in logistics focuses on the utilisation of capital investment in facilities and equipment as well as working capital application to inventory to achieve logistics goals (Bowersox, 1996). Mentzer and Konrad (1991) describe the measurement of utilisation in this sense as the ratio of capacity used and

available capacity. Asset measurement with regards to inventories is best reflected in capital cost and obsolescence cost (Rhea and Shrock, 1987) or in a common denominator called inventory-carrying cost (Christopher, 1971, 1992, Bowersox, 1996, Lambert, 1994, 1999).

3.1.5.1 Transport efficiency

Mentzer and Konrad, (1991) suggest the measurement of transport cost as most appropriate measurement for transport efficiency. They define transport cost as an aggregate of labour, equipment, and energy cost. Rhea and Shrock (1987) advocate total transport cost, cost per weight unit and distance, and equipment utilisation as measure of transport efficiency. Byrne and Markham, (1991) suggest various indicators to measure transport productivity, equipment utilisation and transport cost as measures of transport efficiency:

Productivity:

- Ton-kilometres transported/total actual transportation cost
- Volume of goods transported/total actual transportation cost
- Shipments transported/total actual transportation cost

Equipment utilisation:

- Total transportation capacity used/total transportation capacity paid for

Transport Cost:

- Actual transportation cost/budgeted transportation cost
- Standard transportation cost/actual transportation cost

Samuelsson and Tilanus (1997) define transport efficiency (E) as a function of time efficiency (T), distance efficiency (D), speed efficiency (S), and capacity efficiency (C); i.e.: $E = T \times D \times S \times C$, whereby

- T= time efficiency (availability (availability for use/total time), time utilisation (actual use/available time), driving factor (time spent transporting goods/operating time)
- D= distance efficiency (backhaul factor, routing factor (inefficiencies caused by not visiting the destinations in an optimal sequence, influencing factor the delivery time windows), detour factor (due to that shipments are grouped and delivered in round trips instead of truckloads directly to the destination)
- S= speed efficiency (actual average speed driven over the round trip/maximum speed allowed in the country)
- C= capacity efficiency (actual load volume/possible load volume)

3.1.5.2 Warehousing efficiency

Mentzer and Konrad (1991) suggest as a measurement for warehouse efficiency cost, which they define as an aggregate of labour, administration, and building cost, and warehouse utilisation.

Rhea and Shrock (1987) propose total cost, cost per unit handled or weight, units/weight/orders/euro per square metre as appropriate measures for warehouse efficiency.

Byrne and Markham, (1991) suggest various indicators to measure warehouse productivity, warehouse utilisation and warehousing cost as measures of transport efficiency:

Productivity:

- Value of inventory/total storage cost
- Square metre of space/total storage cost
- Cubic metre of space/total storage cost

Utilisation:

- Square metre of space used/square metre of space paid for
- Cubic metre of space used/cubic metre of space paid for

Costs:

- Actual storage cost/budgeted storage cost

3.1.5.3 Administration

Efficiency in administration refers to efficiency in managing the order process as well as inventory management (Lambert 1994).

With regards to inventory control Mentzer and Konrad (1991) regard labour, and (IT) equipment cost, as major reflectors of efficiency. In addition they outline the importance of forecasting accuracy, inventory carrying cost, and inventory availability as measures of administration efficiency. With respect to order processing Mentzer and Konrad (1991) refer to labour costs as main reflector of efficiency. They suggest the measuring of labour per standard number of orders per man-hour. This should include the whole ordering process, i.e. order entry, order editing, scheduling, shipping and billing.

Rhea and Shrock (1987) postulate the measurement of inventory cost and order administration cost. They suggest measuring these as total cost, cost per unit, or activity cost per hour.

3.1.6 Benchmarking Logistics Performance Measurements

Bowersox (1996) considers that Benchmarking is a critical aspect of comprehensive performance measurement. More and more firms have adopted benchmarking as a technique to compare their operations to those of both competitors and leading firms in related and non-related industries. This has led to number of attempts to establish standard performance measurements.

Commissioned by the American Council of Logistics Management a large survey was conducted in 1995 amongst logistics managers. Amongst other topics and issues, they were asked to rate a number of measure with regards to their relative importance for company performance. The following results reflect the most important ones:

- **Asset management:** inventory turns, inventory levels (no of days of supply)
- **Cost:** total cost, cost per unit, inbound freight cost, outbound freight cost
- **Customer service:** on-time deliveries, cycle time, fill rate, stock outs, shipping errors, delivery consistency, complete orders
- **Productivity:** units shipped per employee, warehouse labour productivity, transportation labour productivity
- **Quality:** order entry accuracy, picking and shipping accuracy, document and invoicing accuracy, information accuracy

Another example of standardisation attempts is the 'Integrated Supply Chain Metric Framework' that has been developed by a consortium of firms, universities, and consultants (see table 3.6). This was developed to ensure a standard set of measurements and thus their integrated application through the supply chain. It reflects in general the efficiency and effectiveness measures that have been discussed in the above, with the exception of time, which is here regarded as a separate the parameter.

Table 3. 6: Integrated Supply Chain Metric Framework

Outcomes	Diagnostics
<i>Customer satisfaction/quality</i>	
Perfect order fulfilment	Delivery-to-commit date
Customer satisfaction	Warranty cost, returns, and allowances
Product quality	Customer inquiry response time
<i>Time</i>	
Order fulfilment lead time	Source/make cycle time
	Supply chain response time
	Production plan achievement
<i>Costs</i>	
Total supply chain costs	value-added productivity
<i>Assets</i>	
Cash-to-cash cycle time	Forecast accuracy
Inventory days of supply	Inventory obsolescence
Asset performance	Capacity utilisation

3.5 Summary

On the basis of a review of the relevant literature this chapter explains that logistics management can be understood as a structured logistics system that adheres to a set of performance goals, which must be derived from overall strategic objectives that determine how customers of an organisation are served. Logistics management in this sense is a set of processes, which follow a hierarchical order and sequence. These processes reflect decisions that are made on a strategic, tactical, project management, and operational level, and capture the design, implementation, and operation of logistics systems. These 3 process categories entail each a set of sub-processes, which comprise again of a certain set of activities. The identification of these activities will be subject to exploratory fieldwork.

In addition this chapter reviewed the pertinent literature on operational logistics performance. The relevance and importance of logistics performance measurement, which reflects how efficient and effective information and products flow in a logistics system, was outlined. The prevailing overall measures are cost for efficiency, and time and quality/customer service for effectiveness. These will be used as a basis for performance measurement.

Chapter 4 Theoretical Perspectives

4.1 Introduction

The application of the third party logistics (TPL) management concept is a recent development and as such has become a popular topic in management literature. The review of the pertinent literature has revealed that the way in which TPL is implemented as a management concept can vary from one organisation to another. This makes the understanding of the concept difficult, because it has a different meaning for each different organisation. In situations where organisations strategically outsource logistics processes to different degrees, the difficulty of understanding the TPL concept becomes even more apparent. One reason for this might be the lack of theoretical concepts to explain the different and changing roles of TPL. To build such a framework, theoretic concepts from various parts of the management literature might be applied. Mentzer and Kahn (1995), and Stock (1997) have postulated this approach to theory building in logistics research particularly.

This chapter explains in brief the theoretic concepts that have been applied to analyse the TPL phenomenon, and those that provide the rationale for this research. Reference is made in particular to transaction cost analysis (TCA) as one of the most commonly used theoretic concepts in TPL research; to network theory (NT) as an overall theoretic basis of this research; resource based theory (RBT), and entrepreneurship (ES) as complementary theoretic concepts to explain TPL, and systems theory (ST) as a rationale for describing logistics systems.

4.2 Transaction Cost Analysis in Third Party Logistics

A commonly used methodology for analysing TPL is transaction cost analysis (TCA) (Coase, 1937, 1952; Williamson, 1975, 1981, 1985).¹ In transaction cost economics, a firm's ownership decision centres on minimising the sum of its transaction and

¹ This paragraph has been largely adapted from Bolumole (2001), *Logistics outsourcing in the UK forecourt convenience retail sector – The supply chain role of Third Party Logistics Service providers*, unpublished PhD thesis, Cranfield University, Cranfield, Beds.

production costs (Coase, 1937; Williamson, 1975). Extending this principle, TCA proposes that different forms of governance structure (individual firms, outsourcing, etc.) emerge in order to maximise profits by reducing transaction costs of economic activities. A firm with a particular governance structure must outperform those with alternative structures in order to survive. Understanding performance differentials between firm-based and market-based transactions therefore motivates the TCA perspective (Williamson, 1981). Williamson (1985) argues that excessive costs may cause transactions to be transferred to other institutions through mechanisms such as hierarchy and/or hybrid mechanism. These institutions in turn internalise market transactions by governing them through long-term contracts which create mutual dependence, improve reciprocal control, curb opportunism and allow for better co-operation between the parties involved. He identifies three forms of governance:

1. Market – arms'-length, one-off transactions for standard investments
2. Hierarchical – vertical integration through ownership
3. Hybrid structures – combining elements of the market and hierarchical mechanisms

TPL relationships are one example of hybrid governance in logistics management, and TCA has therefore been accepted as a useful tool for the analysis of the strategic decision of whether or not to outsource certain activities. Within this perspective the rationale for organisations is the need to minimise logistics costs, including the accompanying transaction costs. Examples of previous research on third party logistics which have linked transaction cost analysis with the outsourcing decision are Ellram (1991), Schary and Coakley (1991), Pfohl and Large (1992), Virum (1993), Cooper et al (1993), Aertsen (1993), Maltz (1994), Ojala (1995), Skjott-Larsen (1995), Cox (1996), and Anderson (1997).

The main limitation of the TCA perspective in today's industrial environment is its narrow view of bounded rationality. Firms no longer compete on the basis of costs alone, but rather, on the basis of overall value. Being increasingly confronted by bounded rationality constraints in a more competitive and technologically complex environment, firms are choosing to focus on their core area of expertise and simply concentrating on doing what they do best (Madhok, 1998). Hence, the formation of

inter-firm relationships cannot be explained on the basis of reducing/eliminating transaction cost alone. To explain different forms of value creation through TPL providers, it is necessary to consider theoretic concepts that adhere to the strategic value of logistics management and co-operative forms of inter-organisational relationships.

4.3 TPLP as part of a Supply Chain Network

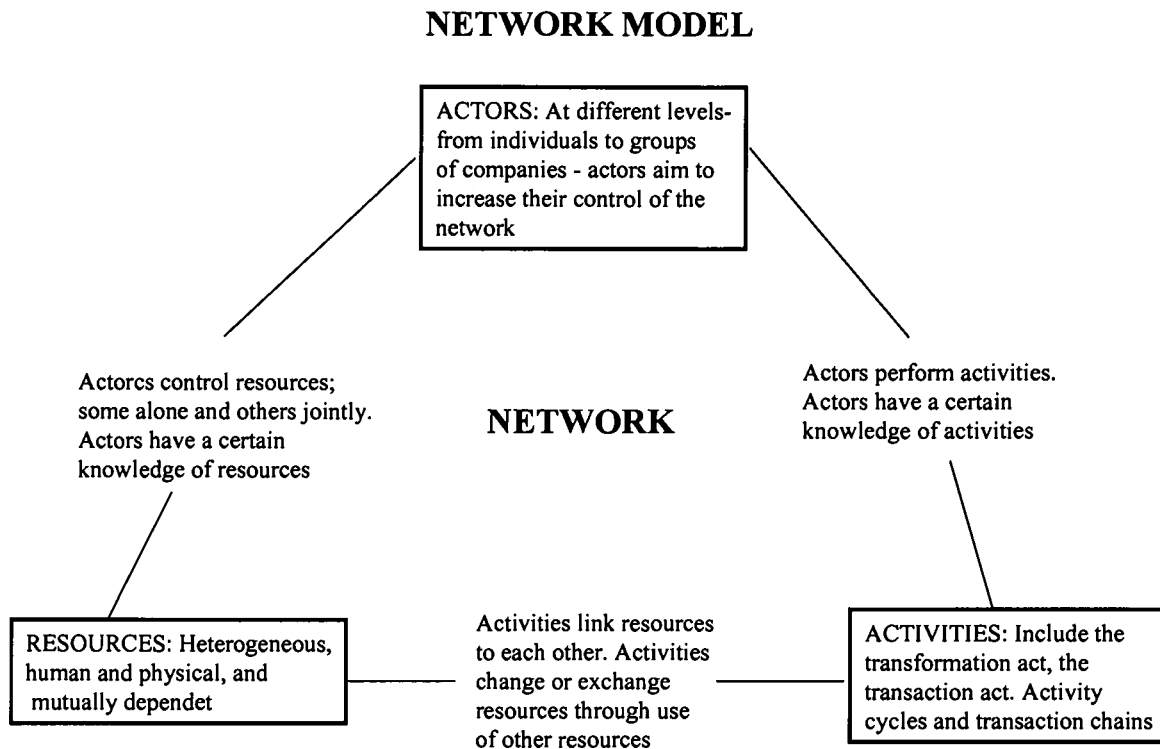
The network perspective is appropriate for describing strategies for inter-organisational co-operation and cross-functional teamwork based on the integration of business processes across organisational boundaries (Bolumole, 2001). Bolumole (2002) adopted the network perspective to describe her view of supply chain actors and the role of TPL providers in the supply chain. A previous example of research linking this perspective with supply chain management and logistics strategy is that of Harland (1993, 1996). Skjoett-Larsen (1999) provides a conceptualisation of the network perspective to third party logistics. In this research the network perspective provides the rationale for the inter-organisational relationship between a shipper and a TPLP within a systems context.

4.3.1 The network perspective

It is the basic assumption in the network model (see Figure 4.1) that the individual firm is dependent on resources and skills controlled by other companies. Access to these resources is achieved through interactions with other firms (Skjott-Larsen, 1999). The actors in business networks – individual or organisational – invest in relationships with other actors and gain knowledge of their partners within the network. It is an inherent tendency in the development of networks that the links become stronger and more stable over time. The relationships between firms in a network develop through adaptation and exchange (Johansson and Mattsson, 1986). Exchange processes include transfer of information, goods and services and social processes (i.e. resources and skills). The latter includes personal bonds, but also technical, logistics and administrative communication. Through social exchange processes, the parties become familiar with each other and gradually develop mutual

trust (Skjoett-Larsen, 1999). Adaptation processes include mutual modification of products, management systems (e.g. logistics systems) and processes to achieve a more efficient allocation of resources in the network (Hakansson and Johanson, 1990).

Figure 4. 1: The Network Model



source: Hakansson, 1987 in cited by Harland (1996)

4.3.2 Networks and dyadic relationships within a supply chain context

Hakansson and Ford (2002) describe networks in their most abstract form as a structure where a number of nodes are related to each other. Emerson (1981) defines networks in a business context as a set of two or more connected business relationships, in which each exchange relation is between business firms that are conceptualised as collective actors. Connected means the extent to which exchange and adaptation in one relation is contingent upon exchange and adaptation (or non-exchange/adaptation) in another (Cook and Emerson, 1978). Moreover, two connected relationships of interest themselves can be both directly and indirectly

connected with other relationships that have some bearing on them, as part of a larger business network. Anderson et al (1994) conclude from these two functions of business networks that the *primary functions* are concerned with the dyadic relationship within a network. Corresponding to activities, resources (and skills) and actors (Henderson and Quandt, 1971; Demsetz, 1992) they are:

1. Efficiency and effectiveness through interlinking of activities
2. Creative leveraging of resource heterogeneity
3. Mutuality based on self-interest of actors

(Hakansson et al, 1993; Anderson et al, 1994).

Activities (and therefore also processes) are enacted (Weick, 1969). They are identified, delimited, perceived, and organised, as a consequence of performance (goals). Over time and through experience, activities are modified and related to each other in organised activity systems (Weick, 1969; Hakansson et al, 1993). Hakansson et al (1993) explain further that organisations in an inter-organisational relationship adapt some minor or major activities to each other. They do this for three reasons. The first is the relationship itself, in order to make it function. The second has to do with rationalisation, whereby adaptation can lead to efficiency and effectiveness gains. The third reason to adapt is related to innovation and the opportunities that can be created by adapting activities and processes. The adapting of processes with TPL relationships relates to the partnership building function that has been elaborated upon in the pertinent TPL literature (Cooper et al, 1993; Gardner et al, 1994). Andersson (1997) elaborates on the long term effects of TPL partnerships as potential gains in effectiveness and efficiency. An example of conceptualising the innovation function of TPL partnerships has been provided by Berglund (2000).

A business relationship in which the resources of two firms are confronted with each other implies that to the extent that those firms are bundles of heterogeneous resources, their combined efficiency can be raised over time (Hakansson, 1993). These resources are in themselves essentially passive and fragmented. It is the firms' interaction with others which leads to an activation and an integration of its resources. The interaction with others is in this way the force that unifies the firm and gives it the

capability (or skill) to perform its activities (Ford et al, 1986). Relationships can thus be the means to develop innovative resources and skills, an aspect of relationships, which is related to the learning process. Two knowledge effects of relationships are noted. Relationships not only facilitate learning, but can also be used as a means to use knowledge without acquiring all the knowledge oneself (Lundvall, 1988). This latter aspect reflects best the nature of TPL relationships. Shippers use the knowledge of TPLPs in logistics management, thereby deploying their resources and skills into the logistics management processes. They thus contribute to logistics management with the aim of creating more competence than the shipper on his own would have been able to do.

The concept of mutuality rests on the importance of collective goals or common interests between firms. Mutuality is a measure of how much a company is prepared to give up its own individual goals or intentions in order to increase the positive outcome of others, and through this, increase its own ultimate well being (Ford et al, 1986). Mutuality is developed through a social exchange process in the relationship and is specific both in content and in direction (Hakansson, 1993). Transposed to the TPL context this means that if TPLPs want to form a closer relationship with their clients, the shippers, they must recognise their interests, i.e. they must act proactively towards their business/logistics goals.

The *secondary or network functions* are caused by the existence of connections between relationships. With regard to the three components, the secondary function concerns chains of activities involving more than two firms, constellations of resources controlled by more than two firms, and shared network perceptions by more than two firms. By adapting activities in several relationships to each other, thus raising the complementarities of sequences or other interdependent activities, activity chains stretching over several firms are created. Similarly, resources and skills developed in a relationship are not only important to those engaged in that relationship, but may also have implications for the resources and skills of parties engaged in connected relationships. Thus innovations developed as a result of interaction in several relationships may support each other (Anderson, 1994).

These secondary network functions provide the rationale for the management of supply chains as strategic networks (Harland, 1996; Skjoett-Larson, 1999; Bolumole, 2002), and they stress the strategic importance of each supply chain relationship, *ergo* also TPL relationships.

The value that TPL relationships create in a network depends on the strategic network identity of TPLPs (adapted from Anderson, 1994). Evidently, actors in a network have bounded knowledge about the networks in which they are engaged (Emerson, 1981; Hakansson and Johansson, 1993). This is due to not only the network extending further and further away from the actor, but also the basic invisibility of network relationships and connections (Anderson, 1994). Network identities are thus context-related and can be described in the same dimension (Hakansson and Snehota, 1989). Each identity communicates a certain orientation towards other actors; it conveys a certain competence, because it is based on each actor's perceived capability to perform certain activities (Albert and Whetten, 1985); and it has certain power content, because it is based on the particular resources each actor possesses (Cook et al, 1983). With regard to TPL relationships, the identity of a TPLP can be described through its contribution to the managerial competence of logistics/supply chain management, and its possession of certain resources and skills.

The focus in this research is on the dyadic relationship between shippers and TPLPs. It must, however, be recognised that this inter-organisational relationship affects a supply chain network indirectly. It is this effect that attributes strategic importance to TPL relationships, and hence the value creating role or identity of TPLPs.

4.3.3 Application of the network perspective in this research

According to network theory, the firm's relations with other companies often constitute its most valuable resource. For example, access to complementary investments (i.e. resources) and capabilities (i.e. skills or knowledge) in other firms provides important building blocks of a network's competence. They play a central part in a firm's competitiveness, because they are hard to copy (Nelson and Winter, 1982).

It is the fundamental assumption in the network model that the firm's persistent interaction with other actors is an important factor in the development of new resources and skills. The assumption implies a shift in focus away from allocation and structure of the firm's internal resources towards the way in which it relates to the other actors' activities and resources in the external environment (Fine, 1998).

The network model adds considerably to the understanding of the dynamics of TPL relations because it provides the rationale for the emergence of different forms of TPL relationships. According to the network model, it is the resource and skills base of the network that reflects logistics competence and determines logistics performance. In addition, the development of mutuality leads to the recognition of the others' interest, without being altruistic. In an outsourcing context, this means that TPLPs' resources and skills, and their ability to recognise their clients' business and/or logistics goals and objectives are key ingredients for TPL relationships in a supply chain network. In this research it is assumed that the TPLPs' resource and skill base, as well as their recognition of their clients' business goals, *or proactive management* of the processes they take responsibility for, directly influence the adaptation of business processes, i.e. how far TPLPs will be involved in these, and thus the efficiency and effectiveness of logistics systems.

The network perspective builds the overall basis for this research. It uses concepts - particularly those of resources and proactivity - that are rooted in other schools of thought, and these must also be described in order to provide a comprehensive theoretic framework for this research, and the variables (dependent and independent) that it contains. A further description of resources, skills and competences can be extracted from a body of literature that adheres to the *resource-based view of the firm*. The following further elaboration of proactive behaviour is rooted in the economic principle of *entrepreneurship*. Finally, the view of logistics as a system is rooted in general *systems theory* and its various applications in operations management.

4.4 The Resource based View of the Firm

4.4.1 Logistics Competence and Competitive Advantage

Competitive advantage may be gained from two main sources: assets, and the capabilities that enable assets to be deployed advantageously (Dierickx and Cool, 1989). Day (1994) defines capabilities as "complex bundles of skills and accumulated knowledge, exercised through organizational processes, which enable firms to coordinate activities and make use of their assets." Management's task is to exploit and leverage firm-specific assets and capabilities (Mahoney and Pandian, 1992). The concepts of competences, capabilities (or skills), and resources descend from a body of literature that is commonly referred to as *resource-based theory or the resource-based view of the firm*. This approach considers firms as collections of heterogeneous resources and capabilities and looks at why they exist and what determines their scale and scope (Lippmann and Rumelt, 1982; Holmstrom and Tirole, 1989). The resource-based view of the firm goes back to the seminal article of Penrose (1959), who defined the firm as a "bundle of linked and idiosyncratic resources and resource conversion activities, which are the root for sustained competitive advantage". Especially in the last two decades this approach has advanced as an important perspective for understanding how firms compete through their resources and capabilities (Wernerfeld, 1984; Nelson and Winter, 1982; Schoemaker, 1992; Hamel and Prahalad, 1990; Peteraf, 1993).

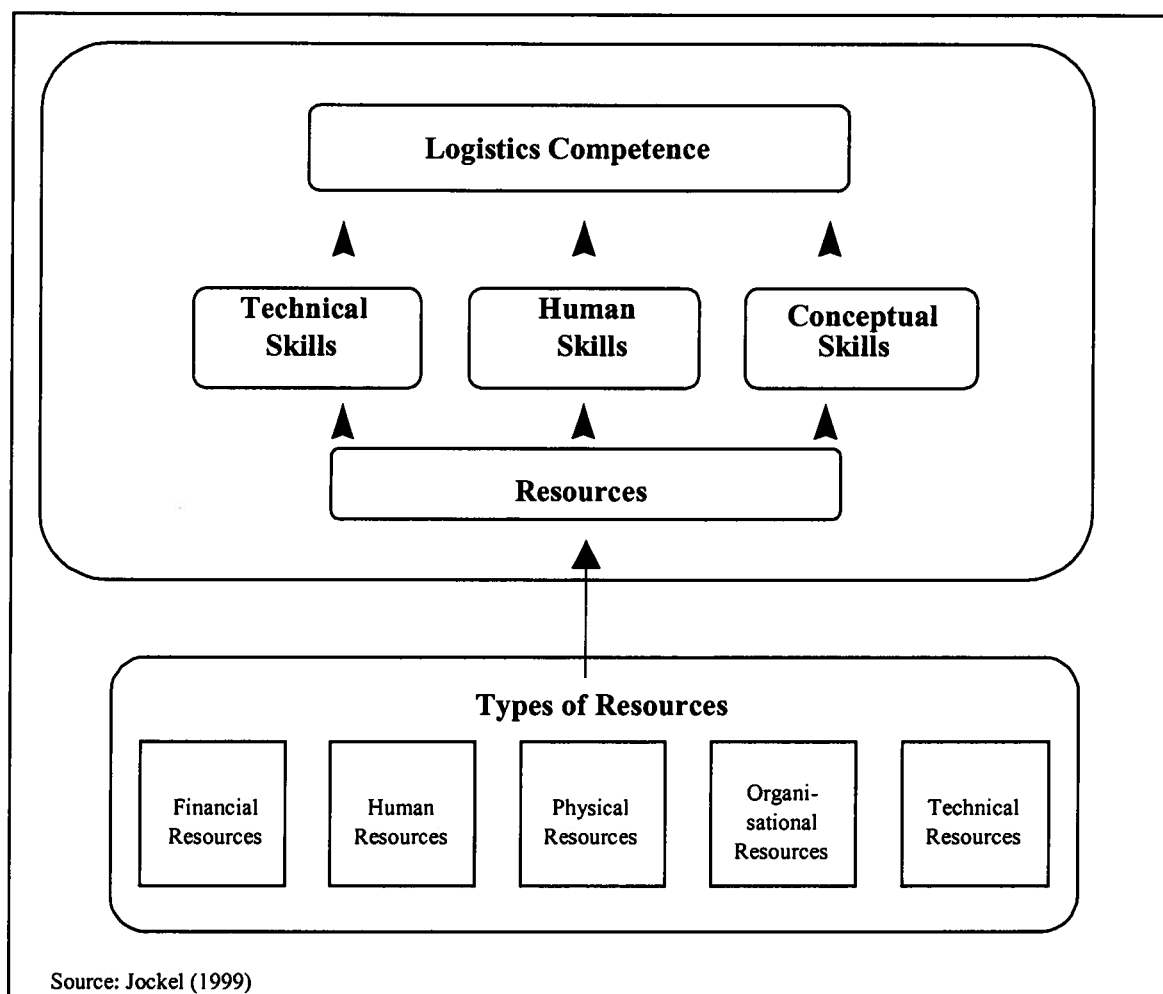
When it comes to the effect of TPL resources and skills, there is only limited knowledge. The concepts of logistical resources and skills are, however, widely postulated by most important writers in the logistics arena as logistics competences. Lambert et al (1998) recognise effective logistics management as a key competence to improve both the profitability and competitive performance of a firm. Bowersox (1996) refers to the strategic importance of logistical management by describing logistics as the competency that links an enterprise with its customers and suppliers. Christopher (1992) discusses logistics competence in the same manner with regard to supply chain management. Gagnon (1999) argues that it might be necessary to adopt the view that the primary goal of an operations strategy is to develop and leverage

resources in order to create new market qualifiers and order winners. This content of a strategy would be supported by logistical capabilities deeply anchored within business processes and organisational routines (Nelson et al, 1992; Stalk et al, 1992). In a similar manner, the outsourcing of logistics activities to TPLPs must also be seen as part of an overall logistics strategy, and thus the means of acquiring better or non-existent logistics resources and skills (Bowersox, 1996; van Damme et al, 1996; Gentry, 1996).

4.4.2 Resources, Capabilities, and Competence

Figure 4.2 depicts a conceptualisation of logistics competence, capabilities (or skills)

Figure 4. 2: Resources, Skills and Logistics Competence



and resources. According to Nanda (1997) competencies (and therefore, also logistics competence) are 'higher order routines' which develop and configure organisational resources. Nanda draws on the concept of organisational routines (Nelson and Winter, 1982) to explain the anatomy of **competencies**. Organisational routines are regular and predictable patterns of activities (or processes) which are made up of a sequence of co-ordinated actions by individuals (or machines), and are learned and perfected by continued repetition.

Resources are the strengths or weaknesses of a given firm, and can be defined as tangible or intangible assets (Itami, 1987; Wernerfelt, 1984). Hofer and Schendel (1978) elaborate on these terms a little more and define:

- Financial resources – e.g. cash flow, debt capacity, new equity availability
- Physical resources – e.g. buildings, manufacturing plants, warehouses, inventories
- Human resources – e.g. scientists, engineers, sales personnel, financial analysts etc.
- Technological resources – e.g. patents, licenses
- Organisational resources – e.g. quality control systems, cash management systems etc, financial schemes (pensions, share options etc), organisational culture

Skills (or capabilities) and resources are closely related terms - access to a resource leads to a capability; a capability arises from the possession of a resource, and is the potential input from the resource stock into the process (Nanda, 1997). A useful typology of capabilities can be derived from Katz's (1974) approach in examining administrative (managerial) processes. He defines abilities (capabilities) as skills that must be effective in action under varying conditions. He suggests three basic developable skills - technical skill, human skill, and conceptual skill. Technical skill implies an understanding of, and proficiency in, a specific kind of activity, particularly one involving methods, processes, procedures, or techniques. Human skill is the ability to effectively work with people (i.e., to manage). Conceptual skill is the 'creative ability' to co-ordinate and integrate activities and interests towards a common objective.

The resource-based logic stresses the importance of competencies to the achievement of competitive advantage, and combines this with the recognition of external resources availability. Adopting this perspective supply chain relationships represent a valuable resource in themselves (McWilliams and Gray, 1995; Varadarajan and Cunningham, 1995). Gentry (1996) and Bolumole (2002) see the value of TPL relationships as potential sources for competitive advantage.

In this research the concept of resources and skills is used to describe the perception of shippers' and TPLPs' perceptions of the role of TPLPs in the management of logistics systems. Furthermore, this research intends to show that differences in the resource and skill base of TPLPs can be a determinant for different degrees of TPL involvement.

4.5 *Entrepreneurship and proactive behaviour of TPLPs*

4.3.4 Proactive behaviour

Hewitt (1994) points out that logistics as a natural "linking" or integrated function, is influenced both directly, by the changing economic and social environment in which all companies operate today, and indirectly, by changes in related functions, such as manufacturing's move to focused factories, or marketing's search for total customer satisfaction. Logistics functions cannot stand still. The choice is between being reactive or proactive towards change. Proactive behaviour in logistics management has been discussed widely with regard to innovation, ranging from process re-engineering (Bowersox, 1996) to supply chain management (Christopher, 1992).

Proactive behaviour can be defined as taking the initiative in improving current circumstances, proposing and implementing management methods and processes, or creating new ones. It involves challenging the status quo, rather than passively adapting to present conditions (Crant, 2000). This aspect of management behaviour is rooted in the economic theory of entrepreneurship (Casson, 1982; Crant, 1996).

4.3.5 Entrepreneurship

The entrepreneurship scholar is heavily involved in research about organisational networks and entrepreneurship (Butler and Hansen, 1991; Johannisson, 1995). Amit and Schoemaker (1993) state that entrepreneurship can be defined as the process of extracting profits from new, unique, and valuable combinations of resources in an uncertain and ambiguous environment; more generally, the creation of new enterprises. Furthermore, they characterise the entrepreneur as an individual who innovates, identifies and creates business opportunities, and assembles and co-ordinates new combinations of resources (i.e. production functions) in order to extract the most profit from their innovations in an uncertain environment. Leibenstein (1968) also emphasises leadership, motivation, and the ability of the entrepreneur to resolve potential crisis situations. Starr and MacMillan (1990) emphasise the importance of social contracting for an entrepreneur acquiring resources. Their research suggests that for entrepreneurs, the use of social assets such as obligation, trust, gratitude, liking and friendship secure their access to resources. Additionally, Burt (1992) stresses the importance of social capital, the ability to build up and maintain different networks that provide opportunities and profits by connecting them. Casson (1982) describes the entrepreneur as an opportunistic co-ordinator of resources. The entrepreneur is someone whose judgment differs from that of other people. He or she believes that without his or her intervention, a wrong decision would be made and resources would not be allocated as efficiently as they might be. Thus an opportunity for an entrepreneur to co-ordinate exists. The entrepreneur intervenes in order to exploit his or her superior judgment. Casson (1982) continues to argue that the entrepreneur's superior judgment enables him/her to identify an opportunity for co-ordination.

4.3.6 Applying proactive/entrepreneurial behaviour to TPL

Proactive/entrepreneurial behaviour has so far only been discussed from an intra-organisational perspective. Issues like leadership (Deluga, 1998; Crant and Bateman, 2000) and organisational innovation (Parker, 1998) have been examined with respect to the proactive behaviour of individuals. Kirkman and Rosen (1999) first applied the

proactive personality construct to the team level. They demonstrated that proactive team behaviour had a positive effect on organisational effectiveness and efficiency.

Although the concept of proactive or entrepreneurial behaviour has not yet been explored deeply on an inter-organisational level, it has been referred to in the examination of shipper–TPLP relationships. Langley (1999) points to TPL innovation through leveraging existing TPL infrastructure. Andersson (1997) elaborates on the restructuring of logistics processes initiated by TPLPs, and Berglund (2000) found evidence of TPLPs being the driving force for supply chain restructuring. Hindson (1999) elaborates particularly on shippers' dissatisfaction with TPLPs failure to be innovative or to take a proactive approach.

Existing research on TPL has revealed so far that TPLPs can act proactively. The intention of this research is that the perception of proactive or entrepreneurial TPL behaviour in logistics management might differ between shippers and TPLPs, and can be a determining factor for shippers to outsource specific parts of logistics management.

4.6 A system theory approach to logistics management and analysis

Johnson (1971) refers to the systems approach as a way of thinking about the job of managing. He explains further that it provides a framework for visualising internal and external environmental factors as an integrated whole. It allows recognition of the function of sub-systems, as well as the complex supra-systems within which organisations must operate. The integrated nature of systems includes the fact that each system has both inputs and outputs and is in a constant state of change. Logistics management uses systems theory concepts widely.

Within this framework, logistics management involves the integration of cross-functional business processes (Christopher, 1971; Stevens, 1989; Christopher 1998) and managing the supply chain (or parts of it) as a single entity (Ellram et al, 1990; Ellram, 1991) through network co-ordination (Ford, 1997) and relationship

management with suppliers (Ellram, 1990; Cooper, 1993) and TPLPs (Gibson, 1993; Gentry, 1996b).

Systems thinking and systems theory owe their roots to the ideas of organismic biologists during the first half of the 20th century. The Viennese biologist Ludwig von Bertalanffy formulated the theory of open systems (von Bertalanffy, 1950, 1968) and established systems thinking as a major scientific movement with new methodologies and applications. He tentatively suggested that living organisms were systems that were open and fed on the continual flux of matter and energy from their environment to remain alive.

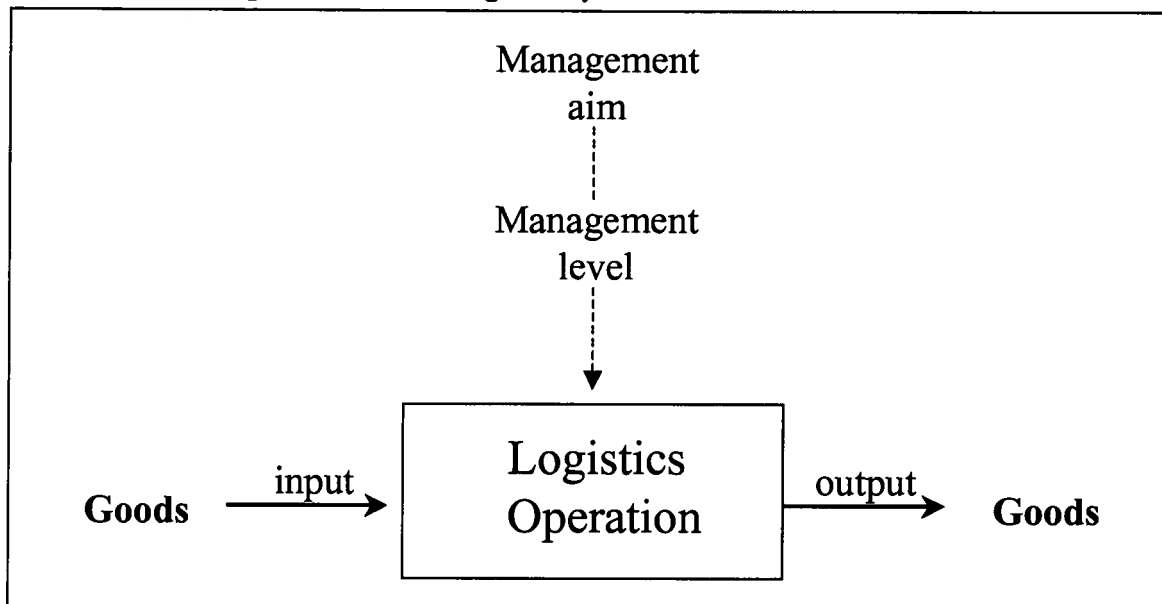
The various systems theory principles derived primarily from the study of biological systems, and are now widely used in the analysis of management and organisations (Katz et al, 1978; Lowson, 2002). Lowson (2002) outlines the many concepts regarding open systems that have been applied to the operational activities in an organisation. In its most basic form, this can be demonstrated by the input – transformation – output process of an open organisational system that is embedded in a wider environment. The transformation can be tangible, transforming raw material into goods, or intangible, when providing services and information, and the activities of nearly all firms can be described using this framework. It describes how input resources, both transforming (needed to perform the transformation) and transformed (changed by the transformation) are altered into various output types (Slack et al, 1998, 2001; Lowson, 2002). Logistics systems in this sense have been described as systems of goods and information transfer (Bowersox, 1996, 2002; Lambert, 1999). The output they create is the time and place to which goods are delivered (Christopher, 1992).

The Organisation for Economic Co-operation and Development (OECD, 1996) devised a simplified model of logistics systems to describe the structure of a logistics system (Figure x). Logistics is here described as an operational system that transfers goods and information-transformed resources through the management of a logistics operation.

In his discussion of systems management, Johnson (1973) describes four distinct stages, which are closely related to each other:

1. Systems determination
2. Design and creation
3. Operation and control
4. Review and evaluation

Figure 4. 3: Conceptual model of a logistics system



Source: OECD (1996)

The decision to create a system is entrepreneurial. Johnson (1973) exemplifies this with the opening of a shop, or the decision to found a new division. Transposed to the logistics context, this means that entrepreneurship is the root of any change in the logistics system.

Next, a system must be designed and created; that is, components must be arranged in some combination to produce a desired goal (Johnson, 1973). The design and implementation of logistics systems has been described widely in Chapter 3. It entails design decisions that are made towards strategic, tactical and operational goals. Implementation is the realisation of design decisions, i.e. putting system components into place. The system then goes into operation.

Fundamental to the theory of systems is the premise that given certain inputs, the processor will give certain outputs, or operate within established limits. However, the equilibrium of an organisation (or a subsystem within it) cannot be determined by a simple equation. It will change within limits, as the components of the system are rearranged, or as the inputs are reallocated (Johnson, 1973). Given the aspect of constant change, a logistics system also requires the constant input of transforming resources at each stage of systems management.

The aspect of 'review and evaluation' is related to the measurement of output or related characteristics. This fourth stage pertains to how well the system has operated, i.e., if it has been effective and/or efficient (Johnson, 1973). The systems approach is well suited to the measuring of logistics or supply chain performance because it offers a method for describing and analysing problems in the context of interdependent complex relationships (Abrahamsson, 1999; Holmberg, 2000).

In this research the analysis of logistics systems focuses on the system, with transforming resources (and skill) input; in particular, the resources and skills coming from TPLPs, and the entrepreneurial aspect of managing these resources and skills.

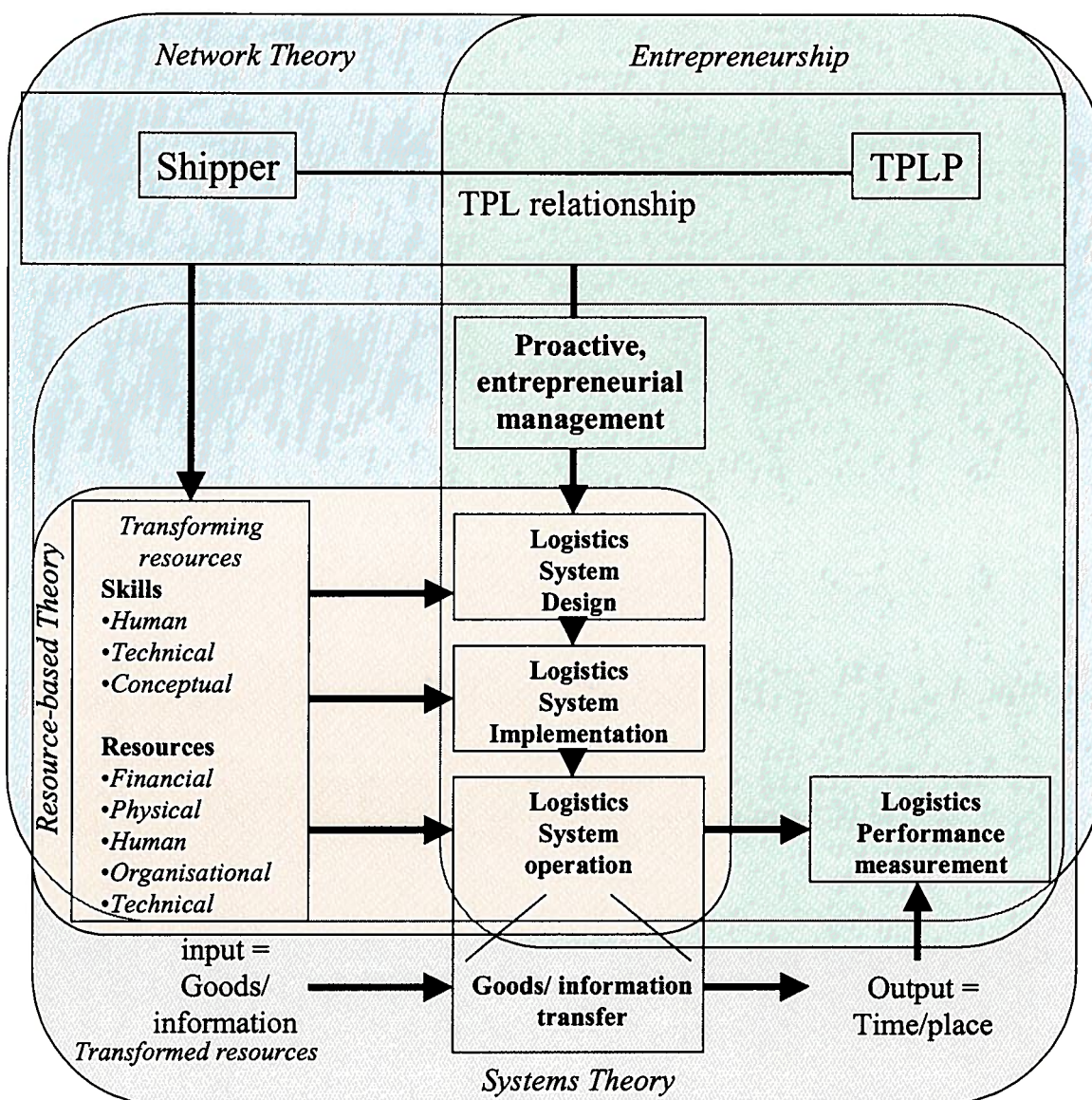
Furthermore, logistics management must, as outlined in Chapter 3, be seen as a system of related and structured processes and activities (i.e. a system) that must be designed, implemented and operated, following certain performance objectives (Bowersox, 1996; Lambert, 1998; Gattorna, 1999).

The systems approach in this research is reflected in the proposed analysis of the systems process structure with respect to TPL involvement (RQ 1 and 2), the conceptualisation of input, in the form of transforming resources (and skills) and management, as well as the analysis of operational performance.

4.7 Conclusion

This chapter has reviewed the theoretic concepts this research is based upon. This research rests on two main ‘pillars’. Network theory provides the overall framework

Figure 4. 4: Theoretic Framework



for the analysis of TPL relationships. The theoretic concepts that are rooted in the resource-based view of the firm and the entrepreneurial school of thought provide the critical concepts, which in turn provide the main building blocks for this research. They provide the definition of the independent variables. Furthermore, resources and

skills and entrepreneurship build the link between network and systems theory. Figure 4.4 depicts the theoretic concepts in a concise manner.

Chapter 5 Philosophical and Methodological Framework

5.1 Introduction

This chapter describes in brief the scope of ontological and epistemological standpoints and outlines the philosophical and methodological approach this research takes. Trigg (1985) states that empirical social science must start from a properly articulated philosophical base if it is to be successful. The philosophy of social science cannot be an optional activity for those reluctant to get on with the 'real' empirical work. It is the indispensable starting point for all social science. Therefore, the chosen research methodology is based on the (implicit or explicit) ontological and epistemological choices of the researcher. This chapter explores the prevailing paradigms in which logistics, and in particular TPL research, is founded. Furthermore, it aims to clarify and justify the ontological and epistemological stance adopted, and its methodological consequences.

5.1 Philosophical Stance in Research

Logistics research, as any other field of research, adheres to some underlying assumptions as to the philosophical position assumed by the researcher (either implicitly or explicitly) and the way in which he or she approaches the investigation process.

There has been a long debate in social science about the most appropriate philosophical position from which methods should be derived (Easterby-Smith et al., 1991). The philosophical position of a researcher is his or her individual set of basic beliefs. The researcher's paradigm is based on his or her ontological and epistemological understanding of the world.

5.1.1 Ontology (Metaphysics)

The root definition of ontology is ‘the science or study of being’. Ontology refers to the claim or assumption that a particular approach to social enquiry makes about the nature of social reality – claims about what exists, what it looks like, what units make it up, and how these units interact with each other (Blaikie, 1993). Ontology is concerned with understanding the kind of things that constitute the world (Schwandt, 1997). Ontology relates to the question: ‘*what is the form and nature of social reality and what is there that can be known about it?*’ (Denzin and Lincoln, 1994).

5.1.2 Epistemology

The root definition of epistemology is ‘the theory or science of the method or grounds of knowledge’. It refers to the claims or assumptions made about the ways in which it is possible to gain knowledge of this reality, whatever it is understood to be; claims about how what exists may be known. An epistemology is a theory of knowledge; it presents a view and a justification for what can be regarded as knowledge – what can be known, and what criteria such knowledge must satisfy in order to be called knowledge rather than beliefs (Blaikie, 1993). Epistemology relates to the question: ‘*what is the nature of the relationship between the knower or would be knower and what can be known?*’ (Denzin and Lincoln, 1994). Gill and Johnson (1997) refer to epistemology as the process by which social science theories are constructed, evaluated and justified. They ask: “*What are the sources of such theories and hypotheses, and how do we set about judging rigorously whether or not these theories and hypothesis are true.*” The answer to this question is constrained by the ontological position that the researcher adopts.

The works of Denzin and Lincoln (1994, 2000) provide extensive elaborations of the spectrum of research approaches. Their works provide a convenient reference framework in which the philosophical stance taken in this research can be positioned. Table x summarises the key issues of the two opposing schools and highlights the researchers’ position within these under post-positivism.

Table 5. 1: Basic beliefs of Alternative Inquiry Paradigms

	Positivism	Post-Positivism	Constructivism
<i>Ontology</i>	Naïve realism – real reality but apprehendable	Critical realism – ‘real’ reality but only imperfectly and probabilistically apprehendable	Relativism – local and specific constructed realities.
<i>Epistemology</i>	Dualist-objectivist; findings true	Modified dualist/objectivist; critical tradition/community; findings probably true	Transactional/ subjectivist; created findings
<i>Methodology</i>	Experimental/ manipulative; verification of hypothesis; chiefly quantitative methods	Modified experimental/ manipulative; critical multiplism; falsification of hypothesis; may include qualitative methods	Hermeneutical/ dialectical
<i>Inquiry aim</i>	Explanation: prediction, control	Explanation: prediction, control	Understanding; reconstruction
<i>Nature of knowledge</i>	Verified hypotheses established as facts or laws	Non-falsified hypotheses that are probable facts or laws	Individual reconstructions, coalescing around consensus
<i>Knowledge accumulation</i>	Accretion-“building blocks” adding to edifice of knowledge”; generalisations and cause-effect linkages	Accretion-“building blocks” adding to edifice of knowledge”; generalisations and cause-effect linkages	More informed and sophisticated reconstruction; vicarious experience
<i>Goodness or quality criteria</i>	Conventional benchmarks of “rigor”: internal and external validity, reliability, and objectivity	Conventional benchmarks of “rigor”: internal and external validity, reliability, and objectivity	Trustworthiness and authenticity

Source: derived from Denzin and Lincoln, 1994.

5.1.3 Two opposing beliefs

5.1.1.1 Positivism

The *positivist paradigm* holds that social reality is fully observable – that is, that observed events are driven by natural laws and mechanisms. The key idea is that the

social world exists externally, and that its properties should be measured through objective methods. The French philosopher Auguste Comte is usually referred to as the founder of the system of positivism in his work *The Positive Philosophy* of 1855, in which he formulated the idea of a natural science of society. Further theorists who have influenced the positivist paradigm are Herbert Spencer, Emile Durkheim and Vilfredo Pareto (Burrell and Morgan, 1979: 26).

Knowledge of the “way things are” is conventionally summarised in the form of time- and context-free generalisation, some of which take the form of cause-effect laws (Guba and Lincoln, 1994: 109). Human activity is understood as observable behavior taking place in observable, material circumstances. Social reality is viewed as a complex mix of causal relations between events, which are depicted as an emerging patchwork of relations between variables. The causes of human behaviour are regarded as being external to the individual (Blaikie, 1993: 94).

The epistemological assumption of positivism is based on dualism and objectivism. Knowledge is derived from sensory experience by means of experimental or comparative analysis, and concepts and generalisations are shorthand summaries of particular observations (Blaikie, 1993: 94). The investigator and the investigated “object” are both assumed to be independent entities, and the investigator to be capable of studying the object without influencing it or being influenced by it. Inquiry takes place as through a one-way mirror. Values and bias are prevented from influencing outcomes, as long as the prescribed procedures are rigorously followed. Replicable findings are, in fact, “true” (Guba and Lincoln, 1994: 110).

5.1.1.2 Constructivism

At the other extreme constructivism holds that ‘*realities are apprehendable in the form of multiple, intangible mental constructions, socially and experimental based, local and specific in nature, and dependent for their form and content on the individual persons or groups holding the construction*’ (Denzin and Lincoln, 1994).

Many different variants are associated more or less closely with constructivism. These include interpretive sociology (Habermas, 1970), naturalistic inquiry (Lincoln and Guba, 1986), social constructionism (Berger and Luckman, 1966), and qualitative methodology (Taylor and Bogdan, 1984). Easterby-Smith summarises these under the term 'phenomenology'.

Generally speaking, the ontological perspective of constructivism is the idea that reality is socially constructed rather than objectively determined (Easterby-Smith et al, 1991: 24). The social scientist under positivism gathers facts and measure how often certain patterns occur, whereas the phenomenological perspective appreciates or apprehends the different constructions and meanings that people place upon their experience. Epistemologically the phenomenological paradigm is based on subjectivism. In contrast to positivism, the phenomenological paradigm suggests that the observer (researcher) is part of what is observed. He or she is characteristically concerned in his or her research with attempting to accurately describe, decode and interpret the precise meanings to people of phenomena occurring in their normal social contexts, and is typically pre-occupied with complexity, authenticity, contextualisation, the shared subjectivity of the researcher and researched, and the minimisation of illusion (Fryer, 1991: 3). The researcher and the object of investigation are assumed to be interactively linked so that the "findings" are literally created as the research process continues (Guba and Lincoln, 1994).

5.2 The Philosophical Stance

Mentzer and Kahn (1995) point to the fact that logistics research has a strong foundation and continuing emphasis on positivism. It has been influenced by the economic, and to a lesser degree, the behavioural approaches to scientific study. The economic approach focuses attention on understanding the determinants of cost, demand, profits etc. through cost analysis, mathematical modelling, simulation and sensitivity analysis. The behavioural approach, on the other hand, focuses on the psychological and sociological aspects of situations, and is primarily obtained via questionnaires, interviews and case studies of individuals.

Analytical researchers in TPL (Ellram, 1991; Schary and Coakley, 1991; Pfohl and Large, 1992; Aertsen, 1992, 1993; Virum, 1993; Cooper et al, 1993; Maltz, 1994; Ojala, 1995; Skjott-Larsen, 1995; Cox, 1996; Anderson, 1997) have clearly followed the positivist tradition, adopting, for instance, the economic concept used in transaction cost analysis to explain the reasons for outsourcing to TPLPs by its minimising effect on production and governance cost. Researchers following a behavioural approach to TPL research (Gardner et al, 1994; Gentry, 1996) have tried to measure degrees of inter-organisational closeness and its effect on the success of TPL partnerships. The focus on causality, as well as the strict adherence to statistical methods used on large samples, identifies both groups clearly as positivists. Researchers who have published their observations of the TPL phenomenon in a descriptive manner (Lieb, 1993, 1998; Peters et al, 1993, 1998; Laarhoven 2000) are not clearly identifiable as being either constructivist or positivist, although the consequent repetition of some of these studies (for example Lieb 1993, 1998, 2000) and their generalising claims points to the latter.

The research that follows adheres closely to the positivist positions that have been traditionally taken in logistics research, and by implication, assumes the existence of a 'real reality' with regard to the TPL phenomenon. More precisely, this research can be described as being post-positivistic, adhering to the 'critical realist' school of thought (Baskhar, 1975) Generally critical realism asserts that there is a reality independent of structures and mechanisms, as well as powers and tendencies, which, although not directly observable, nevertheless underlie the events that we experience. The post-positivistic paradigm also implies that the purpose of the enquiry is to produce causal explanations of these mechanisms, which give rise to what is being observed. Furthermore, the post-positivist (critical realist) paradigm quite openly involves preconceptions that might be culturally specific and restricted to a particular world view. Social scientists (according to critical realism) are by the very nature of their activities required to openly acknowledge and declare these preconceptions from the outset of research (Brown, 1999). The researcher is encouraged to seek and account for social structures which exist beyond the realm of observation. In adopting a network perspective this research assumes the underlying mechanisms of resource and skill exchange, and mutuality, as leverage for efficiency/effectiveness gains. It is

furthermore assumed that objective and true understanding of the shipper/TPLP relationship can probably be established by examining a large sample of shipper/TPLP relationships across several countries and industries. It also recognises however, that the knowledge created in this study, although obtained through examining a large sample, relies on the perception of key informants in organisations, who are thus far from a value-free position towards TPL. It is assumed, however, that the concepts of resources/skills and proactive behaviour, which are complementary to the network approach, can by way of testing be validly applied to explain TPL involvement and logistics performance. The choice of post-positivism means the testing and attempting to falsify of a number of hypotheses. Furthermore, it is assumed that a causal relationship between TPL resources and skills, proactive behaviour and TPL involvement can be established, as well as a causal relationship between TPL involvement and logistics performance.

5.3 The role of theory

A philosophical paradigm encompasses three elements: ontology, epistemology and methodology. Ontology raises basic questions about the nature of reality. Epistemology asks: "How do we know the world? What is the relationship between the inquirer and the known?" Methodology focuses on how we gain knowledge about the world (Denzin and Lincoln, 1994). Furthermore, Blaikie (1993) explains methodology as the analysis of how research should or does proceed. It includes discussions of how theories are generated and tested – what kind of logic is used, what criteria they have to satisfy, what theories look like, and how particular theories can be related to the particular research problem.

The balance of inductive with deductive reasoning in post-positivism supports the notion that the long-term ability of any theory to explain and/or predict phenomena supports the notion that the entities and structures which theory postulates actually exist in the real world. The post-positivist paradigm of critical realism does not postulate that our perception of the world or perceptual methods always give an accurate representation of the world, neither does it claim to reject all forms of objectivity. Instead it postulates that neither of these extreme positions is satisfactory,

and that the validity of any theory of our perception of the world can be achieved through the long term, iterative process of developing and testing in order to verify the existence of the variables and relationships proposed by such theory.

5.4.1 The use of Theory

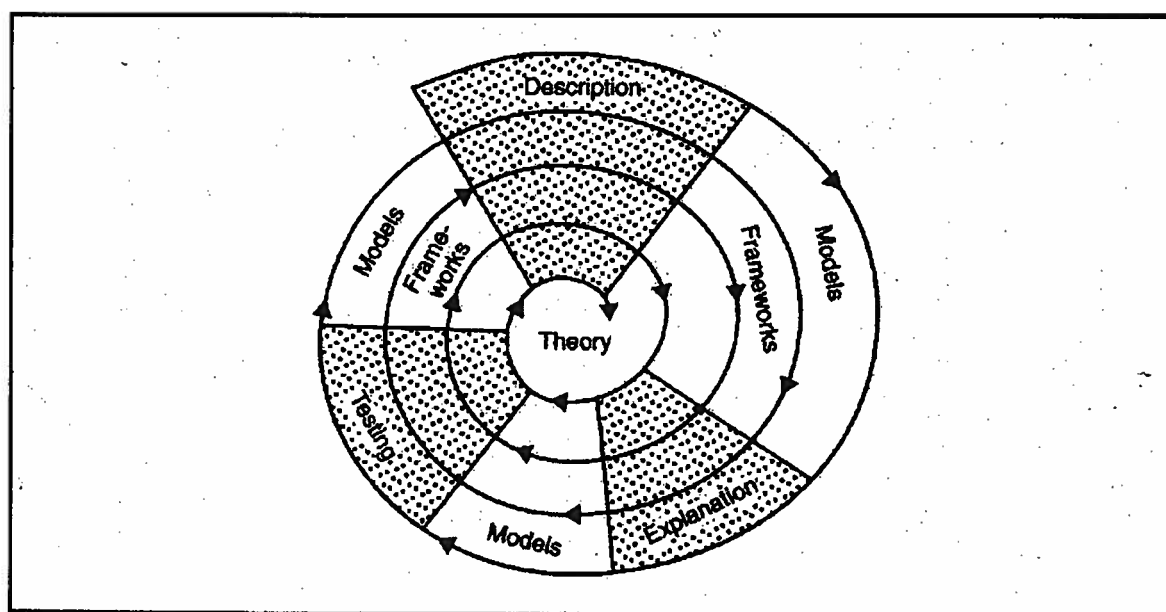
A theory's primary purpose is to explain. The meaning of explanations can either be *theoretical*, i.e. a logical argument that tells why something occurs, or *ordinary*, i.e. a clarification or description of something, in a way that makes it intelligible. The way researchers explain can be causal, structural, and interpretive. Many people, however, confuse prediction with explanation. Whereas prediction is a statement that something will occur, explanation has more logical power, because good explanations also predict (Neumann, 2000).

This research aims to provide a theoretical explanation of different degrees of TPL involvement by establishing a causal relationship between TPL involvement and the resource base of a TPL provider and his proactive behaviour, as well as the effect of different degrees of TPL involvement on logistics performance. Embedded in a theoretical framework that draws on concepts from network theory, resource-based theory, entrepreneurship, and systems theory, this research essentially aims to build a specific explanatory framework which maps causal relationships whereby effects are explained by a previous or simultaneous cause.

Various researchers in logistics and operational management generally agree that there is a real need for more theory development (Meridith, 1992; Mentzer, 1995; Ellram, 1996). As outlined previously, the TPL phenomenon lacks an underlying theory that explains it in full. Moreover, research on TPL consists largely of descriptive, non-analytical research. Analytical research involves mainly the testing of concepts from other theories (transaction cost analysis being the most popular), aiming to explain certain facets of the TPL phenomenon. Recent research (Berglund, 2000; Skjott-Larsson, 2000) has pointed to developments in the scope of TPL that have not yet been explained. In order to understand these it seems necessary to look for alternative concepts that might enrich our understanding of the relationships that offer some explanation of the emergence and scope of TPL.

Appropriate concepts have been investigated in other managerial contexts that offer potential in the area of TPL. They need, however, to be tested in order to assess their applicability. In this research TPL is assumed to be a social construct that requires ongoing description, explanation and testing, whereby the borrowing of concepts from other disciplines in management is legitimate, if not necessary. Meredith (1992) calls this the 'normal research cycle' (Figure x). Throughout this iterative process, descriptive models are expanded into explanatory frameworks, which are tested against reality until they are eventually developed into theories, as research study builds upon research study.

Figure 5. 1: Normal Research Cycle



Source: Meredith, 1993

5.4.2 Inductive vs. Deductive Research

The first methodological question to be addressed is whether the inductive and /or deductive approach is the appropriate method to employ in order to gain knowledge about the object of investigation. The deductive research method entails the development of a conceptual and theoretical structure prior to its testing through empirical observation. The deductive tradition in the social sciences clearly specifies what is involved in being 'scientific knowledge', or what is true knowledge. This

approach is often called the ‘hypothetico-deductive method’. It emphasises the fact that the process by which those ideas are tested and justified is crucial. Generally, the hypothetico-deductive approach to research is intimately bound up with ‘positivism’ (Gill and Johnson, 1991). In contrast, induction involves the collection of observations of the empirical world for the purpose of describing and constructing explanations and theories about what has been observed.

5.4.3 Theory building in this research

This research starts with a conceptual framework (with its inherent hypotheses or propositions) that is derived from several managerial concepts. These were found in the management literature for logistics and supply chain management, and TPL in particular. This research relies conceptually on principles that are taken from different schools of thought, in particular network theory (NT), resource-based theory (RBT), entrepreneurship (ES), and systems theory (ST), described in the previous chapter. Research questions were developed from the conceptual framework and formalised with propositions (hypotheses). The prevailing conceptual ideas reflected in the research were then clarified within the settings of a single case, which enabled the definition of variables. These were subsequently tested on a larger sample. Figure x illustrates the research process and the theoretic approach at the various stages

5.4 *Methodological implications*

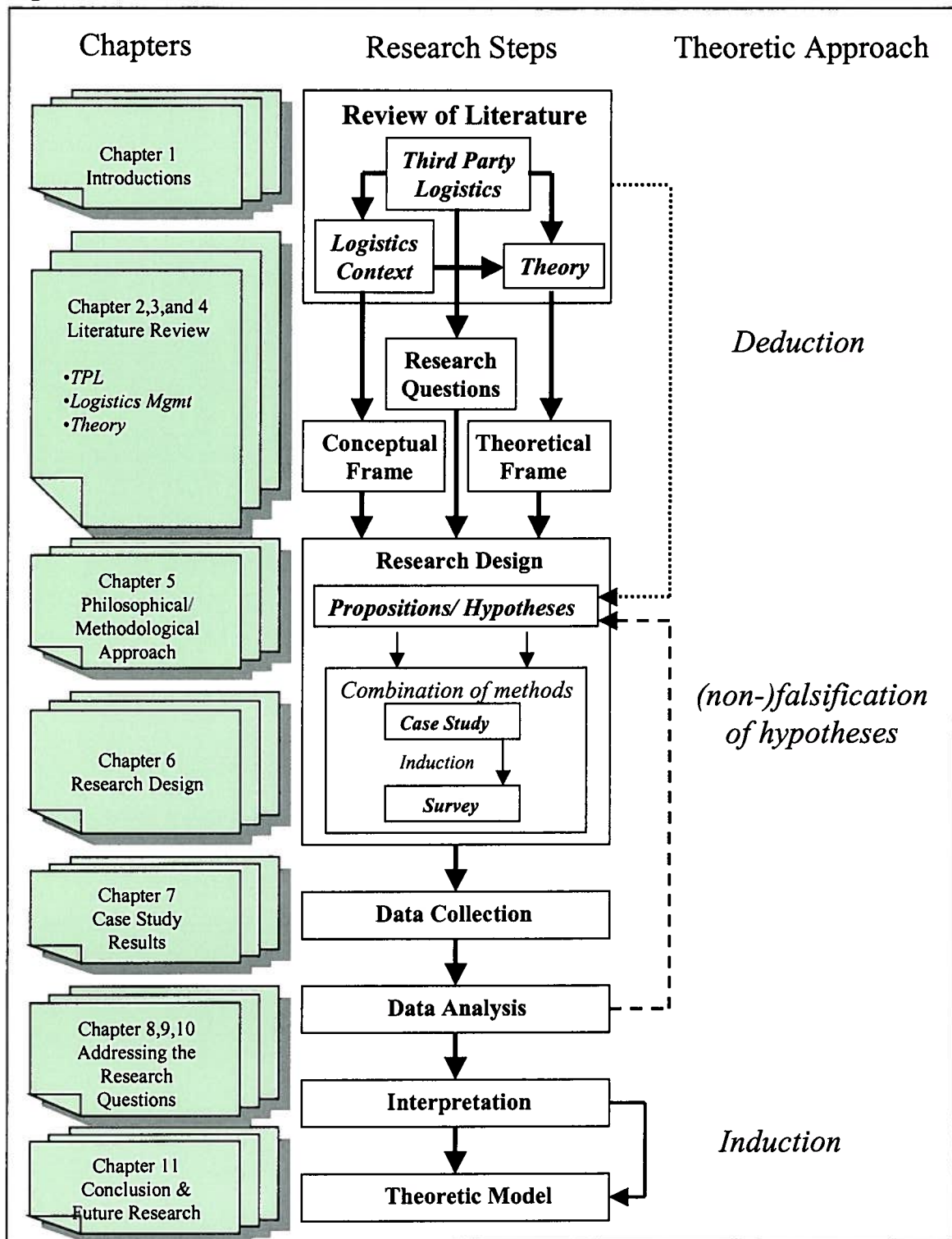
Another issue to be resolved in this context is the question of whether quantitative or qualitative data collection, or both, is suitable to generate the kind of knowledge required to answer the research questions posed earlier. Both qualitative and quantitative data collection techniques have a long tradition. Schwandt (1997) states that the adjectives “quantitative” and “qualitative” have been used as a modifier for terms such as “data”, “methods”, “methodology”, “research”, and “paradigm”. Since both adjectives do not clearly signal a particular meaning, Schwandt (1997) suggests that the clearest use of the adjective is to distinguish between qualitative data – non-numeric data in the form of words – and quantitative data – numeric data. Morgan and Smircich (1980) note that qualitative research stands for an approach rather than a

particular set of research techniques. Typical qualitative methods for generating data are interviews, observations, and document analysis, which are the basis for analysing and interpreting non-statistical meanings. These approaches arose in the mid 1970s as a reaction to the dominance of the practice of randomised and quasi-experimental designs and standardised measures of achievement (Schwandt, 1997).

