

# TNO Strategy, Technology and Policy

## TNO report

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E-commerce in the logistics sector

Assessing the effects on the logistics value chain

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## Management Summary

The Directorate-General for Telecommunications and Post (DGTP) of the Dutch Ministry of Transport, Public Works and Water Management, has asked TNO-STB as participant of the Telematica Instituut to carry out a study to provide insights into the effects of electronic commerce for the Dutch transport and logistics sector.

DGTP commissioned this study in the context of the work initiated by TNO-STB and the Telematica Instituut in the Impacts and Perspectives of Electronic Commerce (IPEC) project. Subsequently this was transferred to the Electronic commerce Business Impacts Project (EBIP) which is currently being done by TNO-STB as participant of the Telematica Instituut and in collaboration with the OECD. The OECD adopted the revised and enlarged IPEC methodology last year as the basis of its multi-country study of e-commerce in business-to-business contexts.

This study is oriented around three questions. These were to be answered through desk-research and face to face interviews with proactive firms in the sector. The research findings of these questions are presented below.

1. What are the value-added characteristics of transport and logistics products and services?

*Value added structure determined by type of goods distributed*

The actual value-added structure of any specific logistics related activity is determined largely by the type of goods being distributed, and the relative intensity of logistics needs (e.g. whether requirements are occasional or on-going, basic or value-added etc.).

*Long-term relationships determine logistics sector*

Much of the logistics industry as oriented to supply chains is structured around long-term relationships, based on client trust as built upon historical experience with individual logistics firms. Dynamic market entries and exits appear to be rare except for casual delivery services, and switching costs can be high.

2. What is the influence of electronic commerce on the value-added structure of the transport and logistics market?

*E-commerce not a strategic tool*

Although the logistics sector is evolving to meet changing customer requirements, separating the specific effects of e-commerce on this evolution is actually very difficult. Most of the case studies show that e-commerce was implemented as a response to a problem, rather than as a strategic tool in its own right.

*Logistics users are drivers for change*

Where logistics suppliers are gearing up with e-commerce solutions, the catalyst is change in user needs. Arguably, it is probably desirable that the motivation for change comes from the users of logistics services, as this will tend to keep the service providers in touch with logistics needs in respective client markets.

*E-commerce causes process innovation*

By far most of the effects lie in the *process innovation* area, mainly as related to transaction completion and production support. This is consistent with the structural role of logistics as a business function within any individual producer firm.

*E-commerce did not increase revenues* Few of the interviewed companies could quantify any effects of e-commerce, and none made the claim that e-commerce has increased revenues by increasing the customer base.

*E-commerce positive impact on internal efficiency* E-commerce has had, or soon will have positive impacts on process efficiency and client care. Interviewees note better internal and external communication, better integration of business processes, more transparency in business processes, more transparency in the logistics process for the client, and generally more flexibility in the logistics process.

*Client profits too* Firms were noted also to be active in *product innovation*, mostly in connection with specific interfaces and systems (e.g. ordering, tracking and tracing etc.) that are made available to clients as part of the overall logistics package. Many of these innovations are oriented to performance monitoring, profit margin maintenance, and quality control.

*Industry cautious with e-commerce* The logistics industry is well aware of the potential of electronic commerce, but seems otherwise to be cautious about the risks of over-investment until such time as concrete assessments can be made of the actual economic impact of e-commerce systems.

*No effects on market transparency yet* The interviewed companies confirm the difficulties of establishing electronic relationships with customers and of developing new electronic marketplaces. They also confirm that logistics processes are becoming more transparent to the user, even if the overall effects on the transparency of markets is not yet shown.

### 3. What are the consequences for public policy and for DGTP in particular?

*Policy-makers to prevent inequities in market* The market can generate solutions like best practice paradigms and technology development fairly efficiently. Of concern to economic policy-makers is ensuring that the adoption of any of these solutions does not create inequities that bias the market and restrict the supply of viable solutions.

*'Smart' businesses may move offshore* 'Smart' business segments that offer end-to-end co-ordination services based around intangible assets are likely to move offshore if there is no complimentary 'smart' advantage in the domestic logistics infrastructure. This observation tends to confirm and reinforce the rationale behind the current 'brainport' strategy in the Netherlands.

*Sharing information key issue for e-marketplaces* The development of on-line marketplaces has so far failed to have an impact. If these marketplaces are in future controlled by groups of firms who agree only to share selected information with each other, logistics providers may impede future overall efficiencies in load and route planning.

*Shift to higher value activities to be investigated* In an e-commerce environment, more and more logistics firms may elect to concentrate on exploiting their intangible assets, concentrating on areas like regional and global inter-modal co-ordination, but leaving more of the actual physical logistics assets in the hands of logistics users. It would be informative to look more closely at evolution in the internal processes of logistics customers, and how their production and logistics functions are or are not co-ordinated.

# Contents

<b>Acknowledgements</b>	<b>2</b>
<b>Management Summary</b>	<b>3</b>
<b>Contents</b>	<b>5</b>
<b>Glossary</b>	<b>6</b>
<b>1 Introduction and background</b>	<b>7</b>
1.1 Assessing the dynamics in the value chain	7
1.2 The EBIP project: gathering empirical data on an international scale	8
1.3 The transport and logistics study	9
1.4 Electronic commerce in logistics and transport	9
1.5 Structure of the study	11
1.6 Research approach	11
1.7 Reason for choosing the logistics and transport sector	11
1.8 Relationship to previous work on logistics and e-commerce in the Netherlands	12
1.9 Orienting industry dynamics to a value chain	13
<b>2 Background to the Transport and Logistics Sector</b>	<b>15</b>
2.1 Size and dimension of the logistics and distribution market	15
2.2 Government policy	17
<b>3 Constructing a transport and logistics value chain</b>	<b>19</b>
3.1 Product and transaction characteristics	19
3.2 Constructing the logistics and distribution value chain	19
<b>4 Case studies</b>	<b>23</b>
4.1 Case study 1: Compaq-Distribution Centre Europe (DCE)	24
4.2 Case study 2: Vos Logistics	27
4.3 Case study 3 Van Gend & Loos (VGL)	30
4.4 Case study 4: Ryder Europe	33
4.5 Case study 5: DHL Netherlands	36
<b>5 Analysis</b>	<b>39</b>
5.1 The value-added characteristics of the transport and logistics sector	39
5.2 The influence of e-commerce on the value-added structure of the transport and logistics market	40
<b>6 Conclusions and policy implications</b>	<b>45</b>
<b>7 References