From the review of literature on the TPL logistics phenomenon it is apparent that much of the research that has been undertaken in this field is based on general description; a fact that Seaker, Waller, and Dunn (1993) point out for the core of all logistics research. Although much research in the area of logistics has become more analytical, the view of Andersson (1997) is relevant - research into logistics in general, and into TPL in particular, has to be more oriented towards developing and testing theoretical concepts. Research in the field of logistics may thus be best undertaken by using a combination of qualitative and quantitative methods in a triangulated approach (Dunn et al, 1994). This means that a combination of two or more different methods is used to study the same phenomenon (Snow and Thomas, 1994). The basic premise of the multi-method approach is that the particular limitations of a given method will be counter-balancing strengths of another (Rohner, 1977). The use of multiple methods helps the researcher to be confident that observed variance between subjects is a product of subject attributes rather than of method (Campbell and Fiske, 1959). Jick (1979) points out that triangulation allows researchers to be more confident of their results and can lead to an enriched explanation of the research problem. Moreover, triangulation can lead to a synthesis or integration of theories, and ultimately to the development of new theory.

This research makes use of both methods (see figure 5.2). It uses the case study method to establish a framework that allows the measurement of TPL involvement. The case study is furthermore used as a pilot study to refine the use of the rather abstract terminology describing 'resources and skills' and 'proactive behaviour'. The quantitative part of this study is aimed at falsification or non-falsification of hypotheses and is used to establish the causal relationships that form an explanatory framework of TPL involvement.

Figure 5. 2: Research Process



5.5 Conclusion

In this chapter the importance of a philosophical perspective in social science research has been outlined. The most prevailing schools of thought have been reviewed in brief and the philosophical stance of this research has been clarified. This research adheres to the ‘post-positivism’ or ‘critical realism’ school of thought, which relies methodologically on the testing of theory as the means for establishing their success. Although it adopts a theory building approach, the proposed research relies on existing theoretic concepts, and could thus be characterised as explanation building. Pursuing the aim to extend the explanatory framework for the TPL phenomenon, qualitative as well quantitative methods are employed.

Chapter 6 Research Design

6.1 Introduction to Research Design

The research design is concerned with turning the research question into a research project. The general principle is that the research strategy, and the methods and techniques employed must be appropriate for the research question being answered (Robson, 1993). There are many potential choices to make when developing a research design, and there are few algorithms, which can guide the researcher into making the ideal choices for a particular situation. However, many of these choices are allied quite closely to different philosophical positions, and an awareness of this can at least ensure that the different elements of the research design are consistent with each other (Easterby-Smith et al, 1991). As outlined in the previous chapter, a combination of the case study and survey method, derived from the philosophical stance, provides the basis for this research. In the following chapter this methodological choice is given further justification, and subsequently described.

6.2 Research designs in logistics

Layder (1993) gives additional advice with respect to determining an appropriate research strategy. He suggests that it helps to consider the research strategies, traditionally thought to be appropriate to a particular problem or topic.

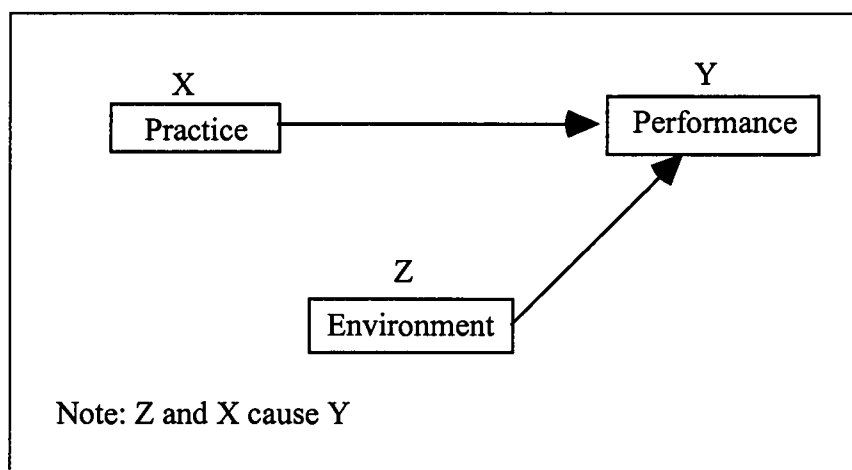
In his discussion of frameworks for logistics research, Mentzer (1995) points out that much of the logistics literature and research remains largely managerial in nature and lacks a rigorous orientation towards theory development, testing, and application. In his later works (Mentzer et al, 1997) he calls for logistics research to become simultaneously more rigorous and more applicable to practitioners. New and Payne (1995) even see a possible trade-off between rigour in logistics research and its relevance to “real” problems. They point out that a major problem in

Table 6. 1: Three frameworks for empirical logistics research

<i>Paradigm</i>	<i>Summary</i>	<i>Research challenge</i>	<i>Major difficulties</i>
One	Managers may choose different types of practice. Some of these are “best” and will give optimum performance for the business, but may have be adapted to different situations	Find out what practices give best performance and then work out how they have to be adapted for transfer to other contexts	Defining and measuring performance; identifying and idealizing practice; deciding what aspects of the environment are important
Two	Performance is driven independently by both practice and the environment	Find out what aspects of practice can be associated with performance	Untangling effects of environment and practice; controlling for environment variation in the comparison of practice
Three	The environment determines practice. Only appropriate practices survive	Explain how practices emerge	Constructing testable theoretical descriptions of interplay of environment and practice

Source: New Payne, 1995

empirical logistics research is the formulation of presumed causal links. These are important because they determine the underlying justification of research questions. They discuss three possible approaches (Table 6.1), which involve *a priori* assumptions about practice, performance and the environment. Analogous to the third paradigm developed by New and Payne (1995), this research proposes that the existing practices in outsourcing have an effect on logistics performance (Figure 6.1).

Figure 6. 1: Research Paradigm two

Source: New and Payne (1995)

It furthermore proposes that these practices are determined by the nature of the organisational environment; in this case, the TPL industry. Specifically, the following features of this environment are of interest in this study:

- 1 The availability of TPL resources and skills
- 2 The pro/reactive behaviour of TPL providers

These are assumed to relate to TPL involvement, and in turn to logistics performance in a cause-effect relationship. It is appreciated that other environmental factors than TPL can have an influence on performance.

6.3 Research Strategy for this research

McGrath (1996) refers to the research process as "a series of logically ordered choices. Those choices run from formulation of the problem, through design and execution of a study, through analysis of results and their interpretation. The series of choices is locally directional: plan must come before execution: data collection must come before data analysis. But the set of choices is systematically circular: it starts with a problem, and gets back to the problem. The philosophical standpoint of the

researcher, the determined research methodology and the research aims and objectives are the basis from which the research design derives.” (Robson, 1993).

6.3.1 The purpose of enquiry

Basically, the research enquiry, the aim of the research work, in terms of its purpose can be distinguished in exploratory, descriptive, and explanatory purposes. Robson (1993) summarises the classification of the different purposes as follows:

1. Exploratory:
 - To find out what is happening
 - To seek new insights
 - To ask questions
 - To assess phenomena in a new light
 - Usually, but not necessarily, qualitative
2. Descriptive:
 - To portray an accurate profile of persons, events or situations
 - Requires extensive previous knowledge of the situation etc. to be researched or described, so that the researcher knows appropriate aspects on which to gather information
 - May be qualitative and / or quantitative
3. Explanatory:
 - Seeks an explanation of a situation or problem, usually in the form of causal relationships
 - May be qualitative and / or quantitative

The novelty of the applied concepts (i.e. degree of outsourcing, resources/skills, proactive behaviour) within the context of logistics systems, and the declared objective of making general comments about TPL relationships leads to the adoption of a research strategy that consists of exploratory and explanatory elements. This

research aims to explore TPL relationships with a focus on TPL involvement in logistics systems, and seeks certain possible causal relationships between TPL involvement and relationship-related variables and systems-related variables respectively. The proposed research attempts to establish different patterns of TPL involvement reflecting different degrees of outsourcing, and is testing the applicability of different theoretical concepts that might further explain the current practices of outsourcing. The nature of this research is thus primarily exploratory, simultaneously providing a possible scope for explanation. It follows thus the principle of explanation building as outlined by Yin (1989). This approach is in part analogous with the case study method, by trying to find patterns that can be explained by the use of theory. Yin (1989) postulates the pattern matching logic as most desirable because it compares an empirically-based pattern with a theoretically-predicted pattern. A particular type of pattern matching, according to Yin (1989), is that of explanation building. In this context the aim is to build an explanation of different roles of third party logistics providers.

The explanation building approach, as well as the combination of qualitative and quantitative methods to third party logistics research, is not new. It has been advocated and used by Sink (1995, 1996) and by Andersson (1997). They also built their research on *a priori* assumptions, which were based on concepts rooted in other theories.

6.3.2 Unit of analysis and level of analysis

The second major consideration in the development of a research strategy is the unit and level of analysis. Neumann (2000) advocates the importance for clearly thinking through and planning a research project by explicitly identifying the unit and the level of analysis. There is a rough match between the topic or research question and the unit or level of analysis. Two protagonists of case research (Eisenhardt, 1989; Yin 1993) point out that the unit of analysis is a critical factor in any theory-building research.

Neuman (2000) explains the difference of the level of analysis and the unit of analysis as follows:

A level of analysis is the level of social reality to which theoretical explanations refer. The level of social reality varies on a continuum from micro level (e.g. small groups or individual processes) to macro level (e.g. civilizations or structural aspects of society). It includes a mix of the number of people, the amount of space, the scope of the activity and the length of time.

The *unit of analysis* refers to the type of unit a researcher uses when measuring. Common units in sociology are the individual, the group, the organization, the social category the social institution, and the society. Although the individual is the most commonly used unit of analysis, it is by no means the only one. Different theories emphasis one or another unit of analysis, and different research techniques are associated with specific units of analysis.

Within this research the level of analysis is a logistics system. In the case study, as well as in the survey, a logistics system of the same basic process structure (information flow and goods flow processes) is examined at design, implementation, and operational levels. The nature of these processes is widely explained in Chapter 3.

The unit of analysis in this research is the relationship between a shipper and a corresponding TPLP. The proposed research aims to find out how shippers and TPLPs perceive the TPL role in a TPL relationship, how the TPL role can be categorized according to the degree of TPL involvement, whether TPL resources/skills and proactive behavior can influence this, and what the effects are of different degrees of outsourcing is on logistics performance.

6.3.3 A combination of methods

Robson (1993) explains three traditional research methods:

1. *Experiment*: measuring the effect of manipulating one variable on another variable.
2. *Survey*: collection of information in standardised form from groups of people.
3. *Case Study*: development of detailed, intensive knowledge about a single 'case' or of a small number of related 'cases' (Robson, 1993).

The *experimental* approach offers a fruitful approach, since it apparently allows causality between variables to be precisely determined. In the experimental approach the researcher aims to set up a situation in which all the variables can be controlled or varied at will (Krausz and Miller, 1974). The researcher can hold constant all the variables except for one, and by varying this one variable and monitoring changes in the resulting outcome(s), the resulting relationship between the variables can be carefully studied and documented. In essence what the researcher is doing is varying one specific independent variable whilst measuring the effects on the dependant variable, while keeping the other intervening variables constant. This approach is very helpful in determining the relationship between the variables. The advantage of the approach is that it can show a causal link between the variables involved. It is considered to be the best approach for testing causal relationships (Neuman, 2000). Also, experiments tend to be easier to replicate. The disadvantage is the difficulty of designing and setting up an experiment to investigate a hypothesis. The approach is limited by the fact that experiments usually test one or just a few hypotheses at a time. Unfortunately this fragments knowledge and makes it necessary to synthesise results across many research projects (Neuman, 2000).

The concept of the *case study* usually refers to an intensive examination of a single unit. Such a unit can be a person, a small group of people or a single organisation (Patton, 1987). The case study approach can be particularly useful when one needs to understand some particular problem or situation in great depth, and where one wishes to obtain lots of rich information. A qualitative case study seeks to describe the unit of analysis (person, group or organisation) in detail, in context and holistically. The advantage of a case study is that it is comprehensive and informative about an organisation (Jankowicz, 1991). The disadvantage of the approach is the fact that the research can be subject to influence and interruptions arising from day-to-day events

results (Patton, 1987). The approach is more suited to exploratory research rather than hypothesis testing. It can also be very time consuming if multiple sources of evidence within an organisation are required.

The survey approach involves the collection of questionnaire data from a number of respondents (Alreck and Settle, 1985). The data can be collected either at a fixed point in time (cross-sectional) or at varying points in time (longitudinal study) for comparative purposes. The data can be collected using a postal questionnaire;

Comparison of data collection methods (based on Alreck and Settle, 1985)

	Personal	Telephone	Postal
<i>Data collection costs</i>	High	Medium	Low
<i>Data collection time required</i>	Medium	Low	High
<i>Sample size for a given budget</i>	Small	Medium	Large
<i>Data quantity per respondent</i>	High	Medium	Low
<i>Reaches widely dispersed sample</i>	No	Maybe	Yes
<i>Interaction with respondent</i>	Yes	Yes	No
<i>Field worker training required</i>	Yes	Yes	No
<i>Degree of interviewer bias</i>	High	Medium	None

telephone or face-to-face (personal) interviews - Table 6.2 presents a comparison of the three types of data collection. It indicates that the personal interview method, compared with the other two methods, yields a high amount of data per respondent, and also allows for a high level of interaction with the respondent. However, it is also the most expensive in terms of data collection costs. On the other hand, the mail approach is the lowest cost option and does not suffer from interviewer bias. However, it does have the drawback of not allowing for interaction with the respondent, and yielding the lowest level of data per respondent when compared with the other two methods. The telephone method appears to fall between the two approaches.

The survey method is one of the most widely used approaches. It tends to be cheaper, quicker and broader in coverage than most of the other methods covered so far. The

The survey method is one of the most widely used approaches. It tends to be cheaper, quicker and broader in coverage than most of the other methods covered so far. The other advantage of the survey approach is the fact that it allows the researcher to explore relationships between variables for a large sample of respondents, and also to generalise the results. The problem with the survey approach is that it does not have the same degree of control, or allow for the level of in-depth investigation one gets from an experiment. In addition, the survey data lacks the richness that the case study approach yields.

Robson (1993) recommends when selecting the research method that a number of research issues, which are more or less interrelated, should be considered:

- Type of research questions
- The degree of control that the investigator has, or wishes to have, over the event.
- Whether the focus of the study is on current or past events

Robson (1993) provides following overview of research strategies and the corresponding type of research question, control issue and research focus (Table 6.3).

Table 6. 3: Appropriate uses of different research strategies (Robson, 1993)

Research Strategy	Type of Research Question	Requires Control over Events?	Focus on Current Events
Experiment	HOW WHY	YES	YES
Survey	WHO, WHAT, WHERE, HOW MANY, HOW MUCH	NO	YES
Case Study	HOW WHY	NO	Usually, but not necessarily

As stated earlier, this research looks at TPL involvement (and the practice of logistics outsourcing correspondingly) and its cause and effect across a large sample of TPL relationships, which thus a focus on current event. Since the aim of the research project is to explore the nature of TPL relationships and the possibility of causal relationships within these, and thus reality, control over this event is neither required nor desired.

This research consists of qualitative and quantitative elements. It combines the comprehensive and informing nature of the case study approach and the survey of a larger sample that allows the exploration of relationships between variables. A number of writers point to the benefits to be gained from combining the two methods. Bonoma (1985) makes the point that collecting different kinds of data by different methods from different sources provides a wider range of coverage, and that this may result in a fuller picture of the unit under study than would have been achieved otherwise. Mitroff and Mason (1982) also make the point that the use of different techniques helps to produce a more holistic approach. In the context of operations management research, Kaplan and Duchon (1988) argue that the survey and case study should not be viewed as polar opposites, as is sometimes done, as it is possible to integrate these two methods.

The purpose of the case study was to clarify the conceptual ideas emerging from the literature and to establish variables describing these concepts that would allow for structured surveying through personal interviews. These variables had to be defined in such a way that as little as possible clarification by the interviewer would be necessary. The case study aided in this respect the establishment of a subset of activities per sub-process, as described in Chapter 3, to enable the measurement of TPL involvement. The literature review of the logistics management context described logistics as a systematic structure of hierarchical processes that consists of several sub-systems containing sub-processes. The measurement of TPL involvement on a sub-process level was only possible through aggregation of measures of TPL participation on an even lower activity level. These had to be identified in the case study.

An additional purpose of the case study was to validate the intended apprehension of the concepts of proactivity and skills and resources. To validate the proactivity concept, it was important to find out whether respondents in organisations would understand by the term ‘proactivity’ or ‘proactive behaviour’ the meanings that are ascribed in the literature, as outlined in Chapter 4. For the latter, resources and skills, a more logistics-specific set of resource and skills were established.

The survey is the component in this research that allows the qualitative and quantitative analysis of a large sample, and thus the answering of the research questions.

6.3.4 The directing research questions

Directing the research project with relevant, researchable questions is the essential starting point for the planned creation of knowledge. They can be exploratory, descriptive or explanatory, and can thus reflect the purpose of the enquiry (Neuman , 2000). The research questions that were developed in Chapter 2 are:

RQ 1: How do European shippers and TPLPs in different industrial contexts perceive the current role of TPLPs?

RQ 2: Can TPL relationships be categorised according to their degree of TPL involvement?

RQ 3: What is the influence of a) a TPLP’s level of proactivity in managing logistics processes and b) his resource and skill base on the degree of involvement in managing logistics processes?

RQ 4: What is the influence of different levels of TPL involvement on the performance of their clients’ logistics systems?

This research contains exploratory, descriptive and explanatory elements. Whereas RQ 1 and RQ 2 aim to explore and describe the nature of TPL involvement, RQ 3 and

RQ 4 try to explain the cause and effect of different degrees of TPL involvement based on *a priori* assumptions. RQ 1 aims to describe the role of TPLPs from a shipper's and a TPLP's point of view, and to explore whether shippers perceive this differently from TPLPs. RQ 2 aims to explore and describe the role of TPLPs in categories or clusters based on differences in their involvement in logistics systems. In contrast, RQ 3 aims to build an explanation for different degrees of TPL involvement by hypothesizing that this is caused by differences in the resource base of TPLPs and differences in their proactive behaviour. RQ 4 aims to build an explanation for different degrees in logistics performance by hypothesizing different degrees in TPL involvement as a cause for differences in logistics operational performance.

6.3.5 Forming Research Propositions and Hypothesis

Although this research as a whole is not in the form of classic hypothesis testing, the rationale for defining the research questions is the same. Eisenhardt (1989) postulates in this respect that without a focus it is easy to be overwhelmed by the volume of data.

Essential to this research is the construction of a framework, which verifies different degrees of TPL involvement as an effect of the TPL resource base and the degrees of proactive behaviour, and subsequently explains the effect of the degree of TPL involvement on logistics performance. Thus the research questions, which adhere to a 'purely' explorative method are specified and focused through more specific propositions, and underlying those research questions that imply a possible explanation, (i.e. focus on the existence of specific relationships between variables) are corresponding hypotheses.

6.3.5.1 Defining Research Question 1

RQ 1: How do European shippers and TPLPs perceive the role of TPLPs in logistics systems?

RQ 1 aims to explore how shippers and TPLPs perceive the role of TPLPs. This entails a description of the degree of TPL involvement as it prevailed at the time of

the survey sample, as well as a description of how this impacts on logistics performance. This exploration further entails the perception of TPLPs' and shippers' perceptions of TPL resources and skills and their future development, the relative importance of those, and TPLPs' and shippers' perceptions of TPLPs' proactive behaviour. Adhering to the fact that network perceptions can differ (Hakansson, 1993), this research question leads to a comparison between shippers' and TPLPs' perceptions, particularly with regard to resource and skills availability/development and proactive behaviour. The following propositions are put forward to support this research question about shippers' and TPLPs' perceptions:

Proposition 1:

The measurable degree of TPL involvement is higher for TPL respondents than for shipper respondents.

The TPL relationships were surveyed by speaking to managers in both TPLPs' and shippers' organisations. Each interview would reflect the perception of a key informant about one TPL relationship. Whereas respondents in the shipper organisations would naturally have not much choice in the TPL relationships they could report about, TPLP respondents had a choice of relationships they could potentially report upon. It can be conjectured that they would report on those that reflected a high degree of involvement.

Proposition 2:

The perception of the relative importance of resources and skills in designing, implementing and operating logistics systems does not on average differ between TPL respondents and shipper respondents.

Proposition 3:

The perception of current sufficiency of resources and skills is on average lower within the shipper sample than in the TPLP sample.

Proposition 4:

Predictions about future developments of TPLP resources and skills do not on average differ between respondents in the shipper and the TPLP sample.

Proposition 5:

Respondents of TPLP organisations perceive themselves on average as more proactive in managing logistics processes in the TPL relationship they report upon than shippers perceive their contractors to be in the TPL relationships they report upon.

Proactive behaviour of TPLPs is conceptualised to be one determinant of TPL involvement. Given the different average degrees of outsourcing outlined in Proposition 1, respondents in the TPL sample should report on average a higher degree of proactive behaviour.

Proposition 6:

The contribution of TPL to logistics performance is reflected on average higher in the TPL sample than in the shipper sample.

Based on the conceptual model outlined in Chapter 2, it is assumed that different degrees of TPL involvement have an effect on their contribution to logistics performance. If the average degree of TPL involvement differs between the shipper and TPLP samples, then the average contribution to logistics performance measurable in the TPLP sample is higher than in the shipper sample.

6.3.5.2 Defining Research Question 2

RQ 2: Can TPL relationships be categorised usefully according to the degree of involvement in managing logistics processes?

Research Question 2 aims to explore whether or not different roles of TPLPs in logistics management can be categorised according to their level of involvement. This assumes that the participation of TPLPs in the various sub-processes across a sample of TPL relationships follows distinguishable patterns, regardless of whether shipper organisations or TPLP organisations are surveyed. It is, however, recognised that because of the sample composition, a tentatively bigger proportion of TPL categories may reflect a high degree of TPL involvement in the TPLP sample. The following two propositions are put forward to support this argument:

Proposition 7:

The provision of logistics services in Europe appears in clusters of different levels of involvement, which typifies a distinct kind of TPL relationship.

Proposition 8:

The TPLP sample contains a higher proportion of TPL categories with a high degree of TPL involvement than the shipper sample.

If a meaningful categorisation (or cluster) of TPL relationships is identifiable, it is also of interest to analyse if and how their resources/skill base, proactive behaviour and influence on logistics performance differs. In this respect the question arises of whether the assumed relationships between the resource/skills base, proactive behaviour of TPLPs and level of TPL involvement in logistics systems, and the effect of that on logistics performance, follows the particular pattern of degrees of TPL involvement in these categories. The following propositions are put forward to focus on this question:

Proposition 9:

Different categories of TPLPs feature on average significant differences in their resource and skills base.

Proposition 10:

Different categories of TPLPs feature on average significant differences in proactive behaviour.

Proposition 11:

Different categories of TPLPs contribute on average differently to logistics performance.

6.3.5.3 Defining Research Question 3

RQ 3: What is the influence of a) a TPLP's level of proactivity in managing logistics processes, and b) his resource and skill base on the degree of involvement in managing logistics processes?

It was conceptualised in Chapter 2 that TPLPs' resources and skills, as well as their degree of proactive behaviour, can influence the degree to which shippers outsource logistics. It was furthermore conceptualised that there is a relationship between the level of TPL involvement in a logistics system and logistics performance. Research Question 3 aims to test the relationship between TPL resources and skills and TPL involvement, as well as the relationship between TPLP's proactive behaviour and their subsequent involvement in the management of logistics processes. Furthermore, RQ 3 aims to assess the impact of both concepts on TPL involvement. The following hypotheses have thus been formulated to support these arguments:

Hypothesis 1: TPLPs who are more proactive in managing logistics processes are more involved in managing logistics processes within clients' logistics systems.

Hypothesis 2: TPLPs who have a better resource and skill base are more involved in managing logistics processes within clients' logistics systems.

Hypothesis 3: TPLPs' degrees of proactivity and their level of resources and skills impact independently on their involvement in managing logistics processes within clients' logistics systems.

6.3.5.4 Defining Research Question 4

RQ 4: What is the effect of different levels of TPL involvement on the performance of their clients' logistics systems?

Research Question 4 finally aims to establish a verifiable link between different degrees of TPL involvement and logistics performance. Logistics performance is seen as having three key components. Firstly, it comprises a measure of logistics cost, secondly a measure of order cycle time, and thirdly, a measure of quality. The impact of TPL involvement is thus tested on each of the elements separately. The following hypotheses are put forward:

Hypothesis 4: TPLPs with a high level of involvement are perceived as bigger contributors to the reduction of logistics costs within their clients' logistics systems than TPLPs with a lower level of involvement.

Hypothesis 5: TPLPs with a high level of involvement are perceived as bigger contributors to cycle time reductions within their client's logistics systems than TPLPs with a lower level of involvement.

Hypothesis 7: TPLPs with a high level of involvement are perceived as bigger contributors to quality improvements within their clients' logistics systems than TPLPs with a lower level of involvement.

6.4 Conclusion

This chapter has outlined the overall design of this research project. It outlines the purpose of the enquiry and clarifies the level and unit of analysis. Furthermore, the choice of methods is justified, and the propositions and hypotheses have been

presented. This chapter provides the rationale for the research strategy adopted. Adhering to an existing framework for empirical research in logistics, this research examines TPL relationships on a systems level. Although the research is overall of an explorative nature, it contains exploratory and explanatory elements. This is reflected in the research propositions and hypotheses that support and define the prevailing research questions, and the combination of methods that have been chosen. These and the research process are further described in the next chapter.

Chapter 7 Research Process

7.1 Introduction

Whereas the previous chapter outlined the design of this research and the approach which has been adopted, this chapter outlines the methods that are used to collect and analyse the data. Following the research strategy of employing a mixed methodology, i.e. case study and survey, this chapter outlines the rationale in both methods that led to the choice of the particular data collection and analysis methods.

The first part of this chapter examines the case study approach that forms the first element of the research. The case study element involved the examination of one TPLP/shipper relationship in the automotive industry, which was known to be ‘far reaching’ with respect to the influence of TPLP. This chapter provides the rationale for the case study research process and describes the selection of the case, the data collection method and the analysis approach used.

The second part of this chapter provides the rationale for the survey that was conducted. A total of 76 face-to-face interviews were conducted with shippers and TPLPs in four different industries throughout Europe. This chapter describes the research process of conducting the survey and provides the rationale for the sampling procedure, the technique that was chosen as the data collection method, and the statistical techniques used to analyse the data.

7.2 Case Study

Hartley (1994) explains case study research as a detailed investigation, often with data collected over a period of time, of one or more organisations, or groups within organisations, with a view to providing an analysis of the context and processes involved in the phenomenon under study. The phenomenon is not isolated from its context (as in, for example, laboratory research) but is of interest precisely because it is in relation to its context. It was especially useful in this research because a holistic,

in-depth investigation was needed to clarify the conceptual ideas emerging from the literature, and to establish variables describing these concepts. The case study thus built the basis for the survey which was conducted subsequently.

7.2.1 Case Selection

According to Stake (1994) a number of issues have to be considered before selecting a case or cases:

1. The purpose of the case study
2. Single or multiple case studies
3. The underlying rationale for the case study

Hartley (1994) distinguishes between three different types of case studies, as defined by their distinct purposes:

- The *explanatory case study* presents data bearing on cause-effect relationships – explaining which cause produced which effect.
- The *descriptive case study* presents a complete description of the phenomenon within its context..
- The *exploratory case study* explores social processes as they unfold in organizations.

. Yin (1994) provides three rationales for the use of the single case study in research:

- If the single case represents the critical case in testing a well-formulated theory
- If the single case represents an extreme or unique case, or
- If the single case is a revelatory case, previously inaccessible to scientific investigation

In this context Stake (1994) states that the researcher has to define what he or she considers to be a case. A case might be simple or complex; it might be an individual

human being or an organisation. The time a researcher spends on the inquiry might be long or short, but the researcher is engaged in the case and concentrates on its specifics. Cases are bounded and integrated systems, such as an organisation, a team, or even just an individual. It is common that certain features are found within the system, within the boundaries of the case, and other features are found outside. But the boundedness and the behaviour patterns of the system are key factors in understanding the case (Stake, 1994).

The second issue that Stake considers is that of the motive for case study research. In the so-called *intrinsic case study*, the researcher wants to gain a better understanding of a particular case. This type of case study is not undertaken because the case illustrates a particular trait or problem, but because, in all its particularity and ordinairness, this case itself is of interest. The *instrumental case study* examines a particular case in order to provide insight into an issue or refinement of theory. The case is of secondary interest; it plays a supportive role, facilitating the understanding of something else. The third type is the *collective case study*. With this type of case study the researcher has less interest in one particular case, and therefore studies a number of cases jointly in order to inquire into the phenomenon, population or general conditions. It is not a study of collective but instrumental case study extended to several cases. Individual cases in the collection may or may not be known in advance to manifest the common characteristics. They may be similar or dissimilar, redundancy and variety each having voice. They are chosen because it is believed that understanding them will lead to better understanding, perhaps better theorising, about a still larger collection of cases (Stake, 1994).

A concern of Yin (1994) is whether the case studies are holistic or embedded. Basically, the question is whether the single unit of analysis is embedded within the boundaries of an individual case or across several cases. If the case study examines only the global nature of a programme or organisation, a holistic case study design would be appropriate. The holistic design is advantageous when no logical sub-units can be identified, and when the relevant theory underlying the case study is itself of a holistic nature (Yin, 1994).

As outlined previously, the research strategy for this study includes one single case study, with the purpose of defining sets of activities in design, implementation and operational sub-processes that would enable the measurement of TPL involvement -. proactivity, resources and skills, and logistic performance. The reason for using a single case study, that of the TLP involvement between a British automotive manufacturer and a TPLP, was that this case is known among professionals and academics (Modern Materials Handling, 1999) for exemplifying a close and successfully working TPL relationship. The co-operation was mentioned several times in the trade press and received an award for excellence in logistics management co-operation by one of the leading trade journals in Britain. The scope of TPL activities within this relationship spread over the design, implementation, and operation of a recently built Integrated Logistics Centre (ILC), coping with the entire inbound flow of goods for one of the most modern automotive production lines in the UK. Access to both organizations was enabled through existing contacts of the Research Director of the Centre of Logistics and Transport, Cranfield School of Management. First contact was established to the General Manager Automotive of the TPLP and the Material Manager of the automotive manufacturer. With both, an initial meeting was agreed.

7.2.2 Case study protocol

Yin (1994) emphasises the need for a case study protocol, especially if the researcher is using a multiple-case design. The case study protocol contains the instruments, procedures and rules that should be followed in using these instruments. The protocol is a major tactic in increasing the reliability of case study research, and is intended to guide the investigator in conducting the individual case studies. According to Yin (1994) the basic elements of the case study protocol are the four following points, which were determined at the beginning of the research project.

- An overview of the case study project (project objectives and auspices, case study issues, and relevant readings about the topic being investigated).

- Field procedures (credentials and access to the case study “sites”, general sources of information, and procedural reminders)
- Case study questions (the specific questions that the case study investigator must keep in mind in collecting data, table shells for specific arrays of data, and the potential source of information for answering each question).
- A guide for the case study report (outline, format for the narrative, and specification of any bibliographical information and the documents).

Field procedures with regard to access and general sources of information (mainly key informants) were documented as letters and e-mails before and after a first interview with the project managers from both the shipper and the TPLP organisation. Procedural reminders were documented on an ongoing basis, mostly in e-mail format, or as entries into a diary between the interviews. The intended questions were tested on dummy respondents, finally formulated, and documented in a questionnaire. The report format adopted comprises a narrative part that outlines the boundaries of the case and some descriptive tables that provide the key results of the interviews, as well as some quantitative data drawn from secondary evidence.

7.2.3 Triangulation

Triangulation is generally considered to be a process of using multiple perceptions to clarify meaning, and verifying the repeatability of an observation or interpretation (Stake, 1994). The triangulation metaphor is derived from navigation and military strategy, where multiple reference points are used to identify an object's exact position. The multiple viewpoints allow for greater accuracy. Similarly, management researchers can improve the accuracy of their judgment by collecting data on the same phenomenon from different points of view. Jick (1979) points to the fact that the method of triangulation can capture a more complete holistic and contextual portrayal of the unit or units under study. He distinguishes between different types of triangulation e.g. source, time and method. Triangulation of sources requires the

researcher to develop evidence from different sources. These might include literature, or other media, as well as interaction with several informants, particularly different types of informants (Jick, 1979).

In his elaboration on case study research, Yin (1989) recommends approaching the “burden of triangulation” by prioritising possible areas of triangulation:

- *Vital* - to secure fundamental basic integrity of data, and gain theoretical insight.
- *Valuable* - triangulation measures which have a major benefit in counteracting bias and for generating insight, but vary in whether or not they are manageable in relation to the overall research task.
- *Peripheral* - areas where triangulation might be attempted, but with either low benefit, or where the costs in terms of making the research approach unwieldy are high or potentially insuperable.

Methodological triangulation, although practised at a higher level (by combining survey and case study research) was at the case study level regarded as rather peripheral, because it was not intended to explain any causal relationships. The purpose of the case study was to explore how informants within an inter-organisational relationship perceive the conceptual ideas that form the basis of this research, and how these could be measured. Triangulation was therefore practised with regard to different sources of information. It was in fact vital to ensure that informants within the shipper organisation, as well as within the TPLP organisation have the same understanding of the terminology that was to be used later in the survey. In addition, triangulation was achieved by including secondary data that was documented during the design and implementation phase of the project, such as team meeting protocols, business plans and presentation.

7.2.4 Data Collection

7.2.4.1 Interview-based Case Study

The case study consisted of semi-structured interviews with key informants from the shipper organisation as well as the TPLP organisation. It contained open-ended questions, as well as some structured questions. These concerned four major sections that were ordered in the following sequence:

1. Logistics process
 - in operation
 - its implementation
 - its design
2. Proactive behavior of TPLPs
3. Resources and skills of TPLPs
4. Logistics performance

This sequence was chosen because it was assumed that it was easier for respondents to relate to the design and implementation of an operation if they were given the opportunity to talk about the operational processes first, and thus enabling them later to refer to a mental frame of reference.

7.2.4.2 Pre-testing the questionnaire

Yin (1994) distinguishes between 'pilot tests' and 'pre-tests'. He views the former as helping the researcher to redefine their data collection plan with respect to both the contents of the data and the procedures to be followed. On the other hand, what Yin (1994) calls the 'pre-test' is a 'dress rehearsal', in which the intended data collection plan is used as faithfully as possible.

A pilot study in the sense of Yin's (1994) outline was not conducted. Instead emphasis was put on the pre-testing of the questionnaire. This aimed to:

- Test the interview procedures, and the reaction and willingness of the interviewee to provide information and unfold their individual perceptions.
- Train the people conducting the interviews, to experience critical situations.
- Test the data analysis methods.

The questionnaire was first tested on peers in the Centre for Logistics and Transport and in the Operations Management Group of Cranfield School of Management. One issue was whether people who did not know anything about the conceptual basis would understand the questions, particularly those that were openly directed towards the examination of resources and skills, and the concept of proactivity.

During the first test interview with a faculty member from the Operations Management Group it became clear that the originally intended approach of using 'text book' terminology, i.e. questions about resources and skills, was for some respondents too abstract to relate to. In the next test interview people were asked to state resources they could relate to by showing them a sheet which listed examples relating to each category of resource and skill. The result was positive. Respondents comprehended the questions faster and were able to relate to the sample list of resources and skills that they were shown immediately. Testing the questionnaire with regard to the concept of proactivity was expected to highlight potential difficulties. Open-ended questions that aimed to test comprehensibility of the concept and the terminology used to describe it, turned out positively, however. Similar results were achieved for the parts the questionnaire that are concerned with logistics processes and logistics performance.

A second (and last) stage of pre-testing the questionnaire was undertaken during the first meeting the General Manager Automotive of the TPLP and the Material Manager of the automotive manufacturer. The purpose was to gather some initial data, and simultaneously test the questionnaire. The interviews turned out to be successful in both aspects. Firstly, both respondents provided a historic overview of the project, and with it some archival data that documented some key issues. Secondly, the respondents provided a list of key informants within their organisations, and facilitated the first contact to those. Scheduling of further meetings with those contacts was to be undertaken on an *ad hoc* basis. In addition, the final test of the

questionnaire led to the discovery that not every potential respondent would be able to answer questions with regard to the whole logistics process in the detail, as had been hoped. The initial intention of using the same questionnaire for each targeted respondent therefore had to be discarded, and the questionnaire had to be tailored towards the competence of the respondent.

7.2.4.3 Key Informant Interviews

The purpose of the key informant interviews was to identify a set of activities that would define the respective sub-processes. In addition, it was necessary to identify the specific resources and skills that were needed in these processes, and to validate proactive behaviour as an applicable concept in so far as it could have an impact on how this process was managed.

The case study was based on semi-structured interviews with several key informants within the shipper organisation, an automotive manufacturer, and within the TPLP organisation. Sixteen interviews were conducted with following people (table 7.1):

Table 7. 1: Key informants

TPL organization	Automotive manufacturer
<i>General Manager Automotive 1x</i>	<i>Pre-Production Manager 1x</i>
<i>Project Manager ILC 2x</i>	<i>Manager Logistics and SC Planning 2x</i>
<i>Project Planning Officer 4x</i>	<i>Manager Material Planning 2x</i>
<i>Manager Collection Service 1x</i>	<i>Transportation Manager 3x</i>

The people listed above were all members of the steering group that controlled eleven small project teams and supporting suppliers and owned the delivery of the ILC project from concept to detailed design and planning through each of the operational delivery phases.

Example:

The manager of the collection service and the transportation manager were asked to describe in detail the design, implementation and operation of the transportation

process. Subsequently they were asked about the resources and skills that were necessary to design, implement and operate this part of the management process, and how proactive they perceived the work of the TPLP to be with respect to themselves. Finally, they were asked how they measured performance of the collection service, what determined this, and how this had changed in comparison to the time before the ILC.

Thus the entire process chain of the logistics operation within the given boundary of inbound traffic was investigated with regard to the involvement of the TPLP and to performance improvements.

The concept of proactivity was explored in terms of its meaning, i.e. what respondents perceived as being proactive. Secondly, respondents were asked how proactive they perceived TPL behavior to be with regard to the management processes they were asked to describe.

With regard to resources and skills, respondents were asked openly to identify the resources and skills they perceived as essential to carry out the design, implementation and operation of logistics processes, and were subsequently asked to make a judgement on the resources and skills of the TPLP involved.

7.2.5 Data Analysis

Eisenhardt (1989) points out that qualitative research tends to generate a mountain of messy data that can be difficult to analyse effectively. Therefore it is important to adopt a structured approach to deal with all the data. The analysis of the data was exploratory, in line with the purpose of the case study, and aimed to enable the drawing and verifying of some descriptive conclusions. Miles and Huberman (1994) define this process as “making complicated things understandable by reducing them to their component parts”. Analysis can start either during or after data collection. The analysis of the data in this case was undertaken in three steps and began during the visits to the plant and the interviews.

Step 1. During the plant visit the interview data was captured by audio-tape recording and also by taking of notes. Several guided tours were undertaken through the various areas of the ILC and the production floor. During these tours notes were also taken. The reason for taking notes was to start to structure the data and impressions as early as possible.

Step 2. Immediately after each of the visits the field notes were checked for clarity, and foot-notes were added to explain any jargon used. The audio-tape data was transcribed. All the interview notes and the transcripts were then collated into a file, one for each respondent .

Step 3. Taking each case in turn, the within-case analysis was then undertaken.

7.2.5.1 Unit and level of analysis

A key component of the case study approach is the unit of analysis - what the case actually is (Yin, 1989). Without knowing what the case is, the researcher does not know how to limit the boundaries of the study. Since the case study approach allows the collection of data from many perspectives and for time periods of undetermined duration, the researcher must clearly define the unit of analysis at the outset of the study. As outlined before, the level of analysis within this case study is the logistics process within a given boundary, and the units of analysis are TPL involvement, TPL pro-activity, TPL resources and skills and process performance.

7.2.5.2 Within-Case Analysis

Eisenhardt (1989) points out that the first step of data analysis using case studies is the narrative description, or within-case analysis.

This process started with the data being reviewed by the process of reading and re-reading, in order to build up a complete picture of what was happening in the plant. This iteration process helps the researcher become intensely familiar with the case as a stand-alone entity. An important part of this process of analysis was to keep a

balance between pre-determined conceptual structures reflected in the questionnaire and to keep an unbiased view on the data. This was ensured through the review of the responses to the open-ended questions. .

The next step in analysing the data was to write up the case in the form of a narrative around the conceptual topics of the questionnaire. Eisenhardt (1989) points to the importance of these “often simply pure descriptions” because they help the researcher to cope early in the analysis process with the often enormous volume of data. Following the advice of Miles and Huberman (1994), the responses of managers to common questions were collated in tabular form to aid the understanding of the case. Questions regarding the understanding of the conceptual constructs were common to all respondents; questions regarding the process and TPLP proactive behaviour, as well as resources and skills, were common only to a small group of managers from both the shipper organisation and the TPLP.

7.2.6 Validity and Reliability

Yin (1989) mentions four tests that are appropriate for assessing the value of a case study approach. The ability to pass these tests has a major impact on the perceived quality of the analyses of the cases. The four tests are:

7.2.6.1 Reliability

The achievement of a high degree of reliability minimises the effects of errors and bias by fully describing the method followed in each case, so that a researcher on the same case could arrive at similar conclusions. A high level of reliability was sought by adhering to the elements of a case study protocol. All informants were subjected to the same structured interview questions.

7.2.6.2 Construct Validity

The case studies contain some data that is "soft", and some which can be quantified. The use of closed questions and scales allows for the operationalisation of some of the

variables to be studied. However, some of the concepts created may be based on interpretative data, and therefore liable to bias caused by subjective assessment. The possible problem of construct validity was overcome by the use of multiple sources of evidence within each case being studied (Yin, 1989). Where contradictions were identified, further clarification was sought, and the contradiction rectified.

7.2.6.3 Internal Validity

The case study approach can cause spurious relationships to arise (Yin, 1989). This was less of a problem in the case study because it was not designed to uncover causal relationships. The desired results were of a descriptive nature. The use of multiple sources of evidence and the analytical technique of pattern matching were used to help overcome this problem, following thus Yin's recommendation

7.2.6.4 External Validity

External validity with respect to the identified sub-processes and activities was partly guaranteed through the magnitude and novelty of the operation, which had required a structured and objective oriented approach to effective design and implementation. An operation of this magnitude would be a suitable benchmark for best practice in logistics management. This process structure was to be used as a framework for further survey inquiry. Thus external validity could only be ensured through the choice of logistics systems that would reveal a comprehensive process structure in order to be used as a raw model for further enquiry. Logistical processes and their design and implementation are known to be complex. During the interviews a layer of sub-activities per sub-process, as outlined in chapter 3, could be established. These could be related to TPL activities, and were thus usable as basis for further survey enquiry about complexity.

7.3 Survey

A survey is a method of primary data collection based on communications with a sample of individuals (Alreck and Settle, 1985). This can be done either at a fixed point in time (cross-sectional) as in this research, or at varying points in time (longitudinal study) for comparative purposes. The advantages of the survey method are that if correctly designed and administered, it provides a quick, inexpensive, efficient, and accurate means of assessing information about a population. A large sample of respondents can provide the basis for statistical analysis and can help to determine the degree of association between the dependent variable and a range of independent variables. The analysis can enable firm conclusions to be drawn from the survey data, and the findings to be generalised. A large sample also helps to raise the level of reliability and validity of the research (Alreck and Settle, 1985).

As outlined at the beginning, the survey was embedded in a large-scale research project initiated by the European Commission, as part of the Fifth Research Technological Development and Demonstration Framework Programme. In this project eleven research organisations and consultants from seven European countries are engaged in this three-year research project, which began in January 2000. The overall aim of the project is to analyse the role and impact of TPLPs on logistics and transport.

7.3.1 Choosing the survey approach

Alreck and Settle (1985) distinguish between three basic survey techniques that can be employed in survey research:

- Postal survey - self administered by the respondent.
- Face-to-face interview - self administered personally or via a third party.
- Telephone survey - interview via the telephone personally or via a third party.

The telephone survey approach was rejected because the detailed information requested cannot be obtained during a telephone conversation. The respondent may not have all the information at hand; for example they may not have information about the number of products manufactured at the plant or the proportion of customised products.

For similar reasons a postal survey was rejected. The number of questions that were to be asked, and the novelty of the concepts these were based on stipulated the use of face-to-face interviews as the data collection method. It was foreseeable that questions with regard to the clarification of interview questions would arise, particularly since the survey was to be carried out in different countries, but only in English.

7.3.2 Measuring TPL involvement

As outlined earlier, TPL involvement in logistics management can be seen as the aggregated degrees of TPL participation in lower level sub-processes and activities. Since TPL involvement has never been measured before on a cardinal scale, this procedure needed some exploration of how it could be undertaken, and verification that it could be done. The results of the case study delivered this confirmation, and also a list of activities for each identified sub-process. Respondents were asked to identify a specific shipper-TPLP relationship and comment on the role of the participating parties (i.e. organisations). The aim was to reveal whether or not the TPLPs carried out the respective activity alone, or as second, third or even fourth contributors to the activities, or whether they were participating in this activity at all. If they were solely responsible for an activity (i.e. carrying it out alone) this was recorded as 100% participation. Partial responsibility (i.e. carrying out parts of it) was recorded as 50% if two parties were involved, or 33% if three were involved, and so forth.

7.3.3 Measuring Resources and Skills and Proactive Behaviour

The use of these concepts as independent variables is new, and the measurement of resources and skills at such an abstract level of questioning has never been attempted before. Because of this novelty the issue of how to measure these concepts was explored in the case study, which as a result confirmed the use of a lower and an upper extreme of perceived 'resource sufficiency', 'skill adequacy', and level of proactivity. These were operationalised through the use of a five-point Likert ordinal scale.

7.3.4 Measuring TPL Contribution to Logistics Performance

It would have been desirable to measure logistics performance directly, and relate it to the contribution of TPL to logistics performance. Conceptual ideas in this direction were discouraged by the fact that 'hard data' with regard to logistics performance is in many organisations classed as confidential information, and therefore unlikely to be revealed in a survey. Secondly, the case study revealed that TPL contributions to logistics performance were also achieved through their involvement in designing a logistics system, as well as in operating it.

Logistics performance can be measured in two different ways; using preset targets as benchmarks for operational measures, and measuring change over time (Bowersox, 1996). The measurement of operational target fulfilment has the advantage that it can be taken at a particular point in time, and the disadvantage that it doesn't necessarily allow the drawing of conclusions with regard to a period of time, which for most organisations is the crucial measure. Furthermore, this type of measurement could not have been related to effects of the TPL involvement in logistics systems design. Measuring change over time is the most meaningful measure of logistics performance. It has the additional advantage of capturing the influence of TPL involvement, not just in an operational sense

In the absence of detailed statistics a measure relying on key informants' perceptions about these changes in logistics performance was adopted. TPL contributions to logistics performance also relied on key informants' perceptions about this. This way of measuring TPL contributions to logistics performance has been used before in two studies investigating the European TPL industry (Laarhoven et al, 1995, 2000).

7.3.5 Construction of the questionnaire

The validity and reliability of the survey results depend on the way in which every aspect of the survey is planned and executed, but the questionnaire design and the way the questions are asked are the most essential components (Alreck and Settle, 1985).

7.3.5.1 Questionnaire design

Designing a questionnaire is a critical task, since a properly designed questionnaire can elicit the precise information that the researcher wants. However, a poorly designed questionnaire will provide data that can be confusing, difficult to analyse and therefore of little value. Also, a poorly designed questionnaire can be prone to systematic error. Systematic error is a potentially avoidable error that distorts the results in a systematic manner (Neuman, 2000). This type of error can impact the validity and reliability of a survey.

Two types of questionnaires were designed (Appendix A, B), one to be used for the sample of shippers, and one to be used on the sample of TPLPs. Although they were directed to different types of respondent in their phrasing, they were exactly the same in their focus and measurability, thus allowing statistical analysis on the whole sample.

One of the first steps in questionnaire design is to clearly define the focus of the research (Moser and Kalton, 1972). The questionnaire should elicit the response that the research is most interested in without too much extraneous information being collected as well. This was not achievable in this research because it is embedded in a research project of a larger scale, adhering to additional objectives. However, the

main sections of the questionnaire reflect the focus of this research as outlined in the previous chapters.

Another important element in questionnaire design is to ensure that the questions are both clear and unambiguous - to ensure that the words have a common meaning for everybody completing the questionnaire (Alreck and Settle, 1985). It is important that good instructions are given with the questions (Oppenheim, 1966). The manner in which the questions are expressed can all too often introduce bias (Alreck and Settle, 1985). Questions should not be loaded (e.g. "Do you advocate a lower speed limit to save human life?") or leading (e.g. "Don't you see some danger in the new policy?").

7.3.5.2 Pre-testing the questionnaire

It is important to carry out pre-testing of the questionnaire in order to ensure that the respondents understand the questionnaire, and to check if systematic bias is present. Pre-testing also allows the researcher to examine the data, to determine whether the questionnaire is providing the kind of information that is being sought.

For this study several pre-tests were undertaken. The questionnaire was tested with several members of the research consortium and peers in faculty. Finally, it was tested in two pilot interviews with a TPLP and a shipper. The pre-testing proved to be very helpful. Only minor changes with respect to the phrasing of some questions had to be made. After the pilot interview with faculty peers it was concluded however that the complexity of the study, and hence the length of the questionnaire, seemed to make it potentially difficult for respondents to understand some questions, because they would appear to be out of context. This might have led to a superficial attitude of the respondent, which again could potentially endanger the quality of the given answers. It was thus decided to insert a section into the questionnaire that would briefly outline the scope of the investigation with regard to TPL involvement and the systems approach taken in the study. Although this increased the length of the questionnaire even further, it would give the respondent a contextual understanding of the study, which it was hoped would keep respondents interested and astute in answering the

questions. A further step that was taken to minimise non-response bias and to ensure that good response was obtained (Alreck and Settle, 1985) was the personal approach to potential respondents, and finally the face-to-face interviewing technique in itself.

7.3.6 The Questionnaire (See Appendix)

7.3.6.1 Organisational Context (Section 1)

Within this section of the questionnaire the respondents were asked to describe a logistics system. In 1.1 a specification of the industrial sector according to the limitation in the sample focus (see 5.5. Sampling) is asked. The emphasis here is on an industrial segment. Respondent are not necessarily OEMs, but also supply chain entities, which are immediately situated before or after the OEM (i.e. first tier suppliers or wholesalers, distributors, retailers).

In section 1.2 respondents are asked for data of a logistics system to create a frame of reference.

7.3.6.2 Design, implementation and operation of a logistics system (Section 2)

The respondent is given here a short and necessary introduction to the conceptual framework used in the study, which is reflected in each section of the questionnaire. Sections 2.2. to 2.4 capture the involvement of TPLPs in the design, implementation and operation of a logistics system by examining their participation in lower level activities.

With respect to the design of the logistics system in sections 2.2.1 to 2.2.6, the respondent is asked to answer a twofold question. The respondent was first asked to make a statement about the leading role in each of the specified sub-processes. This is marked in the questionnaire by a ticking the appropriate box under “In house”, “TPLP” or “Other”. Secondly, he or she was asked the level of activity of those involved. Four different answers are possible:

Client –CL (in shipper questionnaire ‘In-house’ – I),

TPL - T

Other - O

A combination - C

The answer was marked on the questionnaire by writing the appropriate coding given in the questionnaire on the line behind each activity.

Respondents were asked to specify ‘others’ and thus a ‘combination’ if others were involved.

Respondents then were asked how they perceived the current, desired and most likely future role of their TPLPs’ level of proactive behaviour i.e. *What role did their TPLP take in the design of their logistics system? What role would they like them to take in future? What role do they think their TPLP will have most likely in future?*

The answer was given on a five-point scale ranging from reactively enabling sub-tasks to proactively developing logistics processes in order to categorise the role the TPLPs had or could have. It was marked as “n.a.” – not applicable, when the respondent couldn’t confirm any involvement of a TPLP in the logistics system described.

The respondent was asked for information about the implementation processes in the same way as for Section 2.2.

In Section 2.3.5 the respondents were asked how they perceives the current, desired and most likely future role of TPLPs in implementing a logistics system. The five-point scale reflects here a spectrum ranging from reactively contracting sub-tasks to proactive project management. Answers were to be marked in the same fashion as in Section 2.2.

In contrast to Sections 2.2 and 2.3, respondents are not asked to make a statement about the leading role in a sub-process in Sections 2.4.1 – 2.4.3. Neither is a

combination of parties foreseen as a possible answer to the involvement in the activities listed below each sub-process (i.e. planning, execution, control). It was rather assumed that each activity within a sub-process would in practice be carried out by only one organisation. In case more than one party was involved in one of the activities, more than one box could be ticked.

In Section 2.4.4 the respondents are asked how they perceive the current, desired and most likely future role of TPLPs in operating a logistics system. The five-point scale reflects here a spectrum ranging from reactively contracting sub-tasks to proactively driving operational efficiency. Answers are to be marked in the same fashion as in Sections 2.2 and 2.3.

7.3.6.3 Skills and Resources (Section 3)

In Section 3 respondents are asked about the *input* that went into the previously described process structure within the specified logistics system. It was explained to the respondents that the input into any management process must be seen in a *qualitative* way, enabled through some form of *skill*, and in a *quantitative* way, enabled through the input of *resources*. As outlined before, this study distinguishes between three different skills: *technical skill*, *human skill*, and *conceptual skill*, and five basic resources: *physical*, *financial*, *human*, *technological*, and *organisational*.

The following definitions of the resources and skills were given in the questionnaire:

“Technical skill implies an understanding of, and proficiency in, a specific kind of activity, particularly one involving method, processes, procedures, or techniques. Human skill is the ability to effectively [i.e., to manage] work with people. A conceptual skill is the ‘creative ability’ to co-ordinate and to integrate activities and interests towards a common objective. *Financial resources* can be cash flow, debt capacity, or new equity availability. *Physical resources* can be buildings, manufacturing plants, warehouses, or inventories. *Human resources* can be scientists, engineers, sales personnel, or financial analysts. *Technological resources* can be

patents or licenses. *Organisational resources* can be a certain hierarchical structure, financial schemes (pensions, share options etc.) or organisational culture.”

Sections 3.1 – 3.3 examine which actual resources and skills are regarded as necessary input in order to design, implement and operate the logistics system using the skill and resource categories described above. Furthermore, it examines the relative importance of each skill and resource category with respect to these three phases.

Respondents were first of all asked to give their opinion about the relative importance of resources or skills on a five-point scale ranging from *not relevant* to *most important*. The answer is marked in the questionnaire by ticking the appropriate box in the line of the resource/skill category. Subsequently they were asked to indicate those skills or resources that were of particular importance for the design, implementation or operational phase of the system. Since the number of possible answers could vary from case to case it was important for the interviewer to probe in depth.

In Section 3.4 the respondent is asked for his or her judgement of the sufficiency of TPLP resources that were deployed into the design, implementation and operation of the specified logistics system, and how they expect these to develop in the future. The respondent is asked to rate the different resource categories on a five-point scale, from “*totally insufficient*” to “*excessive*”.

In Section 3.5 the respondent is asked for his or her judgement of the adequacy of TPLP skills that were deployed into the design, implementation and operation of the specified logistics system and how they expect these to develop in the future. The respondent is asked to rate the different resource categories on a five-point scale from “*totally inadequate*” to “*leading edge*”.

7.3.6.4 Systems Efficiency and Effectiveness (Section 4)

In Sections 4.1 – 4.3 of the questionnaire the respondent is asked how logistics cost, overall cycle time and quality have changed over the last three years in relation to

turnover. Subsequently, they are asked to rate the influence of their TPLP with regard to these changes on a five-point scale based on the respondents' perception. Answers are marked in the questionnaire by ticking the appropriate boxes.

7.3.7 Sample Selection

The concept of sampling simply means taking part of a population to represent the whole population (Alreck and Settle, 1985). The alternative to sampling is enumeration i.e. counting the whole population. The major reason behind sampling is economy. To survey every individual in a population via enumeration is usually too expensive in terms of money, time and personnel. With sampling the researcher gets a set of cases (or sample) that is more manageable and cost effective to work with than the whole population of all cases. If sampling is carried out properly it lets the researcher collect data about a variable from a small set of cases, but generalise accurately to all the cases (Neuman, 2000). However, the researcher cannot use just any sample to generalise accurately. The sample must be selected according to precise procedures.

There are two approaches to sampling: probability and non-probability sampling (Kidder and Judd, 1987). Table 7.2 shows the different types of probability and non-probability sampling (1 to 4 is probability sampling, 5-8 is non-probability sampling).

Table 7. 2: Sampling Techniques

Sampling Technique	Definition	Comment
Simple	Select people on true random procedure	Laborious and time consuming, but provides most reliable sample procedure
Systematic	Select every nth person(quasi random)	Independent of researchers preference or prejudice
Stratified	Randomly select people in	Laborious and time

	predetermined groups	consuming
Cluster	Take multi stage random samples in each of several levels	Laborious and time consuming
Haphazard	Select anyone who is convenient	The result is only applicable to the sample studied
Quota	Select anyone in predetermined groups	Conclusions drawn are limited to the sample studied but tentative implications for others may be suggested
Purposive	Select anyone in hard to find target group – using ones own judgement	Only tentative generalisations may be made
Snowball	Select people connected to each other	Only tentative generalisations may be made

. Source : Neuman, 2000

With probability sampling every item in the population has a known non-zero probability of selection. The best-known form of probability sampling is the simple random form of sampling. With random sampling each member of the population has an equal probability of being selected. However, non-probability sampling implies that the probability of any particular member of the population being chosen is unknown. In the case of non-probability sampling the selection of sampling units is arbitrary, as the researcher relies heavily on personal judgment. It should be noted that there are no appropriate statistical techniques for measuring random sampling error for a non-probability sample. Thus, projecting the data beyond the sample may be statistically inappropriate. For the researcher the ideal is to go for random sampling with a relatively large sample size. However, the reality, of course, is that the researcher is faced with a number of constraints, namely time, money and administrative support.

The sampling procedure that was used in this research project was the stratified sampling technique. It consisted of shipper and TPLP organisations. The sample of shippers is based on an even spread amongst the four industrial sectors and European countries according to their proportional contribution to Gross European Product (GEP). Ten of the total shipper sample size were determined to be 'European Shippers', i.e. not relating to a nationally based operation. The sample of TPLPs was limited to a list of fifty leading organisations that was compiled at an earlier stage of the project. There was also a common understanding that in each industry companies of different sizes ought to be surveyed. The final choice of TPLPs and shippers was left to the consortium partners that were involved in the survey, because of their existing contacts. The split of interviews over different industries and shippers/providers (the sample) is shown in Table 7.3 below.

Table 7. 3: The distribution of the respondents

Industry	TPL	Shipper	Total
Electronics	12	16	28
Automotive	8	6	14
Food (retail)	9	9	18
Chemicals/Energy	3	13	16
Total	32	44	76

7.3.8 Data Collection

After pre-testing the questionnaires a training session was held to ensure that the interviewers had a comprehensive understanding of the nature of the survey and were prepared to explain any questions from the respondents. In addition, an interviewer manual was produced (see Appendix C) to explain the various sections of the questionnaire and to provide instructions for the interviewer. These comprise typically instructions for probing and explaining.

During the period November 2000 to June 2001 a total of 76 respondents were interviewed (each interview took at least two hours). After the interview the data was entered into a spreadsheet corresponding to the variables specified in the questionnaire and subsequently e-mailed to the Centre for Logistics and Transportation at Cranfield University for central data storage and further analysis.

7.3.9 Data analysis

It was decided early on in the research project to use the SPSS for Windows data analysis software. The questionnaire had been designed for ease of data entry into the SPSS data entry file. The data collected was then subjected to various forms of data analysis.

Firstly, univariate analysis (one variable analysis) was performed to see if there was any significant difference between the answers given by shippers and by TPLPs. Through the compilation of a range of frequency tables it was possible to describe how shippers and TPLPs perceived TPL proactive behaviour, resource sufficiency and skills adequacy, as well TPLPs' contribution to logistics performance. In addition, cluster analysis was used to categorise different degrees of TPL involvement. The cluster analysis could further show any relationship between some independent variables and the dependent variable TPL involvement. To examine the relationship between two variables the bivariate approach was used. The use of regression analysis enabled the investigation of the hypothesised links between the dependent variable, TPL involvement and a number of independent variables. It was used to determine the nature and direction of the linkage.

7.3.9.1 Cluster analysis as explorative method of analysis to establish a current picture of TPL logistics provision in Europe

Cluster analysis is a generic term for a set of techniques that produce classifications from initially unclassified data. Cluster analysis is a generic term for a range of numerical methods for examining multivariate data with a view to uncovering or discovering groups or clusters of homogeneous observations.(Everitt et al, 2001). The clustering techniques aim to divide a heterogeneous collection of data or individuals into homogenous sub-groups. "Its use is appropriate when little or nothing is known about the category structure in a body of data. The object of cluster analysis is to sort a sample of cases under consideration into groups such that the degree of association is high between members of the same group and low between members of different groups" (Jain and Dubes, 1988, cited in Backer, 1995).

The clustering method used in this research is the k-means or hill-climbing algorithm (Friedman and Rubin, 1967) This algorithm uses the means of a cluster as a basis for the optimising criterion.

7.3.9.2 Regression analysis

Regression analysis is a technique that can be used to measure the relationship between a continuous independent variable and a dependent variable that is also continuous, and to assess the significance of this relationship (Alreck and Settle, 1985). When the analysis includes just one independent variable, the more precise term for this statistical method is linear regression, and when there is more than one independent variable it is called multiple regression. Regression analysis generates a regression equation and the r-square value. The regression equation is the formula for computing a predicted value for the dependent variable, based on the value of the independent variable - the equation includes the constant and a regression coefficient. The r-square value indicates the percentage of variance in the dependent variable that is "explained" by the value of the independent variable. It is an indication of how much influence the independent variable has over the dependent variable. The closer the r-square is to 1, the greater the influence.

Regression analysis was undertaken in several steps. The effect of the level of pro-activity per sub-process was tested on TPL involvement in each sub-process using linear regression analysis. The same procedure was carried out for resources and skills. After variable reduction, three independent variables, representing the level of pro-activity, the sufficiency of resources and adequacy of skills, were entered into a multiple regression formula and tested on the TPL involvement per area of activity (design, implementation, operation). Subsequently the level of TPL involvement in design, implementation, and operation were tested separately on the TPL contribution indicators 'Reduction of logistics cost', 'Reduction of cycle time', and 'Quality' using a linear regression model.

7.4 Conclusion

This chapter has outlined the research process in its two stages. Within the single case of a TPL relationship within the automotive context, sixteen interviews were conducted with key respondents in the shipper and TPLP organisations. The survey that was conducted entailed 75 face-to-face interviews in four different industries. The survey was embedded in a large-scale European research project and thus profited from the help of other research consortium members in collecting data. The analysis technique employed included qualitative case analysis, cluster analysis, and regression analysis.

Chapter 8 Case Study Rover – Exel Logistics

8.1 Introduction

As outlined in Chapter 7 the primary objective of the case study is to investigate a TPL relationship within an existing logistics system in order to clarify the conceptual ideas that were identified in order to investigate TPL relationships. One key aspect of the research design was to measure TPL involvement in different logistics system contexts according to a common structure of sub-processes and activities. It was thus necessary to establish a set of activities within each sub-process, particularly in logistics systems design and implementation. Whereas the literature provided a clear description of operational processes including operational planning and control, activities that would describe the design and implementation of logistics systems were not available from the literature. In addition to this the case study was a suitable framework to enable a further specification of resources and skills in a logistics systems context and to verify a common understanding of the concept of pro-activity.

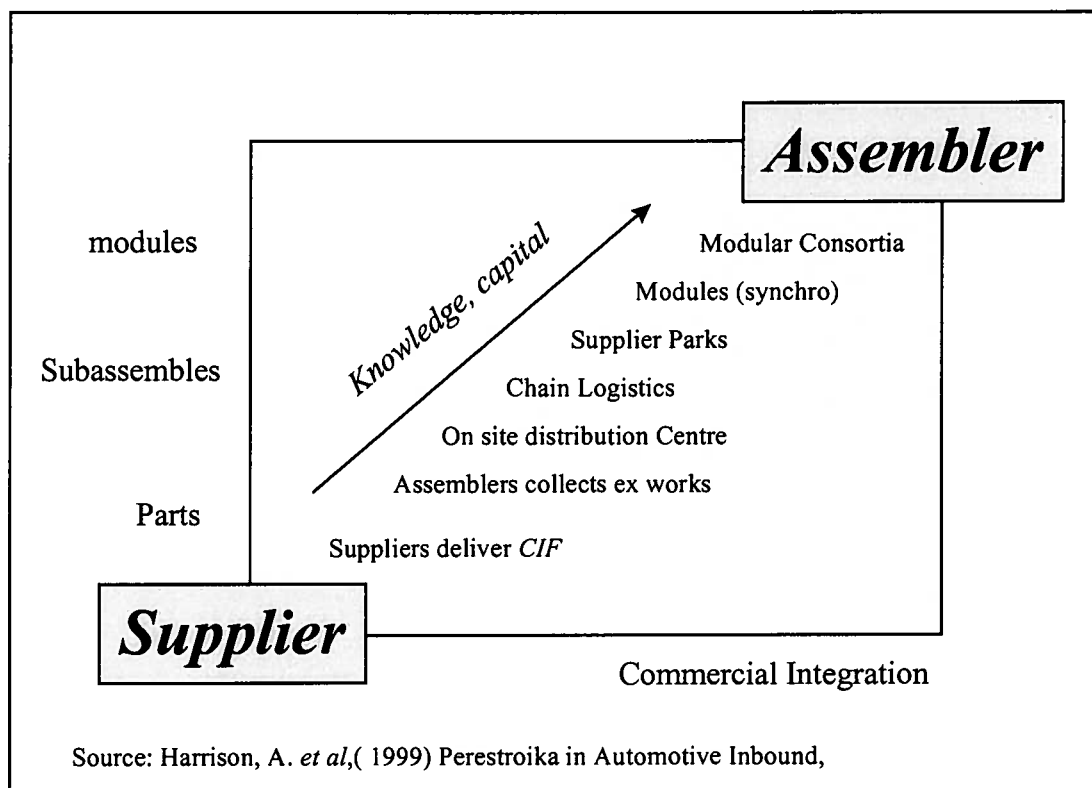
The second objective of the case study was to validate and further understand the conceptualised relationship between TPL involvement and TPL resources and skills, TPL proactivity and the effect TPL involvement had on TPL performance. This would enable the definition of variables, which could be tested then on a larger sample.

This chapter starts with some contextual description of the operational context in the automotive industry, the specific background of both companies involved, and the strategic background of the relationship between both companies. This is followed by a description of the logistics system including its design and implementation, and an assessment of TPL involvement. Then input variables (proactivity, and resources/skills) as well as the output variables for performance are assessed. The chapter ends with a summary of the case study results and an assessment of what has been learned.

8.2 Automotive context

Competitive pressures and the ongoing search for increased efficiencies and greater profits are driving automotive manufacturers and suppliers to re-evaluate their respective supply chain activities and relationships (Collis et al., 1997). The range of logistics solutions (Figure 8.1) is from *cif* delivery by independent suppliers to the assembly plant to highly dependent modular consortia with a high degree of process

Figure 8.1: Automotive inbound solutions



integration and location on site or near to the final assembly plant (Collis et al., 1997). There seems to be a clear trend by which automotive assemblers are reducing their number of 1st tier suppliers and are increasingly expecting those to take more responsibility for integrating inbound logistics (Harrison, et al, 1999). Previous research (Jockel, O. 1996) indicates though that automotive manufacturers' inbound logistics comprises of a mix of solutions depending on supplier locations and type of material.

The outsourcing of logistics functions that link 1st tier suppliers with automotive manufacturers is not a new concept. But there are differences in the extent to which

they are used. The involvement of TPL providers in this context varies from the use of transaction-based services, typically in transport and warehousing, to higher degrees of involvement including value-added services, the management of dedicated distribution centres and information management within 1st tier supplier parks (Jockel, 1996; Harrison et al, 1999). The integration of 1st tier suppliers and assemblers' logistics processes consequently bears implications for TPL, which are involved in the link between these two supply chain entities. In the automotive industry TPL services are regarded as highly integrated into the inbound supply chain processes (Nolan, 2002).

8.3 Background issues Rover, Cowley

After the takeover of the Rover Group by BMW in 1994 product development within the Rover Group was guided by the strategic goal to reach a bigger market with more customised products. With the introduction of the Rover 75 in 1997 the Rover Group was determined to achieve shorter lead times between placing an order for a new car and delivering it to a dealer. To reach this goal, Rover Group worked with Exel Logistics to devise a new supply system. It integrated all inbound parts operations together under one roof.

Leigh Pomlett (*in* Modern Material Handling, 1999), managing director of Exel Logistics Automotive, explains the thinking behind the development of the new system: "The greater volume and complexity of build variations on the new Rover model mean that bringing components into a number of receiving points-and then handling them in the conventional manner-was no longer good enough."

Five separate logistics buildings provided Rover with storage and staging capability for components necessary for the assembly of the Rover 800 and 600 the predecessors of the Rover 75. For the Rover 75 production new Integrated Logistics Centre (ILC) was built for nearly £11 million.

8.4 Background issues Exel Logistics

In the UK, Exel Logistics was launched in 1989 and is today one of Europe's leading providers for logistics services (Distribution, 1999). It offers services to retail and manufacturing customers, including distribution, storage, inventory, and warehouse rental. Its business is characterised by the ability to offer solutions, which extend beyond the traditional boundaries of transport and distribution. They aim to provide efficient and value adding supply chain management solutions. They work in long-term partnerships with their clients. This enables them to obtain specific industry knowledge and best practice experiences, which they share with their clients. Realising the importance of this specific knowledge they reorganised their business structure in 1996 with a focus on five industrial sectors: automotive, electronics, retail, consumer goods and petroleum/chemicals.

8.5 Strategic Background of the Exel – Rover relationship

Exel Logistics and Rover Group have operated in a successful logistics partnership since 1986. Throughout the relationship, continuous improvement and joint planning for future changes has been a key feature. In 1994 it was recognised that the new Rover model (Rover 75) presented a unique opportunity to develop a world-class solution. The challenge was to increase profitability by minimising total logistics costs, whilst ensuring that full 'Kaizen' waste reduction capability could be realised within manufacturing areas. The key-manufacturing driver was the correct and just-in-time presentation of material to the assembly line associates. The challenges were:

- To increase annual production volumes from 50,000 to 140,000
- Optimal assembly layout with all material within the right build station
- Increase from 10 to 20 commodities to be sequenced or late configured to fit-point
- Increase from 40% to 80% parts to be presented to the associate in small plastic boxes
- Consolidation of material from 200 suppliers world-wide to 133 build stations (increase from 10% to 40% of suppliers being non UK based)

- Reduction from 4 days to 1.5 days average inventory in the parts warehouses
- Minimum of 20% productivity improvement in Logistics costs per vehicle
- Man moveable containers instead of fixed conventional containers
- 350 full lorry deliveries to manufacturing pe day
- 50,000 containers to be moved per week¹

8.6 The integrated logistics Centre (ILC) at Rover Cowley

The evolution of the facilities to support previous Rover models had resulted in 5 separate storage locations, sited within existing buildings. To accommodate the volume increase and the increase in logistics operations required in close proximity (late configuration and sequencing), would again have required considerable investment and would have perpetuated a disjointed and sub-optimised approach to inbound logistics, resulting in costly inefficiencies. The solution was to develop an 'Integrated Logistics Centre' (ILC) to have all logistical activities under one roof and as close as possible to the manufacturing assembly area to deliver short material delivery lead-times (see appendix D).

Through a single distribution point, the ILC fosters a "supplier village" concept for sequenced components. The ILC also includes conventional handling of other components within a new, 22,000 sq meter building manned by more than 200 Exel Logistics staff members (see appendix.E).

The solution to improved supply chain management includes the development of a standard range of containers, which are used by all UK and European auto industry suppliers. As far as the UK suppliers are concerned, these containers now travel directly from the supplier into the ILC for consolidation and then to assembly line fit points, rotating on a six-day loop.

Electric tow trains feed the assembly line with components via a connecting tunnel from the ILC, and empty containers are collected and returned to the facility. For most inbound materials, the cycle time from point of call to fit point on the line is reduced from the current four hours by road to one hour.

¹ The outlined objective are documented in a proposal document for the Motor Transport Awards 1999

This shorter delivery time not only increases efficiency and contributes to a cleaner environment, but has the added bonus of improved traffic flow around the plant. The system significantly decreases vehicle movements-cutting trips by up to 300 a day-compared with the conventional over-the-road delivery solution.

8.7 Summarising Research Design issues

8.7.1 Semi structured interviews

The case study was based on semi-structured interviews with several key informants within the shipper organisation, an automotive manufacturer and within the TPL organization. 16 interviews were conducted with following people(table 8.1):

Table 8. 1: Key informants

TPL organization	Automotive manufacturer
<i>General Manager Automotive 1x</i>	<i>Pre-Production Manager 1x</i>
<i>Project Manager ILC 1x</i>	<i>Manager Logistics and SC Planning 2x</i>
<i>Project Planning Officer 3x</i>	<i>Manager Material Planning 2x</i>
<i>Manager Collection Service 2x</i>	<i>Transportation Manager 2x</i>
<i>IT manager 1x</i>	<i>IT Manager 1x</i>

The persons listed above were all members of the steering group that controlled 11 small project teams and supporting suppliers and owned the delivery of the ILC project from concept to detailed design and planning through each of the operational delivery phases.

The first interviews with the General Manager Automotive of the TPL provider and the Pre-Production Manager had the aim to obtain an overall view of the project and its participants. Subsequently interviews with each of above listed respondents were conducted. Some respondents, however, were more familiar with operational aspects and others with overall design and IT implementation activities. Accordingly 3 different questionnaires were used, one emphasizing on the operational aspect of the logistics operation, one concentrating on overall design issues and one with regards to

the implementation of IS/IT systems. Two key informants, the project-planning officer at Exel Logistics and the Material Planning Manager at ROVER could answer questions concerning operations and to some aspects of overall design.

Two different sources of operational expertise prevailed:

Transportation was on the shipper side represented by a transport manager and on the TPLP side by the manager of the collection service. For *warehousing and material management* the project planning officer on the TPL side and the pre-production manager and the materials planning manager were interviewed.

The questions in these interviews were identical with regards to the concepts that were used. However, they were tailored to the parts of the operational logistics process that the respondent was involved in (see Appendix F,G,H).

Separate interviews were conducted concerning overall design of the logistics solution and the implementation of IS/IT systems. With respect to the first the Project Manager at Exel Logistics and the Logistics/SC Planning Manager was interviewed and with respect to the latter the IT Managers in both organisations.

Example:

The manager of the collection service and the transportation manager were asked to describe in detail the design, implementation and operation of the transportation process. Subsequently they were asked about the resources and skills that were necessary to design, implement and operate this part of the management process and how proactive they perceived the work of the TPL provider. Finally they were asked how they measured performance of the collection service, what determined this, and how this had changed in comparison to the time before the ILC.

8.7.2 TPL involvement

Aggregating the degrees of participation in various activities reveal an overall measurement for a sub process. A constraint though was the reliability of respondent

perception of the degree of participation. It was therefore decided not to ask respondents to quantify precisely TPL participation in an activity but rather to rely on a simple scale.. This was achieved by defining participation as 100% if only the TPL provider participated in an activity, 50% if shared by 2 parties. If it is shared by 3 parties (for example a supplier) the score is 33%, and if there is no participation by a TPL the score is 0%.

All respondents were asked about their opinion on why Exel Logistics was involved in managing logistics on behalf of Rover. This provided a first clarification of whether resources and skills or competence played a role in the outsourcing decision and at what level it played that role . This was simply recorded as *first, second, or third answer*.

8.8 Logistics Processes and TPL involvement

The focus (unit of analysis) in this case study is the TPL relationship between ROVER (shipper) and Exel Logistics (TPLP). The context in which this research takes place is the existing inbound material solution, namely the Integrated Logistics Centre (ILC) operation, for the ROVER production facility at Cowley. The level of analysis is the logistics system through which the flow of information and goods are managed.

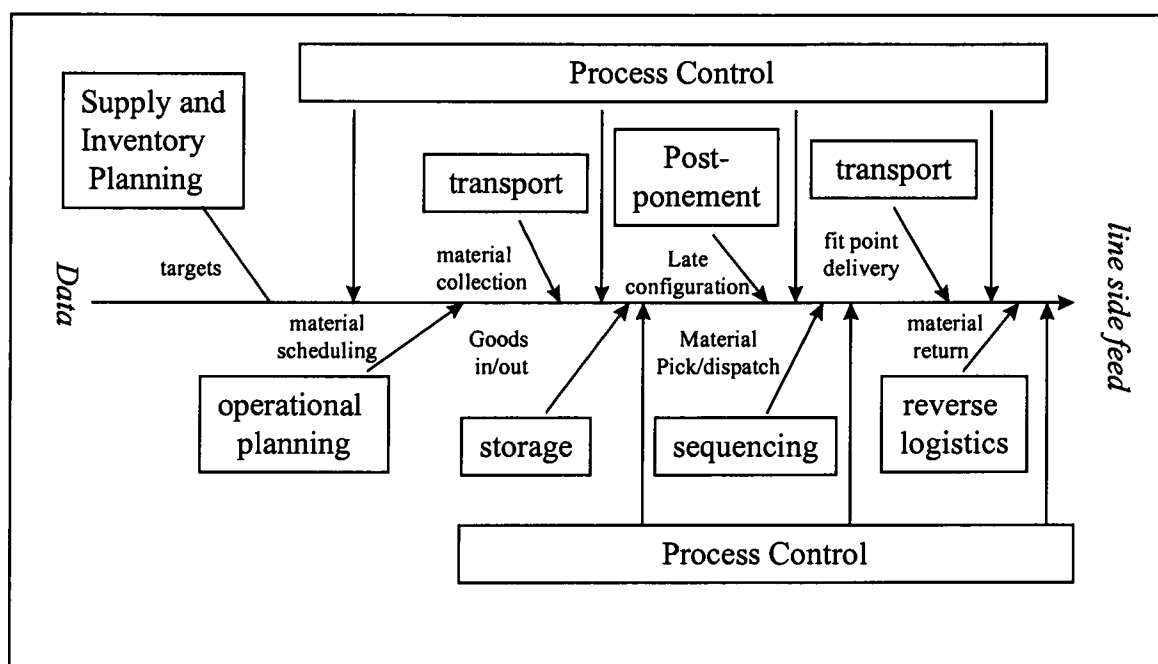
In the following the operational processes and subsequently the design and implementation of these are described. Following the description of logistics processes the involvement of the TPLP is described for each sub-activity.

8.8.1 Operational boundaries

The operational focus of this research is depicted in Figure 8.2. The most important component of this is the Integrated Logistics centre (ILC). It is the receiving and transfer point of all incoming materials.

The ILC building is 22,000 sq metres in size with an additional 2,900 sq metre unloading deck and canopy, a further empty container canopy and pallet park area of around 3,500 sq metres. It is supported by a new one-way road system to optimise vehicle flow, which allows exit from the site and direct road access to the main Rover plant across the new rail infrastructure (see appendix D and E for graphical descriptions).

Figure 8.2: Boundaries of the investigated logistics process



The operation will receive more than 1 million containers per year by road mainly via the Exel Logistics Rover Collection Service from the UK, Europe and the rest of the world. This equates to a throughput inbound and outbound to the Rover assembly lines of 2.6 million cubic metres of containerised components. Components are stored in three areas and storage requirements are based on an average stock holding of 1.5 days at peak production volume.

Conventional Component Material occupies around half of the floor areas and receives and stores containerised components as follows:

Standard Metal containers (up to 1800 x 1100mm) in wide-aisle pallet racking stored up to 8.3m and free-standing block stack areas for larger high turnover containers. These containers are put away and retrieved using conventional reach trucks. Plastic

containers (up to 800 x 600mm) are used in the shelving area up to 2.2m high. These containers are put away and picked using medium level picking trucks.

Sequenced Material

Sequenced containers are stored in block stack configuration with picking operations varying from picking by hand to the use of gravity flow racking and mechanical assistance for certain components. More highly manoeuvrable 3-wheel counterbalance trucks are typically used within the 9 sequenced areas. The three late-configuration areas provide an assembly operation for the required components. The picked and marshalled components are despatched by tow-train to Rover via a connecting tunnel to the Rover assembly building, which is only 250 metres away. A tow-train departs the ILC every minute to satisfy the production requirements. The reusable empty containers are then returned from assembly to the offload areas for reloading and delivery by Exel Logistics Collection service back to the suppliers.

The operation employs around 170 Exel Logistics staff and operates for 24hrs per day, 5 days per week.

8.8.1.1 TPL involvement in operations

The involvement of Exel Logistics in logistics operations reflects a high degree of outsourced activities. These result from the interviews with all respondents. Exel logistics participates in almost all planning activities with the exception of production related planning tasks and the forecasting of demands. Table 8.3 to 8.5 list the operational activities for the operational sub-processes planning, execution, and control and indicates the TPL participation in them. Overall 59,1% of activities regarding operational planning activities within the boundaries of the examined logistics system are outsourced to Exel Logistics.

Table 8.2: TPL Involvement in operational planning

Operational sub-processes and activities	TPL participation
<i>Planning (scheduling) activities</i>	
(Demand) Forecasting (finished Products)	Not at all
Inventory Planning	Partly (50%)
MPS (Master Production Scheduling)	Not at all
Production capacity planning	Not at all
Materials Planning	Partly (50%)
Supplier scheduling	Full
Warehouse capacity planning	Full
Transport scheduling	Full
Transport capacity Planning	Full
Planning of intermodal trp.	Partly (50%)
Planning of reverse logistics	Full
<i>Total TPL involvement</i>	59 %

An even higher degree of involvement of Exel Logistics prevailed in physical operational activities. 85.3 % of all operational activities within confines of the examined logistics system are outsourced.

Table 8.3: TPL Involvement in Physical Operational activities

Operational sub-processes and activities	TPL participation
<i>Physical Operational activities</i>	
Order processing	Full
Transport	Full
Loading/unloading	Full
Cross docking	Full
Storing	Full
Picking	Full
(re-)packing/labeling	Full
Product configuration	Full
Sequence to production line	Full
Shelf replenishment	Full
Customs WH administration	Full
Customs administration	Partly (50%)
Shipping documentation	Full
Crediting/ invoicing	Partly (50%)
OEM customer/suppliers	
Product return administration	Full
Product repair	Not at all
Scrap/disposal/recycling	Partly (50%)
<i>Total TPL involvement</i>	85 %

With regards to operational control process activities had been outsourced to 83%.

Table 8.4: TPL Involvement in operational control

Operational sub-processes and activities	TPL participation
<i>operational control activities</i>	
Replenishment Control	Full
Inventory Control	Partly (50%)
Tracking and tracing	Full
Order fulfillment control	Full
Quality control	Partly (50%)
Carrier Performance measure	Full
<i>Total TPL involvement</i>	83 %

8.8.1.2 Reasons for operational involvement of Exel Logistics

With respect to the question

Why, in your opinion is Exel involved in these (meaning the before described) activities?

Three thematic descriptions were extracted from the interviews that reveal the overall rationale for respondents perception of why Exel Logistics was chosen to be the operator of the ILC and the collection service :

Concentration on core business (We (they) don't want to do it!)

Competence dependence (i.e. " We (they) couldn't do it better!")

Cost (i.e. "We(they) couldn't do it cheaper!")

Table 8.5: Perception of respondents with respect to reasons for TPL involvement in logistics operations

Respondent	1 st answer pointing to	2 nd answer pointing to	3 rd answer pointing to
<i>TPL Organisation</i>			
<i>General Manager Automotive</i>	<i>Core business</i>	<i>Cost</i>	<i>Competence Competence</i>
<i>Project Manager ILC</i>	<i>Core business</i>	<i>Cost</i>	
<i>Project Planning Officer</i>	<i>Core business</i>	<i>Cost</i>	
<i>Manager Collection Service</i>	<i>Core business</i>	<i>Cost</i>	

<i>Automotive Manufacturer</i>			
<i>Pre-Production Manager</i>	<i>Core business</i>	<i>Cost</i>	<i>Competence</i>
<i>Mgr Logistics and SC Planning</i>	<i>Competence</i>	<i>Core business</i>	
<i>Manager Material Planning</i>	<i>Core business</i>	<i>Cost</i>	<i>Competence</i>
<i>Transportation Manager</i>	<i>Cost</i>	<i>Core business</i>	<i>Competence</i>

The prevailing number single answers that was given by almost all respondents reflected the strategic intension of ROVER not to be involved in logistics operations. The 2nd reason for that was given by most respondents, reflected the perception of respondents that Exel Logistics could carry out logistics operations at a lower cost than ROVER could have done.

8.8.2 Designing a new logistics solution

Upon the recognition of the need for a new logistics and supply chain solution for the new Rover 75 in 1994 a key brainstorm event was held with participating members from the Rover group and from Exel Logistics. Exel provided experience across different industries and external input from Cranfield School of Management.

Having developed various logistics scenarios Exel was facilitating joint benchmarking visits across existing Exel automotive business ventures. One of these visits was to the Martorell Supplier Village near Barcelona operated for SEAT and the nearby NISSAN operations. This together with visits to the assembly plants helped give further definition of how the benefits of integration, particularly in the sequencing operations could be delivered.

Two key objectives emerged:

- To create a single point of consolidation to control and release material to manufacturing
- To achieve a reduction from 6 hrs to 1hr capability of the call-off time for just in time delivery of materials, with direct delivery to the point of fit allowing all material requests to made against exact build requirements.

Operational simulation played a vital role in designing the ILC operations with regards to the various operational elements. Amongst other simulation tools 3 D true

scale simulation of the tow-train delivery to line process for example, enabled the project teams to select the optimal combination of resources and give a level of confidence in achieving and maintaining the on-time delivery schedule to the production line.

Making various business cases (see Appendix 6) was enough to secure the project viability. These were developed by analysing the entire (inbound) supply chain from supplier to point of fit. The detailed supply chain cost analysis enabled a very robust project to be created, incorporating all aspects of cost. For incremental £2million capital investment to £ million total minimum operating cost savings could be considered as £37 million over the life of Rover 75.

8.8.2.1 TPL Involvement in Designing the ILC Logistics Solution

The involvement of Exel Logistics in the design phase of the ILC project is considerable. This is not limited to functional design activities like Warehousing (including facility design) or material management which was outsourced to the, extent of 78% and 79% respectively, or Transportation which was fully outsourced to them (see table 8.6 – 8.11). TPL involvement in the case of the Exel / ROVER partnerships also features a high degree of TPL involvement in strategic and tactical planning and decision making activities. Exel supported strategic

Table 8. 6: TPL Involvement in Setting a Customer Service strategy

Design sub-processes and activities	TPL participation
<i>Setting a Customer Service strategy</i>	
Scenario building	Partly (50%)
Making business cases	Partly (50%)
Expert advice	Partly (50%)
Providing data	Partly (50%)
Data analysis	Partly (50%)
Final decision	Partly (50%)
<i>Total TPL involvement</i>	<i>50 %</i>

logistics decision making within ROVER (table 8.6). They provided the benchmarking facilities to other automotive supplier villages, which build the basis for the logistics strategy for inbound materials flows. They thus

Table 8. 7: TPL Involvement in Channel design

Design sub-processes and activities	TPL participation
<i>Channel design</i>	
Providing data	Partly (50%)
Data analysis	Partly (50%)
Making business cases	Partly (50%)
Resource planning	Partly (50%)
Simulations	Partly (50%)
Expert advice	Partly (50%)
Decision on channel members	Not at all
Decision on number of channel members	Partly (50%)
<i>Total TPL involvement</i>	<i>44 %</i>

Table 8. 8: TPL Involvement in Network design

Design sub-processes and activities	TPL participation
<i>Network design</i>	
Providing data	Full
Data analysis	Full
Making business cases	Partly (50%)
Resource planning	Full
Simulations	Full
Expert advice	Partly (50%)
Decision on type of location	Partly (50%)
Decision on number of locations	Partly (50%)
<i>Total TPL involvement</i>	<i>75 %</i>

contributed substantially to the strategic decisions of setting a customer service strategy (50%) featuring shortened lead times and an increased product (model) variety. The also contributed to the strategic decisions on channel design (44%) by promoting the supplier village concept and physical network design (75%) by subsequent analysis of different supplier locations and subsequent distribution simulation.

Table 8. 9: TPL Involvement in Warehouse design and (warehouse-) Operations design

Design sub-processes and activities	TPL participation
<i>Warehouse design and (warehouse-) Operations design</i>	
Specifying WH layout	Full
Specification MH equipment	Full
Process automation	Partly (50%)
Specification of packing and labelling	Partly (50%)
Design of information flow	Full
Design of physical flow	Full
Process simulation	Partly (50%)
Expert advice	Partly (50%)
Resource planning	Full
<i>Total TPL involvement</i>	<i>78 %</i>

Table 8. 10: TPL Involvement in Transportation Management design

Design sub-processes and activities	TPL participation
<i>Transportation Management design</i>	
Design of information flow	Full
Design of physical flow	Ful
Process simulation	Ful
Expert advice	Full
Resource planning	Full
relationships with 2 nd tier providers	Ful
<i>Total TPL involvement</i>	<i>100 %</i>

Table 8. 11: TPL Involvement in Materials Management design

Design sub-processes and activities	TPL participation
<i>Materials Management design</i>	
Replenishment process	Partly (50%)
Order management	Partly (50%)
Inventory management	Full
Process automation	Partly (50%)
Process simulation	Full
Expert advice	Full
Resource planning	Full
<i>Total TPL involvement</i>	<i>79 %</i>

8.8.2.2 Reason for Exels involvement in the design phase of the ILC project

With respect to the question

Why, in your opinion is Exel involved in these implementation (meaning the before described) activities?

This time one two thematic description were extracted from the interviews that revealed the overall rationale for respondents perception of why Exel Logistics was so much involved in the design of the ILC logistics solution

Source for Innovation (i.e. They had new ideas and longer experience)

Competence (i.e. "We(they) could not have achieved this without them(us)!")

Table 8. 12: Perception of respondents with respect to reasons for TPL involvement in the design of ILC logistics solution

Respondent	1 st answer pointing to	2 nd answer pointing to	
<i>TPL Organisation</i>			
<i>General Manager Automotive</i>	<i>Source for Innovation</i>	<i>Competence</i>	
<i>Project Manager ILC</i>	<i>Source for Innovation</i>	<i>Competence</i>	
<i>Project Planning Officer</i>	<i>Source for Innovation</i>	<i>Competence</i>	
<i>Manager Collection Service</i>	<i>Competence</i>		
<i>Automotive Manufacturer</i>			
<i>Pre-Production Manager</i>	<i>Source for Innovation</i>	<i>Competence</i>	
<i>Mgr Logistics and SC Planning</i>	<i>Source for Innovation</i>	<i>Competence</i>	
<i>Manager Material Planning</i>	<i>Competence</i>		
<i>Transportation Manager</i>	<i>Competence</i>		

Widely regarded by respondents within Exel, as well as by the higher ranked managers within ROVER, was Exel Logistics' role as innovator. The second reason that was given by those who had a second reason was their unique competence in designing logistics systems.

8.8.3 Partnering in Project Management

The implementation of a viable logistics solution was constrained by restricted road and delivery deck access on the Rover Cowley site, compounded by the growth in material deliveries (more than 200%). This meant that a significant level of site infrastructure development would need to be undertaken unless a radically different approach could be delivered. A project of this complexity required highly effective teamwork and project management. A Rover / Exel management structure was developed with 11 small project teams (see Appendix 6) and supporting suppliers, led by joint champions, and controlled by a steering group with tightly monitored status reporting and regular reviews at all level within both organisation. The full project team was in place 15 months before the final operational hand-over of the new facility from the builders. The team was drawn from the existing Exel Logistics and Rover organisations and, critically, owned the delivery of the project from concept to detailed design and planning through each of the operational delivery phases.

8.8.3.1 TPL Involvement in implementing the ILC Logistics Solution

The implementation of the ILC solution was the common responsibility of Exel / ROVER project teams, whereby Exel carried out most of the tasks.

With regards to information systems, new applications and hardware had to be put in place. With the exception of the application for material management for which ROVERs PPS systems SCIMITAR stayed in place, new systems were installed based on the specification of Exel (see table 8.13). Crucial here was the need to ensure compatibility of both systems.

Table 8. 13: TPL Involvement in Implementing Information systems

Implementation sub-processes and activities	TPL participation
<i>Information Systems</i>	
Information systems design	
<i>a) Materials management</i>	Not at all
<i>b) Warehouse management</i>	Full
<i>c) Transportation management</i>	Full

Software specification	Full
<i>a) Materials management</i>	Not at all
<i>b) Warehouse management</i>	Full
<i>c) Transportation management</i>	Full
Software development	
<i>a) Materials management</i>	
<i>b) Warehouse management</i>	Full
<i>c) Transportation management</i>	Full
Software installation	Full
Software compatibility management	Full
Total TPL involvement	82 %

The implementation of Policies and procedures was also largely (83%) left (i.e. outsourced) to Exel Logistics (see Table 8.14.). Health and safety regulation were already partly predetermined by the design of the ILC, which was mostly Exel

Table 8. 14: TPL Involvement in Implementing Policies and Procedures

Implementation sub-processes and activities	TPL participation
<i>Policies and Procedures</i>	
Health and Safety Policy	
<i>a) Warehouse</i>	Full
<i>b) Transportation</i>	Full
<i>c) Materials Handling</i>	Partly (50%)
Environmental Policy	
<i>a) Warehouse</i>	Full
<i>b) Transportation</i>	Full
<i>c) Materials Handling</i>	Full
Standard procedures and working instructions (ISO)	
<i>g) Warehouse Management</i>	Full
<i>h) Transportation Management</i>	Full
<i>i) Materials Management</i>	Not at all
Total TPL involvement	83 %

responsibility. The environmental policies that framed the ILC solution were given by the environmental objective of reducing road transport per annum and producing as little waste as possible. Overall a saving of 5.6 millions ton-kilometres per annum was achieved, 300 lorry deliveries per day were eliminated (as compared to the logistics operation that supported the ROVER 600/800 production), and 100 % returnable containers were used as packaging throughout the total inbound supply chain. Organisational Change with respect to erecting an organisation structure and

Table 8. 15: TPL Involvement in Implementing Organisational Change

Implementation sub-processes and activities	TPL participation
<i>Organisational Change</i>	
Changing organisational structure	Partly (50%)
(re-)defining responsibilities	Partly (50%)
Setting performance goals	Partly (50%)
Hiring employees	Full
Training employees	Full
<i>Total TPL involvement</i>	<i>70 %</i>

Many of the team members during the project phase hold now key operational roles. The employment and successive training of new ILC staff was the responsibility of Exel. The overall contribution of Exel to organisational change measures 70%.

Table 8. 16: TPL Involvement in Implementing Facilities and Equipment

Implementation sub-processes and activities	TPL participation
<i>Facilities and Equipment</i>	
Warehouse and MHE	
a) <i>Project management</i>	Full
b) <i>Tendering</i>	Full
c) <i>Contract Management</i>	Full
d) <i>Financing</i>	Partly (50%)
Transport equipment	
a) <i>Project management</i>	Full
b) <i>Tendering</i>	Full
c) <i>Contract (hire) Management</i>	Full
d) <i>Financing</i>	Full
IT systems	
a) <i>Hardware specification</i>	Partly (50%)
b) <i>Project management</i>	Full
c) <i>Tendering</i>	Full
d) <i>Financing</i>	Full
e) <i>Contract Management</i>	Full
f) <i>Hardware compatibility</i>	Partly (50%)
<i>Management</i>	
<i>Total TPL involvement</i>	<i>89 %</i>

The actual implementation of the ILC and the materials handling facilities and equipment was with the exception of financing it left entirely to Exel. The managed the project of building it, they invited tenders for the building and its interior and the where the contracting partners to builders and suppliers. The same accounts for the implementation of transport equipment and IT/electronic hardware. The financial concept for the ILC was based on a mix of investment by Rover and Exel as well as government grants. Overall Exel contributed to almost 90% to the implementation of facilities and equipment.

8.8.3.2 Reasons for Exel to be involved in the implementation of the ILC

Only two thematic descriptions were extracted from the interviews that revealed the overall rationale for respondents perception of why Exel Logistics was as deeply involved in implementing the ILC logistics solution as they were.

Efficiency (i.e. “ They (we) were able to do this most efficiently!”)

Competence (i.e. “We(they) also designed it – nobody else could have done it better!”)

Table 8. 17: Perception of respondents with respect to reasons for TPL involvement in the implementation of ILC logistics solution

Respondent	1 st answer pointing to	2 nd answer pointing to	
<i>TPL Organisation</i>			
<i>General Manager Automotive</i>	<i>Competence</i>	<i>Competence</i>	
<i>Project Manager ILC</i>	<i>Competence</i>	<i>Competence</i>	
<i>Project Planning Officer</i>	<i>Competence</i>	<i>Competence</i>	
<i>Manager Collection Service</i>	<i>Competence</i>	<i>Competence</i>	
<i>Automotive Manufacturer</i>			
<i>Pre-Production Manager</i>	<i>Efficiency</i>	<i>Competence</i>	
<i>Mgr Logistics and SC Planning</i>	<i>Efficiency</i>	<i>Competence</i>	
<i>Manager Material Planning</i>	<i>Competence</i>		
<i>Transportation Manager</i>	<i>Competence</i>		

The prevailing number one reason for Exel’s involvement in implementing the ILC solution was seen in their competence, and secondly in the belief that they could do this most efficiently.

8.9 TPL Proactivity

8.9.1 General Understanding of proactivity

With regards to the concept of proactivity respondents were asked to first give their interpretation of this concept. They were asked:

What do you associate with being proactive in logistics management?

The aim was to verify that all respondents had a common understanding of the concept. Three key elements that describe the concept of proactivity prevailed from the literature review:

- Being innovative
- Taking the initiative
- Acting entrepreneurially

The respondents' answers were screened for the use of these phrases and/or comments that clearly pointed to these themes. Table 8.18 depicts the results. With only one respondent not explicitly referring to 'being innovative' but commenting clearly about this the results showed it could be assumed that the concept

Table 8.18: Respondents answers towards the comprehension of 'pro-activity'

Respondent	Used phrase 'Being innovative'	Used phrase 'Taking initiative'	Used phrase 'Acting entrepreneurial'
<i>TPL Organisation</i>			
<i>General Manager Automotive</i>	X	X	X
<i>Project Manager ILC</i>	X	X	X
<i>Project Planning Officer</i>	X	X	X
<i>Manager Collection Service</i>		X	X
	X	X	X
<i>Automotive Manufacturer</i>			
<i>Pre-Production Manager</i>	X	X	X
<i>Mgr Logistics and SC Planning</i>	X	X	X

<i>Manager Material Planning</i>	X	X	X
<i>Transportation Manager</i>	X	X	X

of proactivity is commonly understood in its key elements of ‘being innovative’ and ‘taking the initiative’.

8.9.2 Measuring TPL Pro-activity

After respondent where asked about their understanding of proactivity they were asked how they would describe the opposite behaviour.

Based on the analysis of the respondents’ answers two extremes of entrepreneurial / proactive attitude/behaviour could be identified for the design, implementation and operational part of the logistics management process (see Table 8.19).

Table 8. 19: Extremes of perceived TPL proactive behaviour

Area of Sub-Processes	Lower Extreme	Upper Extreme
Design of a Logistics System	<i>Reactive Enabler</i>	<i>Proactive Developer</i>
Implementation of Logistics Processes	<i>Reactive Contractor</i>	<i>Proactive Project Management</i>
Operations	<i>Reactive Contractor</i>	<i>Proactive Driver</i>

8.9.3 A Proactive TPL provider

Exel Logistics was overall seen as being very proactive across all areas of involvement. Respondents within Exel seemed to be convinced that they were acting very much in the interest of the client. Particular recognition came from the respondent within ROVER with regards to Exel’s engagement in the early (strategic decision) phase of the project. All respondents within ROVER that were involved in the early project phase praised their approach to finding a solution rather than providing a service.

8.10 Resources and Skills

8.10.1 Logistics resources and skills

The objective of the case study with regards to TPL Resources and Skills was first to compile a listing of resources and skills that would correspond to each identified area of logistics sub-process, i.e. logistics systems design, implementation, and operation.

This was achieved by asking the respondents directly what type of resources and skills respectively they thought were necessary to carry out the activities that they had just described. To illustrate what 'organisational resources' meant to respondents, a template for the different types of resources (skills) as synthesised from the literature was presented and explained to the respondent. Thus a list of resources could be compiled that in some areas was more specific to the various areas of logistics

Table 8. 20: Example of Resources and Skills corresponding to the Design of a Logistics System

Area of Logistics Management	Resources	Skills
Design	<p><i>Financial Resources</i> Cash Available Equity Venture Capital Dept Capacity</p> <p><i>Physical Resources</i> Offices and office equipment ICT Transport means Meeting facility</p> <p><i>Technical Resources</i> IT systems Homepage Patent(s) Knowledge Database Expert Software Simulation tools</p> <p><i>Human Resources</i> Logistics Analysts Production Mgr</p>	<p><i>Technical Skills</i> Logistics-/SC Planning Skills Transport Knowledge Warehouse Design Know How Material Handling Knowledge ICT Knowledge Marketing Know How Financial Skills Legal Knowledge Industry Know How</p> <p><i>Conceptual Skills</i> Analytical skills. Ideas and Visions Project Management Skills Political skills Feel for the Market</p> <p><i>Human Skills</i> Social Skills/ Persuasiveness / Ability to empathise Communication skills</p>

	Transport Mgr Financial Analysts Engineer External Specialists <i>Organisational Resources</i> Reputation MIS Training Schemes Inter-organisational Relationship network Physical Network Hierarchical Structure Trustworthiness Team Orientation	Leadership skills Negotiation skills Assertiveness
Implementation	Same	Same
Operation	Same apart from <i>Human resources (in addition):</i> Drivers Warehouse staff	Same

management than the more generic types that emerged from the literature. Table 8.20 gives an example of the Resources and Skills that could be attributed to each logistics sub-process.

8.10.2 Measuring Resources and Skills

Subsequently respondents were asked to evaluate TPL resources and skills. The perceptions of the respondents was categorised in lower and upper extremes for 'Skills' and 'Resources'.

Example:

In your opinion, how well is Exel equipped with these (referring to the examined activity) resources (skills)?

After screening the transcribed answers two commonly used phrase to describe resources and skills prevailed. The term sufficiency was used most with regards to

resources and the term 'adequate' and 'leading edge' was used mostly with regards to skills. Accordingly a lower and upper extreme for measuring resources and skills could be determined (see table 8.21).

Table 8.21: Lower and upper extreme of TPL Resource and Skills Base

	Lower Extreme	Upper Extreme
Resources	<i>Totally insufficient</i>	<i>Excessive Resources</i>
Skills	<i>Totally inadequate</i>	<i>Leading edge</i>

8.10.3 Exel Resources and Skills

The judgement upon Exel's resource and skills was overwhelmingly positive from both sides. From Rover's point of view Exel's resource base was mostly described as being 'absolutely sufficient' whereas most respondents within Exel most commonly described their situation with regards to resources as 'just sufficient'. Only with respect to available staff did the Exel description point to a situation that was characterised by constraints. This was referring though to the overall situation in the company and not specifically to the number of people engaged in the ILC project.

With regards to skills, respondents within ROVER praised very much the team spirit and commitment to project work throughout all phase of the project. These attributes point clearly to the direction of well developed human skills. Highly regarded by respondents within ROVER was also Exel's dedication to a common vision of a solution that had to be created in line with their own strategy but also with a high emphasis on innovation. This status quo of these conceptual skills reflected also in the answers of respondents within Exel. Technical skills or rather excellence in technical skills prevailed mostly with respect to the project management (implementation) phase. Respondents in both organisations accredited Exel Logistics with well developed man management skills especially with regards to the operation of the ILC.

8.11 Logistics Performance

8.11.1 Preset Performance targets

Logistics performance with the inbound supply chain was very much pre-determined by the objectives that were set out at the beginning of the project (see appendix 4 for an illustration of the business case. They are characterised by effectiveness gains through significantly improved material flows (cycle time reduction from parts warehouse to assembly line reduced from 6hrs to 1 hr and more than 50% inventory reduction. Moving suppliers effectively closer to the manufacturing line by introducing 'late configuration' meant that inventory was not just simply pushed up the supply chain, but was actually deleted. Efficiency gains were also realised by eliminating 300 lorry movements per day from internal and local roads. This was a major effect of centralising inbound activities in one location.

8.11.2 Measuring Operational Logistics Performance

Measuring operational logistics performance within the ILC and for the collection service takes place constantly.

Examples of efficiency measures reported by respondents are:

Cost per car and cost per container

Productivity of the workforce (working hours/no.of despatched or received container)

Warehouse utilisation

MHE (material handling equipment) downtime

Recaptured material (cost savings)

Energy consumption

Examples of effectiveness measures reported are:

Labelling errors

Ordering pattern (aim is to achieve stability)

Emergency requests (if stability is not maintained)

Unsatisfied requests

Reported damage incidents

Supplier claims

8.11.3 TPL contribution to Logistics performance

The main result of the case study with respect to the TPL contribution to Logistics performance was that all respondents believed firmly that the influence of Exel logistics was particularly in the early stages of the project. They had impacted mostly through their contribution to the design of the ILC logistics solution. As outlined before the performance capability of the ILC based operation differs immensely from that supporting the previous Rover 800 model. The operational monitoring of logistics performance was also regarded as contributing to overall logistics performance.

8.12 Summarising the case study results

Overall the objectives that were set out for the case study (see chapter 6 and 7) were achieved as far as the comprehension and applicability of the concepts of resources/skills and proactivity is concerned. With respect to enabling a measure for TPL involvement the results have shown that through aggregation of TPL participation in sub-activities a measuring of TPL involvement on the level of sub-processes is possible. An appropriate list of sub-activities that can be attributed to each sub-process was compiled. With respect to the clarification of the conceptual idea of degree of TPL involvement and its dependency on TPL resources and skills it can be concluded that within the limits of this case study and based on the answers of key informants in both organisations, there seemed to be a strong relationship between the resources and particularly the skills of Exel Logistics and the degree to which they were involved in the project. Competence was in all areas of involvement described as being the primary reason for Exel's involvement. This was seen either as competence dependence implied by the strategic decision to outsource (as reflected in operations) or as a source of innovation (as reflected in the design phase). With regards to the hypothesised relationship between the degree of TPL involvement and

logistics performance it can be confirmed that Exel with this case contributed significantly to better overall logistics performance. They had the biggest impact by being involved in the design and consequent implementation of the project.

Chapter 9 Involvement and contribution of TPL providers in Europe – Answering Research Question 1

9.1 Introduction

Chapter 9 presents the results of a first analysis of the survey data aiming to answer Research question 1 as outlined in chapter 7:

RQ 1: How do European shippers and TPL providers perceive the role of TPL providers in logistics systems?

RQ 1 aims to explore how shippers and TPL providers perceive the role of TPL providers. This entails a description of the degree of TPL involvement as it prevailed at the time of the survey sample, as well as a description of how this impacts on logistics performance. This exploration further entails the perception of TPL providers' and shippers' perception of TPL resources and skills and their future development, the relative importance of those, and TPLP's and shippers' perception of TPLP proactive behaviour. Moreover this chapter describes and compares the views of key informants in shipper and TPL organisations within a cross section of European industries regarding TPL involvement and its impact.

9.2 Degree of outsourcing in logistics processes

To measure the degree of outsourcing in a relationship between a TPLP and a shipper (e.g. a production company), logistics management was broken down into 15 management processes (see table 1). Each one of these comprises 8-10 activities that were based on the literature outlined out in chapters 3 and the findings of the case study outlined in chapter 7. Either the shipper or the TPL provider could potentially carry out these activities. If another type of contractor (e.g. a consultant or IT provider) was employed in addition to the TPL provider, this was to be stated explicitly by the respondent. Thus an activity could be potentially be performed by 1 or 2 or three parties. However the interest in this study was solely on the involvement

of TPLP in the examined processes. Respondents were asked which one of these alternatives was true for the TPL relationship they were reporting on. The reported values for TPL participation (either 33 or 50 or 100%) in each activity were weighted equally and subsequently aggregated to reflect a picture of the average degree of outsourcing for each of the 15 management processes. These 15 processes were then equally weighted to give an overall figure for the average degree of outsourcing for the relationship.

9.2.1 Factors determining the degree of outsourcing of logistics processes to TPLPs

Table 9.1: ANOVA – Degree of outsourcing

ANOVA - Degree of outsourcing		Respondent	Industry	IND*RESP
Defining a customer service strategy	Significance	0.05	0.17	0.13
	F-Value	3.85	1.74	1.98
Channel design	Significance	0.19	0.24	0.47
	F-Value	1.74	1.45	0.85
Network design	Significance	0.00	0.06	0.18
	F-Value	27.17	2.57	1.70
Warehouse(management) design	Significance	0.12	0.46	0.31
	F-Value	2.49	0.88	1.23
Transportation Managment Design	Significance	0.00	0.69	0.80
	F-Value	11.90	0.49	0.34
Materials Managment Design	Significance	0.00	0.16	0.34
	F-Value	10.03	1.79	1.14
Implementing Information Systems	Significance	0.00	0.37	0.21
	F-Value	12.15	1.06	1.54
Implementing policies and procedures	Significance	0.03	0.91	0.08
	F-Value	5.08	0.18	2.34
Bringing about organisational change	Significance	0.01	0.11	0.68
	F-Value	7.60	2.06	0.50
Installing warehouses and MHE	Significance	0.14	0.06	0.06
	F-Value	2.18	2.71	2.66
Implementing transport equipment	Significance	0.08	0.86	0.51
	F-Value	3.17	0.26	0.78
Installing IS Hardware	Significance	0.00	0.07	0.37
	F-Value	12.18	2.48	1.07
Operational planning	Significance	0.00	0.32	0.10
	F-Value	14.32	1.20	2.13
Operational execution	Significance	0.01	0.07	0.75
	F-Value	6.27	2.46	0.41
Operational control	Significance	0.00	0.18	0.54
	F-Value	30.32	1.68	0.72

significant at 5% level

significant at 10% level

Analysis of variance was used to identify any significant difference between the data collected from the respondent (shipper or TPL provider) and between industries. Table 9.1 shows the results of the ANOVA for the 15 processes. Figures where the significance level is less than 5% is marked yellow, where it is less than 10% it is marked brown. For the factor 'Industry' there is no evidence to suggest that the samples taken from different industries differ in their population means. Nor is there any evidence for significant interaction between the two factors. This leads to the conclusion that the main effect within the sample is that of different types of respondents, i.e.: shippers and TPL providers. With the exception of the variables '*Channel Design*' and '*Implementing Warehouse and Material Handling Equipment*' these differences appear to be significant in all other areas of TPL involvement. At a 5% significance level they show F ratios of between 3.85 (Outsourcing of *Defining customer service strategy*) and 30.32 (Outsourcing of *Operational Control*). This is enough to conclude that the sample taken from the shippers group and this from the TPL group must be treated as samples with different population means.

The difference between shipper and the TPL sample can to some degree be caused by the sampling procedure. Sampling shippers meant in most cases that only one TPL relationship is the possible subject of examination. This was different within the TPL sample. TPL providers serve usually more than one client. They can also serve these to different degrees and in different areas of logistics. The reason for this might simply be differences in specific customer needs or differences in their customers' attitude towards outsourcing. Or the difference might occur through recent developments of TPL providers' competence that hasn't proliferated amongst all customers. For some they may thus act 'only' as provider of transport capacity available on a spot-basis, for others they might act as contract distributors and for other clients again they might be the general source logistics knowledge. Berglund (2000) and other writers (for example: Sheffi, et al, 1990, Van Damme, 1996) have already pointed to the fact that TPL providers are with respect to the services they offer still on a path of development and thus quite diverse. TPLP respondents were allowed to choose between several relationships which one to report. And for reasons of self-portrayal they would tend to choose one with a high degree of outsourcing, particularly in areas, which are traditionally less outsourced (e.g. strategic decisions).

Table 8.2 and figure 8.1 confirm that the average degree of outsourcing reported by TPLPs is higher than that reported by shippers in every examined logistics process.

9.2.2 TPL participation seen from two perspectives

The following proposition was put forward to support the research question:

Proposition 1: The measurable degree of TPL involvement is higher for TPL respondents than for shipper respondents.

As outlined it was assumed that respondents in the shipper organisations would naturally have not much choice in the TPL relationships they could report about, whereas TPL respondents had a choice of relationships they could potentially report upon. It can be conjectured that they would report on these that reflected a high degree of involvement.

In a first observation one can see (table 8.2) in both groups of the sample that different areas of logistics management feature different degrees of outsourcing. This means that on average outsourcing was found to be more popular for some logistics.

Table 9. 2: Degree of logistics outsourcing

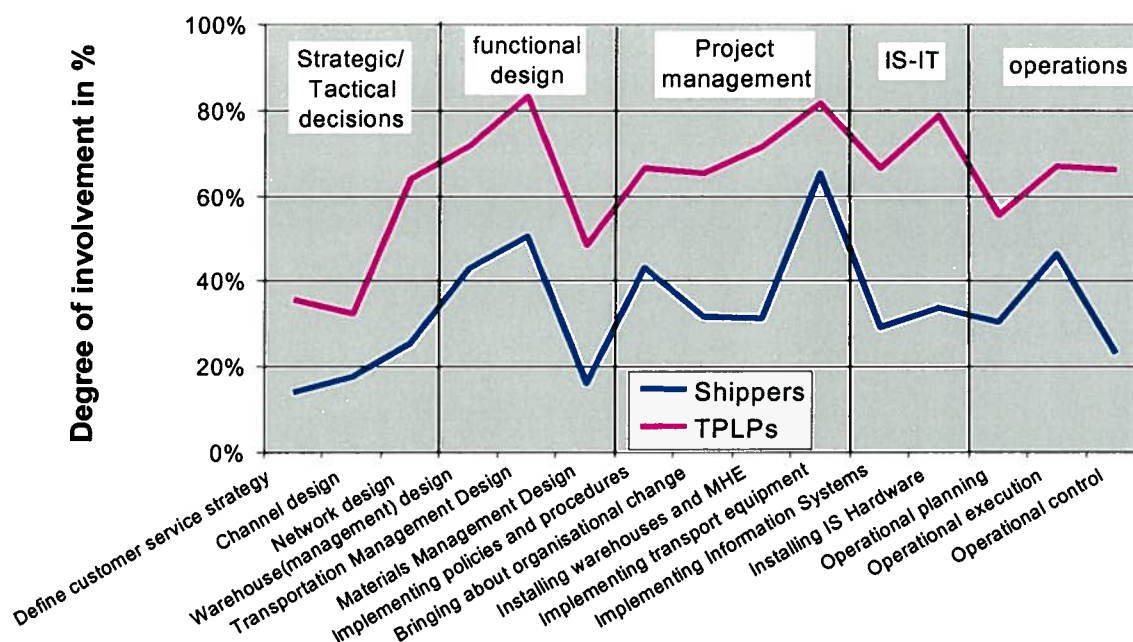
Degree of logistics outsourcing		Shippers		TPLPs	
Management level	Logistics processes	means	Std. Dev.	means	Std. Dev.
Strategic/ tactical	Defining a customer service strategy	13.8%	18.5%	35.5%	25.4%
	Channel design	17.6%	24.8%	32.2%	32.1%
	Network design	25.5%	31.1%	63.8%	29.6%
Functional design	Warehouse(management) design	42.9%	30.6%	71.7%	29.6%
	Transportation Managment Design	50.2%	34.2%	83.1%	24.7%
	Materials Managment Design	15.8%	22.4%	48.3%	35.0%
Project management	Implementing policies and procedures	43.1%	33.4%	66.3%	30.0%
	Bringing about organisational change	31.4%	28.8%	65.3%	28.1%
	Installing warehouses and MHE	31.3%	40.5%	71.5%	39.3%
	Implementing transport equipment	65.3%	43.4%	81.7%	33.0%
IS	Implementing Information Systems	29.3%	26.0%	66.5%	27.3%
IT	Installing IS Hardware	33.8%	33.2%	78.6%	30.7%
Operations	Operational planning	30.4%	18.9%	55.4%	21.1%
	Operational execution	46.3%	18.0%	66.9%	20.0%
	Operational control	23.1%	16.8%	66.1%	27.0%

processes than for others. Furthermore Table 9.2 shows that the mean degree of outsourcing of logistics processes within the shippers' sample is lower overall than that in the TPLP sample. This becomes even more apparent in Figure 9.1 (see below). Proposition 1 could thus be accepted.

It can further be observed that in some areas of logistics management the relative difference in degrees of outsourcing between the two samples is smaller than in others. This appears to be so particularly in the areas '*functional design transport management*', '*Implementation of transport equipment*' and '*Operational execution*'. This reflects the fact that these areas of logistics management have already a long history as most commonly outsourced logistics activities, which is consistent with previous findings (Maltz, 1993). It is thus not surprising to see little or less difference between the sample means in these areas.

Table 9.2 shows also a very high standard deviation for each variable relative to the

Figure 9.1: Mean TPL participation in logistics processes



mean in both the shipper and the TPLP sample. This reveals that there is considerable variation found in involvement and also gives rise to the question whether there are any more meaningful ways of dividing the sample. The variation found in the sample makes it impossible to conclude a particular degree of outsourcing for all existing

TPL relationships. It rather means that TPL relationships vary to a great extent all over Europe. Using a measure of outsourcing it becomes however apparent that there are TPL relationships that can be very far reaching comprising traditional and non-traditional areas for outsourcing and TPL relationships that can be less far reaching. Furthermore the differences in the degree of outsourcing between shipper respondents and TPL respondents is a grouping that, if the hypothesised model is true, should at least indicatively be reflected in the examination of the sample with regards to logistics competences and TPL proactive behaviour i.e., TPL respondents should on average report a higher logistics competence as well as more proactive behaviour than shippers.

9.3 *Logistics competence of TPL providers today and in the future*

The logistics competence of a TPL provider can be defined as reported sufficiency in a set of resources and adequacy in a set of skills relevant to different logistics processes and activities (see Chapter 3). Respondents in the survey were thus asked about the importance and the sufficiency/ adequacy of TPL resources and skills today and in future.

9.3.1 Relative importance of different resources and skills

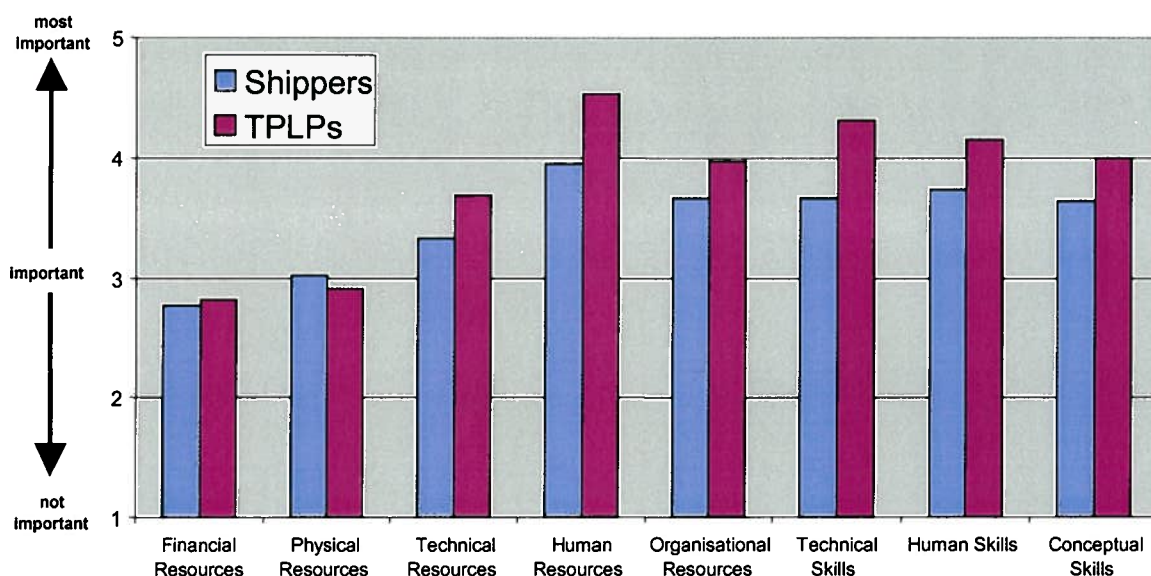
The following proposition with respect to the relative importance of resource and skills was put forward:

Proposition 2: The perception of the relative importance of resources and skills in designing, implementing and operating logistics systems does not on average differ between TPL respondents and shipper respondents.

In the survey respondents were asked how important they would rate a predefined set of resources and skills (see table 9.3 for the list) that corresponded to a particular set of sub-processes (design, implementation or operation) within their logistics system. on a 5-point Lickert scale ranging from 'not at all important' to 'most important'.

Resources and skills that were rated 3.5 and more were classed as critical to the relevant process. These are marked yellow in Table 9.3. Human and organisational resources and technical and human skills are perceived as critical in all phases of logistics management. Technical Resources are seen as critical for the implementation and operation of a logistics system, but not for the design phase. Physical Resources are seen as critical only for operations. Conceptual skills are perceived as critical only for the design of a logistics system. Furthermore conceptual skills are considered to be more important in the design phase than in the implementation phase and they are regarded of less importance in the operational phase. Physical and technical resources are regarded as more important in the operational phase than in the design or implementation phase (see Figures 9.2, 9.3, 9.4).

Figure 9.2: Relative importance of resources and skills when designing a logistics system



TPL providers perceive financial resources necessary to implement logistics system as more important than shippers; a fact that can perhaps be explained by the nature of the outsourcing process. Shippers transfer more and more of the burden of financial capital assets to TPL providers. Surveys in the US showed for the years 1999 and 2000 a reduction of capital assets of 20 /18 percent (Lieb,R, Miller,J., 2000).

Financial Resources necessary to implement logistics systems, i.e. warehouses, transport equipment etc. become consequently more important for TPL providers (see Figure 9.3).

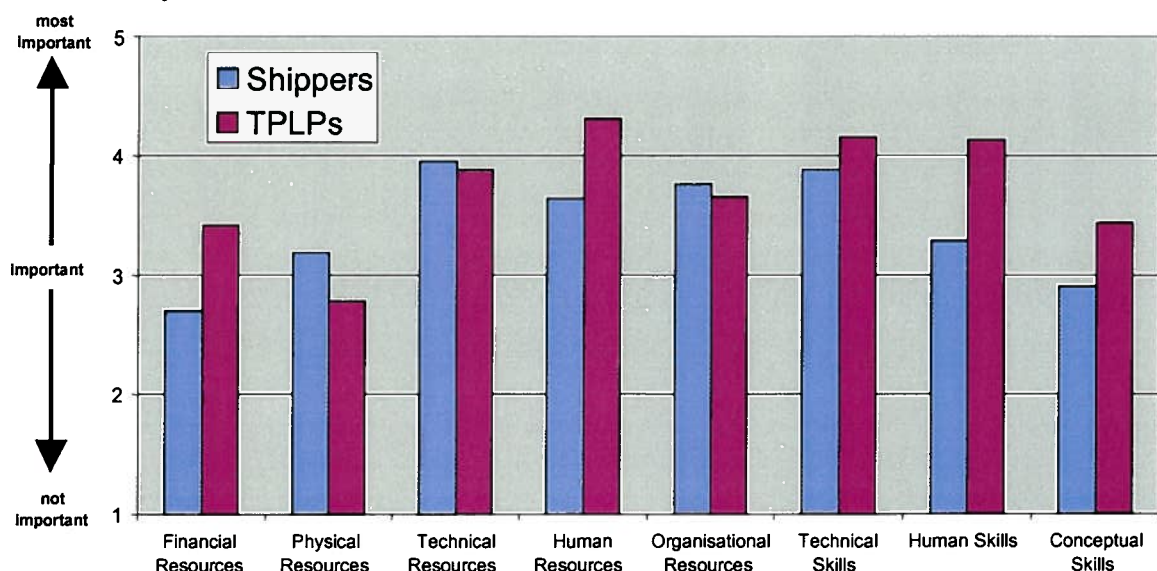
TPL providers rate human resources and skills higher overall, although both, shippers and TPL providers see them as critical (see Figures 9.2, 9.3, 9.4 and table 9.4). This

Table 9.3: Critical resources and skills

Importance of TPL Resources and Skills	Design				Implementation				Operation			
	Shippers		TPLPs		Shippers		TPLPs		Shippers		TPLPs	
	mean	Std.E	mean	Std.E	mean	Std.E	mean	Std.E	mean	Std.E	mean	Std.E
Financial Resources	2.76	0.17	2.81	0.20	2.69	0.14	3.41	0.19	3.05	0.21	2.94	0.18
Physical Resources	3.02	0.15	2.91	0.20	3.19	0.16	2.78	0.17	3.57	0.17	3.78	0.17
Technical Resources	3.33	0.14	3.48	0.17	3.95	0.11	3.88	0.14	3.95	0.12	4.09	0.13
Human Resources	3.95	0.10	4.53	0.10	3.64	0.10	4.31	0.14	3.62	0.12	4.34	0.12
Organisational Resources	3.67	0.15	3.97	0.13	3.76	0.12	3.66	0.15	3.52	0.13	3.38	0.13
Technical Skills	3.67	0.13	4.31	0.11	3.88	0.12	4.16	0.13	3.64	0.14	3.22	0.13
Human Skills	3.74	0.12	4.16	0.13	3.29	0.15	4.13	0.13	2.98	0.17	3.97	0.13
Conceptual Skills	3.64	0.14	4.00	0.15	2.90	0.18	3.44	0.17	2.98	0.09	3.09	0.14

emphasis might be a pointer to current perceived deficiencies that therefore become a particular focus revealing not just the relative importance for the corresponding processes or areas in logistics management but also for organisational development.

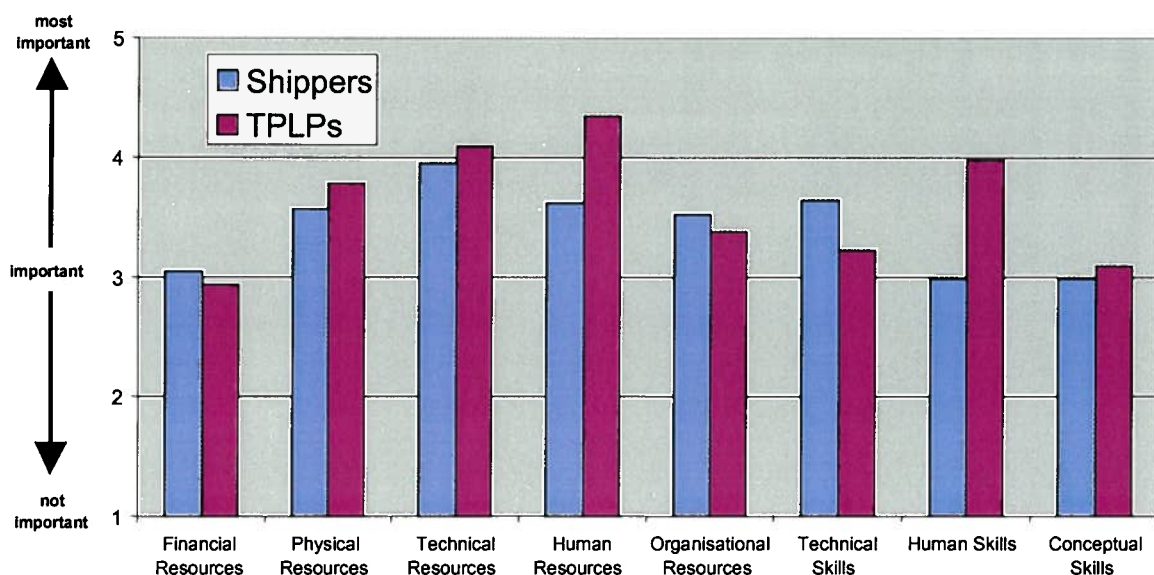
Figure 9.3: Relative importance of resources and skills when implementing a logistics systems



An understanding of the relative importance of logistical resources and skills is important for both shippers and TPL providers, because outsourcing as a strategic

concept is still developing (Skjoett-Larsen, T., 2000, Lieb et al, 2000). For TPLPs it is therefore particularly important to understand those areas of logistics management that could potentially be outsourced. This also requires of course an understanding of the relative importance of the necessary resources and skills to exploit this potential. This might boost development in areas of logistics where TPLPs have traditionally less expertise. On the other hand knowledge about the perception of specific skill and resources by shippers might help TPLPs to convince shippers of their better understanding of and competence in certain logistics processes.

Figure 9.4: Relative importance of resources and skills when operating a logistics system



With one exception ANOVA of the variables depicted in table 9.4 shows that on average respondents in all sampled industries are having the same view on the relative importance of resources and skills necessary for logistics management. Respondents in the food and food retail industry perceive organisational resources significantly more important than respondents in the electronics industry (see Table 9.5). It can only be speculated why this difference in perception occurred. Overall respondents of

Table 9. 4: ANOVA of relative importance of Resources and Skills

ANOVA		Design Phase			Implementation Phase			Operational Phase		
Resource/Skill Importance		Respondent	Industry	IND*RESP	Respondent	Industry	IND*RESP	Respondent	Industry	IND*RESP
Financial Resources	Significance	0.51	0.60	0.29	0.04	0.83	0.29	0.55	0.34	0.09
	F-Value	0.44	0.63	1.27	4.41	0.30	1.29	0.36	1.13	2.24
Physical Resources	Significance	0.79	0.94	0.74	0.26	0.86	0.54	0.25	0.24	0.07
	F-Value	0.07	0.14	0.41	1.27	0.25	0.73	1.33	1.42	2.48
Technical Resources	Significance	0.11	0.47	0.71	0.81	0.82	0.79	0.68	0.93	0.86
	F-Value	2.68	0.85	0.46	0.06	0.31	0.35	0.17	0.14	0.25
Human Resources	Significance	0.02	0.25	0.81	0.00	0.23	0.29	0.00	0.68	0.67
	F-Value	6.23	1.39	0.32	13.07	1.49	1.27	11.82	0.51	0.52
Organisational Resources	Significance	0.75	0.81	0.49	0.27	0.02	0.58	0.31	0.47	0.45
	F-Value	0.10	0.33	0.81	1.23	3.50	0.66	1.04	0.86	0.90
Technical Skills	Significance	0.07	0.81	0.70	0.07	0.54	0.67	0.09	0.95	0.95
	F-Value	3.52	0.32	0.48	3.36	0.73	0.51	3.03	0.11	0.11
Human Skills	Significance	0.59	0.27	0.72	0.01	0.95	0.76	0.02	0.20	0.44
	F-Value	0.29	1.33	0.45	6.86	0.11	0.40	5.29	1.61	0.91
Conceptual Skills	Significance	0.28	0.11	0.74	0.29	0.18	0.56	0.56	0.08	0.33
	F-Value	1.17	2.08	0.42	1.15	1.67	0.69	0.33	2.31	1.16

significant at 5% level

significant at 10% level

all industries seem to have the same perception of the relative importance of TPL resources and skills. For shippers and TPL providers ANOVA shows significant

Table 9. 5: Comparison of resource/skill import between industries**Multiple Comparisons**

Dependent Variable: Importance Organisational Implem. Resources

Bonferroni

(I) Industries	(J) Industries	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Automotive	Chemicals	-.1333	.3105	1.000	-.9780	.7113
	Electronics	.5867	.2555	.149	-.1083	1.2816
	Food(etail)	-8.9855E-02	.2596	1.000	-.7961	.6164
Chemicals	Automotive	.1333	.3105	1.000	-.7113	.9780
	Electronics	.7200	.2830	.080	-4.9899E-02	1.4899
	Food(etail)	4.348E-02	.2868	1.000	-.7366	.8235
Electronics	Automotive	-.5867	.2555	.149	-1.2816	.1083
	Chemicals	-.7200	.2830	.080	-1.4899	4.990E-02
	Food(etail)	-.6765*	.2260	.023	-1.2913	-6.1720E-02
Food(etail)	Automotive	8.986E-02	.2596	1.000	-.6164	.7961
	Chemicals	-4.3478E-02	.2868	1.000	-.8235	.7366
	Electronics	.6765*	.2260	.023	6.172E-02	1.2913

Based on observed means.

*. The mean difference is significant at the .05 level.

differences in perception of importance of financial, implementation resources, human resources throughout all phases, and human skills necessary to implement and operate a logistics system. Further more a significant difference in the perception of the relative importance of technical skills can be observed.

The proposition that shippers as well TPL providers showed no difference in the perception of the relative importance in resources has thus to be rejected. TPL providers put apparently more emphasis on the relative importance of Human Resources and Human skills than shippers, whereas shippers perceive technical skills throughout each phase significantly more important than TPL providers. This could hint at an area of constraint with TPL organisations with respect to Human resources and skills and a similar constraint with regards to Technical skill on the shippers' side. The different significantly higher perception of relative importance of financial implementation resource by TPL providers could simply reflect the fact that TPL providers usually experience demand for finance when facilities and equipment such as trucks and warehouses etc have to be implemented. Particularly when equipment is dedicated this means considerable expense.

9.3.2 Third Party Logistics service Providers' Resources and Skills today and in future

The following two propositions were put forward to support the research question:

Proposition 3: The perception of current sufficiency of resources and skills is on average lower within the shipper sample than in the TPL sample.

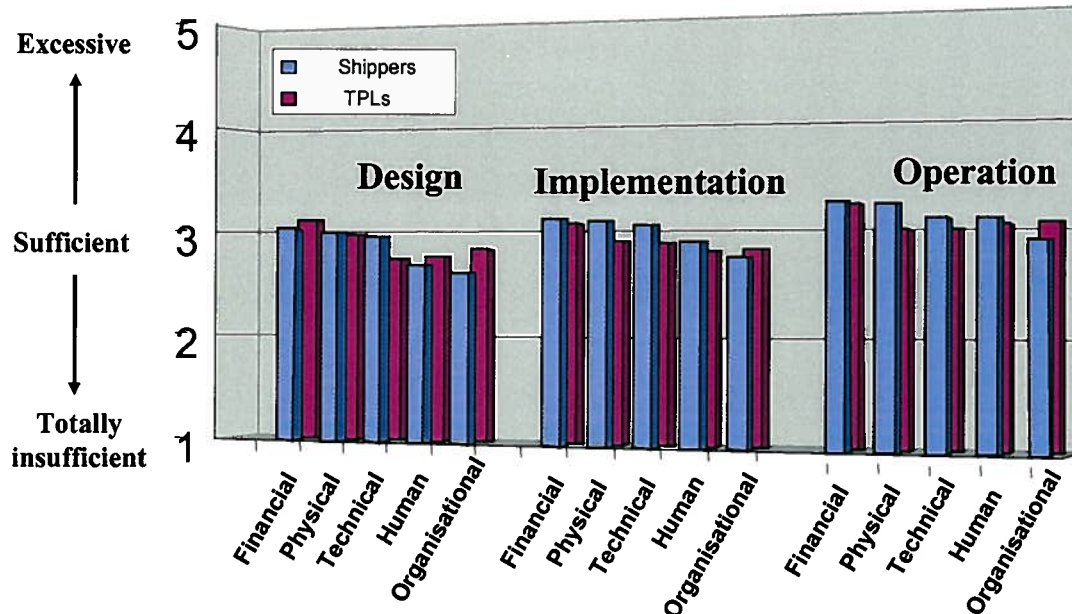
Proposition 4: Predictions about future developments of TPL resources and skills do not on average differ between respondents in the shipper and the TPL sample.

Respondents in the survey were asked how sufficient/adequate they perceived TPLP resources and skills in their TPL relationship at present and how they expected these to develop within the next 5 years.

On average both types of respondents, shippers as well as TPL providers, perceive most of TPL providers' current resources to be 'sufficient' for the design and implementation and operation of logistics systems (see figure 9.5). Marginal deficiencies (i.e a score just under 3) can on average be identified in human and organisational resources - resources that are perceived to be of great importance (see

table 9.6). Future expectation on the development of these is seen positively whereby third-party

Figure 9.5: Comparison of shipper and TPL provider views on the TPL providers' current resources



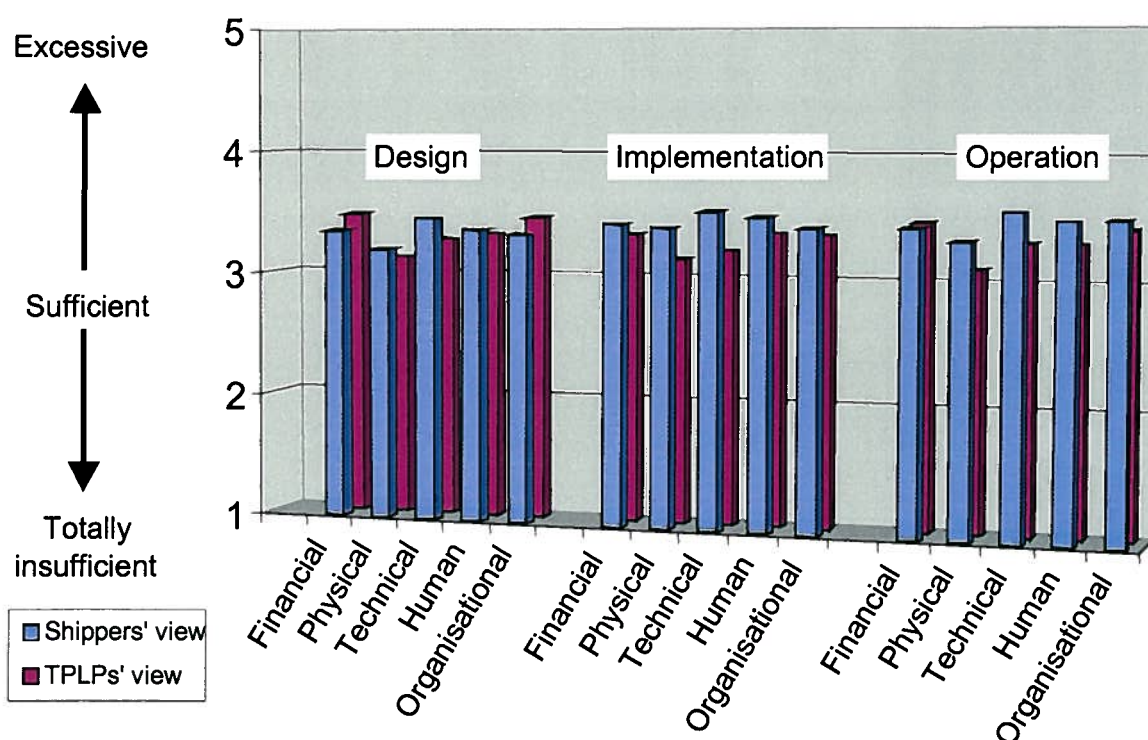
logistics providers rate their own capability of developing (or acquiring) these resources slightly more conservatively (see figure 9.6).

It must, however, be noted that TPL providers can only perform efficiently if their resources are utilised to a maximum i.e. they have to be equipped with resources just sufficient enough, to carry out tasks for their clients in the most efficient way. Berglund (2000) points already out that there seems to be an everlasting conflict of interest between shippers and TPLPs with regards to 'overstocking of resources' – shippers have the tendency to demand from their providers more flexibility, but are on the other hand not willing to pay for excessive resources. This becomes particularly apparent in the areas of cost intensive physical and human resources. Achieving better efficiency is, however, commonly recognised as one of the main reasons for outsourcing in logistics (Sheffi, 1990, Lieb et al, 1990,1993, 1997,2000). It can therefore be expected that the gap between shippers' expected level of resources and TPLPs recognition of this will be maintained.

Table 9.6: Current and future sufficiencies of TPL resources

Skills	Current				In future			
	Shippers		TPLPs		Shippers		TPLPs	
	mean	StdE	mean	StdE	mean	StdE	mean	StdE
<i>Design</i>								
Financial	3.143	0.09	3.094	0.14	3.357	0.11	3.5	0.12
Physical	3.214	0.11	2.938	0.10	3.214	0.1	3.188	0.10
Technical	3.19	0.12	2.84	0.10	3.45	0.14	3.31	0.12
Human	2.90	0.10	2.72	0.14	3.38	0.14	3.34	0.15
Organisational	2.86	0.10	2.88	0.12	3.33	0.09	3.44	0.10
<i>Implementation</i>								
Financial	3.29	0.08	3.03	0.13	3.45	0.11	3.38	0.12
Physical	3.24	0.09	2.81	0.11	3.43	0.11	3.16	0.10
Technical	3.14	0.11	2.88	0.12	3.55	0.13	3.25	0.13
Human	3.07	0.09	2.81	0.14	3.52	0.10	3.38	0.15
Organisational	2.98	0.08	2.91	0.12	3.43	0.11	3.38	0.10
<i>Operation</i>								
Financial	3.02	0.09	3.22	0.09	3.45	0.10	3.50	0.10
Physical	3.12	0.11	3.18	0.09	3.36	0.10	3.09	0.09
Technical	3.09	0.14	2.94	0.10	3.57	0.13	3.34	0.11
Human	3.10	0.10	3.00	0.13	3.52	0.09	3.25	0.14
Organisational	2.81	0.11	3.06	0.12	3.52	0.10	3.38	0.10

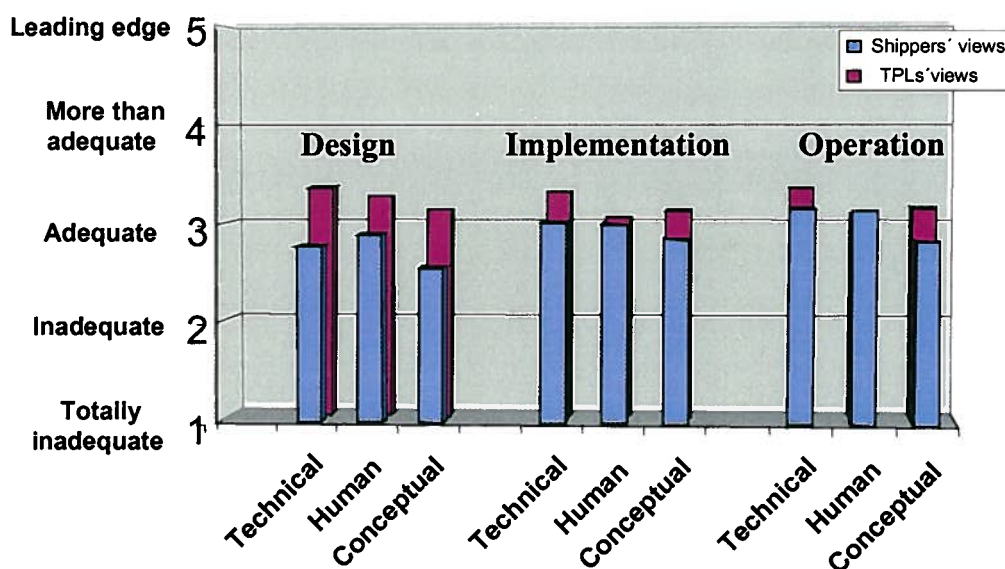
Figure 9.6: Comparison of shipper and provider views on the providers' future resources



With regards to skills, shippers on average believe that TPL service providers currently lack to some extent the necessary skills to design logistics systems (see figure 9.7). 'Lack' is defined here as a mean score of less than 3. In all phases (design, implementation and operation of a logistics system) shippers also perceive a slight lack of conceptual skills (see table 9.7). Third-party logistics service providers believe that they are presently at least adequately equipped (i.e. a mean score over 3) with human, technical and conceptual skills, throughout all phases. They also perceive themselves on average not sufficiently equipped with the necessary personnel (see table 9.6). This reflects TPLPs' competence in a qualitative sense, but marks their incompetence to respond to the quantitative demand for TPL managed processes. This again can be an inhibiting factor to the degree to which at least some clients outsource these processes and thus be reflected in the average degree of outsourcing.

On average both types of respondents see TPLP's skills developing towards a level of adequacy (see figure 9.8). With regards to skills necessary to implement and operate logistics systems the differences between shippers' and TPLPs' perceptions seems to be only marginal, whereas developments in skills necessary to design logistics

Figure 9.7: Comparison of shipper and providers views on the providers' current skills

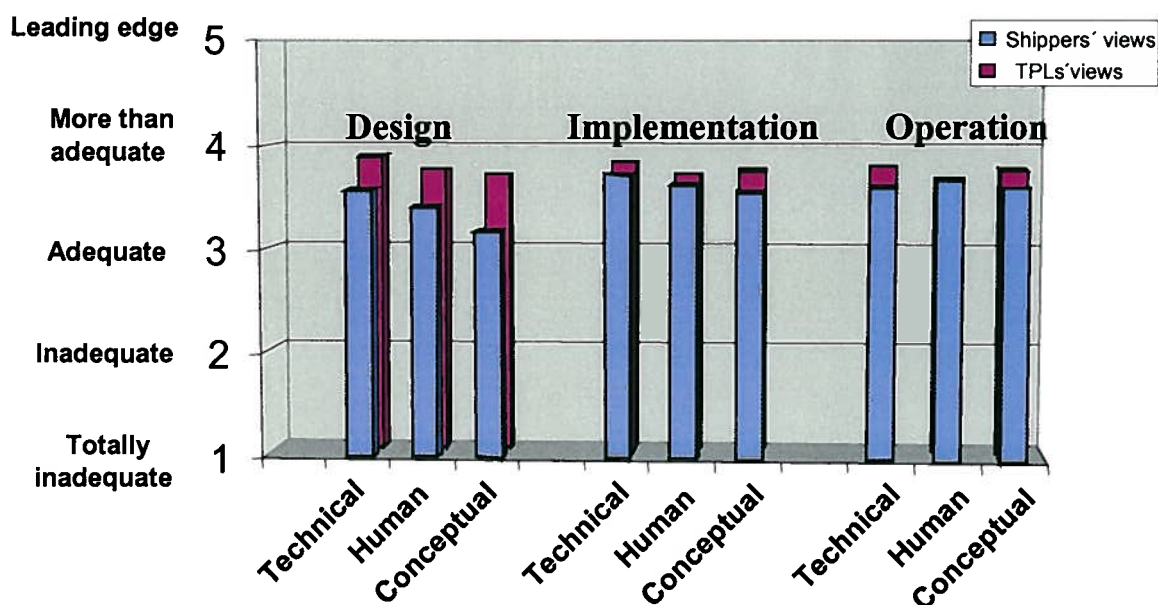


systems are clearly seen less optimistically by shippers than by TPLPs themselves. It is impossible to say though whether third party logistics service providers misjudge their ability to develop better skills or whether shippers underestimate this ability.

Table 9.7: Current and future TPL skills

Skills	Current				In future			
	Shippers		TPLPs		Shippers		TPLPs	
<i>Design</i>	mean	StdE	mean	StdE	mean	StdE	mean	StdE
Technical	2.81	0.10	3.35	0.14	3.57	0.14	3.94	0.15
Human	2.93	0.11	3.28	0.13	3.40	0.11	3.78	0.13
Conceptual	2.61	0.13	3.12	0.15	3.19	0.15	3.84	0.15
<i>Implementation</i>								
Technical	3.12	0.09	3.24	0.13	3.74	0.11	3.94	0.15
Human	3.17	0.09	3.00	0.15	3.64	0.10	3.75	0.13
Conceptual	2.90	0.11	3.12	0.13	3.57	0.10	3.88	0.13
<i>Operation</i>								
Technical	3.12	0.12	3.32	0.12	3.62	0.10	3.88	0.15
Human	3.08	0.15	3.06	0.13	3.52	0.09	3.69	0.12
Conceptual	2.78	0.11	3.19	0.13	3.45	0.10	3.68	0.14

Figure 9.8: Comparison of shipper and provider views on the service providers' future skills



The ANOVA (table 9.8) of the perception of current sufficiency / adequacy of TPL resources and skills shows no significant difference between type of respondent and industry.

Table 9. 8: ANOVA current sufficiency/adequacy of TPL resources and skills

ANOVA - Current TPL		Design Phase			Implementation Phase			Operational Phase		
Resource/Skill sufficiency/adequacy		Respondent	Industry	IND*RESP	Respondent	Industry	IND*RESP	Respondent	Industry	IND*RESP
Financial Resources	Significance	0.88	0.24	0.19	0.25	0.50	0.33	0.42	0.92	0.50
	F-Value	0.02	1.45	1.62	1.36	0.80	1.15	0.65	0.17	0.80
Physical Resources	Significance	0.29	0.77	0.27	0.07	0.29	0.69	0.33	0.96	0.91
	F-Value	1.15	0.38	1.35	3.44	1.27	0.50	0.95	0.11	0.18
Technical Resources	Significance	0.16	0.51	0.62	0.04	0.72	0.32	0.17	0.77	0.23
	F-Value	2.00	0.78	0.60	4.37	0.45	1.20	1.89	0.38	1.46
Human Resources	Significance	0.57	0.71	0.53	0.05	0.37	0.26	0.16	0.93	0.91
	F-Value	0.32	0.46	0.74	3.82	1.06	1.38	2.00	0.14	0.18
Organisational Resources	Significance	0.34	0.61	0.34	0.17	0.31	0.42	0.39	0.21	0.70
	F-Value	0.92	0.61	1.13	1.94	1.23	0.95	0.75	1.54	0.47
Technical Skills	Significance	0.19	0.60	0.41	0.11	0.47	0.96	0.00	0.40	0.46
	F-Value	1.74	0.63	0.97	2.56	0.85	0.10	12.10	1.00	0.88
Human Skills	Significance	0.43	0.58	0.92	0.60	0.96	0.06	0.07	0.60	0.22
	F-Value	0.64	0.66	0.16	0.28	0.10	2.57	3.42	0.63	1.52
Conceptual Skills	Significance	0.08	0.59	0.31	0.03	0.68	0.05	0.02	0.99	0.23
	F-Value	3.19	0.65	1.23	4.84	0.51	2.73	5.46	0.05	1.49

significant at 5% level

significant at 10% level

Differences in perception of some current resources and skills occur between shippers and TPL providers in the implementation and operational phase. Anticipation about the future development of TPL resources and skills seem to be the same between shippers and TPL providers across all industries (see table 9.9). In contrast to the perceptions about the current and future resource sufficiency there appear to be more significant differences between the average shippers' and the average service providers' perception of the TPLP's current skills (See figure 9.7) whereas their future likelihood of development is seen by both respondents in the same way (See table 9.7). TPL providers rate their adequacy of skills apparently higher than shippers do this.

Table 9. 9: ANOVA future sufficiency/adequacy of TPL resources and skills

ANOVA - Future		Design Phase			Implementation Phase			Operational Phase		
Resource/Skill sufficiency/adequacy		Respondent	Industry	IND*RESP	Respondent	Industry	IND*RESP	Respondent	Industry	IND*RESP
Financial Resources	Significance	0.22	0.98	0.28	0.76	0.97	0.59	0.42	0.83	0.50
	F-Value	1.56	0.06	1.30	0.09	0.09	0.64	0.66	0.29	0.79
Physical Resources	Significance	0.67	0.73	0.33	0.15	0.66	0.72	0.15	0.91	0.75
	F-Value	0.19	0.43	1.16	2.13	0.53	0.44	2.17	0.18	0.40
Technical Resources	Significance	0.39	0.58	0.75	0.15	0.58	0.74	0.18	0.63	0.77
	F-Value	0.74	0.65	0.41	2.15	0.66	0.42	1.86	0.59	0.38
Human Resources	Significance	0.79	0.96	0.62	0.89	0.48	0.73	0.12	0.69	0.95
	F-Value	0.07	0.10	0.60	0.02	0.83	0.43	2.55	0.50	0.12
Organisational Resources	Significance	0.32	0.67	0.47	0.78	0.47	0.69	0.86	0.28	0.89
	F-Value	1.00	0.53	0.85	0.08	0.86	0.48	0.03	1.30	0.21
Technical Skills	Significance	0.64	0.27	0.49	0.94	0.65	0.53	0.81	0.61	0.76
	F-Value	0.23	1.33	0.82	0.01	0.55	0.75	0.06	0.61	0.39
Human Skills	Significance	0.05	0.53	0.17	0.40	0.61	0.30	0.70	0.73	0.69
	F-Value	4.01	0.75	1.73	0.72	0.61	1.26	0.15	0.43	0.49
Conceptual Skills	Significance	0.09	0.38	0.35	0.63	0.32	0.74	0.93	0.35	0.68
	F-Value	2.91	1.04	1.12	0.24	1.18	0.42	0.01	1.11	0.50

significant at 5% level

significant at 10% level

This means that with respect to the perception of current TPL resources and skills the shipper sample differs from the TPL sample. Proposition 3 can thus be accepted. In

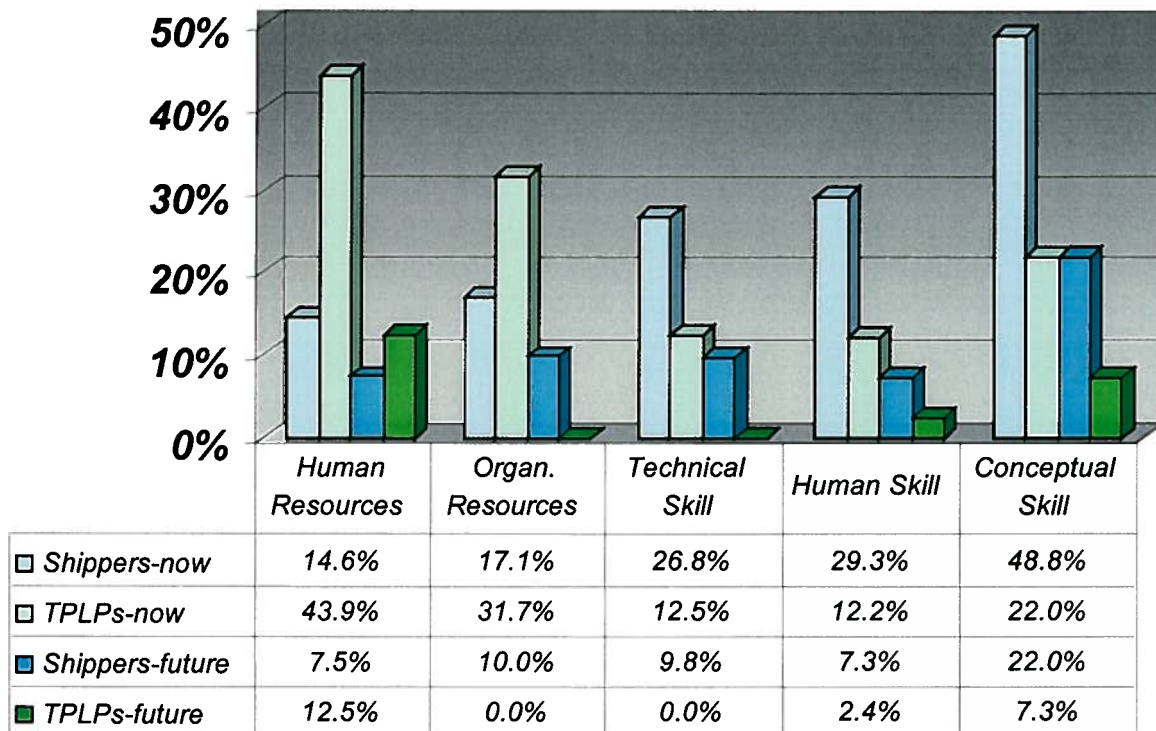
the light of the difference in the degree of participation (see 9.2) this points indeed to a possible relationship between the degree of participation in logistics processes and logistics competence. Proposition 4 can also be accepted, which can be interpreted as a common view of shippers and TPL providers on the development of TPL resources and skills.

A first analysis of the resources and skills base of TPLPs revealed deficiencies in some areas and more than sufficiency in other. The view on the pure averages of resources and skills reported by shippers or TPLPs is however limited in its interpretation of the status quo of skills and resources amongst TPLPs in general. A look at the set of proportion of respondents that perceived critical resources and skills to be not sufficient and also at the set of proportion of respondents who report excellence in crucial skills might be more enlightening.

9.3.3 Deficiencies of TPL Resources and Skills

Figure 9.9 depicts the responses of the set proportion of respondents that have perceived resources and skills that are critical to the design process of a logistics system and which they regard as insufficient or totally insufficient. Critical, as already pointed out under 9.3.1 are those resources and skills that were rated on average above 3.5 on a 5-point Lickert scale for relative importance. It becomes apparent that TPLPs identify their main deficiencies in the area of design as their human and organisational resources. On the other side shippers perceive the providers' biggest deficiencies in skills – technical, human and conceptual. This means that TPL incompetence is from a shippers' point of view clearly seen as a matter of missing skills and capabilities rather than resources. TPLPs have of course a different rather more differentiated view on their deficiencies and see their lack of skill more rooted in the shortage of personnel and internal organisational structures.

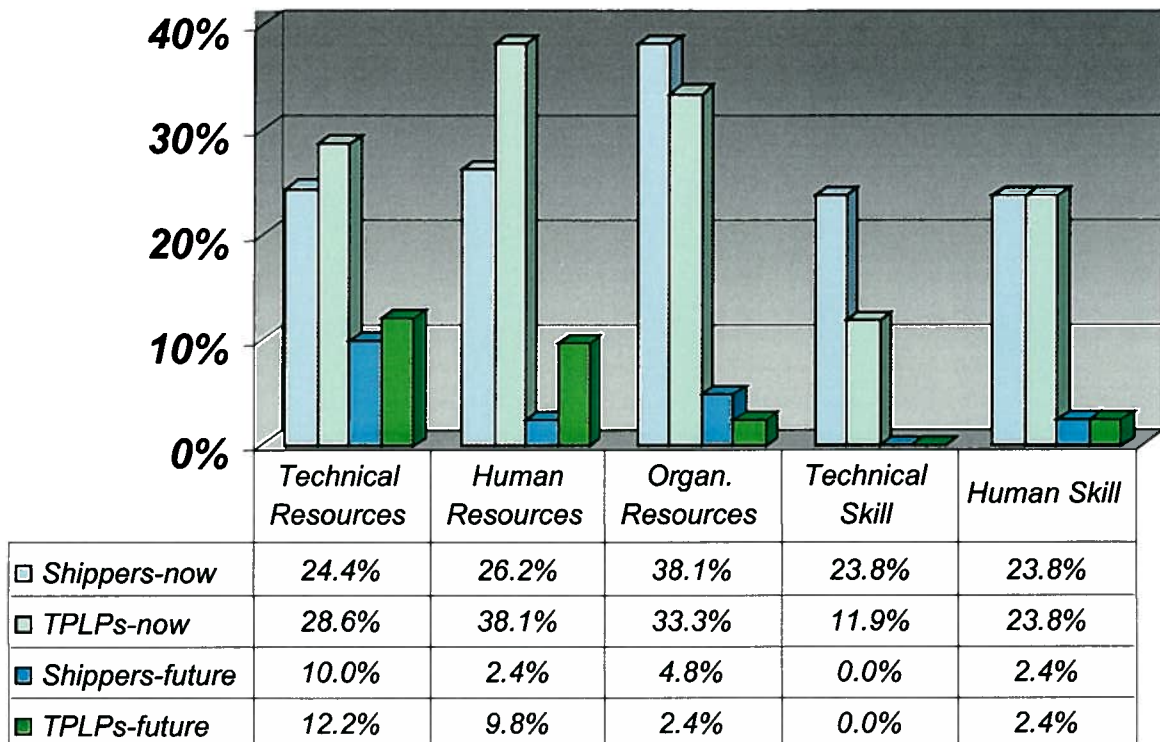
For the future both sets of respondents see a strong reduction in the deficiencies in TPLP resources and skills that are necessary to design logistic systems. Areas that remain a problem are human resources from the TPLP point of view (12% of TPLPs see a human resources deficit also in future), and conceptual skills from a shippers'

Figure 9.9: Deficiencies in critical design resources and skills - now and in future

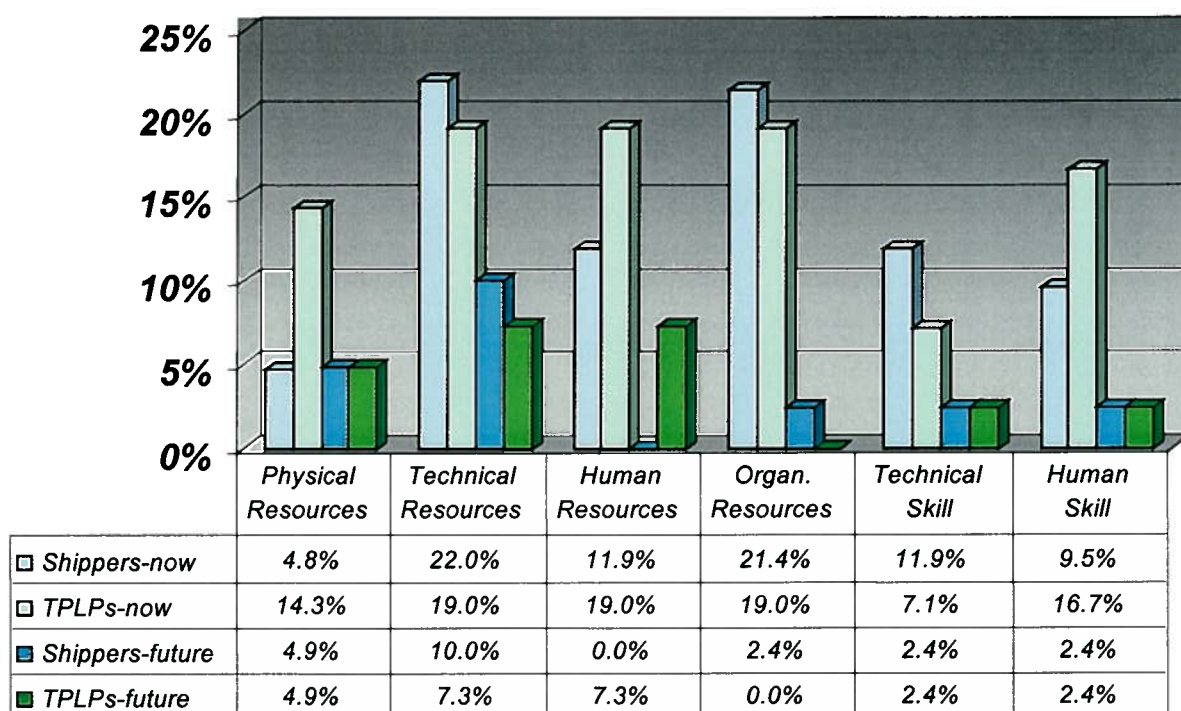
point of view. Currently nearly 50% of shippers regard conceptual skills as insufficient, and 22% of shippers believe that TPLPs will not be able to develop sufficient conceptual skills to design logistics systems.

With respect to resources and skills that are critical for the implementation of logistics systems (figure 9.10) deficiencies seem to be perceived by shippers and TPLPs at a similar level and this for the present as well as for the future anticipated state of TPLP resources. Areas of proportionally bigger differences are the current perceptions about technical skills and again human resources. More shippers (23%) than TPLP (12%) see technical skills as an area of deficiency and more TPLPs (38%) than shippers (26%) see human resources as a main problem area. This could be explained again by the tendency of shippers to judge TPLPs competence more from a qualitative point of view rather than differentiating between the qualitative and quantitative elements that constitute logistics competence. Shippers as well TPLPs seem to be convinced that TPLPs are able to cut back dramatically on their deficiencies. Areas that will remain rudimentary short are from a TPLPs' point of view human resources, and technical resources from both perspectives.

Figure 9.10: Deficiencies in critical implementation resources and skills - now and in future



Compared to the design and implementation of logistics systems much lower deficiency ratings can be observed for resources and skills that are critical for the operation of logistics systems (see figure 9.11). This also reflects the fact that this is the area with the highest level of outsourcing and thus confirms the assumption of some correlation between level of outsourcing and logistics competence. The number of shippers and TPLPs that claim to see deficits of TPLP resources and skills in this area hardly exceed 20%. Deficiencies of this scale are from only perceived for technical and organisational resources (both types of respondents). From the TPLPs' point of view human resources resembles also a problem area of similar significance. With the exception of technical resources there seems to be a common anticipation that these deficiencies disappear in future. The sustaining deficit in human resources reflects also the uncertainty about the availability of qualified operational personnel an issue that seems particularly critical with regards to drivers in Europe (Meczes, 2001).

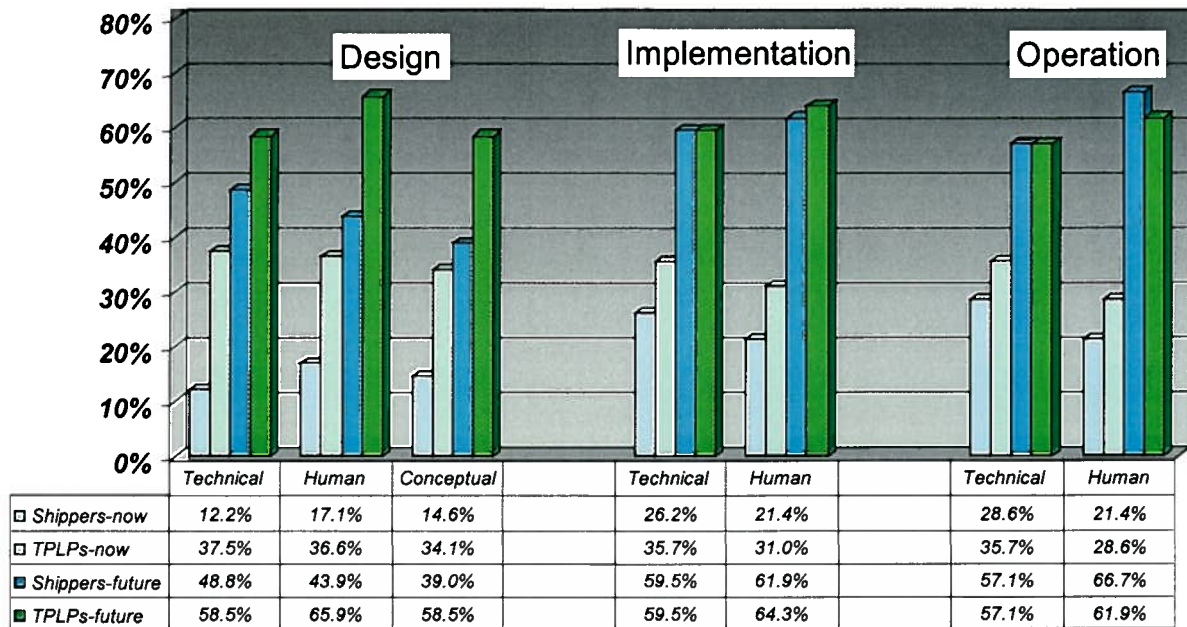
Figure 9.11: Deficiencies in critical operational resources and skills - now and in future

9.3.4 Strengths in TPLP skills

Figure 9.12 depicts the proportion of respondents that perceived TPLP skills as either 'more than adequate' or as 'leading edge'. Only skills that are regarded critical to the relevant process phases are examined, because it is assumed that these are the set of skills where TPLPs have sought to achieve higher than average skill levels.

First of all there seems to be an overwhelming assumption by both shippers as well as TPLPs in the continuing future improvement of TPL capabilities. At least in implementing and operating logistics systems between 60% and 66% of surveyed shippers and TPLPs believe that TPLPs will be strong in. A similar amount of TPLPs believe they will be able to achieve this in the areas of designing logistics systems. Only about 40% of shippers share this view. At present between 30% and 35% of TPLPs believe they have already developed strong skills

Figure 9.12: Strengths in TPLP skills - now and in future



throughout all phases of logistics management, which means that they rate their own skills as 'more than adequate' or as 'leading edge'. Shippers are slightly more moderate in their judgement on this particularly in TPLPs capability to design logistics systems. Only between 12 and 17% of shippers believe that their TPL service providers have more than adequate skills to design logistics systems.

With an overall view of the TPL skills and resources TPL providers seem to be regarded as particularly competent in implementing and operating logistics systems. They are, however, mostly perceived as being rather deficient in the necessary skills to design logistics systems, hardly ever featuring leading edge capabilities.

9.4 Proactive behaviour of TPL providers now and in future

The following proposition was put forward to support the research question with regards to TPL proactive behaviour:

Proposition 5: Respondents of TPL organisations perceive themselves on average as more proactive in managing logistics processes in the TPL relationship they report upon than shippers perceive their contractors to be in the TPL relationships they report upon.

Proactive behaviour of TPL providers is conceptualised to be one determinant of TPL involvement. Given the difference in average degrees of outsourcing between the shipper sample and the TPL sample the TPL sample should report on average a higher degree of proactive behaviour.

Respondents in the survey were asked how proactive they perceived the TPL provider within the TPL relationship and with regards to the various management processes and phases. They were asked to rate a TPLP's proactivity on a 5 point Lickert scale from 1 (= reactive enabler) to 5 (= proactive developer). This reflects as explained in Chapter 4 the entrepreneurial stance of TPL providers in the different management areas.

Table 9. 10: ANOVA – TPL pro activity

ANOVA - TPL proactivity in		Today			By shippers desired			Most likely to happen		
		Respondent	Industry	IND*RESP	Respondent	Industry	IND*RESP	Respondent	Industry	IND*RESP
Defining a customer service strategy	Significance	0.00	0.00	0.00	0.07	0.76	0.45	0.02	0.91	0.20
	F-Value	50.98	19.03	17.94	3.49	0.39	0.88	5.39	0.18	1.60
Channel design	Significance	0.94	0.09	0.28	0.27	0.46	0.91	0.09	0.88	0.22
	F-Value	0.01	2.28	1.31	1.25	0.87	0.18	2.90	0.22	1.53
Network design	Significance	0.04	0.59	0.36	0.23	0.28	0.13	0.01	0.46	0.02
	F-Value	10.57	2.91	1.81	1.46	1.30	1.96	7.51	0.88	3.69
Warehouse(management) design	Significance	0.00	0.04	0.15	0.14	0.80	0.50	0.00	0.78	0.10
	F-Value	2.49	0.88	1.23	2.20	0.34	0.79	9.02	0.37	2.14
Transportation Management Design	Significance	0.03	0.23	0.07	0.24	0.51	0.11	0.01	0.56	0.03
	F-Value	4.99	1.48	2.47	1.43	0.78	2.09	6.45	0.69	3.10
Materials Management Design	Significance	0.79	0.01	0.62	0.49	0.88	0.55	0.05	0.77	0.10
	F-Value	0.07	4.35	0.59	0.48	0.23	0.71	3.95	0.37	2.15
Implementing Information Systems	Significance	0.90	0.06	0.11	0.21	0.42	0.20	0.01	0.42	0.36
	F-Value	0.01	1.06	1.54	1.60	0.95	1.58	6.41	0.95	1.10
Implementing policies and procedures	Significance	0.39	0.22	0.44	0.53	0.68	0.52	0.05	0.70	0.42
	F-Value	0.74	1.49	0.92	0.39	0.50	0.76	4.14	0.47	0.95
Bringing about organisational change	Significance	0.44	0.19	0.87	0.64	0.55	0.26	0.08	0.72	0.51
	F-Value	0.60	1.63	0.24	0.22	0.70	1.38	3.17	0.45	0.79
Implementing facilities and equipment	Significance	0.38	0.22	0.81	0.19	0.81	0.62	0.64	0.89	0.49
	F-Value	0.80	1.51	0.32	1.72	0.32	0.59	0.22	0.21	0.81
Operational planning	Significance	0.58	0.32	0.03	0.35	0.86	0.60	0.14	0.58	0.29
	F-Value	0.31	1.18	3.25	0.88	0.25	0.63	2.23	0.66	1.28
Operational execution	Significance	0.00	0.31	0.37	0.39	0.40	0.30	0.14	0.58	0.29
	F-Value	8.44	1.22	1.06	0.76	1.00	1.24	2.23	0.66	1.28
Operational control	Significance	0.06	0.57	0.16	0.85	0.71	0.20	0.19	0.75	0.28
	F-Value	3.81	0.67	1.75	0.04	0.46	1.60	1.79	0.40	1.29
significant at 5% level		significant at 10% level								

Before examining mean scores on the perception of proactivity an initial ANOVA is undertaken to detect differences in the sample. Analysis of variance applied to the proactivity variables (see table 9.10) reveals significant differences particularly between shippers and TPL. Proposition 6 can thus be accepted. This must be interpreted as a further pointer towards the hypothesised relationship between proactive behaviour and the degree of outsourcing.

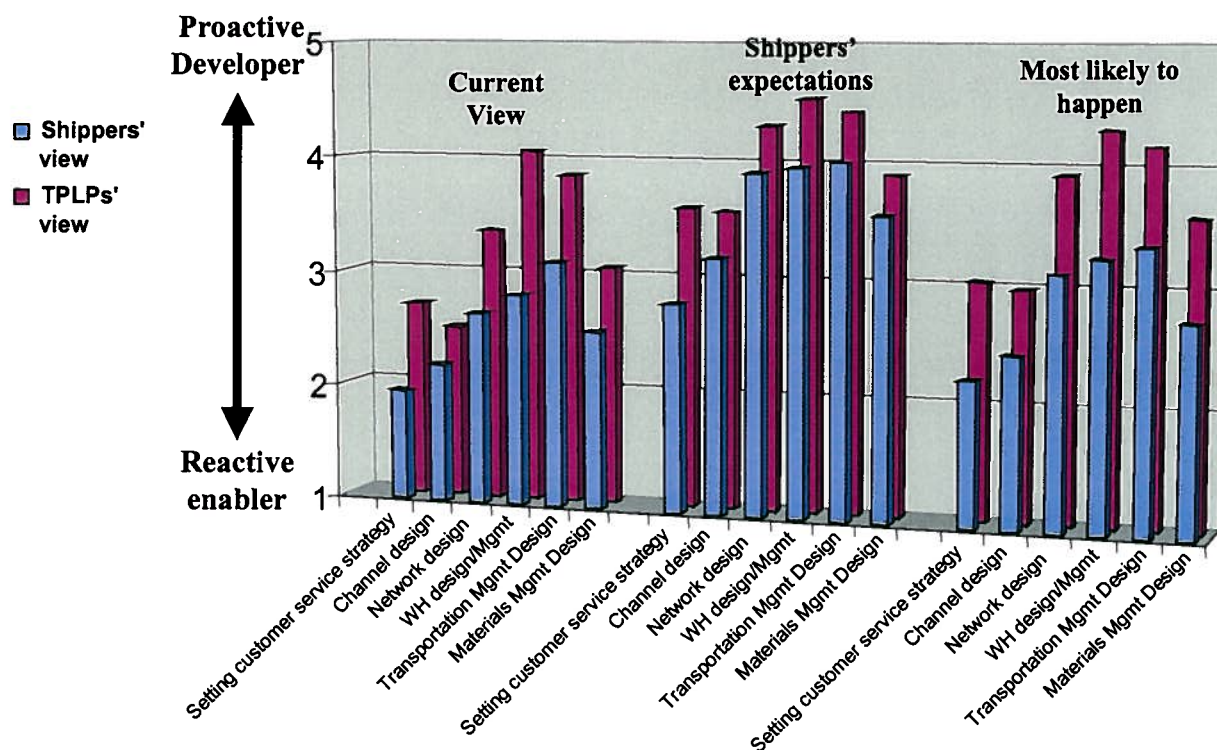
Differences in the perception of TPL proactive behaviour appear for some areas of management also between industries. A subsequent Bonferoni test (see Appendix K) reveals that the differences in perception of current proactivity levels appear only between respondents in the electronics and the automotive sector. This however, is not enough evidence to draw any conclusions about different TPLP behaviour in different industries.

Table 9.10 also reveals a difference between shippers' and TPLPs' perceptions of current (in the questionnaire 'Today') and expected developments ('most likely to happen') in TPL providers' proactive behaviour. This appears *today* with regards to design and operation of a logistics system and is expected to remain for the design phase. With regards to the (by shippers) desired entrepreneurial stance of TPL providers there seems to be no difference between shippers' and TPLPs view. Overall there seems to be a small difference in the perception about the current proactive behaviour of TPL providers and a significant difference with regards to expected future development, not though for the (by shippers) desired entrepreneurial stance of TPL providers.

9.4.1 Design of a logistics system

With regards to the different design aspects of a logistics system, shippers perceive TPL providers as being on average reactive rather than proactive whilst TPLP perceive themselves as being more proactive than shippers do (see figure 9.13). Channel design was rated (by shippers) as being least proactive and activity in transport management design as the most proactive.

Figure 9.13: Perceptions on current TPL provider behaviour in designing a logistics system



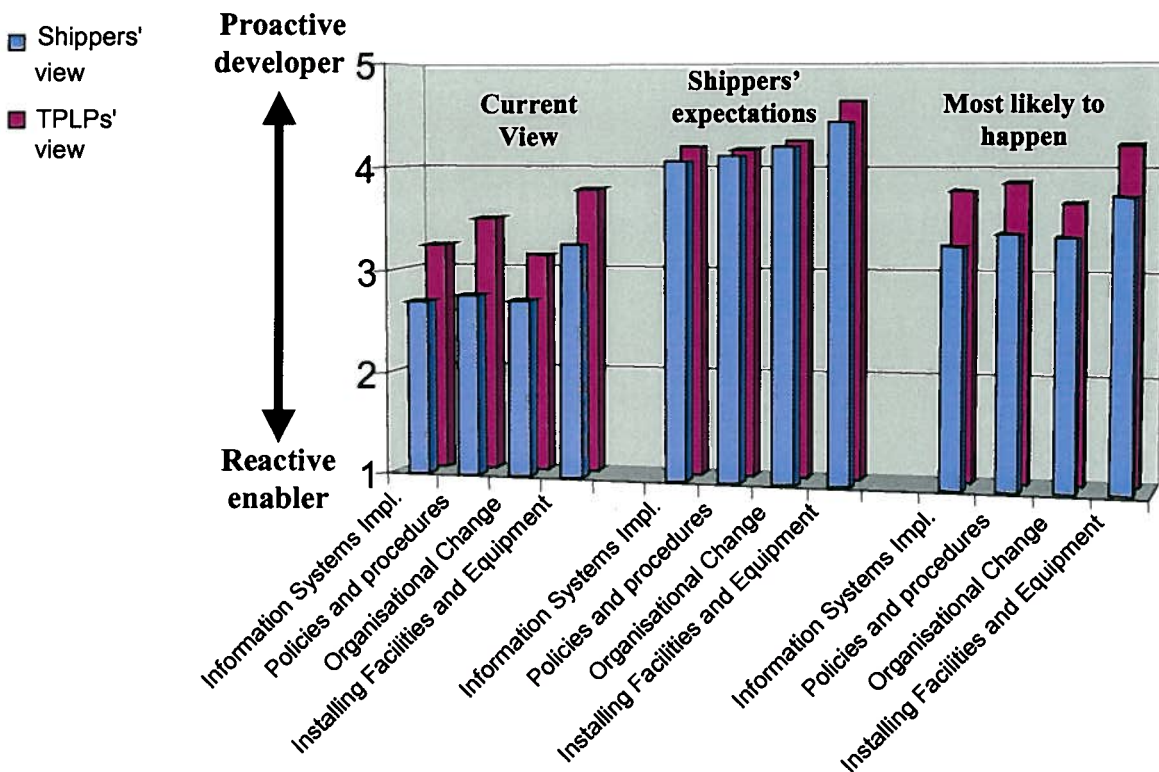
With respect to the desired future (entrepreneurial) role of TPLPs (i.e., shippers' expectations) it becomes apparent that shippers' and TPLPs' views don't differ very much. Both shippers as well as TPLPs see a desirable more proactive role of TPL providers in outsourced logistics processes. Exceptions are here the strategic elements of design decisions. This reveals that TPLPs at large perceive their potential for further involvement correctly.

The third set of responses reveals however that shippers expect a significant shortfall in their desired level of proactivity by TPLPs. TPLPs on the other hand expect only a small shortfall. This is shippers' pessimism about the extent to which TPLPs will ever be able to assume an proactive entrepreneurial on a strategic level on their behalf. The degree of desired TPLP proactivity in setting customer service strategy and channel design reflects this clearly. It also partly explains the discrepancy between shippers' and TPLPs' views on the most likely future scenario

9.4.2 Implementation of logistics systems

In implementing logistics systems (Figure 9.14) shippers regard TPL providers, with the exception of installing facilities and equipment, as more reactive than proactive. Providers again seem to regard themselves as slightly more proactive. Since the measuring scale of objective proactivity in this sense is the shippers perception it becomes clear that TPLPs overrate their degree of proactive behaviour in this phase.

Figure 9.14: Perceptions on current and future TPLP behaviour when implementing a logistics system



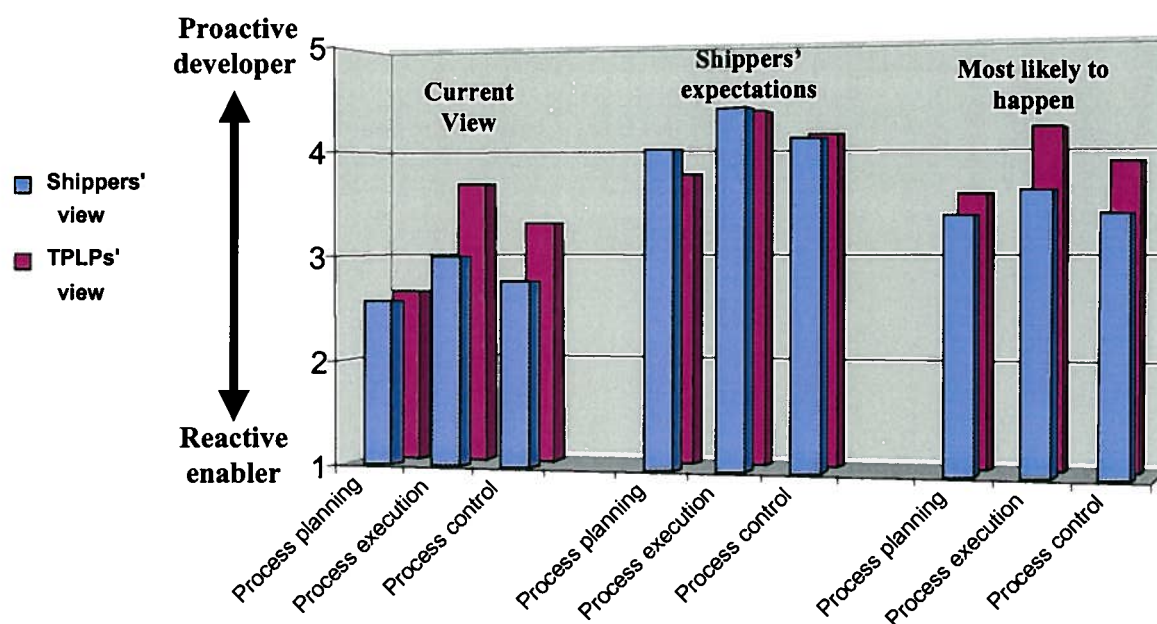
There is, however, little or no difference in perception with regard to the desired future entrepreneurial stance of TPLPs in implementing logistics systems. Shippers as well as TPLPs see development of TPLP proactive behaviour in logistics management as desirable. And again, based on their assessment of the present situation, shippers' hopes about the future in that sense seem to be more subdued.

9.4.3 Operation of logistics systems

Comparing views on TPLPs behaviour in operating a logistics system (Figure 9.15) reveals that the current view of shippers is that there is a slight tendency to reaction, with TPLPs regarding themselves as slightly proactive.

Again there seems to be a different interpretation of TPLPs' proactivity with respect to process execution and process control. An explanation of the discrepancy in process execution could be the lack of resources TPLPs currently report. This

Figure 9.15: Comparing view on TPLPs' behaviour in operating a logistics system



circumstance would of course also explain TPLPs misunderstanding of proactivity in process control. In addition TPLPs might not have understood shippers' or at least not share the same view on the necessity for process control. In the future both shippers and providers desire a more proactive role from TPL providers in operating logistics systems. However, shippers' views of how much of this is actually happening differ from those of TPL providers, particularly with regards to process execution and control. In general TPL providers as well as shippers realise the potential scope for more innovation and initiative coming from Third Party Logistics, although shippers don't see this potential as much realised in the future as TPLPs do. Particularly with

regards to strategic design decisions shippers don't see TPLPs adopting an entrepreneurial stance on their behalf that could be called proactive. There is, however, evidence that the influence of TPLP in tactical and functional aspects will increase in the future- shippers as well as TPL providers expect more proactive behaviour from TPL providers in future. TPL providers seem partly to be aware of their lack of proactive behaviour particularly in the strategic elements of logistics systems design, where they rate their own proactivity below 3.0 (figure 9.13). They seem also to be convinced that they will be able to match the expectations of their clients with regards to more proactivity in all aspects of logistics management in future. Shippers on the other hand do not seem to be fully convinced of this ability. It is questionable though whether TPL providers as a whole can today already be seen as the drivers for (re-) structuring logistics systems or even supply chains. Some may, and some may not be able to. To answer this question a more differentiated assessment of TPL relationships is necessary and will be presented in chapter 10.

9.5 TPL influence on Logistics Performance

The following proposition was put forward to support the research question with regards to TPL influence on Logistics performance:

Proposition 6: The contribution of TPL to logistics performance is reflected on average higher in the TPL sample than in the shipper sample.

Based on the conceptual model outlined in chapter 2 it is assumed that different degrees of TPL involvement have an effect on their contribution to logistics performance. If the average degree of TPL involvement differs between shipper and TPL sample, then the average contribution to logistics performance measurable in the TPL sample is higher than in the shipper sample. To measure logistics performance in detail for each TPL relationship based on recorded data was for several reasons impossible, the main one being lack of data or lack of willingness to reveal data. Instead respondents in the survey were asked about the change over the previous 3 years with regards to some key performance indicators and how they perceived TPLPs had influenced these changes. By combining both variables a value for the

actual contribution of TPLPs to logistics performance was calculated reflecting estimation based on both shippers and TPLPs perception.

The indicators that were used to measure logistics performance were measures of efficiency, i.e. cost, and effectiveness, i.e. quality and cycle time. The measures depicted in Table 9.11 are the sum of various subcategories of cost, cycle time and quality, which again reflect those used by other researchers before (Peters, et al, 1999, Laarhoven, et al, 2000). The exact definition of all indicators and how they were calculated was already explained in chapter 6.

Table 9. 11: ANOVA Performance

ANOVA Performance		Industry	Respondent	IND*RESP
Logistics cost changes	<i>Significance</i>	0.44	0.29	0.66
	F-Value	0.59	1.28	0.54
TPL influence on logistics cost changes	<i>Significance</i>	0.55	0.97	0.82
	F-Value	0.37	0.09	0.31
Logistics cost changes due to TPL	<i>Significance</i>	0.36	0.10	0.40
	F-Value	0.86	2.18	1.00
Cycle time changes	<i>Significance</i>	0.81	0.97	0.93
	F-Value	0.33	0.00	0.16
TPL influence on cycle time changes	<i>Significance</i>	0.53	0.42	0.65
	F-Value	0.75	0.67	0.55
Cycle time changes due to TPL	<i>Significance</i>	0.67	0.47	0.73
	F-Value	0.51	0.54	0.43
Quality changes	<i>Significance</i>	0.06	0.08	0.01
	F-Value	2.72	3.15	3.88
TPL influence on quality changes	<i>Significance</i>	0.36	0.04	0.46
	F-Value	1.09	4.59	0.88
Quality changes due to TPL	<i>Significance</i>	0.05	0.00	0.01
	F-Value	2.78	8.91	3.84
significant at 5% level		significant at 10% level		

Preliminary analysis using Analysis of Variance on these variables (see table 9.11) shows that in general there are no significant differences across all sampled industries, no matter whether shippers or TPLPs were asked. With regards to quality changes since the last 3 years the Bonferoni test (see appendix 9.2) reveals that the food and food retail industry by perception of shippers as well as TPLP has experienced more development in reaching higher logistics quality levels than the automotive segment. Perceptions of TPLPs contribution differ clearly though by respondent. Difference in logistics cost between the shipper and the TPL sample could be detected as significant at the aggregated level of 'Performance changes due to TPL' (i.e.: performance x TPL influence). On the matter of quality changes a significant difference between shippers

and TPLPs appeared on all three levels of measurement. Proposition 5 could, however be accepted. This was an indicator for the hypothesised relationships between the level of outsourcing a TPL providers contribution to performance.

Table 9.12: Average logistics performance changes by

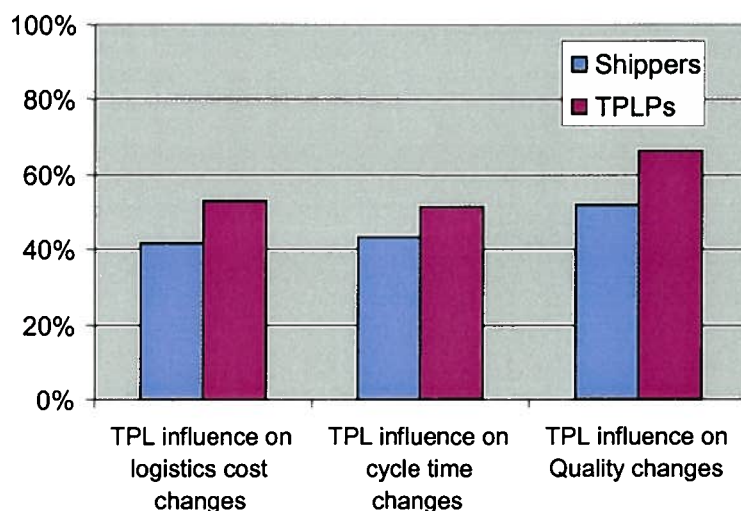
Performance changes over 3 years	Shippers	TPLPs	average
Logistics Cost Changes	-5.5%	-7.6%	-6.52%
Order Cycle time changes	-8.3%	-8.6%	-8.42%
Quality changes	6.8%	7.3%	7.06%
TPL influence on performance	Shippers	TPLPs	average
TPL influence on logistics cost changes	41.7%	53.1%	47.40%
TPL influence on cycle time changes	43.5%	51.6%	47.51%
TPL influence on Quality changes	51.8%	66.4%	59.10%
Performance changes due to TPL	Shippers	TPLPs	average
Logistics cost changes due to TPL	-2.3%	-4.0%	-3.15%
Cycle time changes due to TPL	-3.6%	-4.4%	-4.01%
Quality changes due to TPL	3.5%	4.9%	4.19%

That TPL providers overall were contributing to logistics performance becomes with a view on Table 9.12 very clear. Despite the difference between the shippers and TPLPs an average reported cost reduction in the sample of 6.52%. 47% of this reduction in cost is attributed to the influence of TPL providers implying a TPLP contribution of 3.15 % on average. Order cycle within the observed TPL partnerships is reported to have changed 8,41 % on average and 47.5 % of this is attributed to TPL influence making a contribution of just above between 4%.

Logistics quality is reported to have increased in all industries over the last 3 years, whereby the automotive segment observed from a TPLP perspective shows the biggest changes of between 9.3% and 12.1 %. The highest TPL influence (between 70 and 85%) was also reported within this part of the sample, resulting into actual quality improvement attributable to TPL of 7,5 % to 12.5 %. Observations of the same industrial segment, but from a shipper's perspective are in all 3 categories lower though still higher than in other industries. The lowest quality improvements were reported in the food (retail) segment from a TPLP perspective. The lowest TPL influence in quality changes (35-50%) was reported in the electronics industry from a shipper's point of view.

Table 9.13: Quality changes by industry

Quality	Automotive	Std.E	Chemicals	Std.E	Electronics	Std.E	Food (retail)	Std.E
Quality changes over 3 years	10.2%	1.5%	6.1%	1.5%	6.9%	1.0%	5.5%	1.3%
TPL influence on Quality changes	65.0%	6.8%	61.4%	7.0%	50.0%	5.4%	60.9%	4.9%
Quality changes due to TPL	7.4%	1.7%	4.0%	1.3%	3.8%	0.8%	3.7%	0.9%

Figure 9.16: TPL influence on logistics performance

Overall TPL providers seem to have their biggest impact on quality improvement of a logistics system i.e. to ensure damage free and on-time deliveries, order completeness and administrative accuracy (see figure 9.17). But their contribution to lowering cost and cutting cycle time is also substantial.

9.6 Conclusions

Assuming that the sample described here is representative the current (2001) role of Third Party Logistics providers in Europe can be described as diverse. The degree of involvement in the various activities of logistics management is highest in areas of transport management and lowest in designing customer service strategies on behalf of their clients. These averages disguise wide variation between different shipper TPLP relationships. For instance involvement in transport design varies with a standard deviation of 34 % on the shippers side and with 24,7 % on the TPLP side. On average TPLPs still play a minor (less than 50% on average) role in strategic and tactical decision making areas of logistics. Their expertise and competence is still

mostly reflected in transport related areas of management. Surprisingly they seem to have established themselves as potential outsourcing partners for the implementation of IT and IS systems. This wide variety of involvement means that we should be cautious about generalising results for an average relationship. The difference between the shipper and the TPL sample rather hints that there can be significant differences in the degree of outsourcing. This gives even further reason to ask the question whether TPL relationships can't be categorised into more informative groups.

Logistics competence of TPL providers is generally regarded in all areas as slightly more than adequate but will according to the estimation of all respondents develop sufficiently in the in the next 5 years. There is some uncertainty in this development with regards to human resources and conceptual skills. Differences between the shippers' and the TPLPs' perception of logistics competence were observed. These were particularly significant with respect to current skills. Bearing in mind that both samples differed also significantly in TPL involvement this could be an indicator for a relationship between the level of outsourcing of logistics processes and available TPL skills.

Entrepreneurial innovation and initiative coming from TPL providers is currently regarded as more reactive rather than proactive by shippers. TPLPs see themselves as more proactive in all cases. Although respondents want proactivity to increase significantly (on 5 point scale from around 3 to 4) over the next 5 years the shippers do not expect their hopes / requirements will be met. Significant differences with regards to the perception of current proactive TPL behaviour were detected between the shipper and TPLP part of the sample. Between different industrial segments differences in perception could only be observed for operational planning.

The average influence of TPL on performance reported is especially high for quality improvements. The observed changes in logistics performance revealed the only significant differences between industrial segments as well as shippers and TPLPs also for quality improvements. With regards to TPL influence on logistics performance the TPL group perceived a slightly higher influence than the shipper group.

Chapter 10 Distinct Types of TPL relationships

10.1 Introduction

It was concluded from the literature review that one way to further understand varying degrees of TPL provision was to look for factors, which are rooted in the capabilities of TPL providers. It was further concluded that TPL providers couldn't be distinctively differentiated anymore according to their core business and their specific assets that formed a basis for this. The tendency of players in the TPL logistics market to position (or sometimes rather promote) themselves in the 'high end' of logistics service provision regardless of their historical roots or former core businesses makes it more difficult to distinguish between providers that provide transaction based services and those who provide solutions. In fact, an empirical verification of this divide is, although it has conceptually been suggested (Berglund 2000) still missing. The question (Research question 2) was thus asked:

RQ 2: Can TPL relationships be categorised according to their degree of TPL involvement?

Research question 2 aims to explore if different roles of TPL providers in logistics management can be categorised according to their level of involvement. The research question is supported by several propositions with regards to the resource and skills base of TPL types, their entrepreneurial (proactive) behaviour and their impact on logistics performance, adhering thus to the assumed framework of managerial and theoretic concepts. This chapter describes different types of TPLPs that emerged from clustering the TPL relationships according to the level of TPL involvement with respect to their resource/skill base, their proactive behaviour and their impact on logistics performance.

10.2 Clustering TPL relationships

To cluster TPL relationships it was assumed in this research that the participation of TPL providers in the various sub-processes across a sample of TPL relationships

follows distinguishable patterns, regardless of whether shipper organisations were surveyed or TPL organisations. Respondents in both organisations were asked to report on their involvement in processes on such a low level (which was then aggregated) that the mathematical influence of potential bias in answering the questions could be neglected. The likely hood of capturing the most prevailing forms of TPL relationships surveying 76 existing ones throughout Europe and across various industries was fairly high. It was however recognised that because of the sample composition a tentatively bigger proportion of TPL categories may reflect a high degree of TPL involvement will be found in the TPL sample. This issue has already been explained in more detail in the previous chapter and in chapter 6. The following two propositions were put forward to support the research question outlined above:

Proposition 7: The provision of logistics services in Europe appears in clusters of different levels of involvement, which typifies a distinct kind of TPL relationship

Proposition 8: The TPL sample contains a higher proportion of TPL categories with a high degree of TPL involvement than the shipper sample.

The clustering method used in this research is the k-means or hill-climbing algorithm (Friedman and Rubin, 1967). This algorithm uses the means of a cluster as a basis for the optimising criterion. K-means cluster analysis is often used in marketing to identify segments for marketing (SPSS user guide 10.1, 1999). Cluster analysis in this research is used to identify homogenous groups of TPL relationships according to their degree of TPL involvement.

The algorithm requires specifying the number of clusters *a priori*, which was done based on the description of TPL relationships that emerged from the literature. This revealed the existence of the 'old' type TPL providers that provided asset based services, mainly on a transactional basis (Sheffi, 1990, Berglund, 1997, Anderson, 1997). The emergence of distribution management (Christopher, 1972) during the 1970s and 80s reflected TPL relationships that were characterised by dedicated logistics service provision combining and transport and warehousing and supplementary services like IT and value adding services (Cooper, 1991, Peters et al

1998). Today the need for information and management services seem to require the provision of solutions (Laarhoven, 1999, Lieb, 2000) leading to a further form of TPL provision that is labelled sometimes 4th party logistics (Gattorna, 1999) or simply solution provider (Berglund, 2000). The prevailing notion at the turn of the century seems to be that a segmentation of TPL providers is taking place (e.g., Abrahamsson et al, 1998, Langley, 1999, Berglund 2000, Hastings, 2002, Lewis 2002). One way of providing the empirical evidence for this is to cluster a sample of many TPL relationships according to the process involvement of TPL providers.

10.2.1 Types of TPLP providers according to their level of involvement

The cluster analysis of the sample of 76 TPL relationships that were examined throughout the survey revealed clearly distinct clusters of TPL relationships (see Table 10.1 and figure 10.1). Leaning on the terminology that emerged from the literature review these named

Solution providers

Distribution providers

Transport providers

Proposition 7 could thus be accepted.

The standard deviation for each of the variables relative to the mean differs between processes in all three clusters. In processes where the variance is high a clear distinction between the clusters is not really possible although the mean value for involvement indicates this clearly. It rather means that there is an overlap between the samples. The biggest variance for example appears in 'project management'. This means no actual difference between distribution providers and solution providers but quite a difference between transport providers and solution/distribution providers. An area where the distinction between different types of providers appears clearly is for example 'IS/IT'. With respect of these implementation processes all three clusters differ clearly from each other. Overall the split of the sample into group of providers

Table 10.1 Clusters of TPL providers

Degree of logistics outsourcing		Solution Providers		Distribution Providers		Transport Providers	
Management level	Logistics processes	means	Std. Dev.	means	Std. Dev.	means	Std. Dev.
Strategic/ tactical	Defining a customer service strategy	57.6%	0.14	24.4%	0.20	12.9%	0.22
	Channel design	74.5%	0.28	16.5%	0.23	19.3%	0.23
	Network design	79.3%	0.16	49.9%	0.34	23.7%	0.30
Functional design	Warehouse(management) design	67.9%	0.28	68.9%	0.25	36.8%	0.28
	Transportation Management Design	91.8%	0.21	75.8%	0.30	44.6%	0.31
	Materials Managment Design	76.8%	0.25	35.1%	0.28	11.8%	0.15
Project management	Implementing policies and procedures	62.0%	0.37	72.6%	0.22	33.4%	0.31
	Bringing about organisational change	63.8%	0.28	65.6%	0.25	19.5%	0.29
	Installing warehouses and MHE	75.0%	0.34	73.6%	0.31	13.7%	0.29
	Implementing transport equipment	92.3%	0.33	80.0%	0.30	58.6%	0.46
IS IT	Implementing Information Systems	92.6%	0.20	55.9%	0.27	21.3%	0.19
	Installing IS Hardware	99.0%	0.15	73.1%	0.33	18.9%	0.26
Operations	Operational planning	73.8%	0.24	45.1%	0.15	28.4%	0.18
	Operational execution	85.5%	0.17	57.9%	0.16	44.3%	0.18
	Operational control	86.8%	0.11	48.3%	0.26	22.5%	0.18

shows less variation in each group than the split of the sample between the shipper and TPLPs as outlined earlier. This points to the fact that clustering, rather than splitting the sample in to a TPLP group and a shipper group has achieved a more meaningful grouping with regards to different degrees of outsourcing. It must however be recognised that the clusters 'solution provider' and 'distribution provider' mainly include TPL respondents (see table 10.2). This is an effect though that was caused by the sampling method, and has been outlined above. Proposition 8 can thus also be accepted.

Table 10.2 Clusters by respondent

Clusters by respondent	TPLP	Shipper	total
Solution Providers	11	0	11
Distribution providers	18	13	31
Transportation providers	3	29	32

Another interesting aspect of the clusters appears by looking at the industrial segment they can be attributed to. This is depicted in table 10.3. It appears that most solution

Table 10.3 Clusters by industry

Clusters by industry	Automotive	Food	Electronics	Chemicals	total
Solution Providers	7	3	1	0	11
Distribution providers	5	10	12	4	31
Transportation providers	3	10	12	7	32

providers can be founding the automotive industry, which indicates that TPL as strategic management concept has in this industry developed very much, which is reflected in a high degree of outsourcing in this industry. This is an issue that is also

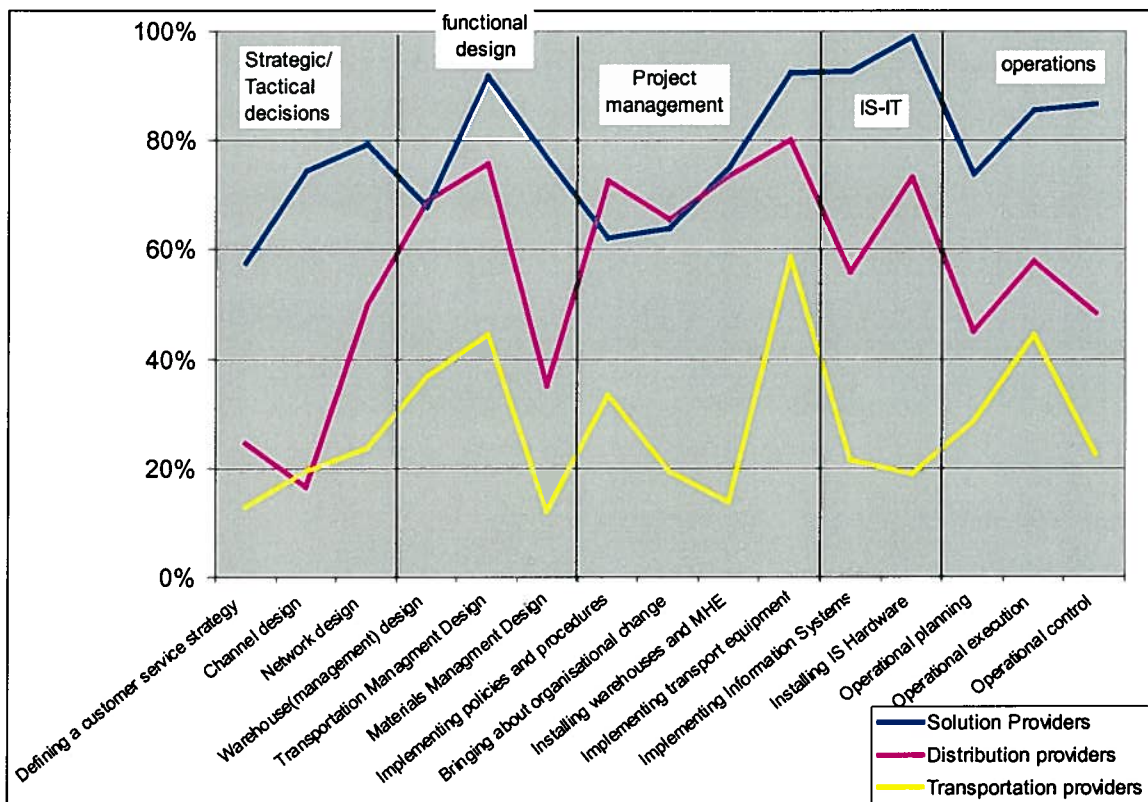
reflected in the choice of the case study (chapter8). On the other extreme appears to be the chemicals industry in which mostly 'low end' TPL provision takes place.

Following this path of interpretation it seems that the Electronics industry and food industry is with regards to the implementation of the TPL management concept on an evolutionary step between the chemicals industry on the lower end and automotive industry on the high end. It has to be considered though that this interpretation are based on a relatively small sample in relation to the whole of Europe. Neither does it take country specific difference into consideration. It can however be concluded that the result with respect to TPL cluster per industry reflect a valid tendency, which might deserve some further investigation.

10.2.2 Describing the clusters

Figure 10.1 depicts the identified clusters graphically. What appears from this at first glance is the big difference between transport providers and distribution providers as

Figure 10.1: Clusters of TPL providers



well as solution providers. They seem to be however close to each other in the area of material management design, though in a negative sense – both are less involved in this area of logistics management – and in the implementation of transport equipment and operational execution respectively, where both are comparatively more involved. Solution providers seem however in almost all areas of logistics management far ahead of transport providers, as far as this is reflected in the degree of TPL involvement. There are also considerable differences between solution providers and distribution providers with regards to their involvement in almost all design aspects of a logistics system as well IS/IT related management processes, and surprisingly also with respect to their involvement in operations, which becomes apparent in the areas of operations control.

10.2.2.1 Transport providers

The first cluster shows the service providers main involvement in transport related design and implementation activities as well as involvement in operations. This cluster practically reflects the traditional service portfolio of haulage providers. This cluster reflects overall comparatively low involvement (below 20%) with only some areas of higher involvement such as transportation and warehouse design (40%), the implementation of policies and procedures (38%) transport equipment (58%) and operational activities (45%).

10.2.2.2 Distribution providers

The second cluster of service providers reveals a concentration of design and implementation activities in warehousing as well as transportation. The capability of designing physical networks as well as implementing IS systems seem to be a substantial part of services that are offered by this category of provider. They also get much stronger involved, when it comes to the implementation of policies and procedures and take joint responsibility to bring about organisational change. This category of service provider reflects the service portfolio that in late 70s and the beginning of the 80s led to the emergence of the term ‘contract distribution’ (e.g.: Cooper, 1991, Lieb, 1993, Langley, 1999). Providers of this kind typically offer customised solutions for warehousing and transport mostly with dedicated own or at

least co-financed assets. Their involvement in the operation of their clients' logistics system is still the basis of their contractual relationship with their clients, and their expertise in transport and warehousing has led to a higher degree of outsourcing with respect to design and implementation in these areas.

10.2.2.3 Solution Providers

The most advanced form of TPL provision was labelled 'solution provider'. Their involvement in logistics decisions is in comparison to both other forms of TPL provider considerably stronger in all design processes, contributing between 60% and 80 % to strategic decisions. They are even more involved in the functional design of their clients logistics system (Warehousing 68%, Transport 92 %, Materials Management 77%). They show also a high(er) involvement in all project management related activities. They distinguish themselves particularly through very high involvement in IS or IT related processes (92% / 99%).

These providers have successfully developed capabilities that exceed the traditional domain of transport and warehousing in logistics. They emphasise additionally their strategic management skills and expertise information systems. This enables them to play a more creative role in the management of their clients' logistics system and has led to a higher degree of outsourcing in an operational sense. Information and change management are typical domains of management consultants. Their low level of involvement in the implementation of transport equipment and warehouse facilities indicates that they concentrate on the management of logistics systems rather than the provision of the necessary assets. They manage processes on behalf of their clients using additional contractors to implement and provide the necessary assets

10.3 Logistics competence of different types of providers

If a meaningful categorisation (or cluster) of TPL relationships is identifiable it is also of interest to analyse if and how their resources/skill base differs. Following these conceptualised ideas the following proposition is put forward to support the research question with regards to TPL providers resource and skill base:

Proposition 9: Different categories of TPL providers feature on average significant differences in their resource and skills base.

10.3.1 Importance of Resources and Skills

In the survey respondents were asked how important they would rate a predefined set of resources and skills (see table 10.4 for the list) that corresponded to a particular set of sub-processes (design, implementation or operation) within their logistics system. Clarity about the relative importance of resources and skills in relation to different areas of logistics management is of great importance for shippers as well as for TPL providers, because it can be assumed that TPLPs must be equipped sufficiently with required resources and at least adequately with the appropriate skills if they want to be considered as outsourcing partner for particular activities or higher order processes. It is thus of interest which resources and skills are perceived of being important and which are not. It can be assumed that the benchmark for the relative importance of

Table 10.4 Relative importance of skills and resources

Design	ANOVA (sig.)	Transport Provider	Distribution Provider	Solution Provider
TPL Financial Resources	0.04	2.81	2.57	3.63
TPL Physical Resources	0.41	3.03	3.03	2.50
TPL Technical Resources	0.61	3.39	3.51	3.75
TPL Human Resources	0.03	3.97	4.34	4.50
TPL Organisational Resources	0.40	3.65	3.94	3.75
TPL Technical Skills	0.01	3.68	4.26	4.00
TPL Human Skills	0.05	3.68	4.14	3.88
TPL Conceptual Skills	0.40	3.65	3.94	3.75
Implementation		Transport Provider	Distribution Provider	Solution Provider
TPL Financial Resources	0.02	2.68	3.23	3.63
TPL Physical Resources	0.63	3.13	2.97	2.75
TPL Technical Resources	0.06	3.81	4.11	3.50
TPL Human Resources	0.01	3.61	4.20	4.00
TPL Organisational Resources	0.83	3.68	3.71	3.88
TPL Technical Skills	0.01	3.68	4.26	4.13
TPL Human Skills	0.04	3.32	3.89	3.88
TPL Conceptual Skills	0.01	2.68	3.46	3.50
Operations		Transport Provider	Distribution Provider	Solution Provider
TPL Financial Resources	0.01	2.58	3.43	2.75
TPL Physical Resources	0.53	3.52	3.80	3.63
TPL Technical Resources	0.12	3.81	4.14	4.25
TPL Human Resources	0.01	3.65	4.06	4.50
TPL Organisational Resources	0.70	3.52	3.46	3.25
TPL Technical Skills	0.73	3.39	3.54	3.38
TPL Human Skills	0.01	2.97	3.71	3.75
TPL Conceptual Skills	0.32	3.19	2.94	3.00

particular resources or skills is set by those categories of TPL relationships that reflect the highest degree of outsourcing. An average score of more than 3.5 on the 5-point Lickert scale, which was the measurement basis for the rating, was set as value that reflects critical importance of a resource or a skill to a particular area of logistics management (marked yellow in table 10.3). A score of 3.5 or higher would reflect the recognition of the critical importance of a particular resource or skill and a value lower would indicate the opposite, which in any case would allow for some interpretation in connection with the examination of the existing resource/skills base of TPL provider types. It is of further interest to examine whether the cluster of TPL providers that reflect different degrees of outsourcing also reflect a difference in their emphasis on specific resources and skills.

Table 10.3 depicts the average scores of the relative importance of different resources and skills in their corresponding category of management (design, implementation, operation) for different TPL categories based on respondents' perception. Analysis of variance was performed which indicates significant differences in the perception of relative importance between the different TPL relationships. Areas of significant difference are marked 'green' in the ANOVA column, and the highest and lowest values are highlighted in each row (see Appendix-Bonferroni test for significance between TPL clusters).

With respect to logistics system design it appears that skills in general and human resources and organisational resources are recognised by each type of provider as being of critical importance. Solution providers and distribution providers regard also technical skills as importance, although the perception of respondents in the transport provider category doesn't differ from these of the other categories significantly. Financial resources are recognised as critical resource for the design of logistics systems by respondents representing TPL relationships with solution providers. Their perception also differs significantly from those in the other two categories. This means that in TPL relationships that reflect only low degrees of outsourcing financial resources are not regarded as being critical to logistics systems design or redesign. Taking into consideration that all respondent in the solution provider category were TPL providers this could hint that is of particular importance for TPL providers to be

equipped with sufficient financial resources, if they want to be involved in the design of logistics systems.

With respect to logistics system implementation respondents in all categories of TPL relationship regard technical, human and organisational resources as critical, as well as Technical and Human Skills, with the exception of respondents in transport providing TPL relationships who perceive the relative importance of human skills significantly less important than respondents in the other two categories. In contrast to respondents in the category of transport providing TPL relationship those in solution providing relationships regard financial resources as critical and significantly more important. This could point to a higher degree of dedicated operations within these kinds of TPL relationships, which requires usually a higher degree of asset acquisition than in operations that are implemented on the basis of existing transport equipment, which is usually shared with other users.

With regards to logistics operations the critical importance of physical, technical, human, and organisational resources is regarded by almost all respondents and if not, like in organisational resources, the perception of those respondents that perceive organisational resources as critical does not differ significantly from those, who rate them as critical. Technical skills are only rate as critical by respondents in distribution providing TPL relationships, but respondents in the transport providing and solution providing segment are not significantly different. in their perception. A significantly lower perception of the relative importance of human skills in operating logistics systems can be detected amongst respondents in the transport providing TPL relationships. Together with an evaluation of the existing TPL resources in this segment this could allow some interpretation with regards to the strategic outset of such providers.

10.3.2 Sufficiency of Resources and Adequacy of Skills

An examination of the resource and skill base of the different TPL provider types will provide further insight into the differences in TPL relationships by reflecting on the

available TPL resources and skills in these relationships. This again will further our knowledge about the different segments in the TPL market.

Respondents in the survey were asked how sufficient/adequate they perceived TPLP resources and skills in their TPL relationship. Analysis of variance was carried out to identify these rating on resource sufficiency and skills adequacy that differed significantly between the TPLP categories (see Appendix-Bonferroni test for significance between TPL clusters).

10.3.2.1 Sufficiency of TPL Resources

Table 10.5 reveals significant differences between the difference type of TPL providers with regards to Financial and Human Design Resources, Financial, Physical and human resources that are necessary to implement logistics systems and particularly with regards to Financial, Technical, Human and Organisational resources

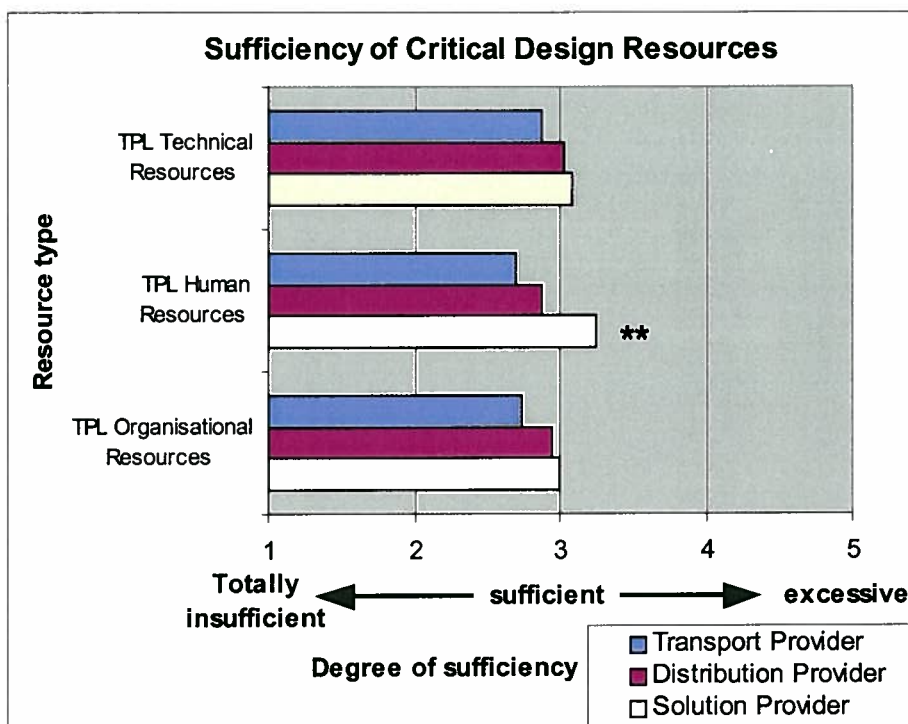
Table 10.5 Sufficiency in TPL Resources

Design Resources	ANOVA (Sig.)	Transport Provider	Distribution Provider	Solution Provider
TPL Financial Resources	0.01	3.23	2.91	3.63
TPL Physical Resources	0.14	3.26	2.94	3.13
TPL Technical Resources	0.75	3.03	3.09	2.88
TPL Human Resources	0.10	2.87	2.69	3.25
TPL Organis. Resources	0.38	2.74	2.94	3.00
Implementation Resources				
TPL Financial Resources	0.10	3.26	3.03	3.50
TPL Physical Resources	0.09	3.23	2.89	3.13
TPL Technical Resources	0.64	3.00	3.00	3.25
TPL Human Resources	0.10	3.00	2.83	3.38
TPL Organis. Resources	0.21	2.84	2.97	3.25
Operational Resources				
TPL Financial Resources	0.10	3.03	3.09	3.50
TPL Physical Resources	0.48	3.03	3.06	2.75
TPL Technical Resources	0.05	2.48	2.94	2.88
TPL Human Resources	0.00	2.61	2.86	3.50
TPL Organis. Resources	0.02	2.65	3.09	3.25

that are required to operate a logistics system. The areas, which reflect significant differences at the 5% level, are marked green in the ANOVA column; significant values at 10% level are marked blue. They marked in the following graphs accordingly with one or two stars.

With a view on resources that are critical for the design of logistics systems (Figure 10.2) – these are technical, human and organisational resources – only solution providers and distribution providers seem on average to be sufficiently equipped with those. Transport providers don't reach sufficiency levels in any critical resource category. Particularly with regards to human resources they differ significantly to solution providers.

Figure 10.2: Sufficiency of Critical Design Resources



A view on the sufficiency ratings of critical implementation resources (figure 10.3) reveals sufficient financial and technical implementation resources amongst all categories of TPLPs, with solution providers being significantly better equipped with finances than distribution providers. In human resources distribution providers seem to be significantly worse equipped than solution providers and transport providers don't seem to be sufficiently equipped with organisational resources.

Figure 10.3: Sufficiency of Critical Implementation Resources

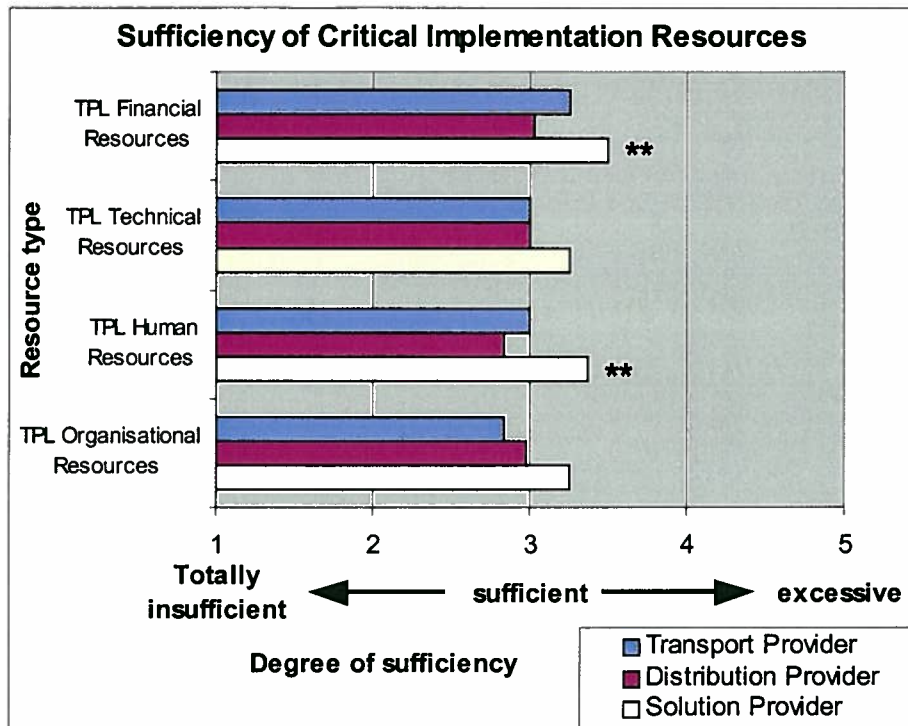
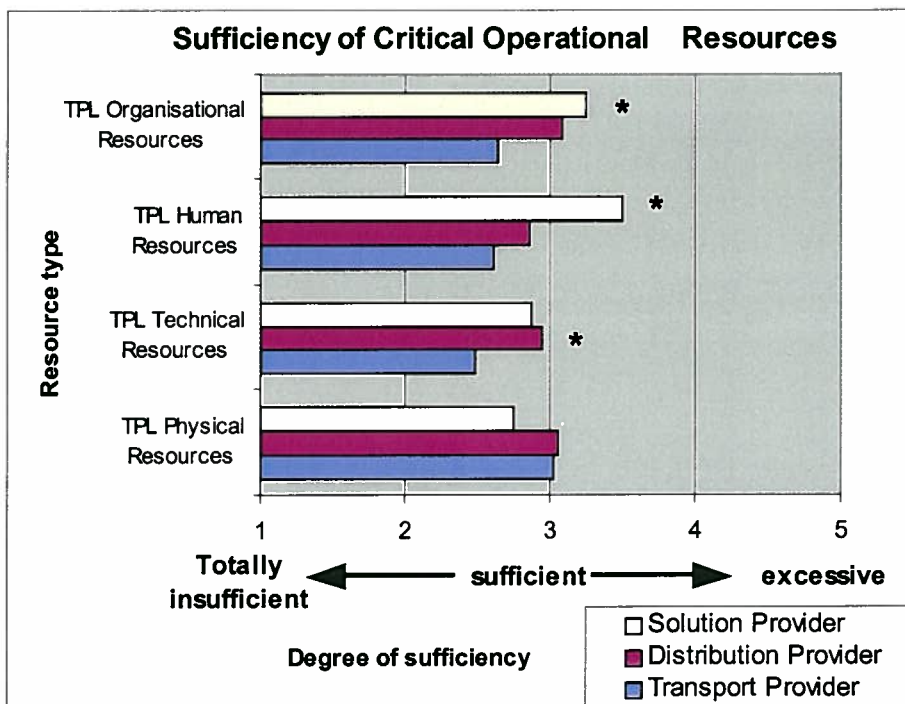


Figure 10.4: Sufficiency of Critical Operational Resources



The biggest discrepancies between TPL provider categories seem to exist with regards to operational resources. This has to be interpreted though with care, because too many resources can, if they reflect a cost factor, mean inefficiencies and thus disadvantages in competitiveness. These resources should be just sufficiently available in an organisation. Organisational resources are in this respect less of a cost factor because they are rather intangible and are usually not accounted for. They are however of critical importance and only distribution providers and solution providers seem to be sufficiently equipped with them. Human resources are critical resources in operations and distribution providers as well as transport providers don't seem to have enough of them, where as solution providers seem to be significantly overstaffed. With regards to technical operational resources only distribution and solution provider barely reach the sufficiency mark. Transport providers seem to be characterised by having significantly less technical resources than the other two categories. With respect to physical resources distribution providers as well as transport providers seem to operate just at sufficiency level, where as solution providers lack sufficient physical resources.

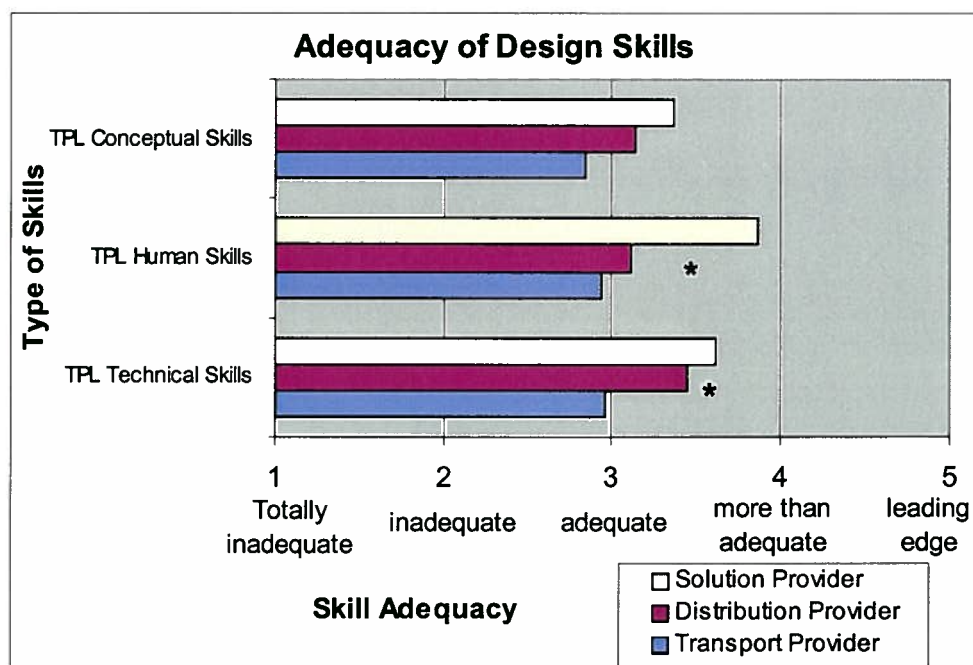
10.3.2.2 Adequacy of Skills

With respect to the necessary skills in logistics management differences between the TPL provider types appear to be significant. They appear especially between solution

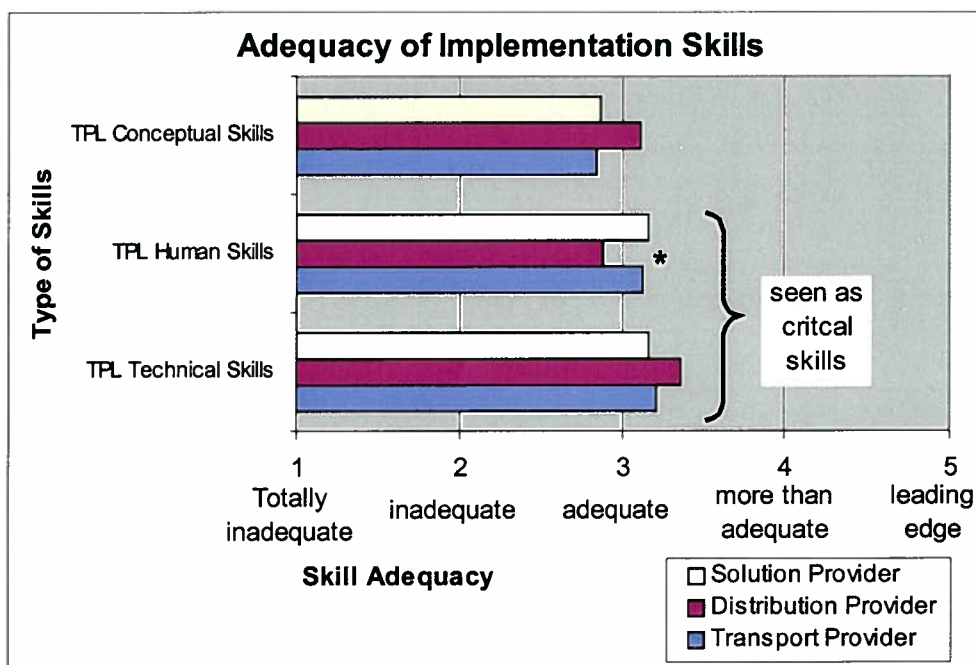
Table 10.6 Adequacy of Skills by TPLP type

Design Skills	ANOVA (Sig.)	Transport Provider	Distribution Provider	Solution Provider
TPL Technical Skills	0.01	2.97	3.46	3.63
TPL Human Skills	0.00	2.94	3.11	3.88
TPL Conceptual Skills	0.16	2.84	3.14	3.38
Implementation Skills				
TPL Technical Skills	0.16	3.22	3.37	3.16
TPL Human Skills	0.00	3.13	2.89	3.16
TPL Conceptual Skills	0.17	2.84	3.11	2.87
Operational Skills				
TPL Technical Skills	0.00	2.65	3.40	3.50
TPL Human Skills	0.00	2.32	2.91	3.63
TPL Conceptual Skills	0.01	2.29	2.94	3.38

providers and transport providers, here in particular with respect to the design and

Figure 10.5: Figure 10.5 Adequacy of Design Skills

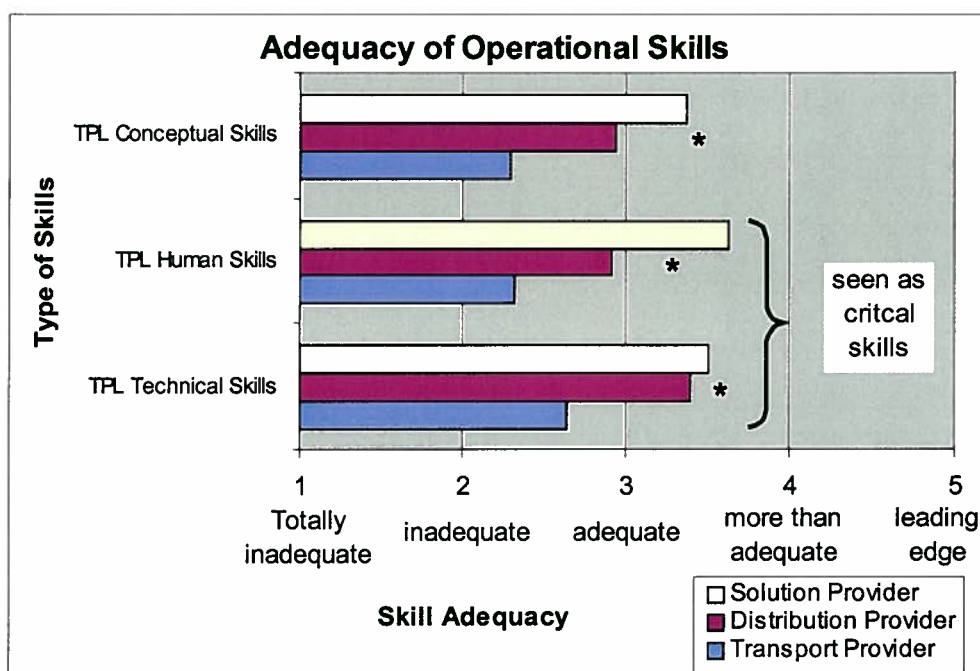
operation of logistics systems. Table 10.6 depicts the ratings for skill adequacy and significant difference between the types of provider (marked green in the ANOVA column).

Figure 10.6: Adequacy of Implementation Skills

Only solution providers and distribution providers can show adequate design skills. Solution providers have been perceived to have human and technical skills that are even more than adequate. These are skills where they significantly differ from transport providers. Solution providers also show the highest rating for conceptual skills, with transport providers not reaching the adequacy mark. Distribution providers seem to be adequately equipped with all necessary skill to design a logistics system.

Human and Technical skills are critical for the implementation of logistics systems. With regards human skills solution providers as well transport providers seem to be adequately equipped with these. Although distribution providers seem to almost reach adequacy level in human skills the have still significantly less human skills than solution providers.

Figure 10.7: Adequacy of Operational Skills



Skills critical to the operation of logistics systems are human and technical skills. Neither of them can be adequately found with transport providers. It thus seems that they compete solely on the basis of most efficient asset utilisation. Distribution providers have almost adequate human skills and rather adequate technical skills. Solution providers show the highest score for human as well as for technical skills in

which they almost reach a 'more than adequate' status and differ thus significantly from transport providers.

Proposition 9 that suggest different TPL categories would also reflect differences in their resource and skill base can thus also be accepted.

10.4 TPL Proactive behaviour

Following the assumed relationship between the degree of outsourcing and the entrepreneurial stance of TPL providers the categorisation (or clustering) of TPL relationships according to their level of TPL involvement also implies that difference in proactive behaviour can be detected between different type of TPL providers. The following proposition has thus been put forward to support the research question with regards to proactive behaviour of different type TPL providers:

Proposition 10: Different categories of TPL providers feature on average significant differences in proactive behaviour

Respondents in the survey were asked how proactive they perceived the TPL provider within the TPL relationship and with regards to the various management processes and phases. They were asked to rate a TPLP's proactivity on a 5 point Lickert scale from 1 (= reactive enabler) to 5 (= proactive developer). This reflects as explained in Chapter 4 the entrepreneurial stance of TPL providers in the different management areas.

Initially analysis of variance ANOVA was undertaken to detect differences in the sample based on the categorisation of TPL providers. Significant differences could be detected in almost all management processes. They are marked green (5% - level) and blue (10%-level) in the ANOVA column of table 10.7. The highest and lowest scores for proactivity, i.e. those that reflect the most significant difference are marked in 'bold'.

Table 10.7 Proactive behaviour of different TPL providers

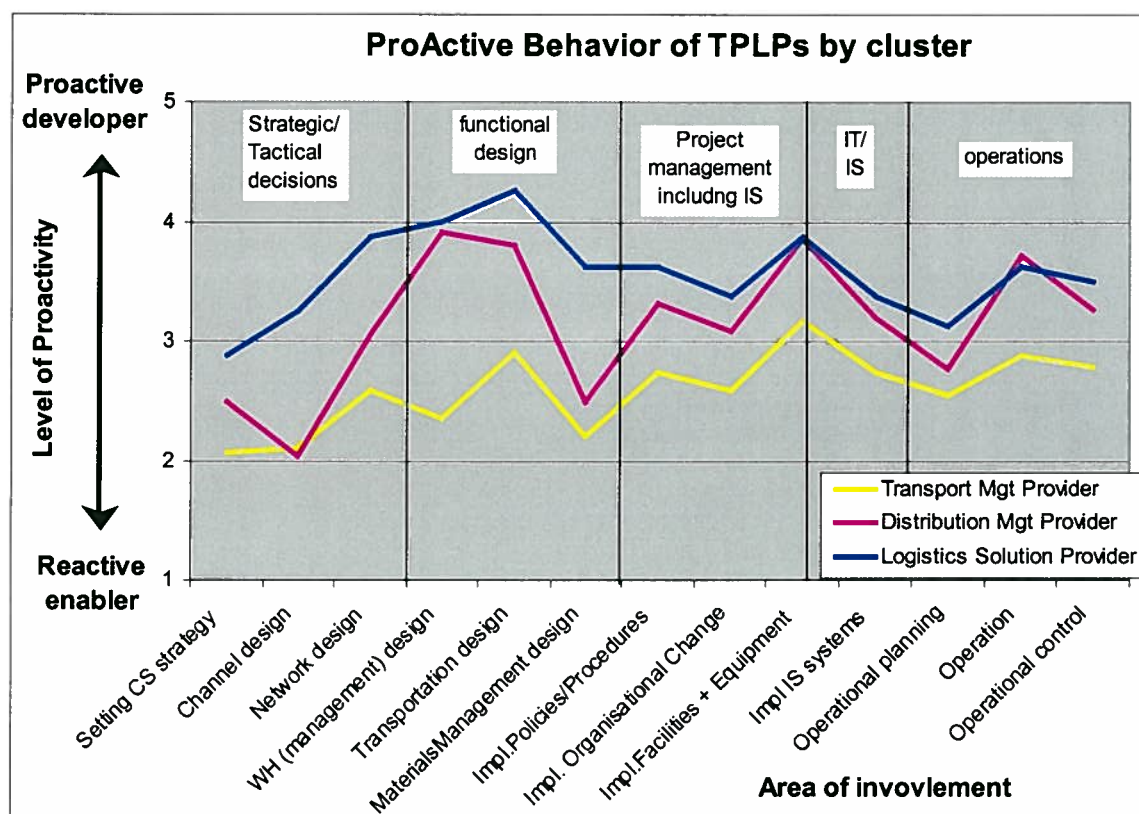
	ANOVA (Sig.)	Solution Provider	Distribution Provider	Transport Provider
Setting CS strategy	0.37	2.88	2.49	2.06
Channel design	0.02	3.25	2.03	2.10
Network design	0.01	3.88	3.06	2.58
WH (management) design	0.00	4.00	3.91	2.35
Transportation design	0.00	4.25	3.80	2.90
MaterialsManagement design	0.01	3.63	2.49	2.19
Impl.Policies/Procedures	0.20	3.63	3.31	2.74
Impl. Organisational Change	0.05	3.38	3.09	2.58
Impl.Facilities + Equipment	0.08	3.88	3.86	3.16
Impl IS systems	0.02	3.38	3.20	2.74
Operational planning	0.35	3.13	2.77	2.55
Operation	0.00	3.63	3.71	2.87
Operational control	0.05	3.50	3.26	2.77
significant at 5% level		significant at 10% level		

The biggest differences in proactive behaviour occurs thus between solution providers and transport providers, which point again to a possible causal relationship between proactive behaviour the degree of outsourcing.

Figure 10.8 shows that solution providers act overall most proactively followed by distribution providers and transport providers who's management behaviour can in almost all areas of logistics management, with the exception of implementing facilities and/or equipment be described as being rather reactive than proactive.

Solution providers are perceived as proactive enablers in almost all areas of logistics management. They act particularly entrepreneurial in the network and functional design of their clients' logistics systems. This includes although on a lower level materials management design. In this area and in strategic decision making they differ most from distribution providers, who in all other areas of management act similarly proactive. In strategic management decision and in material management design they are perceived as being reactive enablers rather than proactive developers.

Figure 10.8: Proactive behaviour of different TPL provider types



Proposition 10 with regards to difference in proactive behaviour between different categories of TPL providers can thus also be accepted.

10.5 The Impact of different type of TPLPs on Logistics performance

The assumed relationships between the level of TPL involvement in logistics systems and the effect TPLPs have on logistics performances implies that different types of TPL providers as they show different patterns in the degrees of TPL involvement also show different patterns in their influence on logistics performance. The following proposition has thus been put forward to support the research question with regards to the impact of different type of TPLPs on logistics performance:

Proposition 11: Different categories of TPL providers contribute on average differently to logistics performance.

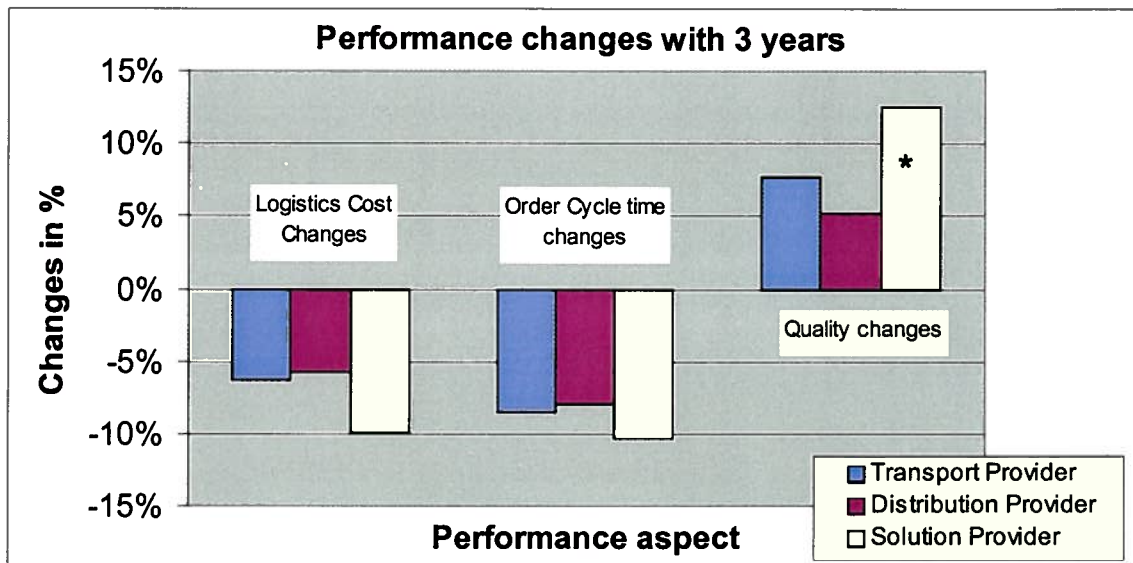
The indicators that were used to measure logistics performance were measures of efficiency, i.e. cost, and effectiveness - quality and cycle time. These measures reflect an aggregation of sub measures that were explained in the literature review and are described in detail in the Appendix. They have also been used by other researchers (Peters, et al, 1999, Laarhoven, et al, 2000).

Based on the perception of respondents performance changes over the recent 3 years were recorded, and also how TPL providers in the TPL relationships had contributed to those changes. These measures are depicted in table 10.7 under '*performance change – last 3 years*' and '*TPL influence during this time*'. Both measures are expressed in percent, and reflect the overall mean of median scores that emerged from performance intervals that have asked for in the questionnaire. Both values have subsequently been aggregated as '*performance changes attributable to TPL*', which is a function of both original measures, and which appear in the questionnaire.

Table 10.8 TPL impact on performance

Performance changes - last 3 years	ANOVA (Sig.)	Transport Provider	Distribution Provider	Solution Provider
Logistics Cost Changes	0.53	-6.26%	-5.69%	-9.88%
Order Cycle time changes	0.70	-8.48%	-7.91%	-10.25%
Quality changes	0.00	7.65%	5.23%	12.50%
TPL influence during this time		Transport Provider	Distribution Provider	Solution Provider
TPL influence on logistics cost changes	0.22	42.74%	46.43%	62.50%
TPL influence on cycle time changes	0.26	42.74%	47.14%	62.50%
TPL influence on Quality changes	0.00	50.81%	57.86%	87.50%
Performance changes attributable to TPL		Transport Provider	Distribution Provider	Solution Provider
Logistics cost changes due to TPL	0.03	-2.67%	-2.64%	-6.17%
Cycle time changes due to TPL	0.34	-3.63%	-3.73%	-6.41%
Quality changes due to TPL	0.00	3.88%	3.03%	10.94%

Analysis of variance was performed to see whether the proposition with regards to differences in TPL contribution to logistics performance could be accepted or was to be rejected. Table 10.7 shows that significant differences (marked green in the ANOVA column, and with a star in the following graphs) appear between solution providers and both other providers type with respect to quality on all three levels with respect to cost changes that appeared over a period of 3 years and were overall attributable to the TPL provider. Proposition 11 could thus be accepted.

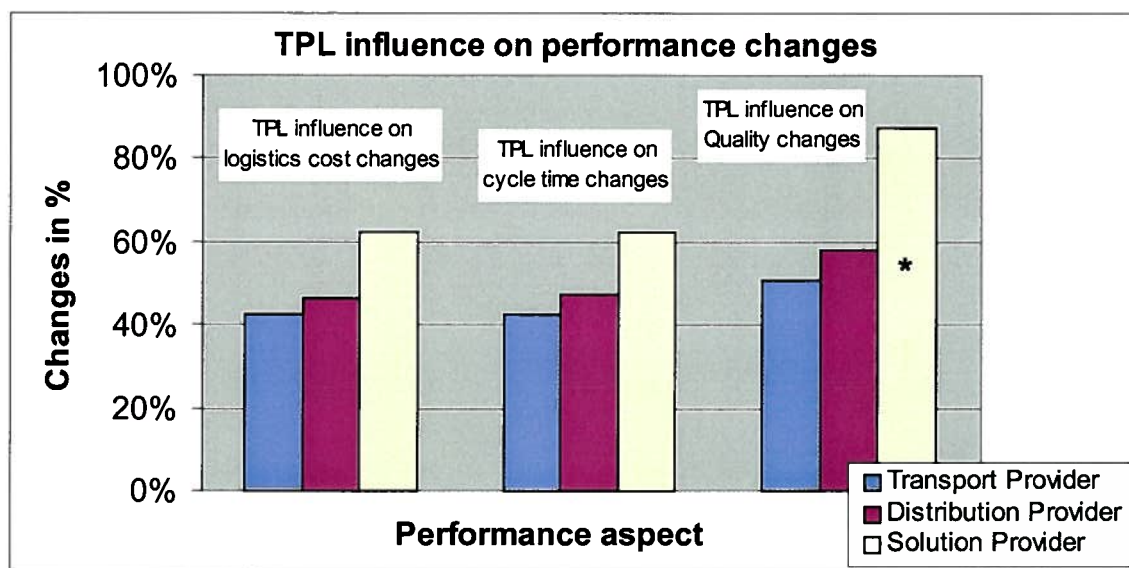
Figure 10.9: Changes in logistics performance since 3 years

Although changes in logistics performance within 3 years (figure 10.9) need not necessarily to be caused by the influence of the TPL provider, it is apparent though that in TPL relationships that reflect a higher degree of outsourcing, namely in those with a solution provider, than the other two categories of TPL relationship. With respect to changes in logistics quality this difference is significant. However solution provider relationships seem also to experience the highest reduction in logistics costs as well as the highest reduction of cycle time within a period of 3 years.

Of more interest are the perceptions of respondents with regards to the actual TPL influence on changes in logistics performance (figure 10.10) that enabled in combination with the changes in logistics performance a measure of the actual leverage the TPL influence had on logistics performance.

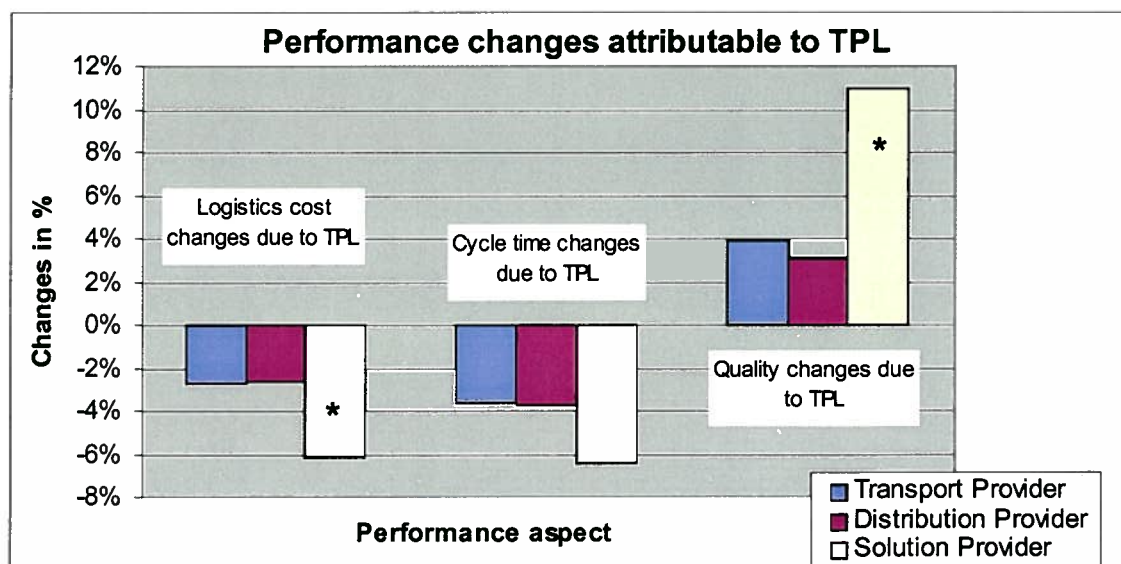
Solution providers have accordingly the biggest influence on changes in logistics performance, although this differed from the influence transport providers and distribution providers had in the sample on significantly in their influence on logistics quality.

Figure 10.10: TPL influence on changes in logistics performance in the 3 years



On average TPL providers seem to have influenced the reduction of logistics cost within a period of 3 years between 42 / 46 % (transport/distribution providers) and 62% (solution providers). With respect to cycle time reductions they influenced changes over a period of 3 years between 43/47 % (transport/distribution providers)

Figure 10.11: Change in performance over last 3 years due to TPL



and 62% (solution providers). Significantly different was however the influence of solution providers on logistics quality within 3 years (87%) as compared to the

influence of distribution providers (58%) or transport providers (51 %) on quality changes. The leverage solution providers had on logistics performance during a period of three years resulted into an average logistics cost reduction for their clients of -6.17% and differed thus significantly from the leverage transport (-2.67%) and distribution providers (-2.64%) had in the same period of time. With regards to cycle time solution providers levered on average 6.4% reduction, whereas transport and distribution providers can only be attributed with 3.6 % and 3.7% respectively. However solution, distribution and transport providers differ (statistically not significantly), which may mean the variance in each is sample is too big or (which is probably more likely the case) the sample on solution providers is too small. A significant and also the highest difference between the different types of TPL providers was detected between the actual contribution of solution providers to quality improvements (11%) and the those of transport (3.9%) and distribution providers (3%).

10.6 Conclusion

The identification of patterns in TPL provision was one of the objectives that were set at the beginning of this research project. Three distinctly different roles of TPL providers could be identified within a sample of 76 surveyed TPL relationships across various industries in Europe. With regards to the objective for this part of the research, i.e. to explore, which kind of TPL relationship would exist in Europe the sample can be seen as representative within the limits of the surveyed industrial segments. It is recognised however that the TPL segment 'solution provider' emerged solely from the TPL part of the sample, which stipulates that potential bias in the answer of respondents in TPL organisations might have blurred the picture of TPL segment.. The identified clusters were further analysed with regards to their resource and skill base, their proactive behaviour and their impact on logistics. The results confirmed the distinct difference between the identified TPL categories and provided further evidence for an existing relationship between TPL involvement and the resource and skill base of a TPL provider and their entrepreneurial stance within their clients' logistics systems respectively. The analysis further produced evidence that TPL providers that were involved to a high degree in their clients' logistics systems

influenced observable changes in logistics performance over a period of time more than TPL providers with lower degrees of involvement.

These relationships will be tested quantitatively in the next chapter.

Chapter 11 Reasoning the degree of outsourcing and TPL Involvement - Research Questions 3 and 4

11.1 Introduction

The literature review revealed that Third Party Logistics as management concept has been described and reasoned for from a shipper's point of view (e.g. Bardi, 1991; Virum, 1993; Bagchi et al, 1995) and from a provider's point of view (e.g. Andersson, 1997, Berglund 2000, Laarhoven, 2000). TPL protagonists that examine the value of TPL involvement from a provider's point of view usually argue that TPL providers are the enabler of logistics processes (Laarhoven, 2000) and can be a source for service and cost improvement (Andersson, 1997) as well as innovation and supply chain restructuring (Berglund, 2000). TPL protagonists who tend towards a shippers point of view most often argue for TPL involvement due to its effect on logistics performance (e.g. Bardi, 1991; Maltz, 1992, 1994; Virum 1993).

The view of some researchers is that the underlying motive behind logistics outsourcing decisions can be seen in the growing trend of firms to focus on core activities (Bardi, 1991; Virum, 1993; Bagchi et al, 1995;) and this therefore qualifies (some) logistics processes for outsourcing. In this research it is suggested that the degree outsourcing is rooted primarily in the capability and managerial attitude of TPL providers to manage their clients' logistics systems or parts of those. It is further suggested that different degrees of outsourcing as a result of these different 'input factors' have different effects on operational logistics performance in a logistics system. The following research questions arose from this reasoning:

RQ 3: What is the influence of a) a TPL providers' level of pro-activity in managing logistics processes and b) his resource and skill base on the degree of involvement in managing logistics processes?

RQ 4: What is the effect of different levels of TPL involvement on the performance of their clients' logistics systems?

Research question 3 aims to test the relationship between TPL resources and skills and TPL involvement, as well as the relationship between TPL proactive behaviour and their subsequent involvement in the management of logistics processes. Furthermore RQ 3 aims to assess the impact of both concepts on TPL involvement. Research question 4 finally aims to test the relationship between different degrees of TPL involvement and logistics performance.

This chapter describes the analysis of dependent and independent variables involved in these research questions. These are supported by a number of hypotheses, which guide the analysis. The acceptance or rejection of these hypotheses finally leads to answers to the research questions.

11.2 The Sample

As outlined in Chapter 6 the unit of analysis in this research is the relationships between a TPL provider and a shipper. Data that described this relationship was collected by way of interviewing key informants in shipper and TPL organisations in 4 different industrial segments in Europe (table 11.1). The sample and the sample selection process has been described in chapter 7.

Table 11. 1: Sample composition

Industry	TPL	Shipper	Total
Electronics	12	16	28
Automotive	8	6	14
Food(retail)	9	9	18
Chemicals/Energy	3	13	16
Total	32	44	76

In the questionnaire information was obtained about the degree of outsourcing (or TPL involvement) in one existing TPL relationships. It was assumed at the outset of

this study that the degree of outsourcing (or TPL involvement) within the existing population of TPL relationships would differ. Evidence for that was found by examining the difference in the observable level of outsourcing between the shipper and TPL sample and by clustering TPL relationships according to their observable level of TPL involvement, which produced further evidence (see table. 11.2 and 11.3) that different degrees of outsourcing appeared within the tested sample across the parameters that describe the sample in table 11.1. The apparent higher proportional representation of TPL relationships with a high degree of outsourcing in the TPL

Table 11. 2: Table 11.2 Clusters by respondent

Clusters by respondent	TPLP	Shipper	total
Solution Providers	11	0	11
Distribution providers	18	13	31
Transportation providers	3	29	32

Table 11. 3: Table 11.3 Clusters by industry

Clusters by industry	Automotive	Food	Electronics	Chemicals	total
Solution Providers	7	3	1	0	11
Distribution providers	5	10	12	4	31
Transportation providers	3	10	12	7	32

sample was explained by sampling method, which encouraged TPLPs to report on only ‘far reaching’ TPL relationships. However, it is recognised that it is not possible to make exact predictions about TPL involvement at a European level across different industries by relying on key informants in shipper and in TPL organisation. But this was not the intention at the outset of this research. The intention is rather to make some generalising comments about different degrees of TPL involvement by probing that relationships between variables describing the degree of TPL involvement and TPL resources/skills and TPL proactive behaviour respectively, as well as the degree of TPL involvement and logistics performance exist.

11.3 Outsourcing from a TPL point of view

Research question 3 is rooted in the idea that TPL providers’ resources and skills as well as their degree of proactive behaviour influence the degree to which shippers

outsource logistics. The following research hypotheses are put forward support the research question:

Hypothesis 1: TPL providers who are more proactive in managing logistics processes are more involved in managing logistics processes within clients' logistics system.

Hypothesis 2: TPL providers who have a better resource and skill base are more involved in managing logistics processes within clients' logistics system.

Hypothesis 3: TPL providers' degree of pr-activity and their level of resources and skills impact on their involvement in managing logistics processes within clients' logistics system independently.

11.3.1 The Key Variables

Information was collected in the questionnaire on the degree of outsourcing or (TPL

Table 11. 4: Table 11.4: TPL involvement - dependent variables

Degree of TPL involvement in					
Phase	Management level	Logistics processes	mean	Std. E	Std deviation
Design Phase	Strategic/ tactical	Defining a customer service strategy	23.19%	2.81%	0.24
		Channel design	23.95%	3.36%	0.29
		Network design	42.08%	4.16%	0.36
	Functional design	Warehouse(management) design	55.35%	3.86%	0.33
		Transportation Managment Design	64.46%	4.00%	0.34
		Materials Managment Design	29.84%	3.79%	0.33
Impl Phase	Project management	Implementing policies and procedures	53.12%	3.75%	0.32
		Bringing about organisational change	46.05%	3.92%	0.34
		Installing warehouses and MHE	48.66%	3.83%	0.33
		Implementing transport equipment	72.36%	5.17%	0.45
	IS IT	Implementing Information Systems	45.39%	4.63%	0.40
		Installing IS Hardware	53.18%	4.53%	0.39
Ops Phase	Operations	Operational planning	41.19%	2.72%	0.23
		Operational execution	55.20%	2.49%	0.21
		Operational control	41.66%	3.54%	0.30

involvement) in sets of activities that correspondent to a sub process, which was also the level on which ordinary values for the degree of outsourcing as an aggregate was obtained. These aggregated levels of outsourcing correspond to a particular sub-process in logistics systems design, implementation or operation (Table 11.4) and represent the dependent variables with regards to RQ 3.

Further information was collected for each sampled relationships with regards to TPL resources and skills necessary to design, implementation and operation (table 11.5) and TPL proactive behaviour in each sub-process (table 11.6).

Table 11. 5: TPL Resources and Skills in design, implementation and operation

Sufficiency/Adequacy of TPL Resources and Skills									
	Design Phase			Implementation Phase			Operational Phase		
	Coding	mean	Std. Dev.	Coding	mean	Std. Dev.	Coding	mean	Std. Dev.
<i>Financial Resources</i>	SUFROPS	3.12	0.68	SUFRIMP	3.18	0.63	SUFRDE	3.11	0.56
<i>Physical Resources</i>	SUPROPS	3.09	0.64	SUPRIMP	3.05	0.64	SUPRDE	3.01	0.65
<i>Technical Resources</i>	SUTROPS	3.04	0.71	SUTRIMP	3.03	0.70	SUTRDE	2.74	0.79
<i>Human Resources</i>	SUHROPS	2.82	0.71	SUHRIMP	2.96	0.67	SUHRDE	2.82	0.69
<i>Organisational Resources</i>	SUOROPS	2.86	0.65	SUORIMP	2.95	0.59	SUORDE	2.92	0.72
<i>Technical Skills</i>	SUTSOPS	3.27	0.76	SUTSIMP	3.31	0.66	SUTSDE	3.09	0.80
<i>Human Skills</i>	SUHSOPS	3.12	0.72	SUHSIMP	3.09	0.71	SUHSDE	2.74	0.94
<i>Conceptual Skills</i>	SUCSOPS	3.04	0.83	SUCSIMP	3.04	0.75	SUCSDE	2.72	1.10

Table 11. 6: TPL proactive behaviour in design, implementation and operational processes

TPL Proactivity in management processes		
Coding	mean	Std.Dev.
<i>ProA in setting CS strategy</i>	2.351	1.642
<i>ProA in channel design</i>	2.189	1.143
<i>ProA in network design</i>	2.946	1.169
<i>ProA in WH (mgt) design</i>	3.270	1.317
<i>ProA in transport mgt design</i>	3.473	1.285
<i>ProA in materials mgt design</i>	2.486	1.230
<i>ProA in impl IS systems</i>	3.027	1.182
<i>ProaA in impl policies and proced</i>	3.108	1.165
<i>ProA in impl organisational change</i>	2.905	1.112
<i>ProA in impl facilities and equipment</i>	3.568	1.074
<i>ProA in operational planning</i>	2.716	1.041
<i>ProA in operational execution</i>	3.351	0.999
<i>ProA in operational control</i>	3.081	0.947

11.3.2 Correlating the variables

In a first step of analysis to test the relationships between the independent and independent variables a correlation matrix was created in order to see whether there is a relationship between the level of involvement in each process and resources and skills and proactive behaviour respectively. Table 11.7 depicts the result and significant correlations

Table 11. 7: Correlation Matrix 1

Total Sample		ProActivity	FinRes	PhysRes	TechRes	HumRes	OrgRes	TechSkill	HumSkill	ConcSkill
Inv in defining a customer service strategy	Pearson Coefficient	0.25	0.01	0.10	0.17	0.24	0.20	0.24	0.30	0.01
	Sig. (2-tailed)	0.03	0.92	0.39	0.15	0.04	0.08	0.04	0.01	0.93
Inv in channel design	Pearson Coefficient	0.48	0.19	0.31	0.11	0.44	0.24	-0.05	0.44	0.21
	Sig. (2-tailed)	0.00	0.10	0.01	0.36	0.00	0.04	0.68	0.00	0.07
Inv in network design	Pearson Coefficient	0.38	0.08	0.14	0.11	0.15	0.17	0.14	0.40	0.25
	Sig. (2-tailed)	0.00	0.51	0.23	0.33	0.20	0.15	0.25	0.00	0.03
Inv in warehouse(management) design	Pearson Coefficient	0.31	-0.15	-0.22	-0.17	-0.22	-0.03	0.05	-0.03	0.22
	Sig. (2-tailed)	0.01	0.20	0.06	0.15	0.06	0.79	0.68	0.83	0.07
Inv in Transportation Managment Design	Pearson Coefficient	0.40	-0.03	-0.27	0.01	0.01	0.04	0.15	0.16	0.30
	Sig. (2-tailed)	0.00	0.80	0.02	0.92	0.91	0.71	0.20	0.18	0.01
Inv in Materials Managment Design	Pearson Coefficient	0.38	0.08	-0.12	-0.02	0.13	0.16	-0.04	0.14	0.20
	Sig. (2-tailed)	0.00	0.51	0.30	0.83	0.27	0.16	0.71	0.22	0.08
Inv in implementing Information Systems	Pearson Coefficient	0.27	0.05	-0.08	0.18	0.02	0.23	0.19	0.05	0.04
	Sig. (2-tailed)	0.02	0.64	0.48	0.13	0.86	0.04	0.10	0.69	0.74
Inv in implementing policies and procedures	Pearson Coefficient	0.11	-0.17	-0.35	-0.11	-0.23	-0.06	0.08	-0.25	-0.13
	Sig. (2-tailed)	0.37	0.14	0.00	0.34	0.05	0.59	0.47	0.03	0.26
Inv in bringing about organisational change	Pearson Coefficient	0.13	0.04	-0.24	-0.02	-0.10	0.27	0.04	-0.19	0.21
	Sig. (2-tailed)	0.26	0.71	0.04	0.89	0.40	0.02	0.75	0.10	0.07
Inv in installing warehouses and MHE	Pearson Coefficient	0.41	-0.09	-0.24	0.09	0.03	0.17	-0.01	-0.07	0.07
	Sig. (2-tailed)	0.00	0.45	0.04	0.42	0.78	0.14	0.90	0.54	0.58
Inv in implementing transport equipment	Pearson Coefficient	0.05	-0.06	-0.08	0.04	-0.08	-0.02	0.18	0.03	0.12
	Sig. (2-tailed)	0.64	0.59	0.53	0.72	0.52	0.89	0.13	0.78	0.32
Involvement in installing IS Hardware	Pearson Coefficient	0.39	0.00	-0.23	0.19	-0.07	0.09	0.18	-0.13	0.04
	Sig. (2-tailed)	0.00	0.97	0.05	0.11	0.54	0.46	0.13	0.26	0.75
Involvement in operational planning	Pearson Coefficient	0.16	0.11	-0.05	0.09	0.20	0.19	0.24	0.32	0.37
	Sig. (2-tailed)	0.17	0.36	0.66	0.44	0.09	0.10	0.04	0.01	0.00
Involvement in operational execution	Pearson Coefficient	0.13	0.02	-0.15	0.09	0.22	0.04	0.10	0.17	0.38
	Sig. (2-tailed)	0.28	0.84	0.20	0.47	0.06	0.78	0.40	0.16	0.00
Involvement in operational control	Pearson Coefficient	0.28	0.29	-0.08	0.21	0.32	0.30	0.34	0.30	0.16
	Sig. (2-tailed)	0.02	0.01	0.50	0.07	0.01	0.01	0.00	0.01	0.18
		significant at 5% level					significant at 10% level			

between dependent and independent variables in yellow at a 5% level and in brown at a 10% level. A superficial examination of the table reveals a comprehensive picture of all detected relationships between independent and dependent variables in the sample.

Correlation analysis was also undertaken to pre select those variable that could be used in regression analysis. For those independent variables (i.e. Resources, Skills and/or proactive behaviour) that showed a significant correlation towards the corresponding variable for TPL involvement.

The correlation matrix was also used to test for multicollinearity between the independent variables and thus to accept or reject (Hypothesis 3).

However the correlation matrix indicated that a further regression analysis on TPL involvement on the disaggregated level of sub-processes would in some processes not produce any (meaningful) results. One reason for this could be that the variables that represented resources and skills were only measured on a process level (i.e. design,

implementation, operation) and only the proactivity variable was measured on the sub-process level. It was therefore decided to aggregate the dependent variables to obtain a more meaningful and interpretable result.

11.3.3 Aggregating the dependent variables

As for the dependent variable - TPL involvement - variables were aggregated according to management areas that emerged from the literature as coherent

Table 11. 8: Aggregated variables for TPL involvement

Aggregated variables	Original variables
<i>Management level</i>	Logistics processes
<i>Strategic/ tactical</i>	Defining a customer service strategy
	Channel design
	Network design
<i>Functional design</i>	Warehouse (management) design
	Transportation Management Design
	Materials Management Design
<i>Project management</i>	Implementing policies and procedures
	Bringing about organisational change
	Installing warehouses and MHE
	Implementing transport equipment
<i>IS IT</i>	Implementing Information Systems
	Installing IS Hardware
<i>Operations</i>	Operational planning
	Operational execution
	Operational control

fields of logistics management. Table 11.8 depicts in the left column the aggregated variables and in the right the variables that were aggregated.

11.3.4 Correlating variables after aggregating the dependent variable TPL involvement

An effect of aggregating the independent variables was that for each independent variable additional independent variables were created, because proactivity was measured on a sub-process level. This meant that for every independent variable that showed a significant correlation the number of observations per independent variables, which is recommended to be a minimum of 16 cases per independent

variable in order to produce a meaningful statistic (Draper, 1998), could potentially not be achieved. With a sample of 76 cases the number of independent variable that could thus be meaningfully regressed on one dependent variable was a maximum five cases. However, the correlation matrix (table 11.9) indicates only 5 independent variables or less being significantly correlated to a dependent TPL involvement variable, with the exception of the variable *TPL involvement in strategic/tactical design*, where 8 independent variables showed a significant correlation. These could be potentially reduced after they had been tested for multicollinearity.

Table 11. 9: Correlation between TPL involvement (dependent variable) and resources, skills proactive behaviour (independent variables)

		ProA CS	ProA CD	ProA ND	FinRes	PhysRes	TechRes	HumRes	OrgRes	TechSkill	HumSkill	ConcSkill
Strategic/Tactical Mgt	Pearson Coeff.	0.278	0.419	0.470	0.120	0.226	0.091	0.328	0.247	0.275	0.467	0.211
	Sig. (2-tailed)	0.02	0.00	0.00	0.31	0.05	0.44	0.00	0.03	0.02	0.00	0.07
Tactical Design	Pearson Coeff.	0.505	0.391	0.172	-0.046	-0.268	-0.186	-0.031	0.076	0.246	0.120	0.314
	Sig. (2-tailed)	0.00	0.00	0.14	0.70	0.02	0.11	0.79	0.52	0.03	0.31	0.01
Project Management	Pearson Coeff.	0.204	0.215	0.388	-0.105	-0.324	-0.035	-0.122	0.133	0.102	-0.162	0.163
	Sig. (2-tailed)	0.08	0.07	0.00	0.37	0.00	0.77	0.30	0.26	0.39	0.17	0.17
IS	Pearson Coeff.		0.429	0.414	0.030	-0.179	0.122	-0.034	0.167	0.200	-0.055	0.123
	Sig. (2-tailed)		0.00	0.00	0.80	0.13	0.30	0.77	0.15	0.09	0.64	0.30
Operations Management	Pearson Coeff.	0.067	0.271	0.164	-0.027	-0.225	0.143	0.193	0.120	0.262	0.217	0.156
	Sig. (2-tailed)	0.57	0.02	0.16	0.82	0.05	0.22	0.10	0.31	0.02	0.06	0.18

This reduction procedure had to be undertaken in order to ensure meaningful results from multiple regression analysis.

11.3.5 Relating the independent to the dependent variables

11.3.5.1 TPL involvement in Strategic/ Tactical management decisions

This describes the involvement of TPL providers in determining a customer services strategy for distribution and in channel and network design.

The correlation table indicates that a significant relationship exists between TPL involvement in Strategic/Tactical management and

- *TPL Proactivity in Setting a customer service strategy*

- *TPL Proactivity in Channel Design*
- *TPL Proactivity in Network Design*
- *TPL Physical Resource*
- *TPL Human Resources*
- *TPL Organisational Resources*
- *TPL Technical Skills*
- *TPL Human Skills*
- *TPL Conceptual Skills*

The strongest relationship seems to exist between TPL involvement and proactive behaviour of TPLPs. To determine which variable had which impact on TPL involvement in Strategic/Tactical management decision, multiple regressions had to be applied. Testing for multi-collinearity revealed that in fact all independent variables were correlated to each other. Table 11.10 depicts in 'yellow' significant correlation at the 5% level. This

Table 11. 10: Test for multi collinearity between independent variables to TPL involvement in strategic/Tactical management decisions

Strategic/Tactical Mgt		ProACS	ProACD	ProAND	PhysRes	HumRes	OrgRes	TechSkill	HumSkill	ConSkill
ProACS	Pearson Coefficient	1.000	0.395	0.324	0.162	0.336	0.110	0.164	0.125	0.229
	Sig. (2-tailed)	.	0.00	0.00	0.17	0.00	0.35	0.16	0.29	0.05
ProACD	Pearson Coefficient	0.395	1.000	0.643	0.106	0.430	0.294	0.207	0.421	0.322
	Sig. (2-tailed)	0.00	.	0.00	0.37	0.00	0.01	0.08	0.00	0.01
ProAND	Pearson Coefficient	0.324	0.643	1.000	-0.011	0.319	0.334	0.308	0.496	0.353
	Sig. (2-tailed)	0.00	0.00	.	0.92	0.01	0.00	0.01	0.00	0.00
PhysRes	Pearson Coefficient	0.162	0.106	-0.011	1.000	0.307	0.097	0.114	0.299	0.095
	Sig. (2-tailed)	0.17	0.37	0.92	.	0.01	0.41	0.33	0.01	0.42
HumRes	Pearson Coefficient	0.336	0.430	0.319	0.307	1.000	0.514	0.165	0.391	0.313
	Sig. (2-tailed)	0.00	0.00	0.01	0.01	.	0.00	0.16	0.00	0.01
OrgRes	Pearson Coefficient	0.110	0.294	0.334	0.097	0.514	1.000	0.379	0.300	0.314
	Sig. (2-tailed)	0.35	0.01	0.00	0.41	0.00	.	0.00	0.01	0.01
TechSkill	Pearson Coefficient	0.164	0.207	0.308	0.114	0.165	0.379	1.000	0.537	0.520
	Sig. (2-tailed)	0.16	0.08	0.01	0.33	0.16	0.00	.	0.00	0.00
HumSkill	Pearson Coefficient	0.125	0.421	0.496	0.299	0.391	0.300	0.537	1.000	0.447
	Sig. (2-tailed)	0.29	0.00	0.00	0.01	0.00	0.01	0.00	.	0.00
ConSkill	Pearson Coefficient	0.229	0.322	0.353	0.095	0.313	0.314	0.520	0.447	1.000
	Sig. (2-tailed)	0.05	0.01	0.00	0.42	0.01	0.01	0.00	0.00	.

means that multiple regression analysis on all significantly correlated independent variables needs to be interpreted with caution. The impact of multicollinearity is not to bias the coefficients but rather bias the standard errors of those coefficients downwards.. This means that the relative weight of each independent variable in

explaining the variance in TPL involvement in 'Strategic/Tactical management decisions' is subject to rather greater uncertainty than the standard errors suggest.

However identifying a positive relationship between the specified dependent and the significantly correlated variable was to be sufficient evidence to accept hypotheses 1 and 2.

Exemplifying the impact of the dependent variables on the degree of TPL involvement in strategic/tactical management decision for their clients Table 11.11 shows the result of simple (one variable) linear regression analysis on the dependent variable

Table 11. 11: Linear-regression analysis on TPL Involvement in Strategic/Tactical Management decisions and 'TPL Proactive behaviour' in Channel Design

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.419 ^a	.176	.164	.2223

a. Predictors: (Constant), ProA in channel design

Coefficients ^a						
		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.102	.056		1.811	.074
	ProA in channel design	8.918E-02	.023	.419	3.917	.000

a. Dependent Variable: Inv StrategicMgt

'Proactiitiy in Channel Design'. The R-square in the model represents the proportion of the variance of the dependent variable (TPL involvement in Strategic/Tactical Management Decisions) that was explained by the model. B in the table below represents the partial regression coefficient and its standard error. The B value indicates that the relationship is positive.

Table 11.12 depicts all R square and Beta-coefficient values for the significantly correlating dependent variables. All independent variables are positively related to TPL involvement in Strategic/Tactical Decision making and offer to explain the variance in this in a range of between 6% and 22%. Proactivity in Network design' and sufficient Human Skills of TPL providers explain a significant proportion of the variance in TPL involvement in Strategic/Tactical management decisions within the sample.

Table 11. 12: Regressions results

Dependent variable : TPL Involvement in Strategic/Tactical Mgt									
Independent variable	ProACS	ProACD	ProAND	PhysRes	HumRes	OrgRes	TechSkill	HumSkill	ConSkill
Adjusted R square	0.08	0.18	0.22	0.05	0.11	0.06	0.06	0.22	0.04
B coefficient	0.04	0.09	0.10	0.09	0.11	0.09	0.09	0.16	0.06

11.3.5.2 TPL involvement in functional design of a Logistics System

This describes the involvement of TPL providers in the (functional) design of their clients' warehouses and warehouse management, their transport management, and their materials management.

The correlation table 11.8 indicates that a significant relationship exists between TPL involvement in the functional design of their clients' logistics systems and

- TPL Proactive Behaviour towards WH and WH management design
- TPL Proactive Behaviour towards Transport Management design
- TPL Physical Resources
- TPL Technical Skills
- TPL Conceptual Skills

Table 11.13 shows that the linear relationship between these dependent variables and the variable for TPL involvement are positively related. It can furthermore be

Table 11. 13: Table 10.12 Regressions on

Dependent variable: TPL Involvement in Functional Design					
Independent variable	ProA WH	ProA TR	PhysRes	TechSkill	ConSkill
Adjusted R square	0.26	0.14	0.07	0.05	0.09
B coefficient	0.10	0.08	-0.11	0.08	0.10

concluded that TPL proactive behaviour towards WH and WH management design explains best the variance that appeared in the sample for TPL involvement in functional design. This means TPL providers that act entrepreneurial in their approach to Warehouse (management design) are more involved in the functional design of their clients' logistics systems than TPL providers who act less entrepreneurial in the area of logistics management.

Testing the dependent variables for multicollinearity reveals again a correlation amongst most of the dependent variables, which makes it impossible to say which of these variable impacts most on TPL involvement in functional design - see table (11.14). Only one independent variable, TPL Physical Resources, impacts negatively on a TPL provider's degree of involvement in functional design. The percentage variance that can be explained by this is rather low. This means that other factors are impacting TPL involvement.

Table 11. 14: Test for multicollinearity between independent variables to TPL

Functional Design		ProA WH	ProA TR	PhysRes	TechSkill	ConSkill
ProA WH	Pearson Coefficient	1.000	0.494	-0.143	0.267	0.214
	Sig. (2-tailed)	.	0.00	0.22	0.02	0.07
ProA TR	Pearson Coefficient	0.644	1.000	0.061	0.343	0.340
	Sig. (2-tailed)	0.00	.	0.61	0.00	0.00
PhysRes	Pearson Coefficient	-0.143	0.061	1.000	0.114	0.095
	Sig. (2-tailed)	0.22	0.61		0.33	0.42
TechSkill	Pearson Coefficient	0.267	0.343	0.114	1.000	0.520
	Sig. (2-tailed)	0.02	0.00	0.33		0.00
ConSkill	Pearson Coefficient	0.214	0.340	0.095	0.520	1.000
	Sig. (2-tailed)	0.07	0.00	0.42	0.00	

11.3.5.3 TPL involvement in the project management phase of a Logistics System

This describes the involvement of TPL providers in the implementation of warehouse facilities, material handling equipment and transport equipment as well the implementation of new policies and procedures, and measures to bring about organisational change.

The correlation matrix 11.8 suggests that the following independent variables are significantly correlated with the TPL involvement variable:

- TPL proactive behaviour with regards to the implementation of Organisational change
- TPL proactivity behaviour in implementing facilities and equipment
- Sufficient physical resources

Table 11. 15: Regressions on

Dependent variable: TPL Involvement in Project Management

Independent variable	ProA OC	ProA F+E	PhysRes
Adjusted R square	0.03	0.14	0.09
B coefficient	0.05	0.09	-0.13

Table 11.15 indicates that proactive behaviour towards the implementation of facilities and equipment is the variable that explains best the variance in TPL involvement in this management area. Its value is still low though, which means that there must be other factors that influence the degree of outsourcing in the implementation phase of a logistics system. Table 11.16 shows again collinearity between the 2 proactivity variables, which makes it impossible to test which one of them influences TPL involvement more in these management processes.

Table 11. 16: Test for multicollinearity between independent variables to TPL

Project Management		ProA OC	ProA F+E	PhysRes
ProA OC	Pearson Coefficient	1.000	0.401	0.065
	Sig. (2-tailed)	.	0.00	0.58
ProA F+E	Pearson Coefficient	0.401	1.000	-0.125
	Sig. (2-tailed)	0.00	.	0.29
PhysRes	Pearson Coefficient	0.065	-0.125	1.000
	Sig. (2-tailed)	0.58	0.29	

11.3.5.4 TPL involvement in implementing IS /IT systems to support the logistics system

This includes the implementation of information systems as well as the implementation of necessary electronic hardware.

The correlation table 11.8 suggests significantly correlating relationships between the TPL involvement in IS/IT implementation and

- TPL proactive behaviour towards implementing IS systems
- TPL proactive behaviour towards implementing electronic Hardware
- Adequate TPL Skills

Table 11.17 shows that TPL providers acting proactively towards the implementation of information systems and possess the relevant technical skills are (within the tested sample) more involved in this area of logistics management than providers that act less proactively. The possession of technical skills does not seem to make much difference though (3%).

Table 11. 17: Regressions on

Dependent variable: TPL involvement in IS / IT Implement

Independent variable	ProA IS	ProA F+E	TechSkill
Adjusted R square	0.17	0.16	0.03
B coefficient	0.12	0.13	0.10

Testing the independent variables for multicollinearity reveals correlation between

Table 11. 18: Test for multicollinearity between independent variables to TPL

IT / IS Implementation		ProA IS	ProA F+E	TechSkill
ProA IS	Pearson Coefficient	1.000	0.474	0.129
	Sig. (2-tailed)	.	0.00	0.27
ProA F+E	Pearson Coefficient	0.474	1.000	0.076
	Sig. (2-tailed)	0.00	.	0.52
TechSkill	Pearson Coefficient	0.129	0.076	1.000
	Sig. (2-tailed)	0.27	0.52	

both proactivity variables (table 11.18). In view of the low explanatory power of TPL Technical Skills a further multiple regression on some common denominator for both proactivity variables does not reveal any better results than the linear regression on each of the variables.

11.3.5.5 TPL involvement in operating their clients logistics system

This entails operational planning activities, operational execution and operational control. The correlation matrix 11.8 shows significantly correlated relationships for the following independent variables to TPL involvement in logistics operations:

- TPL Proactive behaviour towards operational execution
- Sufficient Physical Resources
- Sufficient Human resources
- Adequate Technical Skills
- Adequate Human Skills

Table 11.19 shows though that none of these variables explain the variance in TPL involvement in operations very much. There must thus be other factors that explain varying degrees of operational involvement of TPL providers. TPL involvement in operational processes reveals also the lowest variance explained for all dependent variables'. This may be reflecting TPL relationships overall quite well, because the degree of operational outsourcing of logistics is widely spread amongst shippers.

Table 11. 19: Regressions on

Dependent variable: TPL Involvement in Operations					
Independent variable	ProA O	PhysRes	HumRes	TechSkill	HumSkill
Adjusted R square	0.06	0.04	0.02	0.06	0.03
B coefficient	0.06	0.08	0.06	0.07	0.05

The test for collinearity reveals again multicollinearity amongst the dependent variables, which makes a further application of multiple regression analysis problematic (table 10.20).

Table 11. 20: Test for multicollinearity between independent variables to TPL

Operations Management		ProA O	PhysRes	HumRes	TechSkill	HumSkill
ProA O	Pearson Coefficient	1.000	0.056	0.131	0.474	0.288
	Sig. (2-tailed)	.	0.64	0.27	0.00	0.01
PhysRes	Pearson Coefficient	0.056	1.000	0.341	-0.002	0.208
	Sig. (2-tailed)	0.64		0.00	0.98	0.08
HumRes	Pearson Coefficient	0.131	0.341	1.000	0.230	0.565
	Sig. (2-tailed)	0.27	0.00		0.05	0.00
TechSkill	Pearson Coefficient	0.474	-0.002	0.230	1.000	0.620
	Sig. (2-tailed)	0.00	0.98	0.05		0.00
HumSkill	Pearson Coefficient	0.288	0.208	0.565	0.620	1.000
	Sig. (2-tailed)	0.01	0.08	0.00	0.00	

11.3.6 Answering research question 3

Research question 3 was supported by 3 hypotheses, which emphasised the positive and independent relationship between TPL involvement as dependent variables and TPL resources and skills respectively, as well as TPL proactive behaviour as independent variables. The research question reads:

RQ 3: What is the influence of a) a TPL providers' level of pro-activity in managing logistics processes and b) his resource and skill base on the degree of involvement in managing logistics processes?

Hypothesis 3 expressed the assumption that TPL resources and skills respectively, impact independently from proactive behaviour on TPL involvement. This hypothesis cannot be tested because multicollinearity between the proactivity variable and other

resource/skill variables in each stage of analysis (i.e. on each level of TPL involvement) means that their independent effects cannot be identified with certainty. Proactive behaviour variables are, apart from being always correlated to other proactivity variables on each level of management correlated to skills rather than resources, which means that proactive behaviour might have to be seen as a 'higher order' skill in itself.

Hypothesis 1 expresses the proposition that TPL proactive behaviour impacts positively on TPL involvement. This hypothesis can be accepted. On each level of analysis (i.e. TPL involvement) proactive behaviour appears to be positively correlated to TPL involvement. Furthermore proactive behaviour variables impact with respect to resource and skill variables to the greatest extent. This means that proactive behaviour literally makes a difference, because the variance in TPL involvement could on all levels be explained most by proactive behaviour. TPL proactive behaviour has the biggest impact on TPL involvement in Strategic/Tactical management decision, where it explains up to 22% of the variance in TPL involvement, in functional design of logistics systems, where it explains up to 26% of the variance in TPL involvement and in implementing IS/IT systems. Here proactive behaviour of TPLPs explains 16% / 17% of the variation in TPL involvement. In project management, i.e. the implementation of facilities and equipment, policies and procedures as well as the bringing about of organisational change TPL proactivity explains 14% percent of the variance on TPL involvement and in operations with on 6%. Overall it can be concluded that proactive behaviour of TPL providers has its biggest impact on the degree of outsourcing in the design of logistics systems. This is not surprising since this in comparison to operational involvement is still new business territory for TPL providers (Berglund 2000, Laarhoven, 2000). It also means that shippers need to be convinced that TPL providers have understood their (shippers') logistics aims and objectives, which consequently means that TPL providers have to prove their understanding of these goals by taking the initiative and suggesting innovative solutions to their clients if they want to be involved in this end of logistics management.

Hypothesis 2 expressed the proposition that TPL resources and skills respectively, impact positively on TPL involvement. This can generally be accepted on the grounds

that on each level of analysis, i.e. different management levels reflecting TPL involvement showed the impact of at least one resources and/or skill. This has to be looked upon though in a differentiated way. It must first of all it must be said that the impact of resources on each management level of TPL involvement is rather low. Only Physical, Human and Organisational resources impact on TPL involvement, with organisational resources being (just) detectable as a minor (6%) impacting factor in strategic/tactical decision making. Human resources are detectable as having the biggest impact on TPL involvement, although only with regards to TPL involvement in strategic/tactical management decision, where they explain 11% of the variance in TPL involvement. Some impact of TPL human resources can also be detected on an operational management level. But 2% percentage variance can't be interpreted as being very influential. TPL Physical Resources impact negatively although only moderately on TPL involvement in the functional design (7%) and project management or implementation phase (9%) of logistics systems. These means that TPL providers with a large physical resources base are less likely to be involved in these management activities than TPL providers with a lower physical resource base. This could be interpreted as a support for the asset versus non-asset profile of TPL providers (Sheffi, 1990).

Skills impact overall more than resources on TPL involvement. Human skills seem to be the most important ones. They impact on TPL involvement in strategic/tactical management decisions with 22%, which means that 22% of the variance in TPL involvement on this management level can be explained by higher or lower human skills. On a functional design level of logistics management conceptual skills seem to be the prevailing ones. They explain 9% of the variance in TPL involvement. Technical skills can only be detected as an impacting factor on TPL involvement in operations management (6%) and IS/IT implementation (3%), which does in both cases not give much reason to interpret an overall high influence of Technical Skills.

Overall it can be concluded that the impact of resources and skills on the degree of TPL involvement or the degree of outsourcing could, within the tested sample, not be identified as being very influential. This might have to do though with the sample size and the disaggregated level of resources and skills that were examined in relationships to relatively high management levels of TPL involvement. It can, however firmly be

concluded that despite these analytical constraints some level of influence between TPL involvement and the resource and skill base of TPLPs was detected. As an hypothesis it is accepted.

11.4 Outsourcing from a shippers point of view (The relationships between TPL involvement and Logistics performance)

Research question 4 is rooted in the idea that there is a relationship between the level of TPL involvement in a logistics systems and logistics performance. The following research hypotheses are put forward to support the research question

Hypothesis 4: TPL providers with a high level of involvement are perceived as bigger contributors to reduction of logistics cost within their client's logistics systems than TPL providers with a lower level of involvement.

Hypothesis 5: TPL providers with a high level of involvement are perceived as bigger contributors to cycle time reductions within their client's logistics systems than TPL providers with a lower level of involvement.

Hypothesis 6: TPL providers with a high level of involvement are perceived as bigger contributors to quality improvements within their clients' logistics systems than TPL providers with a lower level of involvement.

11.4.1 The key variables

Information was collected in the questionnaire on changes in logistics costs

- As an aggregate of transport, warehousing, inventory carrying, and administration cost,
- On overall cycle time, being an aggregate of storage, warehouse transfer (in/out), packing/labelling, value adding, and transport lead time,
- As well as in logistics quality as an aggregate of order completeness, damage free delivery, on time delivery and invoice accuracy.

Based on the perception of respondents performance changes over the recent 3 years were recorded, and also how TPL providers in the TPL relationships were perceived to have contributed to those changes. These measures are depicted in table 10.7 under '*performance change – last 3 years*' and '*TPL influence during this time*'. Both measures are expressed in percent, and reflect the overall mean of median scores that emerged from performance intervals that have asked for in the questionnaire. Both values have subsequently been aggregated as '*performance changes attributable to TPL*', which is a function of both original measures, and which appear in the questionnaire.

The standard error column (Std.E) in table 11.21 refers to the confidence in the estimate of the mean. All the scores are highly significant at the 1% level.

Table 11. 21: Logistics performance

Performance changes within 3 years	mean	Std.E	Std.Dev.
Logistics Cost Changes	-6.38%	1.09%	0.09
Order Cycle time changes	-8.41%	0.82%	0.07
Quality changes	7.03%	0.67%	0.06
TPL influence on performance			
on logistics cost changes	46.62%	3.31%	0.28
on cycle time changes	46.96%	3.53%	0.30
on Quality changes	58.11%	2.97%	0.26
Changes due to TPL			
Logistics cost changes due to TPL	-2.97%	0.67%	0.06
Cycle time changes due to TPL	-3.95%	0.55%	0.05
Quality changes due to TPL	4.08%	0.55%	0.05

Independent variables in this context are these that reflect a certain degree of involvement on an aggregated management level (see table 11.22 or 11.7 for further information on the Std. Error and variance in this variable). The different TPL involvement variables were tested only on 'TPL influence', because that is the only clear variable which reflects the contribution of TPLPs to different areas of logistics performance. The variables termed '*...changes due to TPL*' reflect a measure of TPL influence and observable changes which were caused also by other factors. Any variation within this variable would therefore be explained by variations in TPL involvement. Tables 11.2, 11.25, and 11.27 depict the correlation matrices for the dependent variables 'TPL influence on' cost, cycle time and quality changes and their (hypothesised) correlating independent variables.

Table 11. 22: Independent variables TPL involvement

Aggregated variables	Original variables
<i>Management level</i>	Logistics processes
<i>Strategic/ tactical</i>	Defining a customer service strategy
	Channel design
	Network design
<i>Functional design</i>	Warehouse (management) design
	Transportation Management Design
	Materials Management Design
<i>Project management</i>	Implementing policies and procedures
	Bringing about organisational change
	Installing warehouses and MHE
	Implementing transport equipment
<i>IS IT</i>	Implementing Information Systems
	Installing IS Hardware
<i>Operations</i>	Operational planning
	Operational execution
	Operational control

11.4.2 TPL influence on logistics cost reductions in a clients logistic system

Table 11. 23: Correlation matrix for TPL influence on logistics cost changes

Correlations

		TPL influence on logistics cost changes	Inv StrategicMgt	Functional Design	Project Managemnt	IS-IT	operations management
TPL influence on logistics cost changes	Pearson Correlation	1.000	.261*	.259*	.149	.142	.118
	Sig. (2-tailed)	.	.025	.026	.204	.226	.317
Inv StrategicMgt	Pearson Correlation	.261*	1.000	.409**	.162	.457**	.364**
	Sig. (2-tailed)	.025	.	.000	.169	.000	.001
Functional Design	Pearson Correlation	.259*	.409**	1.000	.694**	.650**	.404**
	Sig. (2-tailed)	.026	.000	.	.000	.000	.000
Project Managemnt	Pearson Correlation	.149	.162	.694**	1.000	.661**	.408**
	Sig. (2-tailed)	.204	.169	.000	.	.000	.000
IS-IT	Pearson Correlation	.142	.457**	.650**	.661**	1.000	.420**
	Sig. (2-tailed)	.226	.000	.000	.000	.	.000
operations management	Pearson Correlation	.118	.364**	.404**	.408**	.420**	1.000
	Sig. (2-tailed)	.317	.001	.000	.000	.000	.

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Table 10.23. shows a clear relationship between TPL influence on logistics cost (reductions) and their involvement at Strategic and functional design level of a logistics system. However, both these independent variables are strongly correlated

with each other so that further multiple regression analysis adds little to our understanding. The R square value for them stemming from the linear regression model indicates though that both variables have a significant explanatory power with regards to the variance in TPL influence on logistics costs (see table 11.22). The hypothesis that was put forward to suggest that TPL providers with a high level of involvement have a bigger impact on logistics cost reductions within the sample than TPL provider with a lower level of involvement can therefore be accepted. This has to be balanced by the fact that only TPL involvement at the design level of logistics systems showed an effect on logistics cost reductions and that at an insignificant value of little more than 5% percentage variance explained.

Table 11. 24: Linear regression on

Dependent variable: TPL influence on logistics cost reductions

Independent variable	Inv in Strategic Mgmt	Inv functional Des.
<i>Adjusted R square</i>	0.055	0.054
B coefficient	0.305	0.288

11.4.3 TPL influence on cycle time reductions in a client's logistic system

Table 10.24 shows a clear relationship between TPL influence on cycle time reductions in a client's logistics system and their involvement at Strategic Management level and in operations management respectively.

Table 11. 25: Correlation matrix for TPL influence on cycle time changes**Correlations**

		TPL influence on cycle time changes	Inv StrategicMgt	Functional Design	Project Managemnt	IS-IT	operations management
TPL influence on cycle time changes	Pearson Correlation Sig. (2-tailed)	1.000 .	.244* .036	.159 .175	.127 .282	.142 .227	.312* .007
Inv StrategicMgt	Pearson Correlation Sig. (2-tailed)	.244* .036	1.000 .	.409** .000	.162 .169	.457** .000	.364** .001
Functional Design	Pearson Correlation Sig. (2-tailed)	.159 .175	.409** .000	1.000 .	.694** .000	.650** .000	.404** .000
Project Managemnt	Pearson Correlation Sig. (2-tailed)	.127 .282	.162 .169	.694** .000	1.000 .	.661** .000	.408** .000
IS-IT	Pearson Correlation Sig. (2-tailed)	.142 .227	.457** .000	.650** .000	.661** .000	1.000 .	.420** .000
operations management	Pearson Correlation Sig. (2-tailed)	.312* .007	.364** .001	.404** .000	.408** .000	.420** .000	1.000 .

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

The R square value for them (see table 10.26) stemming from the linear regression model indicate that TPL involvement in strategic management has only an insignificant influence (4.6%) and TPL involvement in operation has the dominant, but also very limited impact on TPL influence on cycle time reduction (8.5 %).

The hypothesis that was put forward to suggest that TPL providers with a high level of involvement have a bigger impact on cycle time reductions within the sample then TPL provider with a lower level of involvement has to be accepted. This is balanced by the fact that only TPL involvement at strategic management level together with high involvement at operational of logistics systems has an effect on TPL influence on cycle time reductions. The low R square value indicates though that other factors also determine TPL influence on cycle time reductions.

Table 11. 26: Linear regression on

Dependent variable: TPL influence on cycle time reductions

Independent variable	Inv in Strategic Mgmt	Inv operations
Adjusted R square	0.046	0.085
B coefficient	0.305	0.429

11.4.4 TPL influence on quality improvements in a clients logistic system

Table 11.27 shows a clear relationship between TPL influence on quality improvement in a clients logistics system and their involvement at Strategic and

Table 11. 27: Correlation matrix for TPL influence on quality changes

		Correlations					
		TPL influence on Quality changes	Inv StrategicMgt	Functional Design	Project Managemnt	IS-IT	operations management
TPL influence on Quality changes	Pearson Correlation	1.000	.483**	.260*	.070	.305**	.162
	Sig. (2-tailed)	.	.000	.025	.551	.008	.169
Inv StrategicMgt	Pearson Correlation	.483**	1.000	.409**	.162	.457**	.364**
	Sig. (2-tailed)	.000	.	.000	.169	.000	.001
Functional Design	Pearson Correlation	.260*	.409**	1.000	.694**	.650**	.404**
	Sig. (2-tailed)	.025	.000	.	.000	.000	.000
Project Managemnt	Pearson Correlation	.070	.162	.694**	1.000	.661**	.408**
	Sig. (2-tailed)	.551	.169	.000	.	.000	.000
IS-IT	Pearson Correlation	.305**	.457**	.650**	.661**	1.000	.420**
	Sig. (2-tailed)	.008	.000	.000	.000	.	.000
operations management	Pearson Correlation	.162	.364**	.404**	.408**	.420**	1.000
	Sig. (2-tailed)	.169	.001	.000	.000	.000	.

** . Correlation is significant at the 0.01 level (2-tailed).

* . Correlation is significant at the 0.05 level (2-tailed).

functional design level of a logistics system as well as their involvement in implementing IS/IT systems.

The R square values (see table 11.28) stemming from the linear regression model indicates though a significant impact of TPL involvement in strategic management (22%) and in implementing IS/IT systems (8%) and less, though detectable impact of TPL involvement the functional design level of a logistics systems. Operations has also a limited impact on TPL influence on cycle time reduction (8.5 %).

Table 11. 28: Linear regression on

Dependent variable: TPL influence on quality improvements

Independent variable	Inv in Strategic Mgmt	Inv functional Des.	Inv IS/IT
Adjusted R square	0.222	0.055	0.080
B coefficient	0.507	0.260	0.236

The hypothesis that was put forward to suggest that TPL providers with a high level of involvement have a bigger impact on quality improvements within the sample than TPL provider with a lower level of involvement can be accepted. The impact of high degree of TPL involvement on TPL influence on quality changes is in comparison to the impact they have on logistics cost or cycle time reductions quite high. A high degree of outsourcing in logistics systems design and IS/IT implementation is of particular importance.

11.4.5 Answering research question 4

Research question 4 is supported by 3 hypotheses, which emphasise the positive relationship between the degree of TPL involvement (as set of independent variables) and TPL influence on logistics costs reduction, cycle time reduction and logistics quality improvement as dependent variables. The research question reads

RQ 4: What is the effect of different levels of TPL involvement on the performance of their clients' logistics systems?

Hypothesis 4 expresses the assumption that TPL providers with a high level of involvement are perceived as bigger contributors to the reduction of logistics cost within their client's logistics systems than TPL providers with a lower level of involvement. This hypothesis is accepted on the ground that proportionally higher involvement in the design of logistics systems impacts with a limited but identifiable influence of TPLPs on logistics cost reductions.

Hypothesis 5 expressed the assumption that TPL providers with a high level of involvement are perceived as bigger contributors to cycle time reduction within their client's logistics systems than TPL providers with a lower level of involvement. This hypothesis was accepted on the ground that a higher involvement in the strategic management design and operations leads to a small, but detectable, influence on TPLPs on cycle time reductions..

Hypothesis 6 expresses the assumption that TPL providers with a high level of involvement are perceived as bigger contributors to logistics quality improvement within their client's logistics systems than TPL providers with a comparatively lower level of involvement. This hypothesis is accepted on the ground that a proportionally higher involvement in the design of logistics systems and in IS/IT implementation is associated with a substantial influence of TPLP involvement on cycle time reductions.

Overall it can be concluded that the degree of TPL involvement or the degree of outsourcing is an influence on logistics performance. It could be detected, despite the obvious statistical weaknesses that were caused by a relatively small sample size and the analysis of TPL involvement on a (probably too) low a level of management. It therefore is even more encouraging to conclude that high degrees of TPL involvement particularly in (re-) designing a logistics system will be advantageous to shippers with respect to all parameters of logistics performance and particular with respect to quality improvements.

11.5 Summary and conclusions

In this chapter the strategic relevance of different degrees of outsourcing or TPL involvement has been examined from a TPL providers perspective as well as from a shippers perspective.

It is shown that a high degree of entrepreneurial behaviour in on behalf of their clients has an effect on the degree to which shippers outsource logistics. This is of particular relevance for level of logistics management that have to do with the design and implementation of logistics systems. It is also shown that TPL resources, and in particular TPL skills have an impact on shippers decision to outsource. The level of skills and resources however are highly correlated with innovative approaches to logistics management and therefore it is not possible to confidently separate their relative influence.

It was also shown that shippers who outsource to a high degree are likely to enjoy better performance values, particularly with respect to logistics quality.

Chapter 12 General Conclusions and Future Research

12.1 Introduction

This final chapter summarises the research project, its main findings and evaluates their contribution to knowledge. Furthermore the approach used to research TPL is discussed and evaluated.

Initially the research project and the methodological approach to it is outlined. This is followed by a summary of the research findings in correspondence with the research propositions and hypotheses. In the section after this the contribution of this research is outlined and the research approach is critiqued. Finally some directions for further research are outlined.

12.2 The research project

Third party logistics is a concept that is widely accepted as an alternative to vertical integration. The degree to which it is applied in practice varies considerably.

The focus of this research is the role of TPLPs in existing logistics systems, and how they themselves can influence this. This is influenced by the strategic position with which a TPLP is trusted by a shipper, and to some extent by a TPLP's competence and entrepreneurial behaviour towards logistics management. Logistics competence is sourced externally up to the level at which a shipper recognises this to be advantageous. TPL involvement might be influenced by TPLPs' initiatives towards innovative ideas in logistics management.

The objectives of this research were to explore different roles that TPLPs can assume in the management of their clients' logistics systems, and the impact of their contribution on logistics performance. This research aims therefore to provide further and better understanding of third party logistics, and to develop a general framework for evaluating the effects of the logistics competence and entrepreneurial behaviour

(with regards to their clients' logistics requirements) of TPLPs on logistics outsourcing, and thus the strategic role assumed by TPLPs.

The literature review in chapter 2 examined the current state of TPL in Europe in comparison to other geographic regions - the U.S., Australia, and Asia. It furthermore examined current knowledge about the reason for logistics outsourcing. Most analytical research in the areas has adopted the transaction cost analysis approach. Little of the reviewed literature revealed any empirical evidence that could be linked to TPL competence or proactive/entrepreneurial behaviour. Another prevailing issue in TPL research has been that of TPL partnerships. TPL relationships today seem at large to develop towards partnering as opposed to arm's length relationships. This and the further proliferating core business concept in western industries seem to have initiated a change in the TPL providers' role in logistics management, which is more management and information driven rather than by the provision of asset based services. A tendency of players in the TPL logistics market to position (or sometimes rather promote) themselves in the 'high end' of the logistics service provision, regardless of their historical roots or former core businesses, can be observed.

The critique of the literature in led to a conceptual research model and the following research questions with their corresponding proposition and hypotheses respectively:

RQ 1: How do European shippers and TPLPs perceive the current role of TPLPs?

Proposition 1: The measurable degree of TPL involvement is higher for TPL respondents than for shipper respondents.

Proposition 2: The perception of the relative importance of resources and skills in designing, implementing and operating logistics systems does on average not differ between TPL respondents and shipper respondents.

Proposition 3: The perception of current sufficiency of resources and skills is on average lower within the shipper sample than in the TPL sample

Proposition 4: Predictions about future developments of TPL resources and skills do on average not differ between respondents in the shipper and the TPL sample

Proposition 5: Respondents of TPL organisations perceive themselves on average as more proactive in managing logistics processes in the TPL relationship they report upon than shippers perceive their contractors to be in the TPL relationships they report upon.

Proposition 6: The contribution of TPL to logistics performance is reflected on average higher in the TPL sample than in the shipper sample.

RQ 2: Can TPL relationships be categorised according to their degree of TPL involvement?

Proposition 7: The provision of logistics services in Europe appears in clusters of different levels of involvement, which typifies a distinguishable kind of TPL relationship

Proposition 8: The TPL sample will contain a higher proportion of TPL categories reflecting a high degree of TPL involvement than the shipper sample.

Proposition 9: Different categories of TPL providers feature on average significant differences in their resource and skills base.

Proposition 10: Different categories of TPL providers feature on average significant differences in proactive behaviour

Proposition 11: Different categories of TPL providers contribute on average differently to logistics performance.

RQ 3: What is the influence of a) a TPLP's level of proactivity in managing logistics processes, and b) his resource and skill base on the degree of involvement in managing logistics processes?

Hypothesis 1: TPL providers who are more proactive in managing logistics processes are more involved in managing logistics processes within clients logistics system.

Hypothesis 2: TPL providers who have a better resource and skill are more involved in managing logistics processes within clients logistics system.

Hypothesis 3: TPL providers' degree of pro-activity and their level of resources and skills impact on their involvement in managing logistics processes within clients logistics system independently.

RQ 4: What is the influence of different levels of TPL involvement on the performance of their clients' logistics systems?

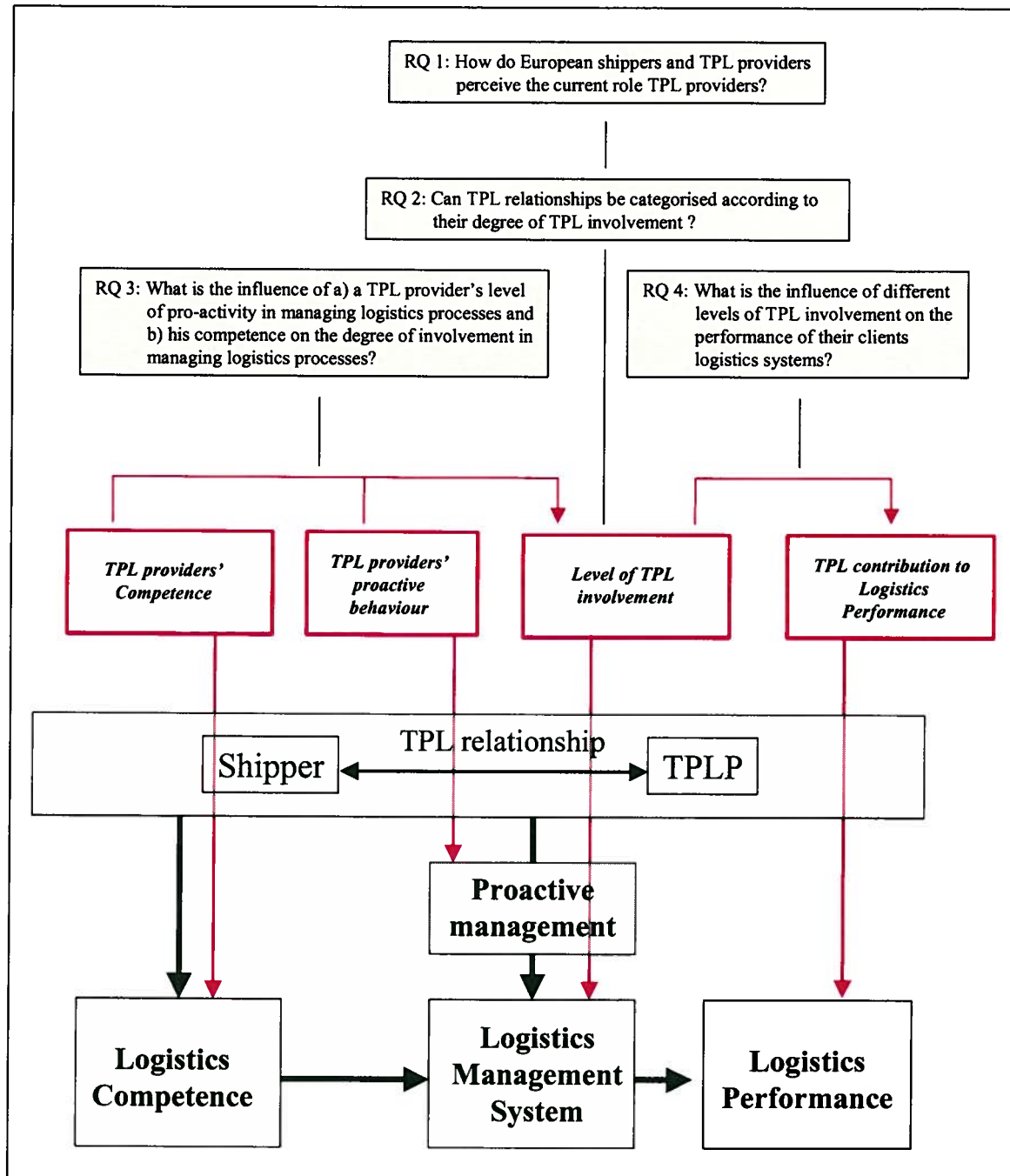
Hypothesis 4: TPL providers with a high level of involvement are perceived as bigger contributors to reduction of logistics cost within their clients logistics systems than TPL providers with a lower level of involvement.

Hypothesis 5: TPL providers with a high level of involvement are perceived as bigger contributors to cycle time reductions within their clients logistics systems than TPL providers with a lower level of involvement.

Hypothesis 7: TPL providers with a high level of involvement are perceived as bigger contributors to quality improvements within their clients logistics systems than TPL providers with a lower level of involvement.

The conceptual research model integrates the prevailing TPL themes within logistics systems management and highlights the research problems.

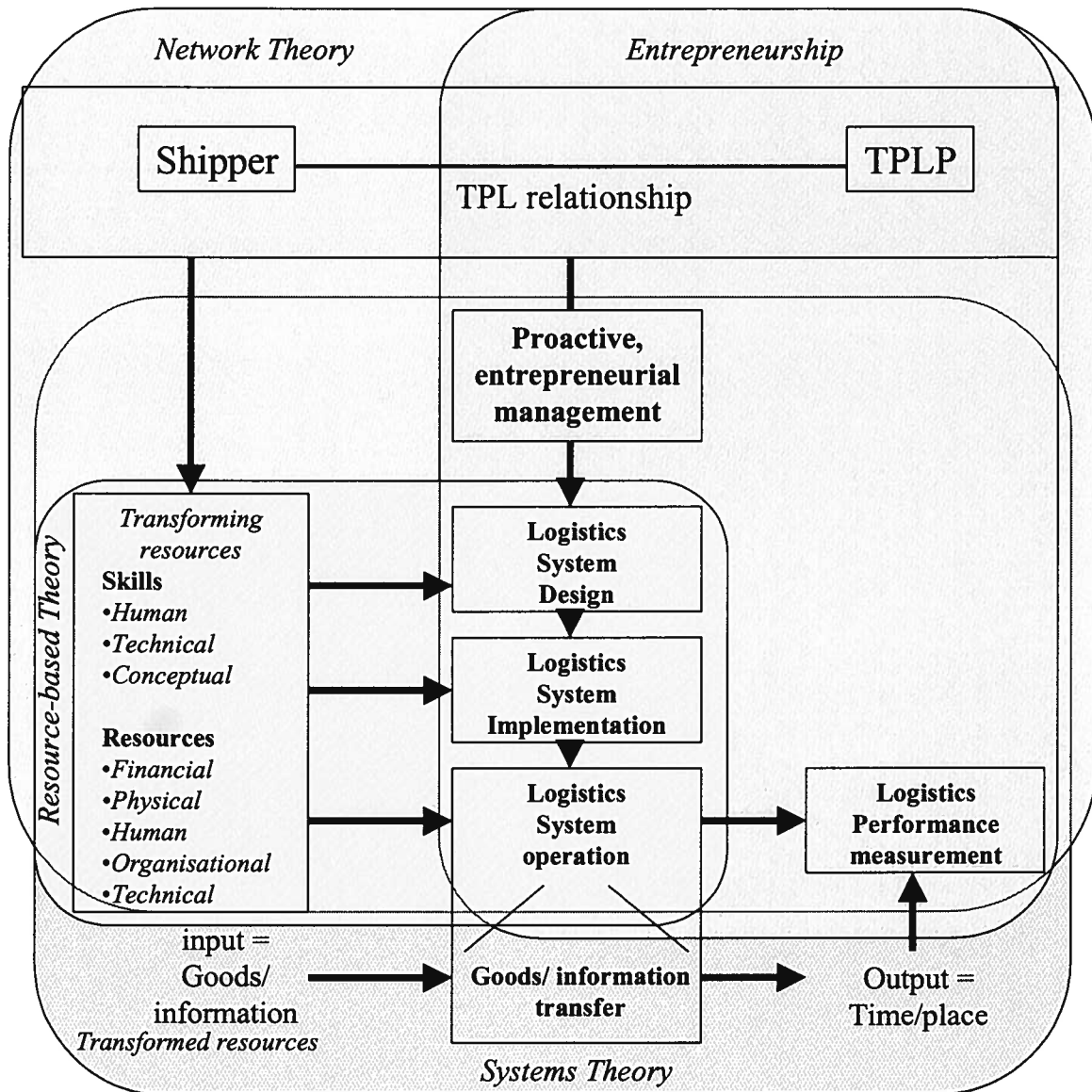
Figure 12.1 Conceptual Research Model



The first step in this research was to identify a hierarchy of processes and sub-processes in logistics design, implementation and operations in the framework of an existing logistics system and measure the level of outsourcing or *TPL involvement* in this. Hence the conceptual foundation of the research was laid by reviewing the pertinent literature on logistics systems and performance (chapter 3) and as well as related bodies of theory (chapter 4).

The descriptions of logistics management aspect in chapter 3 delivered the basis for the development of testable hypotheses with regards to logistics systems and logistics performance. The systems approach towards logistics management in this research means that the potential scope for logistics outsourcing is not limited to operational

Figure 12.2. Theoretic Frame of reference



logistics. Logistics management in this sense is a set of processes, which follow a hierarchical order and sequence. These processes reflect decisions that are made on a strategic, tactical, project management, and operational level, and capture the design, implementation, and operation of logistics systems. Many of the so far only

conceptualised roles of TPL providers are described as competences in these 'high end' areas of logistics management. However research in TPL has so far mostly concentrated on the operational side of logistics. To capture the full scope of potential areas of logistics involvement it was therefore necessary create a frame of reference with regards to logistics systems management and the output of such a systems, which is referred to as logistics performance. Chapter 3 defined the prevailing overall measures for logistics performance as cost for efficiency, and time and quality/customer service for effectiveness of a logistics system..

In chapter 4 the conceptual building blocks were put into a framework of existing theoretic perspectives (see figure 12.2). These bodies of theory provided the abstract logic for the proposed relationships and the basic descriptions of the resource and skill variables as well as the variable that reflected entrepreneurial behaviour. These basic descriptions of resources and skills required also further refinement in order to be tested in a logistics context whereas proactive behaviour as a variable had to be validated as an applicable description of a concept with common or similar associations of any potential respondent.

12.3 Research Strategy

The novelty of the applied concepts (i.e. degree of outsourcing, resources/skills, proactive behaviour) within the context of logistics systems and the declared objective of making general comments about TPL relationships leads to the adoption of a research strategy that consists of exploratory and explanatory elements. The research explores TPL relationships with a focus on TPL involvement in logistics systems and seeks for certain possible causal relationships between TPL involvement and relationship related variables and a systems related variable respectively. The research establishes different patterns of TPL involvement reflecting different degrees of outsourcing and tests the applicability of different theoretical concepts that might further explain the current practices of outsourcing. The nature of this research is thus primarily exploratory but simultaneously providing a possible scope for explanation. It consists of qualitative and quantitative elements. It combines the comprehensive

and informing nature of the case study approach and the survey of a larger sample that allows exploration of relationships between variables.

The purpose of the case study was to clarify the conceptual ideas emerging from the literature and to establish variables describing these concepts that would allow for structured surveying through personal interviews. An additional purpose of the case study was to validate the intended use of the concepts of proactivity and skills and resources.

The survey is the component in this research that allows the qualitative and quantitative analysis of a large sample, and thus a response to the research questions. The number of question that were to be asked and the novelty of the concepts these were based on stipulated the use face-to-face interview as data collection method. It was foreseeable that questions with regards to the understanding of questions would arise particularly since the survey was to be carried out in different countries (The survey was embedded in a large-scale research project initiated by the European Commission, as part of the Fifth Research Technological Development and Demonstration Framework Programme). The interviews were held among respondents large shipper and TPL organisations throughout Europe covering 4 of the most important industry segments.

12.4 Summary of the research findings

12.4.1 Case study results

The primary objective of the case study was to investigate a TPL relationship within an existing logistics system in order to clarify the conceptual ideas that were identified in order to investigate TPL relationships. The second objective of the case study was to validate and further understand the conceptualised relationship between TPL involvement and TPL resources and skills, TPL proactivity and the effect TPL involvement had on TPL performance.

Overall the objectives that were set out for the case study (see chapter 6 + 7) were achieved as far as the comprehension and applicability of the concepts of resources/skills and proactivity is concerned. With respect to enabling a measure for TPL involvement the results have shown that through aggregation of TPL participation in sub-activities a measurement of TPL involvement on the level of sub-processes is possible. An appropriate list of sub-activities that can be attributed to each sub-process was compiled, within the limits of this case study and based on the answers of key informants in both organisations. There seemed to be a strong relationship between the resources and particularly the skills of Exel Logistics and the degree to which they were involved in the project. Competence was in all areas of involvement described as being the primary reason for Exel's involvement. Exel Logistics contributed significantly to better overall logistics performance within this case. They had the biggest impact by being involved in the design and consequent implementation of the project.

12.4.2 Survey results

12.4.2.1 Involvement and contribution of TPL providers in Europe – Answering Research Question 1

The objective was to examine whether the decision of shippers to outsource and the TPL industry in general are in line with the development of TPLPs' competence and their ability to understand the logistics needs of their clients. A number of propositions were developed under this objective:

Proposition 1: The measurable degree of TPL involvement is higher for TPL respondents than for shipper respondents.

Respondents in the shipper organisations naturally have little choice in the TPL relationships they could report about, whereas TPL respondents had a choice of relationships they could potentially report upon. It can be conjectured that they would report on these that reflected a high degree of involvement.

It was found that the mean degree of outsourcing of logistics processes within the shippers' sample was lower overall than that in the TPLP sample. Proposition 1 could thus be accepted.

Proposition 2: The perception of the relative importance of resources and skills in designing, implementing and operating logistics systems does on average not differ between TPL respondents and shipper respondents.

For shippers and TPL providers analysis (using ANOVA) showed a significant difference in the perception of importance of financial, implementation resources, human resources throughout all phases, and human skills necessary to implement and operate a logistics system. Furthermore a significant difference in the perception of the relative importance of technical skills was observed.

Proposition 3: The perception of current sufficiency of resources and skills is on average lower within the shipper sample than in the TPL sample

On average both types of respondents, shippers as well as TPL providers, perceive most of TPL providers' current resources to be 'sufficient' for the design and implementation and operation of logistics systems (see figure 9.5). Marginal deficiencies (i.e a score just under 3) can on average be identified in human and organisational resources - resources that are perceived to be of great importance.

Proposition 4: Predictions about future developments of TPL resources and skills do on average not differ between respondents in the shipper and the TPL sample

On average shippers and TPL providers see TPLPs' skills developing towards a level of adequacy. With regards to skills necessary to implement and operate logistics systems the differences between shippers' and TPLPs' perceptions seems to be only marginal, whereas developments in skills necessary to design logistics systems are clearly seen less optimistically by shippers than by TPLPs themselves.

Proposition 5: Respondents of TPL organisations perceive themselves on average as more proactive in managing logistics processes in the TPL relationship they report upon than shippers perceive their contractors to be in the TPL relationships they report upon.

With regards to the different design aspects of a logistics system, shippers perceive TPL providers as being on average more reactive than proactive whilst TPLPs perceive themselves as being more proactive than shippers do. In implementing logistics systems shippers regard TPL providers, with the exception of installing facilities and equipment, as more reactive than proactive. Providers again seem to regard themselves as slightly more proactive. Comparing views on TPLPs behaviour in operating a logistics system reveals that the current view of shippers is that of reactive TPL behaviour, whereas TPLPs regard themselves as (significantly) more proactive.

Proposition 6: The contribution of TPL to logistics performance is reflected on average higher in the TPL sample than in the shipper sample.

Difference in logistics cost between the shipper and the TPL sample could be detected as significant at the aggregated level of 'Performance changes due to TPL' (i.e.: performance x TPL influence). On the matter of quality changes a significant difference between shippers and TPLPs appeared on all three levels of performance measurement.

12.4.2.2 Distinct Types of TPL relationships

One objective set out in the beginning was to identify and clarify the different roles that third party logistics providers can actually play in managing their clients' logistics systems and to determine the impact of different TPL roles on logistics performance. The following propositions supported this objective:

Proposition 7: The provision of logistics services in Europe appears in clusters of different levels of involvement, which typifies a distinct kind of TPL relationship

The cluster analysis of the sample of 76 TPL relationships that were examined throughout the survey revealed clearly distinct clusters of TPL relationships. Leaning on the terminology that emerged from the literature review these are named

Solution providers

Distribution providers

Transport providers

The identification of patterns in TPL provision was one of the objectives that were set at the beginning of this research project. These three distinctly different roles of TPL providers could be identified within a sample of 76 surveyed TPL relationships across various industries in Europe. With regards to the objective for this part of the research, i.e. to explore, which kind of TPL relationship would exist in Europe the sample can be seen as representative within the limits of the surveyed industrial segments

Proposition 8: The TPL sample contains a higher proportion of TPL categories with a high degree of TPL involvement than the shipper sample

Closely related to proposition 1 this was confirmed.

Table 12.1 Clusters by respondent

Clusters by respondent	TPLP	Shipper	total
Solution Providers	11	0	11
Distribution providers	18	13	31
Transportation providers	3	29	32

Proposition 9: Different categories of TPL providers feature on average significant differences in their resource and skills base.

Significant differences between the different types of TPL providers were found, in particular with regards to Financial and Human Design Resources, Financial, Physical and human resources that are necessary to implement logistics systems and particularly with regards to Financial, Technical, Human and Organisational resources that are

required to operate a logistics system. With respect to the necessary skills in logistics management significant differences appeared between solution providers and transport providers, here in particular with respect to the design and operation of logistics systems. In general solution providers were found to be better equipped with resources and skills than distribution providers and transport providers. Distribution providers again were found to be more sufficiently equipped with resources and in some areas of logistics management more adequately equipped with skills than transport providers.

Proposition 10: Different categories of TPL providers feature on average significant differences in proactive behaviour

Significant differences could be detected in almost all management processes. The biggest differences in proactive behaviour occurs thus between solution providers and transport providers. Whereas Solution Providers are perceived as proactive developers in almost all areas of logistics management Transport Providers are generally seen as reactive enablers. Solution providers act particularly entrepreneurial in the network and functional design of their clients logistics systems. In strategic decision making they also differ most from distribution providers, who in all other areas of management act similarly proactive. In strategic management decision and in material management design distribution providers are perceived as being reactive enablers rather than proactive developers.

Proposition 11: Different categories of TPL providers contribute on average differently to logistics performance.

Differences in contribution to logistics performance appeared between solution providers and both other provider type with respect to quality and with respect to cost changes that appeared over a period of 3 years and were overall attributable to the TPL provider. In general solution providers contributed more to logistics cost reductions and quality improvements than distribution providers or transport providers.

12.5 Outsourcing from a TPL point of view

The objectives were firstly to identify and explain the influence of TPL competence on the degree of logistics outsourcing and secondly to identify and explain the influence of TPLPs' entrepreneurial stance *or proactive behaviour* within their clients' logistics management systems on the degree of logistics outsourcing.

An indication for the existence of the proposed relationships between TPL resources and skill and proactive behaviour respectively and the degree of outsourcing was already found in the analysis of the sample from a respondent point of view and from a TPL category perspective. In both cases it appeared that the sufficiency/adequacy of TPL resources and skills as well as proactive behaviour could be associated tentatively to high degrees of outsourcing whereas insufficient TPL resources and inadequate skills as well reactive behaviour appeared to be associated with low degrees of outsourcing. To explore further these relationships more statistical analysis was under taken. The following hypotheses are relevant:

Hypothesis 1: TPL providers who are more proactive in managing logistics processes are more involved in managing logistics processes within clients' logistics system.

This hypothesis could be accepted. On each level of analysis (i.e. TPL involvement) proactive behaviour appears to be positively correlated to TPL involvement.

Hypothesis 2: TPL providers who have a better resource and skill base are more involved in managing logistics processes within clients' logistics system.

This hypothesis could be accepted on the grounds that on each level of analysis, i.e. different management levels reflecting TPL involvement showed the impact of at least one resources and/or skill. These impacted overall positively on the degree of outsourcing.

Hypothesis 3: TPL providers' degree of proactivity and their level of resources and skills impact on their involvement in managing logistics processes within clients' logistics system independently.

This hypothesis could not be tested because multicollinearity between the proactivity variable and other resource/skill variables in each stage of analysis (i.e. on each level of TPL involvement) meant that their independent effects could not be identified with certainty.

12.6 Outsourcing from a shippers point of view

The objective was to identify and explain the influence of the degree of outsourcing on logistics performance. Similarly to the relationship between TPL resources and skill and proactive behaviour respectively and the degree of outsourcing some evidence of an existing relationship between the degree of TPL involvement and logistics performance was already found in the analysis of the sample from a respondent point of view and from a TPL category perspective. In both cases it appeared that a higher degrees of outsourcing could be associated tentatively to higher TPL influence on logistics performance. To explore these relationships further more statistical analysis was under taken concerning the following hypotheses:

Hypothesis 4: TPL providers with a high level of involvement are perceived as bigger contributors to reduction of logistics cost within their client's logistics systems than TPL providers with a lower level of involvement.

This hypothesis could be accepted on the grounds that a proportionally higher involvement in the design of logistics systems impacts with a limited but identifiable influence of TPLPs on logistics cost reductions.

Hypothesis 5: TPL providers with a high level of involvement are perceived as bigger contributors to cycle time reductions within their client's logistics systems than TPL providers with a lower level of involvement.

This hypothesis was accepted on the basis that a higher involvement in the strategic management design and operations leads to a small, but detectable, influence on TPLPs on cycle time reductions.

Hypothesis 6: TPL providers with a high level of involvement are perceived as bigger contributors to quality improvements within their clients' logistics systems than TPL providers with a lower level of involvement.

This hypothesis was accepted given the finding that a proportionally higher involvement in the design of logistics systems and in IS/IT implementation is associated with a substantial influence of TPLP involvement on cycle time reductions.

12.7 Contribution of this research

The intension at the outset of this research was to on a managerial or practical level to add knowledge about the strategic significance of logistics outsourcing, which is directed at shippers and TPLPs. For shippers it will be important to know what effect different degrees of outsourcing and for TPLPs it will be important to learn whether their competence and entrepreneurial approach is influencing the degree to which shippers are prepared to outsource logistics.

At a scholarly level the intention was to add knowledge to logistics management in the sense that it explores different degrees of logistics outsourcing and explains, to some extent, why shippers outsource in different degrees. The prevailing contribution of this research was to create further understanding of the TPL phenomenon by examining it from a new perspective.

12.7.1 TPL versus Shippers views

By looking at TPL relationships from a shippers and a TPL perspective it was possible to gain an understanding, in which areas of logistics management contrasting views on the logistics competence of TPL providers and their attitude towards proactive management prevailed. Assuming that TPL providers and shipper want to work close together in partnerships type relationships – this is the underlying assumption in this research - it is important for shippers as well as for TPL providers to understand how TPL competence and proactive behaviour is perceived. It is also of

importance to understand what impact TPL service provision has on logistics performance. This research has shown that shippers have contrasting views on the current resource and skill base of TPL providers as well as on their proactive behaviour. Whereas hardly any difference appears in the perception about TPL importance shippers in contrast to TPL providers seem not to be convinced that TPL providers are currently adequately equipped with the necessary skills in some areas of logistics management nor that they will be able to develop these skills. With respect to proactive behaviour the general impression of shippers also contrast to this of TPL provider who see themselves overall as more proactive than shippers. Although consensus seems to be reached between shippers and TPL providers about desired developments in proactive behaviour shippers see in contrast to TPL providers less likelihood in these desired development than TPL providers. A common understanding between shippers and TPL providers seems to exist with regards to the impact of TPL, which is believed to be highest in improving logistics quality.

12.7.2 Identification of TPL Clusters

The identification of patterns in TPL provision was one of the objectives that were set at the beginning of this research project. Three distinctly different roles of TPL providers could be identified within a sample of 76 surveyed TPL relationships across various industries in Europe.

It is important for shippers to understand the competence of TPL providers and attitude towards entrepreneurial thinking on their behalf, to make strategic decisions with respect to outsourcing. It is however of even further importance for shippers to understand what different forms of TPL relationship mean for the improvement of logistics performance. It is of most importance for TPL providers to understand different patterns of TPL provision, because they want to establish themselves identifiable in the market.

For logistics research it is, however, importance to understand the different roles of logistics service providers with respect to their profile, which defined by a certain

level of competence, proactive behaviour and potential level of contribution to logistics performance.

The identified clusters were analysed with regards to their resource and skill base, their proactive behaviour and their impact on logistics. The results confirmed the distinct difference between the identified TPL categories and provided further evidence for an existing relationship between TPL involvement and the resource and skill base of a TPL provider and their entrepreneurial stance within their clients' logistics systems respectively. The analysis further produced evidence that TPL providers that were involved to a high degree in their clients' logistics systems influenced observable changes in logistics performance over a period of time more than TPL providers with lower degrees of involvement.

12.7.3 Further Understanding of the strategic importance of TPL

The strategic importance of TPL can be seen from a shippers' and from a TPL perspective.

TPL protagonists that examine the value of TPL involvement from a provider's point of view usually argue that TPL providers are the enabler of logistics processes (Laarhoven, 2000) as well as being a source for service and cost improvement (Andersson, 1997) sometimes involving innovation and supply chain restructuring (Berglund, 2000). TPL protagonists who tend towards a shippers' point of view most often assess the benefit of TPL involvement as due to its effect on logistics performance (e.g. Bardi, 1991; Maltz, 1992, 1994; Virum 1993).

This research develops further understanding from both perspectives. From a TPL point of view it shows how TPL resources and skills relates to the degree to which shippers are prepared to outsource logistics management and from a shipper's point of view it is examined if different degrees of outsourcing impact differently on logistics performance.

Both hypothesised relationships could be verified. An existing, although only weakly detectable positive relationship was found in the sample between TPL resources and skills and the degree of TPL involvement (or logistics outsourcing). A stronger positive relationship was detected between the proactive behaviour of TPL providers and the degree to which shippers in the sample outsourced logistics processes.

With respect to TPL influence on logistics performance a positive relationship to the degree of outsourcing indicated an influence of TPL providers on logistics performance improvement in relation to their degree of involvement in the logistics management process.

12.7.4 A new approach in TPL research

Overall the approach that has been chosen in this research has never been taken before. Some researchers like Gentry (1996) have conceptualised the potential influence of TPL competence, but failed to empirically verify it. Bolumole (2002) used the concept of resources and skills only as complementary tool to identify different possible roles of TPL providers based on a case in the food retail industry.

In this research resources and skills in combination with entrepreneurship have been conceptualised as one of the building blocks for TPL relationships, which are embedded in the management of logistic systems. The key postulate of this research is that TPL relationships have to be understood as network relationships that can be evaluated according to their input of transforming resources and the output that can be related to these, following thus a systems approach. The use of resource, skill and proactivity variables can be also regarded as a novelty in logistics research and in TPL research in particular. This approach has strengths and weaknesses.

12.8 Strengths and weaknesses of the research

12.8.1 Strengths of this research approach

Whilst the collection of data from 76 respondents proved a time consuming and resource intensive exercise, it was successful in capturing robust and relevant data. Analysis of the data clearly exposed the different types of TPL involvement. At the same time the critical concepts used – involvement, resources, skills, proactivity and performance – proved amenable to analysis. Whilst their precise interpretation may differ slightly between respondents the evidence of positive relationships confirms that respondents are providing answers with a coherent logic.

The strength of this approach is rooted not just in its novelty, but also in the attempt to empirically verify the often-conceptualised influence of competence on logistics management. It succeeded in this respect in that the existence of these conceptualised relationships could be empirically verified. It further allowed a comparison of TPLPs and shippers understanding of TPL logistics competence and their impact on logistics performance.

And it can be seen as a strength of this research that it enabled the empirically verified identification of different roles of TPL providers play in Europe today, and it based on this it was further possible to profile different types of TPL providers with regards their competence and potential for contributions to logistics performance improvement with regards to logistics management design, implementation and operation.

12.8.2 Weaknesses (limitations) of this research

Perhaps the main weakness of the approach used to derive relationships is inherent in cross-sectional analysis. The impact of resources, skills and proactivity on the involvement of a particular TPL provider cannot be traced and confirmed. Similarly

the impact of higher involvement on the change in performance parameters cannot be traced to a particular relationship, or the specific path of causality traced. Times series analysis or the case study approach does offer much stronger evidence for relationships.

In the choice of the sample for the survey there is a distinct bias towards large companies, certain industries and certain countries. This means general conclusions for all of Europe and all situations must be severely qualified. A larger sample would be desirable but the current size did not prevent the identification of some key relationships.

The extended nature of the survey (examining successively a large number of subactivities) meant that respondent fatigue almost certainly limited the range of answers to certain questions – scores often did not discriminate notably between some sub activities.

A particular weakness of this research is the examination of resources and skills on such a disaggregated level within the confines of the relatively small sample size. Especially the measurement of resources proved to be problematic, because not much variance could be detected. This weakness prevailed particularly in the regression analysis. The overall impact of resources and skills on the degree of TPL involvement or the degree of outsourcing could, within the tested sample, not be identified as being very influential.

This was most likely caused by the attempt to analyse resources and skills on a disaggregated level of TPL involvement, which was desirable. The collected data resource and skills sufficiency was, however related to a higher level of TPL involvement and thus the significance of the detected relationships were rather weak. This was not the case with the proactivity variable. Here data was collected with respect to a lower level of TPL involvement, and the results showed significant relationships on each process level.

12.8.3 Suggested further research

Future research with regards to Third Party Logistics (TPL) will in the light of the changing role of TPL providers continue to be revealing and of interest to shippers as well as for TPL providers and researchers alike.

The overall success of this research project in taking a new approach within Third Party Logistics and the problems experienced in implementing these concepts suggests the need for further research in this area.

The changing business environment characterised by a tendency to form networks that act collectively and cooperatively towards certain business goals suggests further research into TPL relationships from a network perspective. The novelty of this approach within TPL research leaves a lot of scope for further applications. Further research might concentrate on particular areas of TPL involvement and might thus try to identify the impact of resources and skills and / or proactive behaviour with a higher statistical significance, which would allow far more precise conclusion about this relationship. Another direction within the confines of this research approach might be a closer examination of logistics specific resources and skills. However, further examination of resources and skills with respect to process involvement of TPL providers requires some care with respect to the ratio of dependent to independent variables. Here researchers might find themselves in the amongst researchers commonly known dilemma of having to trade off quantitative and statistically verifiable rigour - in this with regards to the relationship between TPL involvement and resources and skill - and the need for a further understanding of (these) concepts. It is therefore suggested that further case based research be employed with regards to logistics specific competences as a basis for the further testing of these concepts in relation to TPL involvement on bigger samples. However, this might require though a closer focus on particular areas of (potential) TPL involvement.

Particular areas of research that arise immediately from questions that are directly related to this research project, but remain unanswered are:

1. Differences in TPL involvement in relation to different cultures
2. Differences in TPL involvement in different industry segments
3. Structural implications of moving to TPL partnerships
4. Segmentation of the logistics market and the particular role of solution providers

Differences in TPL involvement have been related to different regions yet only in a descriptive manner comparing very big regions. Most studies in this field, like the recent one published by Langley (2002) compare various aspects of TPL involvement between Europe and the U.S. (see chapter 2 for a full review of existing studies on this). Not only do these studies fail to relate differences in TPL involvement directly to different cultures, they also compare a region with an allegedly homogenous business culture like the U.S., with a region containing many different countries that despite many harmonisation efforts during the past 40 years, can be argued to show many differences in business cultures. With regards to research on TPL in Europe this implies the a priori assumption that differences in attitudes towards logistics outsourcing also exist. In the light of growing Pan-European trade, particularly in easterly directions and in the context of developing competence sharing (i.e. companies concentrating on core business activities), the importance of knowledge about these differences becomes apparent.

This study produced some evidence of differences between different countries (see Chapter 9), although hardly enough to conclude cultural difference with regard to logistics outsourcing. This is, however not surprising considering the limited sample size per country. It is more surprising that despite these statistical limits some differences were significant – an additional factor that supports further hypotheses about cultural differences with regard to logistics outsourcing.

Additional research is needed to first of all identify particular cultural differences towards logistics outsourcing. For the management of Pan-European supply chains particularly from a TPLP perspective it will be more important to explain these differences, i.e. to investigate why attitude to TPL involvement differs between cultural regions.

In addition to different cultural environments TPL involvement must also be seen in the light of different industrial contexts. This research revealed (see chapter 9) that differences between the degree of TPL involvement exist between different industry sectors. This has not been pursued any further, because it was not an objective of this research. It is, however, a revelation that in the context of supply chain management, i.e. the management of product and information flows in chains or networks of different types of organisations, i.e. different industrial sectors, that it bears some importance. It is particularly important to those managers and organisations who adopt a core competence view of managing supply chains, on the shipper as well as on the provider side. In the light of further (inter-organisational) supply chain integration, and the growing importance of TPL providers in facilitating this, it is important to gain further knowledge about how much attitudes towards TPL differ between industries, also in the light of different cultures, and even more important, why this is the case.

More explanatory as well as exploratory research about TPL involvement from the cultural and industry perspective is needed to understand the current role of TPL providers in Europe. From a logistics industry point of view this is even more important, because it will help TPL providers to build strategies for use of their existing competence and those they decide to develop. Particularly in the light of deregulation and EU extension it will help providers to position themselves in a market that becomes more segmented. The strategy for further research in these areas is recommended to follow the example of this research, i.e. to employ in depth cases studies in combination with cross sectional analysis

The role of solution providers in the logistics market deserves particular attention because it can be assumed that the structural implications of moving to a level of outsourcing that encompasses strategic logistics decisions can be far reaching for shipper organisations and whole supply chains.

This research has been able to produce empirical evidence of an existing segment within the logistics service provider market that shows a level of involvement that must be seen as very far-reaching, and implying competences that are not traditionally

attributed to TPL providers. Many questions arising from this remain unanswered however. For those shippers, who consequently follow the path of strategic outsourcing it is first of all of utmost importance to understand the segmentation (process) in the TPL market, and secondly to have an understanding of the competences that TPL providers have developed and will be able to develop, before engaging in unprecedented outsourcing levels. The questions of how far TPL providers will thus be able to assume a strategic role in supply chain management, or even become the driving force of reconfiguring supply chains, by shaping or rebuilding SC processes still remain unanswered. More case based research like that presented by Bolumole (2002) will help to create more transparency of the possible SC role of TPL providers, particularly in different industrial and cultural contexts. Of particular importance will be any investigation which helps to explain how competences that are required to manage supply chains are built. An approach to research that is built on the analysis of time series will be favourable in this context.

This study produced evidence that high-level involvement of TPL can lead to better efficiency and effectiveness of existing logistics systems rather than a lower level of involvement. Any further conclusions with respect to the supply chain role of TPL providers in this research are limited by the wide process spectrum of investigation and the cross sectional approach to analysis. The strategic role of TPL providers, particularly with respect to supply chain management, needs further research that investigates TPL involvement particularly in the design and implementation phase of logistics systems. If research is also to reveal the process of outsourcing that might ultimately lead to a leading role for TPL providers in SCM, the analysis of time series is probably the most favourable.

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Appendix A - Shipper Questionnaire - survey

1. General Information

Company name _____
 Organisational unit name _____

1.1 To which industry does your company belong?

☐ Electronics (HI-Tech) ☐ Retailers/ wholesalers food
☐ Chemicals and energy ☐ Automotive

1.2 Definition of logistics system

Please describe a Logistics System with respect to a product or product group and/ or a geographical scope that involve(d)s third party logistics services for its design and/or implementation and/or operation.

1.2.1 Please indicate the main product group involved.

☐ Raw materials
☐ Semi-finished goods/subassemblies/Components
☐ Finished products
☐ Spare parts
☐ Packaging materials/non-production material
☐ Supplies/consumables
☐ Other, please specify _____

1.2.2 Describe the typical product for the selected logistics system:

Average size _____ m³
 Average weight _____ kg
 Average value _____ Euro

- Number of shipments (per year) _____
 - Total weight of products shipped _____ tons
 - Total volume of products shipped _____ m³
 - Total value of products shipped _____ Euro

1.2.3 Regional scope

☐ Pan-European
☐ European Region (Spec North, South, West, East) _____
☐ Single country (Specify) _____
☐ Intercontinental _____

1.2.4 Please describe the selected Logistics system by indicating the nodes goods are flowing from and to, and the transport modes which are used!

From or to:

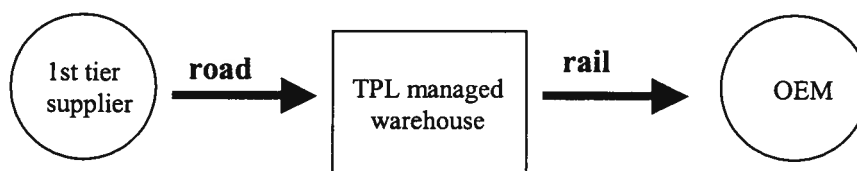
1st tier supplier, OEM, Distributor, Wholesaler, Retailer, Final Customer

Via: Terminal, Client operated warehouse, TPL managed warehouses, Hubs, Cross docking facilities

Transport modes: Rail, Road, Airline, Inland shipping, Short Sea,

From	Trp. Mode	Via	Trp. Mode	To

example



1.2.5 To which category belongs the Third Party Logistics provider you are working with?.

☐ Carriers

☐ Storage and warehousing companies

☐ Shippers

☐ Forwarders and brokers

☐ Mail and express companies

☐ Actors from non-traditional logistics areas

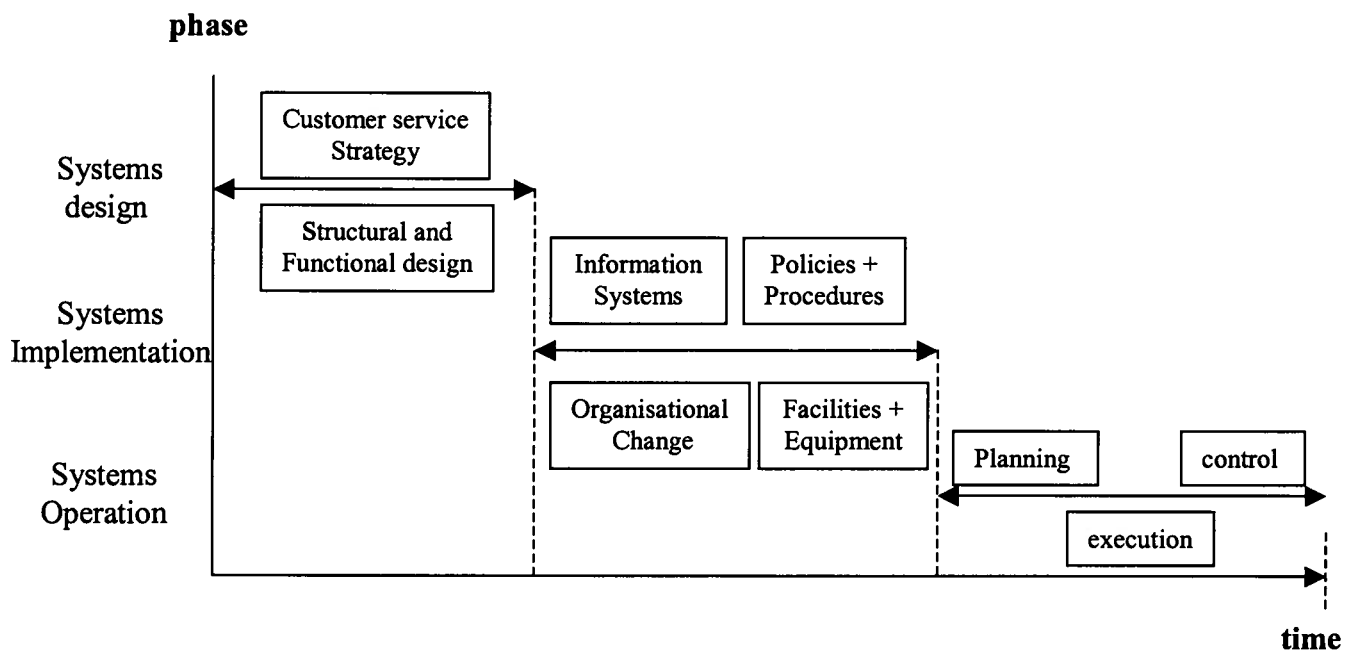
1.2.6 Starting year of the relationship with your TPL: _____

1.2.7 Your TPL's name: _____

2 Design, implementation and operation of a logistics system

2.1 Phases

The main phases of building your logistics system can be seen in its design (or re-design), its implementation, and finally its operation (please see graphics below). The design phase is characterised by decision making towards its channel structure (i.e. which/how many 1st, 2nd, 3rd tier suppliers, wholesalers, distributors, 3rd party service providers etc.?) and its network structure (i.e. which/how many supplying, manufacturing, distributing locations?). It comprises also decision making about functional elements of the system (i.e. warehouse design and operations, transportation management and materials management). The implementation phase is characterised by decision making towards required information systems, policies and procedures, installing facilities and equipment, and changing organisational structures and hiring and training employees. Finally the operational phase is about planning, executing and controlling the day to day processes of a system.



2.1.1 Please indicate the length of each phase below

2.1.1 a Design phase months

2.1.1b Implementation phase months

2.1.1 c Operational phase months

2.1.1 d In operation sinceyear and month

2.2 System Design

*Which of the parties below took a leading role in the different elements of Systems design
Please do also indicate who was involved in the activities listed below by marking them with
the appropriate letter (I=In-house, T=TPL, O=other, C=combination). Please specify 'others'
and combination if additional parties were involved.*

	In House	TPL provider	other
2.2.1 Setting a Customer Service strategy	O	O	O
<i>The included activities:</i>			
a) scenario building (Cost / Service trade off)	—	d) providing data	—
b) making business cases	—	e) data analysis	—
c) expert advice	—	f) packaging design as customer communication	—
g) final decision	—		

	In House	TPL provider	other
2.2.2 Channel design	O	O	O
<i>The included activities:</i>			
a) providing data	—	f) simulations	—
b) data analysis	—	g) decision on channel members	—
c) making business cases	—	h) decision on number of channel members	—
d) expert advice	—		
e) resource planning	—		
i) other.....	—		

	In House	TPL provider	other
2.2.3 Network design	O	O	O
<i>The included activities:</i>			
a) providing data	—	f) simulations	—
b) data analysis	—	g) decision on kind of locations	—
c) making business cases	—	g) decision on number of locations	—
d) expert advice	—		
e) resource planning	—		
i) other.....	—		

	In House	TPL provider	other
2.2.4 Warehouse design and (warehouse-) operations design	O	O	O
<i>The included activities:</i>			
a) specifying WH layout	—	e) design of information flow	—
b) specification MH equipment	—	f) design of physical flow	—
c) specification of packing and labeling	—	g) resource planning	—
d) process simulation	—	h) expert advice	—
		i) process automation	—
		k) other	—

	In House	TPL provider	other
2.2.5 Transportation Management design	O	O	O
<i>The included activities:</i>			
a) design of information flow	—	e) resource planning	—
b) design of physical flow	—	f) expert advice	—
c) Design of Intermodal Systems	—	g) relationships with 2 nd tier providers	—
d) process simulation	—	h) other	—

	In House	TPL provider	other
2.2.6 Materials-Management design	O	O	O
<i>The included activities:</i>			
a) replenishment	—	e) process simulation	—
b) order management	—	f) resource planning	—
c) inventory management	—	g) expert advice	—
d) process automation	—	h) other	—

2.2.7 How would you rate the current and future role of TPL providers in (re-) designing logistics systems on a 5-point scale ranging reactively enabling subtasks to proactively developing logistics processes?

	Current role						desired future role						most likely future role					
	Reactive enabler			Proactive developer			Reactive enabler			Proactive developer			Reactive enabler			Proactive developer		
Design Phase	1	2	3	4	5	N.A.	1	2	3	4	5	N.A.	1	2	3	4	5	N.A.
Setting customer																		
Service strategy	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Channel design	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Network design	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
WH design/Mgmt	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Transportation Mgmt	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Materials Mgmt	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O

2.3 Implementation

Which of the parties below took a leading role in implementation? Please do also indicate who was involved in the activities listed below by marking them with the appropriate letter (I=In-house, T=TPL, O=other, C=combination). Please specify 'others' and combination if additional parties were involved

	In House	TPL provider	other
2.3.1 Implementation of Information Systems	O	O	O
<i>The included activities:</i>			
information systems design		software development	
materials management	—	materials management	—
warehouse management	—	warehouse management	—
transportation management	—	transportation management	—
software specification		software installation	—
materials management	—	Software compatibility	—
warehouse management	—	management	—
transportation management	—		

	In House	TPL provider	other
2.3.2 Implementation of Policies and Procedures	O	O	O
<i>The included activities:</i>			
Health and Safety Policy		Standard procedures and working instructions (ISO)	
a) Warehouse	—	g) Warehouse Management	—
b) Transportation	—	h) Transportation Management	—
c) Materials Handling	—	i) Materials Management	—
Environmental Policy		k)other	—
d) Warehouse	—		
e) Transportation	—		
f) Materials Handling	—		

	In House	TPL provider	other
2.3.3 Implementation of Organisational Change	O	O	O
<i>The included activities:</i>			
changing organisational structure	—	setting performance goals	—
(re-)defining responsibilities	—	hiring employees	—
		training employees	—
			

	In House	TPL provider	other
2.3.4 Implementation of facilities and equipment	O	O	O
<i>The included activities:</i>			
Warehouse and MHE		IT systems	
a) project management	—	i) hardware specification	—
b) Tendering	—	k) project management	—
c) Contract Management	—	l) Tendering	—
d) Financing	—	m) Financing	—
Transport equipment		n) Contract Management	—
e) project management	—	o) Hardware compatibility	—
f) Tendering	—	Management	—
g) Contract (hire) Management	—		
h) Financing	—		

2.3.5 How would you rate the current and future role of TPL providers in implementing logistics systems on a 5-point scale ranging from reactively contracting subtasks to proactive project management?

	Current role						desired future role						most likely future role					
	Reactive Contractor			Proactive Project Management			Reactive Contractor			Proactive Project Management			Reactive Contractor			Proactive Project Management		
	1	2	3	4	5	N.A.	1	2	3	4	5	N.A.	1	2	3	4	5	N.A.
Implementation Phase																		
Information Systems	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Policies and procedures	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Organisational Change	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Installing Facilities and Equipment	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O

2.4 Operations

Who carries out the following operational activities?

	Client	TPL provider	TPL Sub-contractor	other
2.4.1 Planning (scheduling)				
(demand) Forecasting	☐	☐	☐	☐
(finished Products)				
Inventory Planning	☐	☐	☐	☐
MPS	☐	☐	☐	☐
Production capacity planning	☐	☐	☐	☐
Materials Planning	☐	☐	☐	☐
Supplier scheduling	☐	☐	☐	☐
warehouse capacity planning	☐	☐	☐	☐
Transport scheduling	☐	☐	☐	☐
Transport capacity Planning	☐	☐	☐	☐
Planning of intermodal trp.	☐	☐	☐	☐
Planning of reverse logistics	☐	☐	☐	☐
2.4.2 Process execution				
Order processing	☐	☐	☐	☐
Transport	☐	☐	☐	☐
Intermodal transport	☐	☐	☐	☐
Loading/unloading	☐	☐	☐	☐
Cross docking	☐	☐	☐	☐
Storing	☐	☐	☐	☐
Picking	☐	☐	☐	☐
(re-)packing/labeling	☐	☐	☐	☐
Product configuration	☐	☐	☐	☐
Product installation	☐	☐	☐	☐
Sequence to production line	☐	☐	☐	☐
Shelf replenishment	☐	☐	☐	☐
Customs WH administration	☐	☐	☐	☐
Customs adminsitration	☐	☐	☐	☐
Shipping documentation	☐	☐	☐	☐
Crediting/ invoicing	☐	☐	☐	☐
OEM customer/suppliers	☐	☐	☐	☐
Product return administration	☐	☐	☐	☐
Product repair	☐	☐	☐	☐
Scrap/disposal/recycling	☐	☐	☐	☐
<i>other activities</i>				
.....	☐	☐	☐	☐
.....	☐	☐	☐	☐

	Client	TPL provider	TPL Sub-contractor	other
2.4.3 Process control				
Replenishment Control	O	O	O	O
Inventory Control	O	O	O	O
Tracking and tracing	O	O	O	O
order fulfilment control	O	O	O	O
Quality control	O	O	O	O
Carrier Performance measure	O	O	O	O
other controlling activities				
.....	O	O	O	O
.....	O	O	O	O

2.4.4 How would you rate the current and future role of TPL providers in operating a logistics systems on a 5-point scale ranging from reactively contracting subtasks to proactively driving operational efficiency?

	Current role						desired future role						most likely future role					
	Reactive Contractor			Proactive Driver			Reactive Contractor			Proactive Driver			Reactive Contractor			Proactive Driver		
	1	2	3	4	5	N.A.	1	2	3	4	5	N.A.	1	2	3	4	5	N.A.
Operational Phase																		
Process planning	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Process execution	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Process control	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O

2.5. How would you rate the performance of TPL providers with respect to designing, implementing, and operating your logistics system on a 5-point scale from very unsatisfied to exceeding expectation?

	Very un- satisfied	not satisfied	satisfied	Very satisfied	exceeding expectation	Not applicable
Design Phase						
Setting customer						
Service strategy	☐	☐	☐	☐	☐	☐
Channel design	☐	☐	☐	☐	☐	☐
Network design	☐	☐	☐	☐	☐	☐
WH design/Mgmt	☐	☐	☐	☐	☐	☐
Transportation Mgmt	☐	☐	☐	☐	☐	☐
Materials Mgmt	☐	☐	☐	☐	☐	☐
Implementation Phase						
Information Systems	☐	☐	☐	☐	☐	☐
Policies and procedures	☐	☐	☐	☐	☐	☐
Organisational Change	☐	☐	☐	☐	☐	☐
Installing Facilities and Equipment	☐	☐	☐	☐	☐	☐
Operational Phase						
Process planning	☐	☐	☐	☐	☐	☐
Process execution	☐	☐	☐	☐	☐	☐
Process control	☐	☐	☐	☐	☐	☐

3. Skills and Resources

Many *Resources* and *Skills* were necessary to built your operable Logistics System. Resources in this context could be physical resources, technical resources, human resources, financial resources or organisational resources. Skills (*or knowledge*) were necessary to make use of these resources. For the purpose of this study we distinguish between Technical, Human, and Conceptual skills and knowledge.

In the following we would like you to think of the various resources and skills that were necessary in the various phases of building your Logistics Systems, from Design to Operation. Where possible please quantify the resources that were necessary! In addition we ask you, to evaluate them with respect to their importance during the relevant phase. Please rate the single importance of each resource or skill and the overall importance of each resource and skill category on a 5 point scale ranging from **not relevant** (*could have done without*) to **most important** (*could not have done without*).

3.1 Design Phase

How important were following categories of resources (i.e. the quantity of the input) and skills (i.e. the quality of the input) throughout the design phase (considering all parties involved). What specific resources were needed to design (and/or re-design) your logistics system? Please also tick these resources and skills that where of particular relevance to you!

	Not relevant	not important	important	very important	most important
3.1.1 Financial Resources	[1]	[2]	[3]	[4]	[5]
Cash			Dept Capacity		
Available Equity			Other		
Venture Capital					
3.1.2 Physical Resources	[1]	[2]	[3]	[4]	[5]
Offices and office equipment			Transport means (for personnel)		
ICT			Meeting facility		
			other		
3.1.3 Technical Resources	[1]	[2]	[3]	[4]	[5]
IT systems			Expert Software (describe)		
Homepage			Simulation tools		
Patent(s)			Other		
Knowledge Database (describe)					
3.1.4 Human Resources	[1]	[2]	[3]	[4]	[5]
Logistics Analysts			Financial Analysts		
Production Mgr			Engineer		
Transport Mgr			External Specialists		
Other					
3.1.5 Organisational Resources	[1]	[2]	[3]	[4]	[5]
Reputation			Physical Network		
MIS			Hierarchical Structure		
Training Schemes			Trustworthiness		
Inter-organisational			Team Orientation		
Relationship network			Other		

	Not relevant	not important	important	very important	most important
3.1.6 Technical Skills	[1]	[2]	[3]	[4]	[5]
Logistics-/SC Planning Skills	_____		Marketing Know How	_____	
Transport Knowledge	_____		Financial Skills	_____	
Warehouse Design Know How	_____		Legal Knowledge	_____	
Material Handling Knowledge	_____		Industry Know How	_____	
ICT Knowledge	_____		Other	_____	
3.1.7 Human Skills/ Knowledge	[1]	[2]	[3]	[4]	[5]
Social Skills/ Persuasiveness			Negotiation skills	_____	
/ Ability to empathise	_____		assertiveness	_____	
Communication skills	_____		other	_____	
Leadership skills	_____				
3.1.8 Conceptual Skills	[1]	[2]	[3]	[4]	[5]
Analytical skills.	_____		Political skills	_____	
Ideas and Visions	_____		Feel for the Market	_____	
Project Management Skills	_____		Other.....	_____	

3.2 Implementation Phase (Process)

How important were following categories of resources (i.e. the quantity of the input) and skills (i.e. the quality of the input) throughout the implementation phase(considering all parties involved)? What specific resources and skills were needed to implement your logistics system? Please mark those that where of particular importance to you (please mark up to 3)!

	Not relevant	not important	important	very important	most important
3.1.1 Financial Resources	[1]	[2]	[3]	[4]	[5]
Cash			Dept Capacity		
Available Equity			Other		
Venture Capital					
3.2.2 Physical Resources	[1]	[2]	[3]	[4]	[5]
Offices and office equipment			Car(s)		
Office ICT			Meeting facility		
			other		

	Not relevant	not important	important	very important	most important
3.2.3 Technical Resources	[1]	[2]	[3]	[4]	[5]
IT systems			<i>Expert Software (describe)</i>		
Homepage			Simulation tools		
Patent(s)			Other		
<i>Knowledge Database (describe)</i>					
3.2.4 Human Resources	[1]	[2]	[3]	[4]	[5]
Logistics Analysts			Financial Analysts		
Production Experts			Engineer		
Transport Experts			External Specialists		
Other					
3.2.5 Organisational Resources	[1]	[2]	[3]	[4]	[5]
Reputation			Physical Network		
MIS			Hierarchical Structure		
Training Schemes			Trustworthiness		
Inter-organisational			Team Orientation		
Relationship network			<i>Other</i>		
3.2.6 Technical Skills	[1]	[2]	[3]	[4]	[5]
Logistics-/SC Planning Skills	___		Marketing Know How	___	
Transport Knowledge	___		Financial Skills	___	
Warehouse Design Know How	___		Legal Knowledge	___	
Material Handling Knowledge	___		Industry Know How	___	
ICT Knowledge	___		Other	___	
3.2.7 Human Skills/ Knowledge	[1]	[2]	[3]	[4]	[5]
Social Skills/ Persuasiveness			Negotiation skills	___	
/ Ability to empathise	___		assertiveness	___	
Communication skills	___		other	___	
Leadership skills	___				
3.2.8 Conceptual Skills	[1]	[2]	[3]	[4]	[5]
Analytical skills.	___		Political skills	___	
Ideas and Visions	___		Feel for the Market	___	
Project Management Skills	___		Other.....	___	
3.3 Operational Phase (Process)					

How important are the following categories of resources (i.e. the quantity of the input) and skills (i.e. the quality of the input) to operate your logistics system (considering all parties involved)? What specific resources and skills are needed to operate it? Please mark those that are of particular importance to you!

	Not relevant	not important	important	very important	most important
3.3.1 Financial Resources	[1]	[2]	[3]	[4]	[5]
Cash			Dept Capacity		
Available Equity			Other		
Venture Capital					
3.3.2 Physical Resources	[1]	[2]	[3]	[4]	[5]
Offices and office equipment			Car(s)		
Office ICT			Trucks		
MH Equipment			Warehouses		
			Cross docking points		
3.3.3 Technical Resources	[1]	[2]	[3]	[4]	[5]
I T Systems			Bar coding		
Web link to customers			GPS System		
Track + Trace system			Warehouse automation		
Knowledge Database			Other		
3.3.4 Human Resources	[1]	[2]	[3]	[4]	[5]
Logistics Analysts			External Specialists		
Production Experts			Warehouse Managers		
Logistics Planners			Transport Managers		
Logistics Managers			Warehouse staff		
Transport Experts			Drivers		
Financial Analysts			Other		
Engineer					
3.3.5 Organisational Resources	[1]	[2]	[3]	[4]	[5]
Reputation			Physical Network		
MIS			Hierarchical Structure		
Training Schemes			Trustworthiness		
Inter-organisational			Team Orientation		
Relationship network			Other		

3.3.6 Technical Skills	[1]	[2]	[3]	[4]	[5]
Logistics-/SC Planning Skills	___		Marketing Know How	___	
Transport Knowledge	___		Financial Skills	___	
Warehouse Design Know How	___		Legal Knowledge	___	
Material Handling Knowledge	___		Industry Know How	___	
ICT Knowledge	___		Other	___	

3.3.7 Human Skills/ Knowledge	[1]	[2]	[3]	[4]	[5]
Social Skills/ Persuasiveness					
/ Ability to empathise					
Communication skills					
Leadership skills					
Negotiation skills					
assertiveness					
other					

3.3.8 Conceptual Skills	[1]	[2]	[3]	[4]	[5]
Analytical skills.	_____		Political skills	_____	
Ideas and Visions	_____		Feel for the Market	_____	
Project Management Skills			Other.....	_____	

3.4 How would you rate the current and future provision of resources, i.e. the quantity of input factors of TPL providers to design, implement and operate a logistics system, on a 5-point scale from “totally insufficient” to “excessive”?

	NOW					IN FUTURE				
	Totally insufficient	insufficient	Sufficient	More than sufficient	Excessive resources	Totally insufficient	insufficient	Sufficient	More than sufficient	Excessive resources
<i>Financial Resources</i>										
Design Phase	[1]	[2]	[3]	[4]	[5]	[1]	[2]	[3]	[4]	[5]
Implementation Phase	[1]	[2]	[3]	[4]	[5]	[1]	[2]	[3]	[4]	[5]
Operational Phase	[1]	[2]	[3]	[4]	[5]	[1]	[2]	[3]	[4]	[5]
<i>Physical Resources</i>										
Design Phase	[1]	[2]	[3]	[4]	[5]	[1]	[2]	[3]	[4]	[5]
Implementation Phase	[1]	[2]	[3]	[4]	[5]	[1]	[2]	[3]	[4]	[5]
Operational Phase	[1]	[2]	[3]	[4]	[5]	[1]	[2]	[3]	[4]	[5]
<i>Technical Resources</i>										
Design Phase	[1]	[2]	[3]	[4]	[5]	[1]	[2]	[3]	[4]	[5]
Implementation Phase	[1]	[2]	[3]	[4]	[5]	[1]	[2]	[3]	[4]	[5]
Operational Phase	[1]	[2]	[3]	[4]	[5]	[1]	[2]	[3]	[4]	[5]
<i>Human Resources</i>										
Design Phase	[1]	[2]	[3]	[4]	[5]	[1]	[2]	[3]	[4]	[5]
Implementation Phase	[1]	[2]	[3]	[4]	[5]	[1]	[2]	[3]	[4]	[5]
Operational Phase	[1]	[2]	[3]	[4]	[5]	[1]	[2]	[3]	[4]	[5]
<i>Organisational Resources</i>										
Design Phase	[1]	[2]	[3]	[4]	[5]	[1]	[2]	[3]	[4]	[5]
Implementation Phase	[1]	[2]	[3]	[4]	[5]	[1]	[2]	[3]	[4]	[5]
Operational Phase	[1]	[2]	[3]	[4]	[5]	[1]	[2]	[3]	[4]	[5]

3.5 How would you rate the current and future provision of skills, i.e. the quality of the input, of TPL providers with respect to designing, implementing, and operating a logistics system, on a 5-point scale from “totally inadequate” to “leading edge”?

	Totally inadequate	Inadequate	Adequate	More than adequate	Leading edge	Totally inadequate	Inadequate	Adequate	More than adequate	Leading edge
Technical Skills										
Design Phase	[1]	[2]	[3]	[4]	[5]	[1]	[2]	[3]	[4]	[5]
Implementation Phase	[1]	[2]	[3]	[4]	[5]	[1]	[2]	[3]	[4]	[5]
Operational Phase	[1]	[2]	[3]	[4]	[5]	[1]	[2]	[3]	[4]	[5]
Human Skills										
Design Phase	[1]	[2]	[3]	[4]	[5]	[1]	[2]	[3]	[4]	[5]
Implementation Phase	[1]	[2]	[3]	[4]	[5]	[1]	[2]	[3]	[4]	[5]
Operational Phase	[1]	[2]	[3]	[4]	[5]	[1]	[2]	[3]	[4]	[5]
Conceptual Skills										
Design Phase	[1]	[2]	[3]	[4]	[5]	[1]	[2]	[3]	[4]	[5]
Implementation Phase	[1]	[2]	[3]	[4]	[5]	[1]	[2]	[3]	[4]	[5]
Operational Phase	[1]	[2]	[3]	[4]	[5]	[1]	[2]	[3]	[4]	[5]

3.6 How is training and education of your personnel typically organised:

- ☐ formal, in advance according to a plan
- ☐ formal, just-in-time when needed
- ☐ informal, on-the-job
- ☐ other _____

3.7 Who was the main source of education and training competence for the specific logistics system surveyed here?

- ☐ Your own organisation
- ☐ Your TPL service provider
- ☐ External specialist
- ☐ Other _____

4. Systems Efficiency and Effectiveness

Logistics Systems can be measured in their Efficiency and Effectiveness, which can be called supply chain performance!

The measurements of Logistics Effectiveness relates to externally oriented factors that determine the cycle time for a customer order (outbound) and the cycle time for replenishment (inbound), as well as the quality of the order fulfilment. The measurement of Logistics Efficiency relates to internally oriented factors that determine the cost per order.

In the following please answer the Questions with respect of the Logistics System you specified!

4.1. Costs

4.1.1 How have the following costs changed over the last 3 years in relation to turnover?

	Substantial Decrease >15%	Slight Decrease 2–15%	No change +/-1%	Slight Increase 2%-15%	Substantial Increase >15%
Total Logistics costs	☐	☐	☐	☐	☐
Transportation costs	☐	☐	☐	☐	☐
Warehousing costs	☐	☐	☐	☐	☐
Inventory carrying costs	☐	☐	☐	☐	☐
Administration costs	☐	☐	☐	☐	☐
Other (specify)	☐	☐	☐	☐	☐

4.1.2 How much of the change in cost, as proportion of your turnover, can be attributed to the work done by the third party logistics provider (TPLP)?

	TPLP had no influence			Change entirely due to TPLP	
Total Logistics Costs	[1]	[2]	[3]	[4]	[5]
Transportation costs	[1]	[2]	[3]	[4]	[5]
Warehousing costs	[1]	[2]	[3]	[4]	[5]
Inventory carrying costs	[1]	[2]	[3]	[4]	[5]
Administration costs	[1]	[2]	[3]	[4]	[5]
Other (specify)	[1]	[2]	[3]	[4]	[5]

4.2 Time

4.2.1 How have the following lead times changed over the last 3 years?

	Substantial Decrease >15%	Slight Decrease 2–15%	No change +/-1%	Slight Increase 2%-15%	Substantial Increase >15%
Overall Cycle time	☐	☐	☐	☐	☐
Storage time	☐	☐	☐	☐	☐
(Re-)packing/labelling time	☐	☐	☐	☐	☐
order processing time	☐	☐	☐	☐	☐
WH in/out time	☐	☐	☐	☐	☐
Transport lead time	☐	☐	☐	☐	☐
Value adding time	☐	☐	☐	☐	☐

4.2.2 How much of the change in lead times can be attributed to the influence of the third party logistics provider (TPLP)?

	TPLP had no influence			Change entirely due to TPLP	
Overall Cycle time	[1]	[2]	[3]	[4]	[5]
Warehouse in/out time	[1]	[2]	[3]	[4]	[5]
storage time	[1]	[2]	[3]	[4]	[5]
order processing time	[1]	[2]	[3]	[4]	[5]
(Re-)packing /labelling time	[1]	[2]	[3]	[4]	[5]
Transport lead time	[1]	[2]	[3]	[4]	[5]
Value adding time	[1]	[2]	[3]	[4]	[5]

4.3 Quality

4.3.1 How have the following quality levels changed over the last 3 years?

	Substantially worse >15%	Slightly worse 2–15%	No change +/-1%	Slight better 2%-15%	Substantially better >15%
Order completeness	☐	☐	☐	☐	☐
Damage free delivery	☐	☐	☐	☐	☐
On time delivery	☐	☐	☐	☐	☐
Invoice accuracy	☐	☐	☐	☐	☐
Other (specify)	☐	☐	☐	☐	☐

4.3.2 How much of the change in quality, can be attributed to the work done by the third party logistics provider (TPLP)?

	TPLP had no influence			Change entirely due to TPLP	
Order completeness	[1]	[2]	[3]	[4]	[5]
Damage free delivery	[1]	[2]	[3]	[4]	[5]
On time delivery	[1]	[2]	[3]	[4]	[5]
Invoice accuracy	[1]	[2]	[3]	[4]	[5]
Other (specify)	[1]	[2]	[3]	[4]	[5]

4.4 Future Demand on Effectiveness and Efficiency of Logistics Systems

How do you see the relative importance of the following performance factors in a logistics system changing in future?

	Much Less Important		the same		Much more Important	
Transportation costs	[1]	[2]	[3]	[4]	[5]	
Warehousing costs	[1]	[2]	[3]	[4]	[5]	
Inventory carrying costs	[1]	[2]	[3]	[4]	[5]	
Administration costs	[1]	[2]	[3]	[4]	[5]	
Warehouse in/out time	[1]	[2]	[3]	[4]	[5]	
storage time	[1]	[2]	[3]	[4]	[5]	
order processing time	[1]	[2]	[3]	[4]	[5]	
(Re-)packing/labelling time	[1]	[2]	[3]	[4]	[5]	
Transport lead time	[1]	[2]	[3]	[4]	[5]	
Value adding time	[1]	[2]	[3]	[4]	[5]	
Order completeness	[1]	[2]	[3]	[4]	[5]	
Damage free delivery	[1]	[2]	[3]	[4]	[5]	
On time delivery	[1]	[2]	[3]	[4]	[5]	
Invoice accuracy	[1]	[2]	[3]	[4]	[5]	

5. Transport Modes

5.1 Which transport modes are used for the selected logistics system?

☐ Rail.
 ☐ Inland shipping
☐ Road
 ☐ Sea
☐ Airline
 ☐ Intermodal

5.1.1 During which phases was a decision made about transport modes that are used in your logistics system?

☐ Design Phase
 ☐ Implementation Phase
 ☐ Operational Phase

5.1.2 Who influenced this decision? (Please attribute a proportion out of 100!)

☐ Your Organisation
☐ TPL provider
☐ Your Customer(s)
☐ Your Supplier(s)
☐ Other(s)

100%

5.1.3 What is the delivery time window within the specified logistics system?

>1 hr 1-3 hrs 3-6 hrs 6-12 hrs 12-24 hrs >24 hrs
☐ ☐ ☐ ☐ ☐ ☐

5.1.4 How capable in your opinion is a logistics system which incorporates Intermodal Transport in meeting these delivery time window requirements today and in future?

At present In future
 not capable very capable not capable very capable

Delivery time window

>1 hr	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
1-3 hrs	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
3-6 hrs	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
6-12 hrs	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
12-24 hrs	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
>24 hrs	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

- 5.1.5 What changes in systems efficiency/effectiveness would you expect today, if you were to change your logistics system to either start using or significantly increase the use of intermodal transport?

	Substantially worse >15%	Slightly worse 2-15%	No change +/-1%	Slight better 2%-15%	Substantially better >15%
Total Logistics costs	☐	☐	☐	☐	☐
Total Order Cycle time	☐	☐	☐	☐	☐
Total Quality	☐	☐	☐	☐	☐

6. Closure

- 6.1** Which of the following best describes your current strategy regarding the use of third party logistics (TPL) and Intermodal transport(INT)?

☐ We are expanding our use of TPL	☐ We are expanding our use of INT
☐ We are reducing the use of TPL	☐ We are reducing the use of INT
☐ The use of TPL will remain the same	☐ The use of INT will remain the same
☐ We are increasing the number of TPLP	
☐ We are reducing the number of TPLPs	
☐ The number of TPLP will be the same	

- 6.2** How would you rate the success of using third party logistics?

Not very successful			Highly successful	
1	2	3	4	5

- 6.3** How would you rate the success of using Intermodal transport?

Not very successful			Highly successful	
1	2	3	4	5

- 6.4** Would you like to add anything with respect to your requirements on TPL facilitated transport systems?

- 6.5** How can third party logistics providers proactively facilitate higher efficiency/effectiveness of your logistics system?

- 6.6** Do you have any suggestion for questions which could be interesting to include in the questionnaire for next year?

Appendix B - TPL Questionnaire - Survey

1. General Information

Company name _____

Organisational unit name _____

1.1 Please indicate to which category of service provider your company (originally) belongs.

___ Carriers

___ Storage and warehousing companies

___ Shippers

___ Forwarders and brokers

___ Mail and express companies

___ Actors from non-traditional logistics areas

1.2 Definition of logistics system

Please describe a Logistics System with respect to an industry, a product or product group and/ or a geographical scope that involve(d)s your services for its design and/or implementation and/or operation.

1.2.1 To which industry does the described logistics system belong?

___ Electronics (HI-Tech) ___ Retailers/ wholesalers food

___ Chemicals and energy ___ Automotive

1.2.2 Please indicate the main product group involved.

___ Raw materials/Components

___ Semi-finished goods/subassemblies

___ Finished products

___ Spare parts

___ Packaging materials/non-production material

___ Supplies/consumables

___ Other, please specify _____

1.2.3 Describe the typical product for the selected logistics system:

Average size _____ m³

Average weight _____ kg

Average value _____ Euro

- Number of shipments (per year) _____
- Total weight of products shipped _____ tons
- Total volume of products shipped _____ m3
- Total value of products shipped _____ Euro

1.2.4 Regional scope

- _____ Pan-European
- _____ European Region (Spec North, South, West, East) _____
- _____ Single country (Specify) _____
- _____ Intercontinental _____

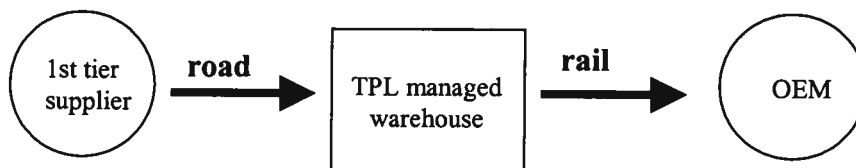
1.2.5 Please describe the selected Logistics system by indicating the nodes goods are flowing from and to, and the transport modes which are used!**From or to:**

1st tier supplier, OEM, Distributor, Wholesaler, Retailer, Final Customer

Via: Terminal, Client operated warehouse, TPL managed warehouses, Hubs, Cross docking facilities

Transport modes: Rail, Road, Airline, Inland shipping, Short Sea,

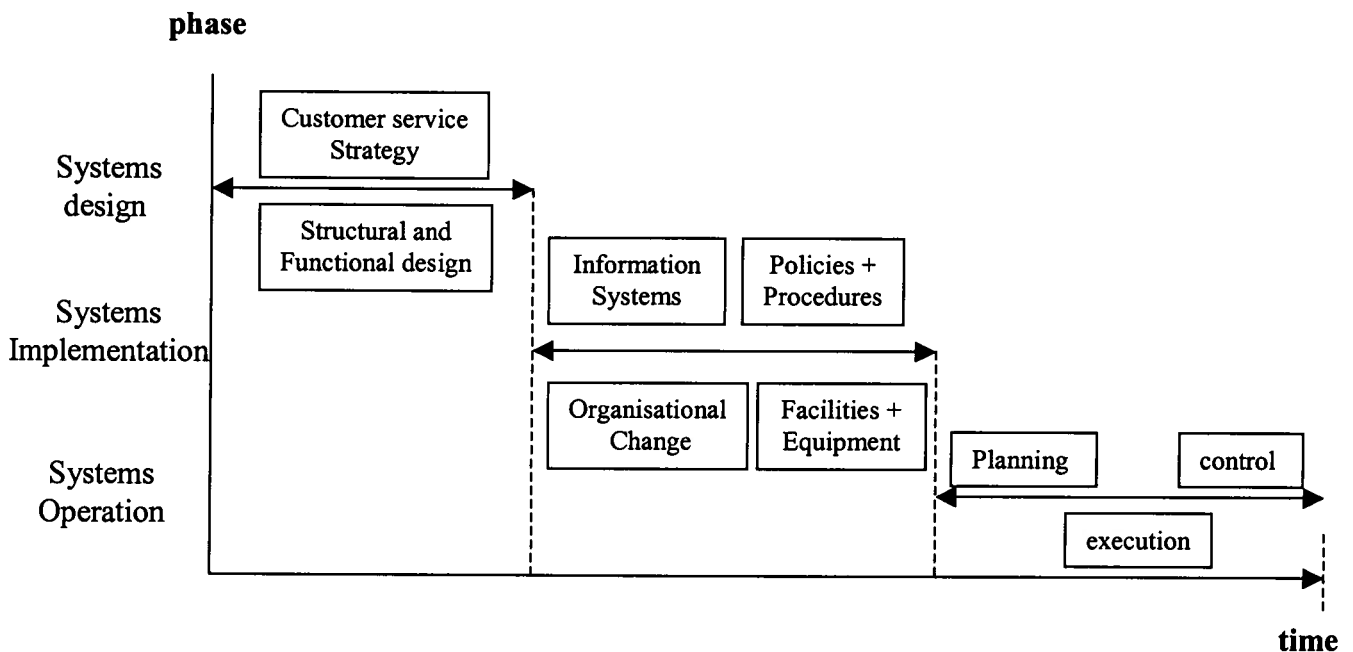
From	Trp. Mode	Via	Trp. Mode	To

Example**1.2.6 Starting year of the relationship with your client: _____****1.2.7 Your client's name: _____**

2 Design, implementation and operation of a logistics system

2.2 Phases

The main phases of building your client's logistics system can be seen in its design (or re-design), its implementation, and finally its operation (please see graphics below). The design phase is characterised by decision making towards a customer service strategy, its channel structure (i.e. which/how many 1st, 2nd, 3rd tier suppliers, wholesalers, distributors, 3rd party service providers etc.?) and its network structure (i.e. which/how many supplying, manufacturing, distributing locations?). It comprises also decision making about functional elements of the system (i.e. warehouse design and operations, transportation management and materials management). The implementation phase is characterised by decision making towards required information systems, policies and procedures, installing facilities and equipment, and changing organisational structures and hiring and training employees. Finally the operational phase is about planning, executing and controlling the day to day processes of a system.



2.2.1 Please indicate the length of each phase below

2.1.1 a Design phase months

2.1.1b Implementation phase months

2.1.1 c Operational phase months

2.1.1 d In operation sinceyear and month

2.2 System Design

Which of the parties below took a leading role in the different elements of Systems design
Please do also indicate who was involved in the activities listed below by marking them with
the appropriate letter (CL=Client, T=TPL, O=other, C=combination).). Please specify
'others' and combination if additional parties were invovled.

	In House	TPL provider	other
2.2.1 Setting a Customer			
Service strategy	O	O	O
<i>The included activities:</i>			
a) scenario building (Cost / Service trade off)	—	d) providing data	—
b) making business cases	—	e) data analysis	—
c) expert advice	—	f) packaging design as	—
g) final decision	—	customer communication	—

	In House	TPL provider	other
2.2.2 Channel design	O	O	O
<i>The included activities:</i>			
a) providing data	—	f) simulations	—
b) data analysis	—	g) decision on	—
c) making business cases	—	channel members	—
d) expert advice	—	h) decision on number of	—
e) resource planning	—	channel members	—
i) <i>other</i>	—		—

	In House	TPL provider	other
2.2.3 Network design	O	O	O
<i>The included activities:</i>			
a) providing data	—	f) simulations	—
b) data analysis	—	g) decision on kind of	—
c) making business cases	—	locations	—
d) expert advice	—	g) decision on number of	—
e) resource planning	—	locations	—
i) <i>other</i>	—		—

	In House	TPL provider	other
2.2.4 Warehouse design			
and (warehouse-)			
operations design	O	O	O
<i>The included activities:</i>			
a) specifying WH layout	—	e) design of information flow	—
b) specification MH	—	f) design of physical flow	—
equipment	—	g) resource planning	—
c) specification of	—	h) expert advice	—
packing and labeling	—	i) process automation	—
d) process simulation	—	k) <i>other</i>	—

	In House	TPL provider	other
2.2.5 Transportation Management design	O	O	O
<i>The included activities:</i>			
a) design of information flow	—	e) resource planning	—
b) design of physical flow	—	f) expert advice	—
c) Design of Intermodal Systems	—	g) relationships with 2 nd tier providers	—
d) process simulation	—	h) other	—

	In House	TPL provider	other
2.2.6 Materials-Management design	O	O	O
<i>The included activities:</i>			
a) replenishment	—	e) process simulation	—
b) order management	—	f) resource planning	—
c) inventory management	—	g) expert advice	—
d) process automation	—	h) other	—

2.2.7 How would you rate the current and future role of TPL providers in (re-) designing logistics systems on a 5-point scale ranging reactively enabling subtasks to proactively developing logistics processes?

	Current role						desired future role						most likely future role					
	Reactive enabler		Proactive developer				Reactive enabler		Proactive developer				Reactive enabler		Proactive developer			
Design Phase	1	2	3	4	5	N.A.	1	2	3	4	5	N.A.	1	2	3	4	5	N.A.
Setting customer																		
Service strategy	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Channel design	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Network design	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
WH design/Mgmt	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Transportation Mgmt	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Materials Mgmt	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O

2.3 Implementation

Which of the parties below took a leading role in implementation? Please do also indicate who was involved in the activities listed below each heading by marking them with the appropriate letter (CL=Client, T=TPL, O=other, C=combination). Please specify 'others' and 'combination' if additional parties were involved.

	In House	TPL provider	other
2.3.2 Implementation of Information Systems	O	O	O
<i>The included activities:</i>			
information systems design		software development	
materials management	—	materials management	—
warehouse management	—	warehouse management	—
transportation management	—	transportation management	—
software specification		software installation	—
materials management	—	Software compatibility	—
warehouse management	—	management	—
transportation management	—		

	In House	TPL provider	other
2.3.2 Implementation of Policies and Procedures	O	O	O
<i>The included activities:</i>			
Health and Safety Policy		Standard procedures and working instructions (ISO)	
a) Warehouse	—	g) Warehouse Management	—
b) Transportation	—	h) Transportation Management	—
c) Materials Handling	—	i) Materials Management	—
Environmental Policy		k)other	—
d) Warehouse	—		
e) Transportation	—		
f) Materials Handling	—		

	In House	TPL provider	other
2.3.3 Implementation of Organisational Change	O	O	O
<i>The included activities:</i>			
changing organisational structure	—	setting performance goals	—
(re-)defining		hiring employees	—
responsibilities	—	training employees	—
			

	In House	TPL provider	other
2.3.4 Implementation of facilities and equipment	O	O	O
<i>The included activities:</i>			
Warehouse and MHE		IT systems	
a) project management	—	i) hardware specification	—
b) Tendering	—	k) project management	—
c) Contract Management	—	l) Tendering	—
d) Financing	—	m) Financing	—
Transport equipment		n) Contract Management	—
e) project management	—	o) Hardware compatibility	—
f) Tendering	—	Management	—
g) Contract (hire) Management	—		
h) Financing	—		

2.3.5 How would you rate the current and future role of TPL providers in implementing logistics systems on a 5-point scale ranging from reactively contracting subtasks to proactive project management?

	Current role						desired future role						most likely future role					
	Reactive Contractor			Proactive Project Management			Reactive Contractor			Proactive Project Management			Reactive Contractor			Proactive Project Management		
	1	2	3	4	5	N.A.	1	2	3	4	5	N.A.	1	2	3	4	5	N.A.
Implementation Phase																		
Information Systems	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Policies and procedures	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Organisational Change	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Installing Facilities and Equipment	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O

2.4 Operations

Who carries out the following operational activities?

	Client	TPL provider	TPL Sub-contractor	other
2.4.1 Planning (scheduling)				
(demand) Forecasting	☐	☐	☐	☐
(finished Products)				
Inventory Planning	☐	☐	☐	☐
MPS	☐	☐	☐	☐
Production capacity planning	☐	☐	☐	☐
Materials Planning	☐	☐	☐	☐
Supplier scheduling	☐	☐	☐	☐
warehouse capacity planning	☐	☐	☐	☐
Transport scheduling	☐	☐	☐	☐
Transport capacity Planning	☐	☐	☐	☐
Planning of intermodal trp.	☐	☐	☐	☐
Planning of reverse logistics	☐	☐	☐	☐
2.4.2 Process execution				
Order processing	☐	☐	☐	☐
Transport	☐	☐	☐	☐
Intermodal transport	☐	☐	☐	☐
Loading/unloading	☐	☐	☐	☐
Cross docking	☐	☐	☐	☐
Storing	☐	☐	☐	☐
Picking	☐	☐	☐	☐
(re-)packing/labeling	☐	☐	☐	☐
Product configuration	☐	☐	☐	☐
Product installation	☐	☐	☐	☐
Sequence to production line	☐	☐	☐	☐
Shelf replenishment	☐	☐	☐	☐
Customs WH administration	☐	☐	☐	☐
Customs adminsitration	☐	☐	☐	☐
Shipping documentation	☐	☐	☐	☐
Crediting/ invoicing	☐	☐	☐	☐
OEM customer/suppliers	☐	☐	☐	☐
Product return administration	☐	☐	☐	☐
Product repair	☐	☐	☐	☐
Scrap/disposal/recycling	☐	☐	☐	☐
<i>other activities</i>				
.....	☐	☐	☐	☐
.....	☐	☐	☐	☐

	Client	TPL provider	TPL Sub-contractor	other
2.4.3 Process control				
Replenishment Control	O	O	O	O
Inventory Control	O	O	O	O
Tracking and tracing	O	O	O	O
order fulfilment control	O	O	O	O
Quality control	O	O	O	O
Carrier Performance measure	O	O	O	O
other controlling activities				
.....	O	O	O	O
.....	O	O	O	O

2.4.4 How would you rate the current and future role of TPL providers in operating a logistics systems on a 5-point scale ranging from reactively contracting subtasks to proactively driving operational efficiency?

	Current role						desired future role						most likely future role					
	Reactive Contractor			Proactive Driver			Reactive Contractor			Proactive Driver			Reactive Contractor			Proactive Driver		
	1	2	3	4	5	N.A.	1	2	3	4	5	N.A.	1	2	3	4	5	N.A.
Operational Phase																		
Process planning	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Process execution	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Process control	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O

2.5 How would do you think is your performance in designing, implementing, and operating a logistics system perceived by your clients on a 5-point scale from very unsatisfied to exceeding expectation?

	Very un- satisfied	not satisfied	satisfied	Very satisfied	exceeding expectation	Not applicable
<i>Design Phase</i>						
Setting customer						
Service strategy	☐	☐	☐	☐	☐	☐
Channel design	☐	☐	☐	☐	☐	☐
Network design	☐	☐	☐	☐	☐	☐
WH design/Mgmt	☐	☐	☐	☐	☐	☐
Transportation Mgmt	☐	☐	☐	☐	☐	☐
Materials Mgmt	☐	☐	☐	☐	☐	☐
<i>Implementation Phase</i>						
Information Systems	☐	☐	☐	☐	☐	☐
Policies and procedures	☐	☐	☐	☐	☐	☐
Organisational Change	☐	☐	☐	☐	☐	☐
Installing Facilities and Equipment	☐	☐	☐	☐	☐	☐
<i>Operational Phase</i>						
Process planning	☐	☐	☐	☐	☐	☐
Process execution	☐	☐	☐	☐	☐	☐
Process control	☐	☐	☐	☐	☐	☐

3. Skills and Resources

Many *Resources* and *Skills* were necessary to built your operable Logistics System. Resources in this context could be physical resources, technical resources, human resources, financial resources or organisational resources. Skills (*or knowledge*) were necessary to make use of these resources. For the purpose of this study we distinguish between Technical, Human, and Conceptual skills and knowledge.

In the following we would like you to think of the various resources and skills that were necessary in the various phases of building a Logistics System of the kind you described from Design to Operation. Please evaluate them with respect to their importance during the relevant phase. Please rate the importance of each resource or skill category on a 5 point scale ranging from **not important** (*could have done without*) to **very important** (*could not have done without*). In addition we ask you to mark those resources or skills that you think are of particular importance.

3.1 Design Phase

How important were following categories of resources (i.e. the quantity of the input) and skills (i.e. the quality of the input) throughout the design phase (considering all parties involved). What specific resources were needed to design (and/or re-design) your logistics system? Please also mark these resources and skills that where of particular importance to you!

	Not relevant	not important	important	very important	most important
3.1.1 Financial Resources	[1]	[2]	[3]	[4]	[5]
Cash			Dept Capacity		
Available Equity			Other		
Venture Capital					
3.1.2 Physical Resources	[1]	[2]	[3]	[4]	[5]
Offices and office equipment			Transport means (for personnel)		
ICT			Meeting facility		
			other		
3.1.3 Technical Resources	[1]	[2]	[3]	[4]	[5]
IT systems			Expert Software (describe)		
Homepage			Simulation tools		
Patent(s)			Other		
Knowledge Database (describe)					
3.1.4 Human Resources	[1]	[2]	[3]	[4]	[5]
Logistics Analysts			Financial Analysts		
Production Mgr			Engineer		
Transport Mgr			External Specialists		
Other					
3.1.5 Organisational Resources	[1]	[2]	[3]	[4]	[5]
Reputation			Physical Network		
MIS			Hierarchical Structure		
Training Schemes			Trust Worthiness		
Interorganisational			Team Orientation		
Relationship network			Other		

	Not relevant	not important	important	very important	most important
3.1.6 Technical Skills	[1]	[2]	[3]	[4]	[5]
Logistics-/SC Planning Skills	_____		Marketing Know How	_____	
Transport Knowledge	_____		Financial Skills	_____	
Warehouse Design Know How	_____		Legal Knowledge	_____	
Material Handling Knowledge	_____		Industry Know How	_____	
ICT Knowledge	_____		Other	_____	
3.1.7 Human Skills/ Knowledge	[1]	[2]	[3]	[4]	[5]
Social Skills/ Persuasiveness			Negotiation skills	_____	
/ Ability to empathize	_____		assertiveness	_____	
Communication skills	_____		other	_____	
Leadership skills	_____				
3.1.8 Conceptual Skills	[1]	[2]	[3]	[4]	[5]
Analytical skills.	_____		Political skills	_____	
Ideas and Visions	_____		Feel for the Market	_____	
Project Management Skills	_____		Other.....	_____	

3.2 Implementation Phase (Process)

How important were following categories of resources (i.e. the quantity of the input) and skills (i.e. the quality of the input) throughout the implementation phase (considering all parties involved)? What specific resources and skills were needed to implement your logistics system? Please mark those that were of particular importance to!

	Not relevant	not important	important	very important	most important
3.1.1 Financial Resources	[1]	[2]	[3]	[4]	[5]
Cash			Dept Capacity		
Available Equity			Other		
Venture Capital					
3.2.2 Physical Resources	[1]	[2]	[3]	[4]	[5]
Offices and office equipment			Car(s)		
Office ICT			Meeting facility		
			other		
	Not	not		very	most

	relevant	important	important	important	important
3.2.3 Technical Resources	[1]	[2]	[3]	[4]	[5]
IT systems			<i>Expert Software (describe)</i>		
Homepage			Simulation tools		
Patent(s)			Other		
<i>Knowledge Database (describe)</i>					
3.2.4 Human Resources	[1]	[2]	[3]	[4]	[5]
Logistics Analysts			Financial Analysts		
Production Experts			Engineer		
Transport Experts			External Specialists		
Other					
3.2.5 Organisational Resources	[1]	[2]	[3]	[4]	[5]
Reputation			Physical Network		
MIS			Hierarchical Structure		
Training Schemes			Trust Worthiness		
Interorganisational			Team Orientation		
Relationship network			<i>Other</i>		
3.2.6 Technical Skills	[1]	[2]	[3]	[4]	[5]
Logistics-/SC Planning Skills	___		Marketing Know How	___	
Transport Knowledge	___		Financial Skills	___	
Warehouse Design Know How	___		Legal Knowledge	___	
Material Handling Knowledge	___		Industry Know How	___	
ICT Knowledge	___		Other	___	
3.2.7 Human Skills/ Knowledge	[1]	[2]	[3]	[4]	[5]
Social Skills/ Persuasiveness			Negotiation skills	___	
/ Ability to empathize	___		assertiveness	___	
Communication skills	___		other	___	
Leadership skills	___				
3.2.8 Conceptual Skills	[1]	[2]	[3]	[4]	[5]
Analytical skills.	___		Political skills	___	
Ideas and Visions	___		Feel for the Market	___	
Project Management Skills	___		Other.....	___	

3.4 Operational Phase (Process)

How important are the following categories of resources (i.e. the quantity of the input) and skills (i.e. the quality of the input) to operate your logistics system (considering all parties involved)? What specific resources and skills are needed to operate it? Please mark those that are of particular importance to you (please mark up to 3)!

	Not relevant	not important	important	very important	most important
3.3.1 Financial Resources	[1]	[2]	[3]	[4]	[5]
Cash			Dept Capacity		
Available Equity			Other		
Venture Capital					
3.3.2 Physical Resources	[1]	[2]	[3]	[4]	[5]
Offices and office equipment			Car(s)		
Office ICT			Trucks		
MH Equipment			Warehouses		
			Cross docking points		
3.3.3 Technical Resources	[1]	[2]	[3]	[4]	[5]
I T Systems			Barcoding		
Web link to customers			GPS System		
Track + Trace system			Warehouse automation		
Knowledge Database			Other		
3.3.4 Human Resources	[1]	[2]	[3]	[4]	[5]
Logistics Analysts			External Specialists		
Production Experts			Warehouse Managers		
Logistics Planners			Transport Managers		
Logistics Managers			Warehouse staff		
Transport Experts			Drivers		
Financial Analysts			Other		
Engineer					
3.3.5 Organisational Resources	[1]	[2]	[3]	[4]	[5]
Reputation			Physical Network		
MIS			Hierarchical Structure		
Training Schemes			Trust Worthiness		
Interorganisational			Team Orientation		
Relationship network			Other		

	NOW					IN FUTURE				
	Totally insufficient	insufficient	Sufficient	More than sufficient	Excessive resources	Totally insufficient	insufficient	Sufficient	More than sufficient	Excessive resources
Financial Resources										
Design Phase	[1]	[2]	[3]	[4]	[5]	[1]	[2]	[3]	[4]	[5]
Implementation Phase	[1]	[2]	[3]	[4]	[5]	[1]	[2]	[3]	[4]	[5]
Operational Phase	[1]	[2]	[3]	[4]	[5]	[1]	[2]	[3]	[4]	[5]
Physical Resources										
Design Phase	[1]	[2]	[3]	[4]	[5]	[1]	[2]	[3]	[4]	[5]
Implementation Phase	[1]	[2]	[3]	[4]	[5]	[1]	[2]	[3]	[4]	[5]
Operational Phase	[1]	[2]	[3]	[4]	[5]	[1]	[2]	[3]	[4]	[5]
Technical Resources										
Design Phase	[1]	[2]	[3]	[4]	[5]	[1]	[2]	[3]	[4]	[5]
Implementation Phase	[1]	[2]	[3]	[4]	[5]	[1]	[2]	[3]	[4]	[5]
Operational Phase	[1]	[2]	[3]	[4]	[5]	[1]	[2]	[3]	[4]	[5]
Human Resources										
Design Phase	[1]	[2]	[3]	[4]	[5]	[1]	[2]	[3]	[4]	[5]
Implementation Phase	[1]	[2]	[3]	[4]	[5]	[1]	[2]	[3]	[4]	[5]
Operational Phase	[1]	[2]	[3]	[4]	[5]	[1]	[2]	[3]	[4]	[5]
Organisational Resources										
Design Phase	[1]	[2]	[3]	[4]	[5]	[1]	[2]	[3]	[4]	[5]
Implementation Phase	[1]	[2]	[3]	[4]	[5]	[1]	[2]	[3]	[4]	[5]
Operational Phase	[1]	[2]	[3]	[4]	[5]	[1]	[2]	[3]	[4]	[5]

3.5 How would you rate the current and future provision of your own skills, i.e. the quality of the input, as TPL provider, with respect to designing, implementing, and operating a clients logistics system, on a 5-point scale from “totally inadequate” to “leading edge”?

	Totally inadequate	Inadequate	Adequate	More than adequate	Leading edge	Totally inadequate	Inadequate	Adequate	More than adequate	Leading edge
Technical Skills										
Design Phase	[1]	[2]	[3]	[4]	[5]	[1]	[2]	[3]	[4]	[5]
Implementation Phase	[1]	[2]	[3]	[4]	[5]	[1]	[2]	[3]	[4]	[5]
Operational Phase	[1]	[2]	[3]	[4]	[5]	[1]	[2]	[3]	[4]	[5]
Human Skills										
Design Phase	[1]	[2]	[3]	[4]	[5]	[1]	[2]	[3]	[4]	[5]
Implementation Phase	[1]	[2]	[3]	[4]	[5]	[1]	[2]	[3]	[4]	[5]
Operational Phase	[1]	[2]	[3]	[4]	[5]	[1]	[2]	[3]	[4]	[5]
Conceptual Skills										
Design Phase	[1]	[2]	[3]	[4]	[5]	[1]	[2]	[3]	[4]	[5]
Implementation Phase	[1]	[2]	[3]	[4]	[5]	[1]	[2]	[3]	[4]	[5]
Operational Phase	[1]	[2]	[3]	[4]	[5]	[1]	[2]	[3]	[4]	[5]

3.6 How is training and education of your personnel typically organised:

- ☐ formal, in advance according to a plan
- ☐ formal, just-in-time when needed
- ☐ informal, on-the-job
- ☐ other _____

3.8 Who was the main source of education and training competence for the specific logistics system surveyed here?

- ☐ Your own organisation
- ☐ Your TPL service provider
- ☐ External specialist
- ☐ Other _____

5. Systems Efficiency and Effectiveness

Logistics Systems can be measured in their Efficiency and Effectiveness, which can be called supply chain performance!

The measurements of Logistics Effectiveness relates to externally oriented factors that determine the cycle time for a customer order (outbound) and the cycle time for replenishment (inbound), as well as the quality of the order fulfillment. The measurement of Logistics Efficiency relates to internally oriented factors that determine the cost per order.

In the following please answer the Questions with respect of the Logistics System you specified!

4.1. Costs

5.1.1 How have the following costs changed over the last 3 years in relation to your clients turnover?

	Substantial Decrease >15%	Slight Decrease 2–15%	No change +/-1%	Slight Increase 2%-15%	Substantial Increase >15%
Total Logistics costs	☐	☐	☐	☐	☐
Transportation costs	☐	☐	☐	☐	☐
Warehousing costs	☐	☐	☐	☐	☐
Inventory carrying costs	☐	☐	☐	☐	☐
Administration costs	☐	☐	☐	☐	☐
Other (specify)	☐	☐	☐	☐	☐

4.1.2 How much of this change in cost, can be attributed to the work done by you as third party logistics provider (TPLP) of your client?

	TPLP had no influence			Change entirely due to TPLP	
Total Logistics Costs	[1]	[2]	[3]	[4]	[5]
Transportation costs	[1]	[2]	[3]	[4]	[5]
Warehousing costs	[1]	[2]	[3]	[4]	[5]
Inventory carrying cost	[1]	[2]	[3]	[4]	[5]
Administration costs	[1]	[2]	[3]	[4]	[5]
Other (specify)	[1]	[2]	[3]	[4]	[5]

4.2 Time

4.2.1 How have the following times changed in your clients logistics system over the last 3 years?

	Substantial Decrease >15%	Slight Decrease 2–15%	No change +/-1%	Slight Increase 2%-15%	Substantial Increase >15%
Overall Cycle time	☐	☐	☐	☐	☐
Storage time	☐	☐	☐	☐	☐
(Re-)packing/labelling time	☐	☐	☐	☐	☐
order processing time	☐	☐	☐	☐	☐
WH in/out time	☐	☐	☐	☐	☐
Transport lead time	☐	☐	☐	☐	☐
Value adding time	☐	☐	☐	☐	☐

4.2.2 How much of the change in time can be attributed to the influence of you as third party logistics provider (TPLP) of your client?

	TPLP had no influence			Change entirely due to TPLP	
Overall Cycle time	[1]	[2]	[3]	[4]	[5]
Warehouse in/out time	[1]	[2]	[3]	[4]	[5]
storage time	[1]	[2]	[3]	[4]	[5]
order processing time	[1]	[2]	[3]	[4]	[5]
(Re-)packing /labelling time	[1]	[2]	[3]	[4]	[5]
Transport lead time	[1]	[2]	[3]	[4]	[5]
Value adding time	[1]	[2]	[3]	[4]	[5]

4.3 Quality

4.3.1 How have the following quality levels changed in your clients logistics system over the last 3 years?

	Substantially worse >15%	Slightly worse 2–15%	No change +/-1%	Slight better 2%-15%	Substantially better >15%
Order completeness	☐	☐	☐	☐	☐
Damage free delivery	☐	☐	☐	☐	☐
On time delivery	☐	☐	☐	☐	☐
Invoice accuracy	☐	☐	☐	☐	☐
Other (specify)	☐	☐	☐	☐	☐

4.3.2 How much of the change in quality, can be attributed to the work done by of you as third party logistics provider (TPLP) of your client?

	TPLP had no influence			Change entirely due to TPLP	
Order completeness	[1]	[2]	[3]	[4]	[5]
Damage free delivery	[1]	[2]	[3]	[4]	[5]
On time delivery	[1]	[2]	[3]	[4]	[5]
Invoice accuracy	[1]	[2]	[3]	[4]	[5]
Other (specify)	[1]	[2]	[3]	[4]	[5]

4.4 Future Demand on Effectiveness and Efficiency of Logistics Systems

How do you see the relative importance of the following performance factors in a logistics system changing in future?

	Much Less Important		the same	Much more Important	
Transportation costs	[1]	[2]	[3]	[4]	[5]
Warehousing costs	[1]	[2]	[3]	[4]	[5]
Inventory carrying costs	[1]	[2]	[3]	[4]	[5]
Administration costs	[1]	[2]	[3]	[4]	[5]
Warehouse in/out time	[1]	[2]	[3]	[4]	[5]
storage time	[1]	[2]	[3]	[4]	[5]
order processing time	[1]	[2]	[3]	[4]	[5]
(Re-)packing/labelling time	[1]	[2]	[3]	[4]	[5]
Transport lead time	[1]	[2]	[3]	[4]	[5]
Value adding time	[1]	[2]	[3]	[4]	[5]
Order completeness	[1]	[2]	[3]	[4]	[5]
Damage free delivery	[1]	[2]	[3]	[4]	[5]
On time delivery	[1]	[2]	[3]	[4]	[5]
Invoice accuracy	[1]	[2]	[3]	[4]	[5]

5. Transport Modes

5.1 Which transport modes are used for the selected logistics system?

☐ Rail.
 ☐ Inland shipping
☐ Road
 ☐ Sea
☐ Airline
 ☐ Intermodal
 .

5.1.1 During which phases was a decision made about transport modes that are used in your logistics system?

☐ Design Phase
 ☐ Implementation Phase
 ☐ Operational Phase

5.1.2 Who influenced this decision? (Please attribute a proportion out of 100!)

☐ Your Client
☐ Your Organisation (TPL provider)
☐ Your clients Customer(s)
☐ Your clients Supplier(s)
☐ Other(s)

100%

5.1.5 What is the delivery time window within the specified logistics system?

>1 hr 1-3 hrs 3-6 hrs 6-12 hrs 12-24 hrs >24 hrs
☐ ☐ ☐ ☐ ☐ ☐

5.1.6 How capable in your opinion is a logistics system which incorporates Intermodal Transport in meeting these delivery time window requirements today and in future?

At present **In future**
not capable very capable **not capable very capable**

Delivery time window

>1 hr	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
1-3 hrs	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
3-6 hrs	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
6-12 hrs	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
12-24 hrs	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
>24 hrs	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

5.1.5 What changes in systems efficiency/effectiveness would you expect today, if you were to change a clients logistics system to either start using or significantly increase the use of intermodal transport?

	Substantially worse >15%	Slightly worse 2–15%	No change +/-1%	Slight better 2%-15%	Substantially better >15%
Total Logistics costs	☐	☐	☐	☐	☐
Total Order Cycle time	☐	☐	☐	☐	☐
Total Quality	☐	☐	☐	☐	☐

6. Closure

6.2 Which of the following do you think describes best the current strategy of your clients regarding the use of third party logistics (TPL) and Intermodal transport(INT)?

- | | |
|---|--|
| ☐ They are expanding their use of TPL | ☐ They are expanding our use of INT |
| ☐ They are reducing the use of TPL | ☐ They are reducing the use of INT |
| ☐ The use of TPL will remain the same | ☐ The use of INT will remain the same |
| ☐ They are increasing the number of TPLP | |
| ☐ They are reducing the number of TPLPs | |
| ☐ The number of TPLP will be the same | |

6.2 How would you rate the success of the partnership with your client?

Not very successful			Highly successful		
1	2	3	4	5	

6.3 How would you rate the success of using Intermodal transport?

Not very successful			Highly successful		
1	2	3	4	5	

6.4 Would you like to add anything with respect to your clients requirements on TPL facilitated transport systems?

6.5 How can third party logistics providers proactively facilitate higher efficiency/effectiveness of a clients logistics system?

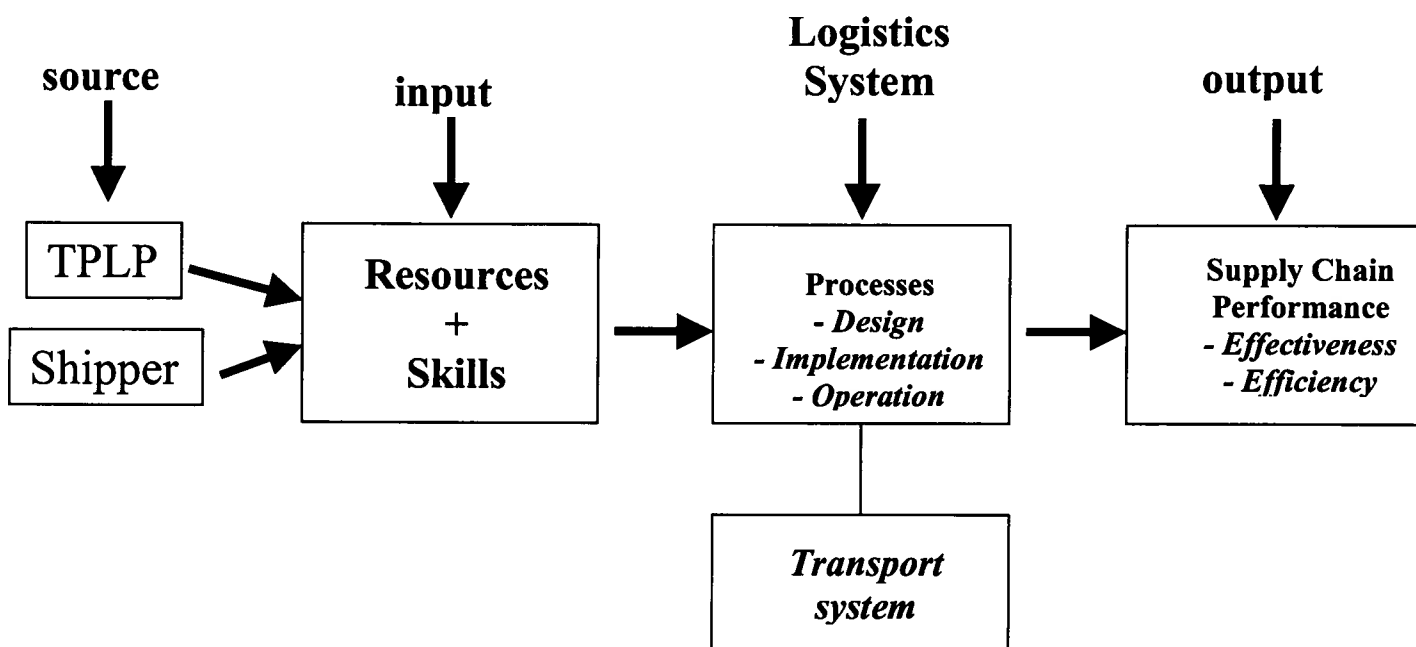
6.7 Do you have any suggestion for questions, which could be interesting to include in the questionnaire for next year?

Appendix C - Interviewer Manual - Survey

PROTRANS WP 3 - Shippers demands versus TPL Services

Conceptual Frame

In order to ensure some academic rigour and thus the validity of the project outcome WP 3 is based on a coherent conceptual framework consisting of 3 managerial concepts from economic, organisational and Logistics/Supply Chain Theory. Although it is of less importance for the interviewer and the interviewee to be familiar with these theoretic concepts it is probably helpful to be all time aware of the reason for the chosen structure and content of the questionnaires. Following visualisation is therefore perhaps helpful!



In accordance with the main objective of WP 3 we take a more holistic view of a coherent logistics system as 'unit of analysis', with transport system(s) as part of this. A logistics systems can be seen as a certain structure of (decision making) processes over a certain period of time and at certain levels (i.e.: design, implementation and operation). To compare shippers demands with the corresponding services of TPL providers it necessary to explore the input (i.e.: Resources + Skills) and the output (i.e.: performance) of such a system. Whilst the link between the source of input (i.e., shipper or TPLP) is directly asked in sections 2. and 3. The results of the analysis will later tell us more about the link between the output (performance) of the system and the source of its input.

The questionnaire starts with the identification of a logistics system in Section 1 and subsequently explores in Section 2 the process structure of the defined system. Section 3 then revolves around the input (and the source of input) and Section 4 focuses on the output. Finally Section 5 explores at a higher level the importance and influence of intermodal transport within a logistics system linking thus WP 3 with WP 4.

Procedure

Generally WP 3 aims to capture the view of both, shippers and TPL providers. The accumulated list of 35 providers we aim to interview is rooted in the database of leading TPL service providers (WP 1). The sample of shipper is based on a even spread amongst the 4 industry sectors and European countries according to their proportional contribution to Gross European Product (GEP). Whilst the choice of TPL providers is predetermined the choice of shippers is largely dependent on the existing contacts of all consortium partners. The share of the workload (i.e. conducting interviews) is based on the resources of each partner made available to WP 3.

The details of the workload share can be seen in Annex 1, which might for operational reasons be subject to changes during the interviewing period.

Since the questionnaire is rather long (estimated interview time: 2 hrs) and complex it has been agreed to send it together with a covering letter at least 1 week prior to the interview to the potential respondent. Thus we give the interviewee a chance to familiarise him or her self with the questionnaire, which will save time during the actual interview, and helps the respondent to hopefully give us all the information we ask for.

Questionnaires

This manual refers to both the Shipper's and the TPL questionnaire. The questions asked in both questionnaires are essentially the same alone the perspective (shipper or TPL provider) differs where necessary.

Section 1. General Information

In 1.1 a specification of the industrial sector according to the limitation in WP 3 and WP 1 is asked. The emphasis is here on an industrial segment. Respondent are not necessarily OEMs, but also Supply Chain entities, which are immediately situated before or after the OEM (i.e.:1st tier suppliers or wholesalers, distributors, retailers).

In 1.2 we ask for data of a logistics system to create a frame of reference. It is important for the later analysis that the data collection in this section is complete.

1.2.1 Several answers are theoretically possible. Be aware though, that most logistics systems will be build around a certain product group.

1.2.2 – 1.2.3 are self explanatory!

In 1.2.4. we want a description of the physical flow of the previously specified product group describing the nodes (breakpoints) and the modes used to and from these nodes.

1.2.5 –1.2.7 asks some contextual data and makes a link to WP 1.

Section 2 Design, implementation and operation of a logistics system

2.1. Phases

The respondent is given here in an explanatory way a short and (so we think) necessary introduction of the conceptual frame used in the study. This is necessary because the process structure used here is reflected in each section of the questionnaire and depicts it in relation to time.

Section 2.2. to 2.4 are exploring the structure sub-processes in each phase explained in 2.1 further to a lower level of activities ('subsub-processes').

2.2 System Design

In 2.2.1 to 2.2.6 the respondent is asked to answer a 2-fold question. He is first asked to make a statement about the leading role in each of the specified **sub-processes**. This is marked in the questionnaire by a ticking the appropriate box under "In house", "TPL provider" or "other". Secondly he is asked on an **activity level** to indicate, who was involved in those. 4 different answers are possible:

Client, (In-house)-CL

TPL - T

Other - O

A combination C

The answer is marked on the questionnaire by writing the appropriate coding given in the questionnaire on the line behind each activity.

It is most important to mark on the questionnaire, if a 'combination' contains other parties than the TPLP and the shipper. It is also desirable to specify, who a potential 'other' parties was.

2.2.7 Based on their just stated experience with TPLPs, respondents are asked here how they perceive the current, desired and most likely future role. I.e.: *What role did TPLPs take in the design of their logistics system ? What role would they like them to take in future? What role do they think TPLPs will have most likely in future?*

The answer should be either given on a 5-point scale ranging from **reactively enabling subtasks** to **proactively developing logistics processes** in order to categorise the role the TPLS had or could have. It should be marked as "n.a." – not applicable, when the respondent can't confirm any involvement of a TPLP provider in the described logistics system, respectively thinks that no involvement is desired or seen in the future.

2.3 Systems Implementation

The respondent is asked in the same way as in 2.2 for information about who was involved in the implementation of the specified logistics system.

2.3.1– 2.3.4 : same as 2.2.1 – 2.2.6

2.3.5 : Similar to question 2.2.7 the respondents are asked here how they perceive the current, desired and most likely future role of TPLPs in implementing a logistics system. The 5-point scale reflects here a spectrum ranging from **reactively contracting subtasks** to **proactive project management**. Answers should be marked in the same fashion as in 2.2.

2.4 Systems Operation

2.4.1 – 2.4.3

In contrast to 2.2 and 2.3 respondents are not asked to make a statement about the leading role in a sub-process. Neither is a combination of parties foreseen as possible answer to the involvement in the activities listed below each sub process (i.e. Planning, Execution, Control). It is assumed that each activity within a sub-process in practice will be carried out by only one organisation. In case more than one party is involved in one of the activities, more than one box can be ticked. The characterisation of the overall role of each party in a sub-process will be deducted through the analysis of the given answers.

In **2.4.4** the respondents are asked here how they perceive the current, desired and most likely future role of TPLPs in operating a logistics system. The 5-point scale reflects here a spectrum ranging from **reactively contracting subtasks** to **proactively driving operational efficiency**. Answers should be marked in the same fashion as in 2.2 and 2.3.

2.5 TPL performance

Respondents are here asked to put their judgement towards TPLP involvement in their logistics system. Answers should be marked by ticking the appropriate box. 'Not applicable' is appropriate when the TPLP had no involvement in the sub-process.

Section 3. Skills and Resources

In section 3 we now explore the *input* that went into the just explicitly described process structure within the specified logistics system. The concept used in this section is derived from an economic concept called Resource Based Theory. The input into any management process must be seen in *qualitative* way enabled through some form of *skill* and in a *quantitative* way enabled through the input of *resources*. In this study we distinguish between 3 different skills, *technical skill*, *human skill*, *conceptual skill*, and 5 basic resources *Physical*, *Financial*, *Human*, *Technological*, *Organisational Resources*. Technical skill implies an understanding of and proficiency in, a specific kind of activity, particularly one involving method, processes, procedures, or techniques. Human skill is the ability to effectively [i.e., to manage] work with people. Conceptual skills are the

‘creative ability’ to co-ordinate and integrate activities and interests towards a common objective.

Resources are best explain by examples:

Financial Resources can be cash flow, debt capacity, or new equity availability. *Physical Resources* can be buildings, manufacturing plants, warehouses, or inventories. *Human Resources* can be scientists, engineers, sales personnel, or financial analysts. *Technological Resources* can be patents or licenses. *Organisational Resources* can be a certain hierarchical structure, financial schemes (pensions, share options etc.) or organisational culture.

In 3.1 – 3.3 we examine now which actual resources and skills were (are) necessary as input in order to design, implement and operate the logistics system using the skill and resource categories described above. Further more we examine the relative importance of each skill and resource category with respect to these 3 phases.

Respondents are first of all asked to give their opinion about the relative importance of resource or skill on a 5-point scale ranging from *not relevant* to *most important*. The answer should be marked in the questionnaire by tick of the appropriate box in the line of the resource/skill category. When ever the answer of the respondent is ‘higher’ than ‘*not relevant*’ we want to know from the respondent which skill or resource is (was) of particular importance during the design, implementation or operational phase of the system. This answer should be marked in the questionnaire on the dotted line next to the listed resources or skill. Since the number of answers that are possible here will differ from case to case it is important for the interviewer to probe in depth.

In 3.4 we ask the respondent to put his (her) judgement to the sufficiency of TPLP resources that were deployed into the design, implementation and operation of the specified logistics system and how they expect these to develop in the future. The respondent is asked to rate the different resource categories on a 5-point scale from “*totally insufficient*” to “*excessive*”. Answers should be marked by a tick of the appropriate box.

In 3.5 the respondent is asked to put his (her) judgement to the adequacy of TPLP skills that were deployed into the design, implementation and operation of the specified logistics system and how they expect these to develop in the future. The respondent is asked to rate the different resource categories on a 5-point scale from “*totally inadequate*” to “*leading edge*”. Answers should be marked by a tick of the appropriate box.

3.6 and 3.7 : Please tick appropriate box!

Remark: We must be aware that the whole concept of skills and resource is rather complex and might by some potential respondents not be fully comprehended at first glance. I would therefore like to stress that the interviewer must be prepared to explain this again to the respondent at this point of the interview. If there are any questions don't hesitate to ask Otto Jockel under +49 179 2424820.

Section 4 Systems Efficiency and Effectiveness

Logistics Systems can be measured in their Efficiency and Effectiveness, which can be called supply chain performance!

The measurements of Logistics Effectiveness relates to externally oriented factors that determine the cycle time for a customer order (outbound) and the cycle time for replenishment (inbound), as well as the quality of the order fulfilment. The measurement of Logistics Efficiency relates to internally oriented factors that determine the cost per order.

In 4.1 – 4.3 we ask the respondent how logistics cost, overall cycle time and quality have changed over the last 3 year in relation to turnover. Further more we ask them to rate the influence of TPLPs with regard to these changes on a 5-point scale based on the respondents perception. Answers should marked in the questionnaire by ticking the appropriate box!

This approach has been chosen because it might be difficult to ask for actual 'numbers' since these might be confidential in some organisations.

4.4 : Here we ask the respondent to give his opinion on the relative importance of performance factors in the future. Answers should marked in the questionnaire by ticking the appropriate box!

Answers should marked in the questionnaire by ticking the appropriate box!

Section 5. – Transport Modes

In this section we try to build the link to WP 4 which concentrates on the influence of Intermodal Transport.

Questions 5.1.1, 5.1.3, 5.1.4 and 5.1.6 are fairly self-explanatory and answer are marked in the questionnaire by ticking the appropriate box/line.

In 5.1.2 and 5.1.5 the respondent is asked to distribute out of 100.

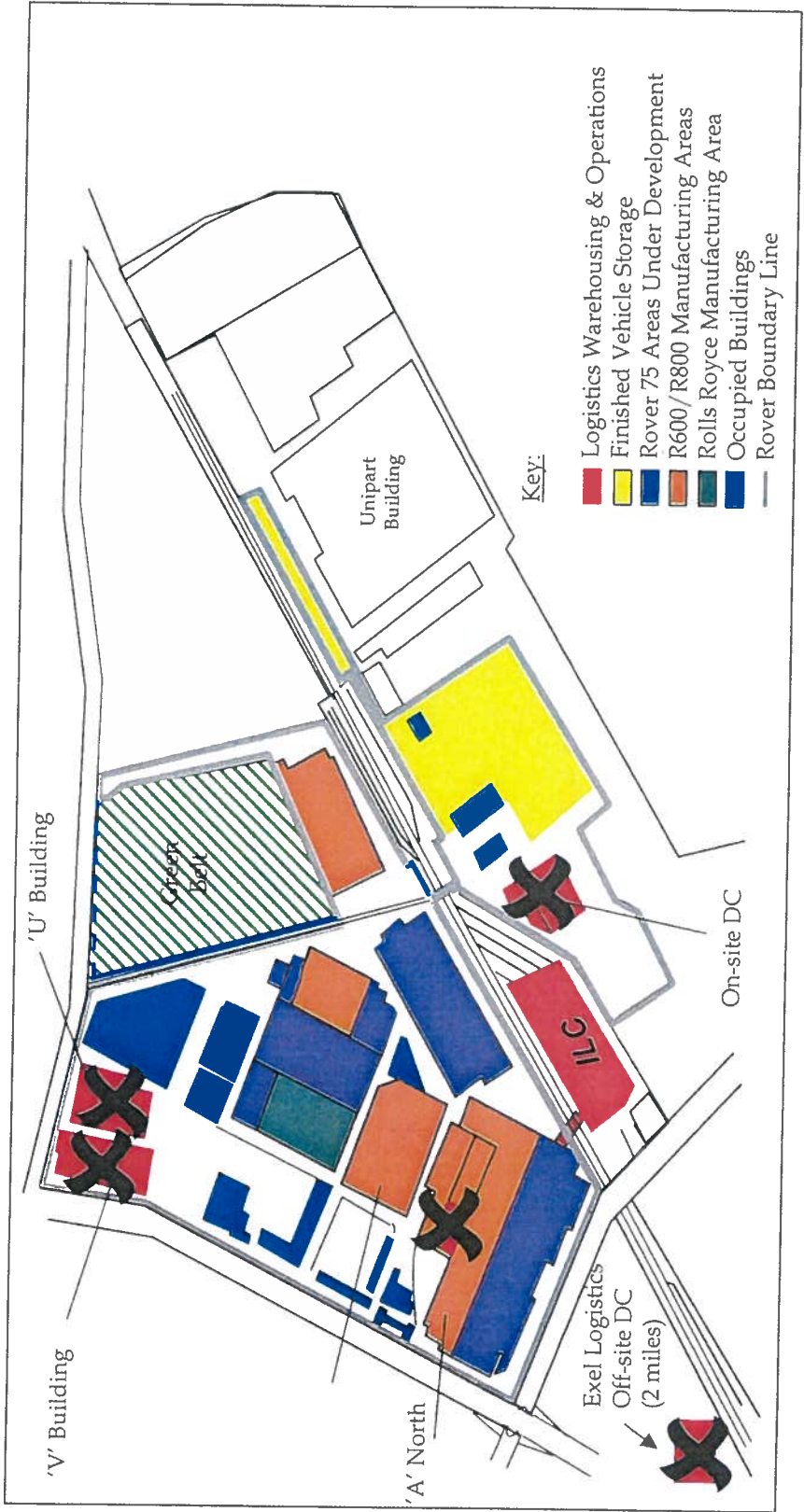
Section 6 – Closure

In 6.1 to 6.3 we ask the respondents opinion on the success of using TPLP and Intermodal Transport and their current strategy on these elements of a logistics system.

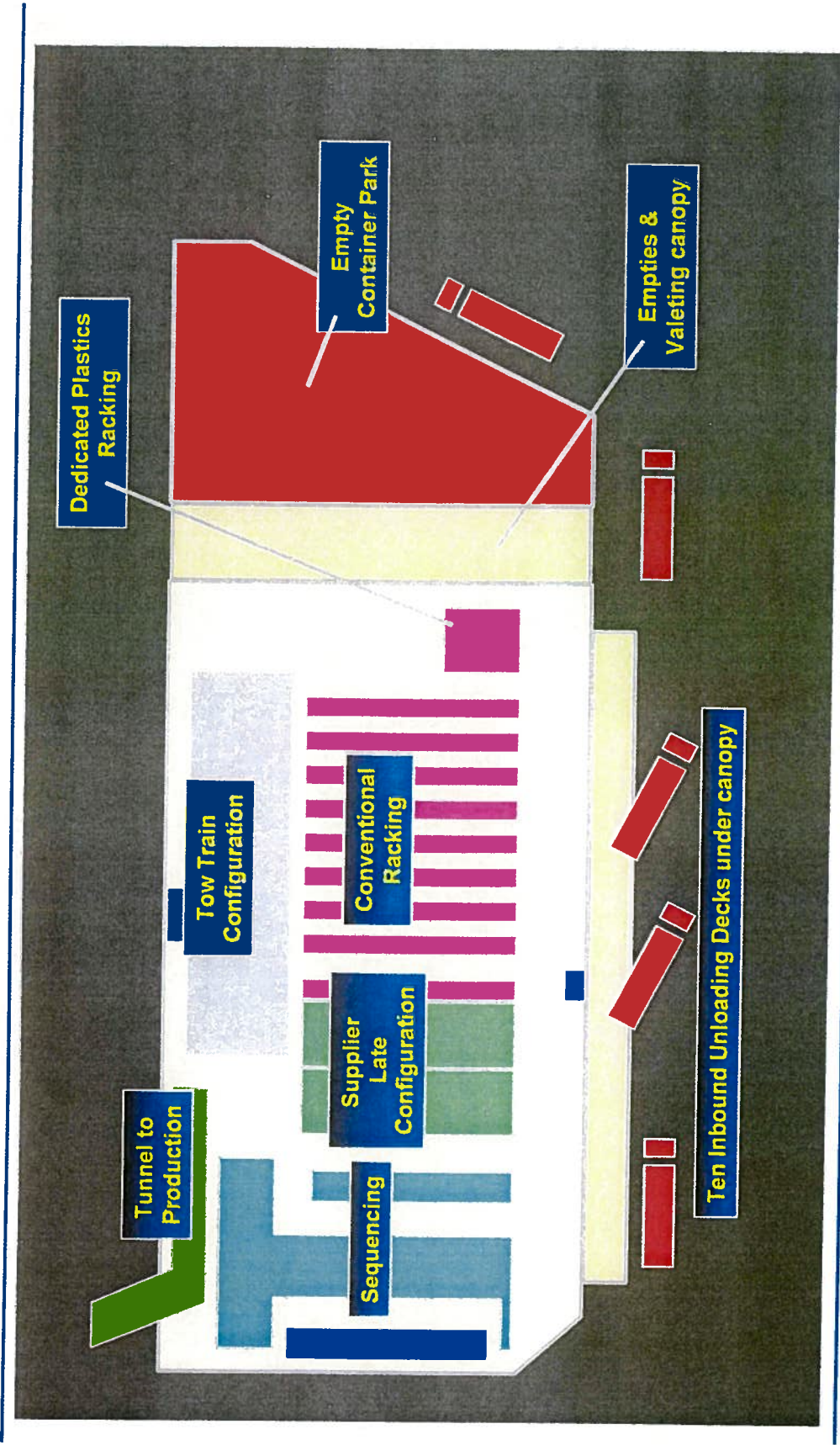
6.3 – 6-6 gives the respondent the opportunity to add issues he thinks are important and were not captured through the rigid structure of the questionnaire.

Final remark: I am aware that the questionnaires are rather complex and involve questions, which are not exactly easy to comprehend. It can be anticipated though that the results will reveal fairly new insights into the role of TPL providers. So I hope everything goes well and wish you good luck with the interviews!

Appendix D : Consolidated site infrastructure



Appendix E: ILC Layout



Appendix F: Questionnaire Operations

Questionnaire – Case Study Rover/Exel

Transport Operations

(Exemplifying! - task description according to responsibility)

Can you please describe the transportation process within and to the ILC in its key activities including planning and control!

How would you in a similar manner describe in brief the design and implementation of the transportation system?

Who is involved in these activities – Rover, Exel another party (if so, can specify this please)?

Why, in your opinion is Exel involved in these activities?

What type of financial, physical, technical, organisational, and human resources resource are necessary in the transport process? (Refer to template of resources)

In your opinion, how well is Exel 'equipped' with these resources?

What type of technical, human and conceptual skills are necessary in the transport process? (Refer to template of skills)

In your opinion, how well is Exel 'equipped' with these skills?

As how pro-active would you describe the role of Exel Logistics with regards to transportation management?

What do you associate with being proactive in transportation management?

What would be the opposite?

How do you measure operational performance in transportation, and which operational measures do you use?

Has operational performance in transportation changed as compared to the operational set-up for the ROVER 800 model?

How, in your opinion is Exel Logistics contributing to performance within transportation management?

Appendix G: Questionnaire Design and Implementation

Questionnaire – Case Study Rover/Exel

Design and implementation

Can you please describe the design of the logistics solution 'ILC' in its key elements and activities? Could you please elaborate on following areas of decision making!

Setting a customer strategy

Channel design

Network design

Functional Design (warehouse – transportation, material management)

Can you please in a similar manner describe in brief the key activities with regards implementing

Facilities and Equipment

Policies and procedures

IS Systems

Organisational Change

Who was involved in these activities – Rover, Exel another party (if so, can specify this please)?

Why, in your opinion was Exel involved in these activities?

What type of financial, physical, technical, organisational, and human resources resource are necessary in the transport process? (Refer to template of resources)

In your opinion, how well is Exel 'equipped' with these resources?

What type of technical, human and conceptual skills are necessary for design and implementation of a logistics solution of this kind? (Refer to template of skills)

In your opinion, how well is Exel 'equipped' with these skills?

As how pro-active would you describe the role of Exel Logistics with regards to design and implementation of the ILC logistics solution?

What do you associate with being proactive in logistics management?

What would be the opposite?

Has operational performance in transportation changed as compared to the operational set-up for the ROVER 800 model?

How, in your opinion is Exel Logistics contributing to logistics performance within the ROVER inbound supply chain.

Appendix H: Questionnaire IT/IS

Questionnaire – Case Study Rover/Exel

Information Systems and Technology

Can you please describe the IS solution for the 'ILC' and the steps of implementing it including hardware and software?

Who was involved in these activities – Rover, Exel another party (if so, can specify this please)?

Why, in your opinion was Exel involved in these activities?

What type of financial, physical, technical, organisational, and human resources resource are necessary in the transport process? (Refer to template of resources)

In your opinion, how well is Exel 'equipped' with these resources?

What type of technical, human and conceptual skills are necessary for design and implementation of a logistics solution of this kind? (Refer to template of skills)

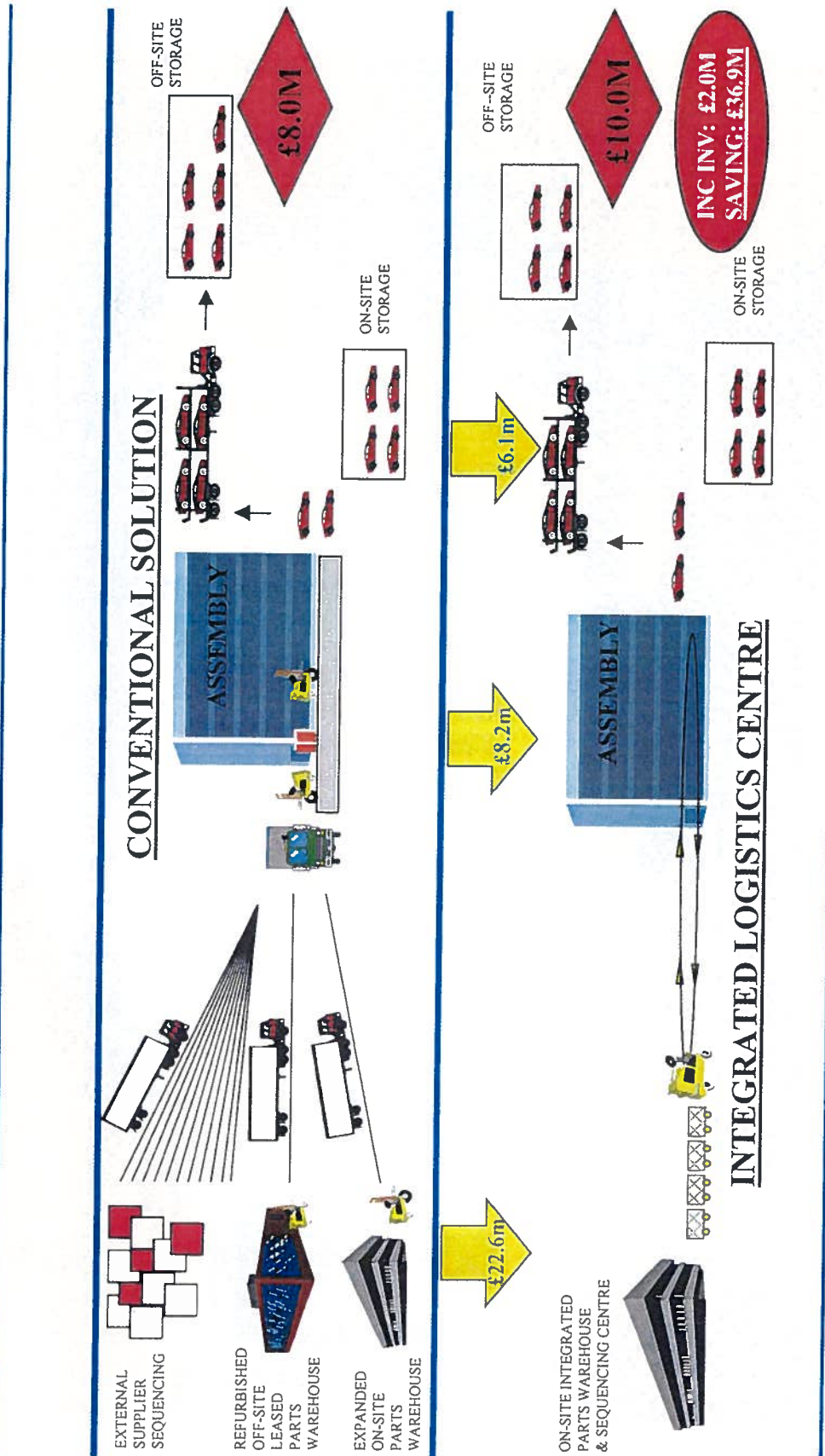
In your opinion, how well is Exel 'equipped' with these skills?

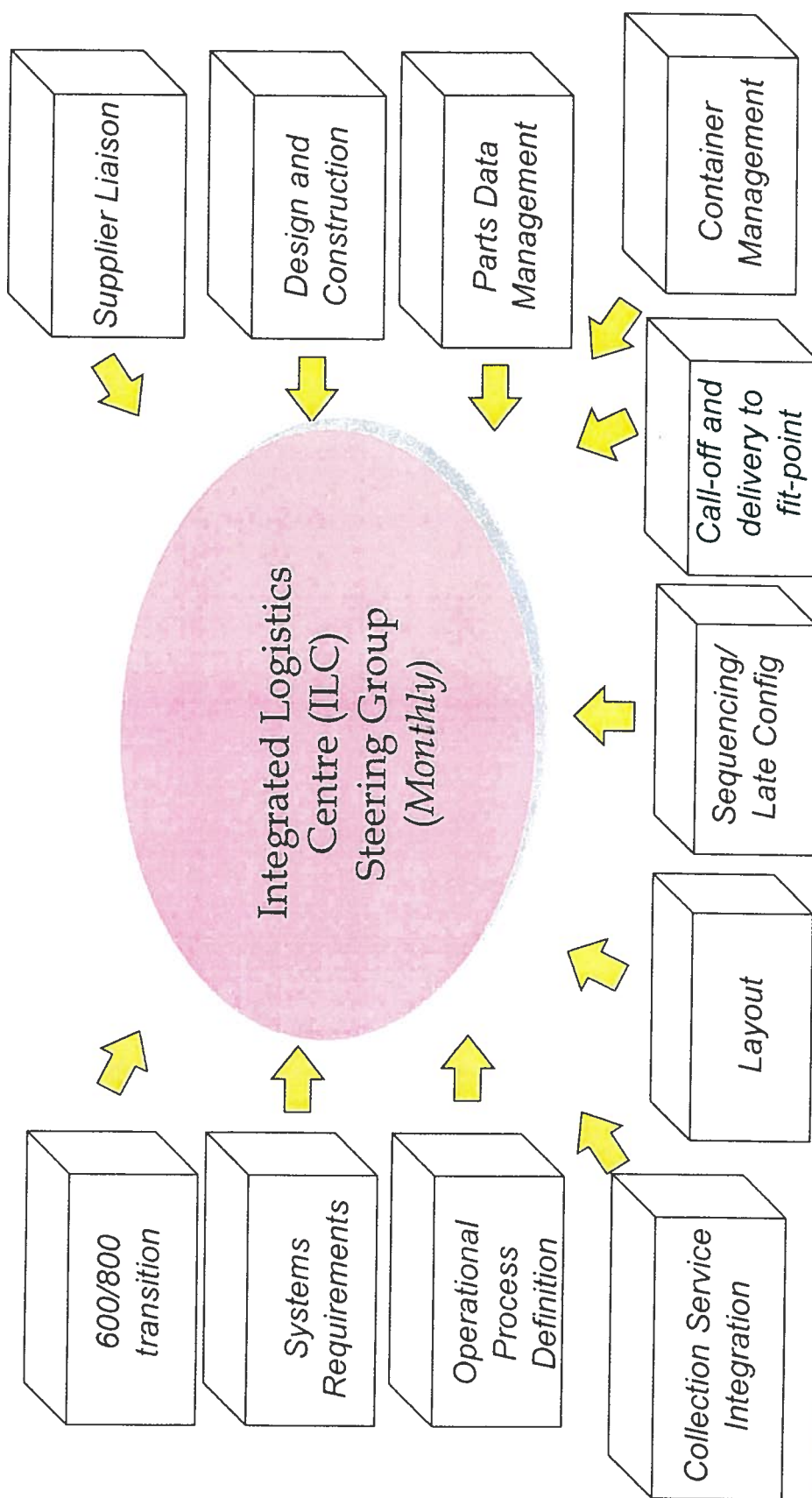
As how pro-active would you describe the role of Exel Logistics with regards to the implementation of appropriate Information Systems and Technology?

What do you associate with being proactive in IT/IS management?

What would be the opposite?

Appendix I: ILC Business case



Appendix J: ILC Project teams

Appendix K: 9.1 Bonferroni test: Proactivity in (see tables)

Multiple Comparisons

Dependent Variable: ProA in channel design

Bonferroni

(I) Industries	(J) Industries	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Automotive	Chemicals	3.030E-02	.4321	1.000	-1.1450	1.2056
	Electronics	.9867*	.3555	.043	1.968E-02	1.9537
	Food(etail)	.4493	.3612	1.000	-.5333	1.4319
Chemicals	Automotive	-3.0303E-02	.4321	1.000	-1.2056	1.1450
	Electronics	.9564	.3938	.107	-.1149	2.0276
	Food(etail)	.4190	.3990	1.000	-.6664	1.5044
Electronics	Automotive	-.9867*	.3555	.043	-1.9537	-1.9682E-02
	Chemicals	-.9564	.3938	.107	-2.0276	.1149
	Food(etail)	-.5374	.3145	.553	-1.3928	.3181
Food(etail)	Automotive	-.4493	.3612	1.000	-1.4319	.5333
	Chemicals	-.4190	.3990	1.000	-1.5044	.6664
	Electronics	.5374	.3145	.553	-.3181	1.3928

Based on observed means.

*. The mean difference is significant at the .05 level.

Multiple Comparisons

Dependent Variable: ProA in materials mgt design

Bonferroni

(I) Industries	(J) Industries	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Automotive	Chemicals	.7879	.4564	.534	-.4535	2.0293
	Electronics	1.4533*	.3755	.002	.4320	2.4747
	Food(etail)	.7681	.3816	.289	-.2697	1.8060
Chemicals	Automotive	-.7879	.4564	.534	-2.0293	.4535
	Electronics	.6655	.4160	.687	-.4660	1.7969
	Food(etail)	-1.9763E-02	.4215	1.000	-1.1662	1.1266
Electronics	Automotive	-1.4533*	.3755	.002	-2.4747	-.4320
	Chemicals	-.6655	.4160	.687	-1.7969	.4660
	Food(etail)	-.6852	.3322	.258	-1.5888	.2183
Food(etail)	Automotive	-.7681	.3816	.289	-1.8060	.2697
	Chemicals	1.976E-02	.4215	1.000	-1.1266	1.1662
	Electronics	.6852	.3322	.258	-.2183	1.5888

Based on observed means.

*. The mean difference is significant at the .05 level.

Multiple Comparisons

Dependent Variable: ProA in WH (mgt) design

Bonferroni

(I) Industries	(J) Industries	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Automotive	Chemicals	1.0242	.4313	.123	-.1490	2.1975
	Electronics	1.1333*	.3549	.013	.1681	2.0986
	Food(etail)	.4116	.3606	1.000	-.5693	1.3925
Chemicals	Automotive	-1.0242	.4313	.123	-2.1975	.1490
	Electronics	.1091	.3931	1.000	-.9603	1.1784
	Food(etail)	-.6126	.3983	.773	-1.6961	.4708
Electronics	Automotive	-1.1333*	.3549	.013	-2.0986	-.1681
	Chemicals	-.1091	.3931	1.000	-1.1784	.9603
	Food(etail)	-.7217	.3139	.148	-1.5757	.1322
Food(etail)	Automotive	-.4116	.3606	1.000	-1.3925	.5693
	Chemicals	.6126	.3983	.773	-.4708	1.6961
	Electronics	.7217	.3139	.148	-.1322	1.5757

Based on observed means.

*. The mean difference is significant at the .05 level.

Appendix L 9.2 Bonferroni test: Logistics performance

Multiple Comparisons

Dependent Variable: Quality changes

Bonferroni

(I) Industries	(J) Industries	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Automotive	Chemicals	4.109E-02	2.135E-02	.351	-1.6973E-02	9.916E-02
	Electronics	3.280E-02	1.756E-02	.398	-1.4973E-02	8.057E-02
	Food(retail)	4.678E-02	1.785E-02	.065	-1.7626E-03	9.533E-02
Chemicals	Automotive	-4.1091E-02	2.135E-02	.351	-9.9155E-02	1.697E-02
	Electronics	-8.2909E-03	1.946E-02	1.000	-6.1214E-02	4.463E-02
	Food(retail)	5.692E-03	1.971E-02	1.000	-4.7930E-02	5.931E-02
Electronics	Automotive	-3.2800E-02	1.756E-02	.398	-8.0573E-02	1.497E-02
	Chemicals	8.291E-03	1.946E-02	1.000	-4.4633E-02	6.121E-02
	Food(retail)	1.398E-02	1.554E-02	1.000	-2.8279E-02	5.624E-02
Food(retail)	Automotive	-4.6783E-02	1.785E-02	.065	-9.5328E-02	1.763E-03
	Chemicals	-5.6917E-03	1.971E-02	1.000	-5.9314E-02	4.793E-02
	Electronics	-1.3983E-02	1.554E-02	1.000	-5.6245E-02	2.828E-02

Based on observed means.

Appendix M: Bonferroni -Test Importance of Resources and Skills

Bonferroni Test				
Dependent variable	Cluster		Std. Error	Significance
Importance Financial Design Resources	Distr.Provider	Transport Provider	0.2606	1.00
		Solution Provider	0.4141	0.04
	Transport Provider	Distr.Provider	0.2606	1.00
		Solution Provider	0.4191	0.16
	Solution Provider	Distr.Provider	0.4141	0.04
		Transport Provider	0.4191	0.16
Importance Physical Design Resources	Distr.Provider	Transport Provider	0.2617	1.00
		Solution Provider	0.4158	0.62
	Transport Provider	Distr.Provider	0.2617	1.00
		Solution Provider	0.4208	0.63
	Solution Provider	Distr.Provider	0.4158	0.62
		Transport Provider	0.4208	0.63
Importance Technical Design Resources	Distr.Provider	Transport Provider	0.2334	1.00
		Solution Provider	0.3709	1.00
	Transport Provider	Distr.Provider	0.2334	1.00
		Solution Provider	0.3753	1.00
	Solution Provider	Distr.Provider	0.3709	1.00
		Transport Provider	0.3753	1.00
Importance Human Design Resources	Distr.Provider	Transport Provider	0.1626	0.07
		Solution Provider	0.2583	1.00
	Transport Provider	Distr.Provider	0.1626	0.07
		Solution Provider	0.2614	0.14
	Solution Provider	Distr.Provider	0.2583	1.00
		Transport Provider	0.2614	0.14
Importance Organisational Design Resources	Distr.Provider	Transport Provider	0.2200	0.54
		Solution Provider	0.3495	1.00
	Transport Provider	Distr.Provider	0.2200	0.54
		Solution Provider	0.3537	1.00
	Solution Provider	Distr.Provider	0.3495	1.00
		Transport Provider	0.3537	1.00
Importance Technical Design Skills	Distr.Provider	Transport Provider	0.1885	0.01
		Solution Provider	0.2995	1.00
	Transport Provider	Distr.Provider	0.1885	0.01
		Solution Provider	0.3030	0.87
	Solution Provider	Distr.Provider	0.2995	1.00
		Transport Provider	0.3030	0.87
Importance Human Design Skills/Knowledge	Distr.Provider	Transport Provider	0.1895	0.05
		Solution Provider	0.3012	1.00
	Transport Provider	Distr.Provider	0.1895	0.05
		Solution Provider	0.3048	1.00
	Solution Provider	Distr.Provider	0.3012	1.00
		Transport Provider	0.3048	1.00
Importance Conceptual Design Skills	Distr.Provider	Transport Provider	0.2200	0.54
		Solution Provider	0.3495	1.00
	Transport Provider	Distr.Provider	0.2200	0.54
		Solution Provider	0.3537	1.00
	Solution Provider	Distr.Provider	0.3495	1.00
		Transport Provider	0.3537	1.00
Importance Financial Implem. Resources	Distr.Provider	Transport Provider	0.2463	0.09
		Solution Provider	0.3914	0.94
	Transport Provider	Distr.Provider	0.2463	0.09
		Solution Provider	0.3961	0.06
	Solution Provider	Distr.Provider	0.3914	0.94
		Transport Provider	0.3961	0.06
Importance Physical Implem. Resources	Distr.Provider	Transport Provider	0.2584	1.00
		Solution Provider	0.4106	1.00
	Transport Provider	Distr.Provider	0.2584	1.00
		Solution Provider	0.4155	1.00
	Solution Provider	Distr.Provider	0.4106	1.00
		Transport Provider	0.4155	1.00
Importance Technical Implem. Resources	Distr.Provider	Transport Provider	0.1813	0.28
		Solution Provider	0.2881	0.11
	Transport Provider	Distr.Provider	0.1813	0.28
		Solution Provider	0.2916	0.89
	Solution Provider	Distr.Provider	0.2881	0.11
		Transport Provider	0.2916	0.89

Importance Human Implem. Resources	Distr.Provider	Transport Provider	0.1779	0.00
		Solution Provider	0.2827	1.00
	Transport Provider	Distr.Provider	0.1779	0.00
		Solution Provider	0.2861	0.54
	Solution Provider	Distr.Provider	0.2827	1.00
		Transport Provider	0.2861	0.54
Importance Organisational Implem. Resources	Distr.Provider	Transport Provider	0.2045	1.00
		Solution Provider	0.3249	1.00
	Transport Provider	Distr.Provider	0.2045	1.00
		Solution Provider	0.3287	1.00
	Solution Provider	Distr.Provider	0.3249	1.00
		Transport Provider	0.3287	1.00
Importance Technical Implem. Skills	Distr.Provider	Transport Provider	0.1764	0.00
		Solution Provider	0.2803	1.00
	Transport Provider	Distr.Provider	0.1764	0.00
		Solution Provider	0.2837	0.36
	Solution Provider	Distr.Provider	0.2803	1.00
		Transport Provider	0.2837	0.36
Importance Human Implem. Skills/Knowledge	Distr.Provider	Transport Provider	0.2290	0.05
		Solution Provider	0.3638	1.00
	Transport Provider	Distr.Provider	0.2290	0.05
		Solution Provider	0.3681	0.41
	Solution Provider	Distr.Provider	0.3638	1.00
		Transport Provider	0.3681	0.41
Importance Conceptual Implem. Skills	Distr.Provider	Transport Provider	0.2576	0.01
		Solution Provider	0.4093	1.00
	Transport Provider	Distr.Provider	0.2576	0.01
		Solution Provider	0.4142	0.15
	Solution Provider	Distr.Provider	0.4093	1.00
		Transport Provider	0.4142	0.15
Importance Financial Operational Resources	Distr.Provider	Transport Provider	0.2832	0.01
		Solution Provider	0.4500	0.41
	Transport Provider	Distr.Provider	0.2832	0.01
		Solution Provider	0.4554	1.00
	Solution Provider	Distr.Provider	0.4500	0.41
		Transport Provider	0.4554	1.00
Importance Physical Operational Resources	Distr.Provider	Transport Provider	0.2539	0.80
		Solution Provider	0.4034	1.00
	Transport Provider	Distr.Provider	0.2539	0.80
		Solution Provider	0.4082	1.00
	Solution Provider	Distr.Provider	0.4034	1.00
		Transport Provider	0.4082	1.00
Importance Technical Operational Resources	Distr.Provider	Transport Provider	0.1819	0.21
		Solution Provider	0.2890	1.00
	Transport Provider	Distr.Provider	0.1819	0.21
		Solution Provider	0.2925	0.40
	Solution Provider	Distr.Provider	0.2890	1.00
		Transport Provider	0.2925	0.40
Importance Human Operational Resources	Distr.Provider	Transport Provider	0.1963	0.12
		Solution Provider	0.3119	0.48
	Transport Provider	Distr.Provider	0.1963	0.12
		Solution Provider	0.3156	0.03
	Solution Provider	Distr.Provider	0.3119	0.48
		Transport Provider	0.3156	0.03
Importance Organisational Operational Resources	Distr.Provider	Transport Provider	0.1940	1.00
		Solution Provider	0.3082	1.00
	Transport Provider	Distr.Provider	0.1940	1.00
		Solution Provider	0.3119	1.00
	Solution Provider	Distr.Provider	0.3082	1.00
		Transport Provider	0.3119	1.00
Importance Technical Operational Skills	Distr.Provider	Transport Provider	0.2109	1.00
		Solution Provider	0.3351	1.00
	Transport Provider	Distr.Provider	0.2109	1.00
		Solution Provider	0.3391	1.00
	Solution Provider	Distr.Provider	0.3351	1.00
		Transport Provider	0.3391	1.00
Importance Human Operational Skills/Knowledge	Distr.Provider	Transport Provider	0.2511	0.01
		Solution Provider	0.3990	1.00
	Transport Provider	Distr.Provider	0.2511	0.01
		Solution Provider	0.4038	0.17
	Solution Provider	Distr.Provider	0.3990	1.00
		Transport Provider	0.4038	0.17
Importance Conceptual Operational Skills	Distr.Provider	Transport Provider	0.1674	0.42
		Solution Provider	0.2660	1.00

Appendix N: Bonferroni Test Design Resources and Skills by

Multiple Comparisons

Bonferroni

Dependent Variable	(I) Ward Method	(J) Ward Method	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
sufdde	1	2	-.3115	.1604	.168	-.7049	8.183E-02
		3	-.7107*	.2549	.020	-1.3357	-8.5714E-02
	2	1	.3115	.1604	.168	-8.1832E-02	.7049
		3	-.3992	.2579	.378	-1.0317	.2333
	3	1	.7107*	.2549	.020	8.571E-02	1.3357
		2	.3992	.2579	.378	-.2333	1.0317
SUPRDE	1	2	-.3152	.1568	.145	-.6997	6.926E-02
		3	-.1821	.2491	1.000	-.7930	.4287
	2	1	.3152	.1568	.145	-6.9265E-02	.6997
		3	.1331	.2521	1.000	-.4851	.7512
	3	1	.1821	.2491	1.000	-.4287	.7930
		2	-.1331	.2521	1.000	-.7512	.4851
SUTRDE	1	2	5.346E-02	.1770	1.000	-.3807	.4876
		3	.2107	.2813	1.000	-.4791	.9005
	2	1	-5.3456E-02	.1770	1.000	-.4876	.3807
		3	.1573	.2847	1.000	-.5407	.8553
	3	1	-.2107	.2813	1.000	-.9005	.4791
		2	-.1573	.2847	1.000	-.8553	.5407
SUHRDE	1	2	-.1853	.1720	.855	-.6070	.2365
		3	-.5643	.2733	.128	-1.2344	.1058
	2	1	.1853	.1720	.855	-.2365	.6070
		3	-.3790	.2765	.524	-1.0571	.2990
	3	1	.5643	.2733	.128	-.1058	1.2344
		2	.3790	.2765	.524	-.2990	1.0571
SUORDE	1	2	.2009	.1598	.639	-.1910	.5929
		3	-5.7143E-02	.2540	1.000	-.6799	.5656
	2	1	-.2009	.1598	.639	-.5929	.1910
		3	-.2581	.2570	.956	-.8882	.3721
	3	1	5.714E-02	.2540	1.000	-.5656	.6799
		2	.2581	.2570	.956	-.3721	.8882
SUTSDE	1	2	.4894*	.1793	.024	4.972E-02	.9291
		3	-.1679	.2849	1.000	-.8665	.5307
	2	1	-.4894*	.1793	.024	-.9291	-4.9725E-02
		3	-.6573	.2883	.077	-1.3642	4.968E-02
	3	1	.1679	.2849	1.000	-.5307	.8665
		2	.6573	.2883	.077	-4.9681E-02	1.3642
SUHSDE	1	2	.1788	.1663	.858	-.2290	.5866
		3	-.7607*	.2643	.016	-1.4087	-.1127
	2	1	-.1788	.1663	.858	-.5866	.2290
		3	-.9395*	.2674	.002	-1.5953	-.2838
	3	1	.7607*	.2643	.016	.1127	1.4087
		2	.9395*	.2674	.002	.2838	1.5953
SUCSDE	1	2	.3041	.2035	.419	-.1949	.8032
		3	-.2321	.3234	1.000	-1.0251	.5608
	2	1	-.3041	.2035	.419	-.8032	.1949
		3	-.5363	.3273	.317	-1.3387	.2662
	3	1	.2321	.3234	1.000	-.5608	1.0251
		2	.5363	.3273	.317	-.2662	1.3387

*. The mean difference is significant at the .05 level.

Appendix O: Bonferroni Test – Implementation Resources and Skills by Cluster

Multiple Comparisons

Bonferroni

Dependent Variable	(I) Ward Method	(J) Ward Method	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
SuFRImp	1	2	-.2295	.1518	.405	-.6018	.1428
		3	-.4714	.2412	.164	-1.0630	.1201
	2	1	.2295	.1518	.405	-.1428	.6018
		3	-.2419	.2441	.975	-.8405	.3567
	3	1	.4714	.2412	.164	-.1201	1.0630
		2	.2419	.2441	.975	-.3567	.8405
SUPRIMP	1	2	-.3401	.1544	.093	-.7188	3.858E-02
		3	-.2393	.2454	.998	-.8410	.3624
	2	1	.3401	.1544	.093	-3.8582E-02	.7188
		3	.1008	.2483	1.000	-.5080	.7097
	3	1	.2393	.2454	.998	-.3624	.8410
		2	-.1008	.2483	1.000	-.7097	.5080
SUTRIMP	1	2	.0000	.1744	1.000	-.4276	.4276
		3	-.2500	.2771	1.000	-.9295	.4295
	2	1	.0000	.1744	1.000	-.4276	.4276
		3	-.2500	.2804	1.000	-.9376	.4376
	3	1	.2500	.2771	1.000	-.4295	.9295
		2	.2500	.2804	1.000	-.4376	.9376
SUHRIMP	1	2	-.1714	.1626	.886	-.5700	.2272
		3	-.5464	.2583	.114	-1.1798	8.693E-02
	2	1	.1714	.1626	.886	-.2272	.5700
		3	-.3750	.2614	.467	-1.0159	.2659
	3	1	.5464	.2583	.114	-8.6935E-02	1.1798
		2	.3750	.2614	.467	-.2659	1.0159
SUORIMP	1	2	.1327	.1454	1.000	-.2237	.4892
		3	-.2786	.2310	.695	-.8449	.2878
	2	1	-.1327	.1454	1.000	-.4892	.2237
		3	-.4113	.2337	.248	-.9844	.1618
	3	1	.2786	.2310	.695	-.2878	.8449
		2	.4113	.2337	.248	-.1618	.9844
SUTSIMP	1	2	.2101	.1610	.588	-.1845	.6048
		3	-.2536	.2558	.974	-.8807	.3735
	2	1	-.2101	.1610	.588	-.6048	.1845
		3	-.4637	.2588	.232	-1.0983	.1709
	3	1	.2536	.2558	.974	-.3735	.8807
		2	.4637	.2588	.232	-.1709	1.0983
SUHSIMP	1	2	-.2756	.1636	.289	-.6767	.1256
		3	-.8643*	.2599	.004	-1.5016	-.2269
	2	1	.2756	.1636	.289	-.1256	.6767
		3	-.5887	.2630	.085	-1.2337	5.625E-02
	3	1	.8643*	.2599	.004	.2269	1.5016
		2	.5887	.2630	.085	-5.6250E-02	1.2337
SUCSIMP	1	2	.2433	.1826	.561	-.2043	.6910
		3	-.2607	.2901	1.000	-.9720	.4506
	2	1	-.2433	.1826	.561	-.6910	.2043
		3	-.5040	.2935	.271	-1.2238	.2157
	3	1	.2607	.2901	1.000	-.4506	.9720
		2	.5040	.2935	.271	-.2157	1.2238

*. The mean difference is significant at the .05 level.

Appendix P: Bonferroni Test – Operational Resources and Skills by Cluster

Multiple Comparisons

Bonferroni

Dependent Variable	(I) Ward Method	(J) Ward Method	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
SUFROPS	1	2	5.346E-02	.1364	1.000	-.2810	.3879
		3	-.4143	.2167	.180	-.9456	.1171
	2	1	-5.3456E-02	.1364	1.000	-.3879	.2810
		3	-.4677	.2193	.109	-1.0054	6.996E-02
	3	1	.4143	.2167	.180	-.1171	.9456
		2	.4677	.2193	.109	-6.9955E-02	1.0054
SUPROPS	1	2	2.488E-02	.1613	1.000	-.3705	.4203
		3	.3071	.2562	.704	-.3211	.9354
	2	1	-2.4885E-02	.1613	1.000	-.4203	.3705
		3	.2823	.2593	.840	-.3535	.9180
	3	1	-.3071	.2562	.704	-.9354	.3211
		2	-.2823	.2593	.840	-.9180	.3535
SUTROPS	1	2	.4590	.1908	.056	-8.9219E-03	.9269
		3	6.786E-02	.3032	1.000	-.6756	.8113
	2	1	-.4590	.1908	.056	-.9269	8.922E-03
		3	-.3911	.3068	.620	-1.1435	.3612
	3	1	-6.7857E-02	.3032	1.000	-.8113	.6756
		2	.3911	.3068	.620	-.3612	1.1435
SUHROPS	1	2	.2442	.1594	.389	-.1465	.6350
		3	-.6429*	.2532	.040	-1.2637	-2.1997E-02
	2	1	-.2442	.1594	.389	-.6350	.1465
		3	-.8871*	.2562	.003	-1.5154	-.2588
	3	1	.6429*	.2532	.040	2.200E-02	1.2637
		2	.8871*	.2562	.003	.2588	1.5154
SUOROPS	1	2	.4406*	.1690	.033	2.614E-02	.8550
		3	-.1643	.2685	1.000	-.8227	.4942
	2	1	-.4406*	.1690	.033	-.8550	-2.6140E-02
		3	-.6048	.2717	.088	-1.2712	6.148E-02
	3	1	.1643	.2685	1.000	-.4942	.8227
		2	.6048	.2717	.088	-6.1480E-02	1.2712
SUTSOPS	1	2	.7548*	.1744	.000	.3272	1.1824
		3	-.1000	.2771	1.000	-.7794	.5794
	2	1	-.7548*	.1744	.000	-1.1824	-.3272
		3	-.8548*	.2804	.010	-1.5424	-.1673
	3	1	.1000	.2771	1.000	-.5794	.7794
		2	.8548*	.2804	.010	.1673	1.5424
SUHSOPS	1	2	.5917*	.2098	.019	7.719E-02	1.1062
		3	-.7107	.3334	.109	-1.5282	.1068
	2	1	-.5917*	.2098	.019	-1.1062	-7.7187E-02
		3	-1.3024*	.3374	.001	-2.1297	-.4751
	3	1	.7107	.3334	.109	-.1068	1.5282
		2	1.3024*	.3374	.001	.4751	2.1297
SUCSOPS	1	2	.6525*	.2588	.042	1.806E-02	1.2870
		3	-.4321	.4111	.890	-1.4403	.5760
	2	1	-.6525*	.2588	.042	-1.2870	-1.8065E-02
		3	-1.0847*	.4160	.033	-2.1048	-6.4536E-02
	3	1	.4321	.4111	.890	-.5760	1.4403
		2	1.0847*	.4160	.033	6.454E-02	2.1048

*. The mean difference is significant at the .05 level.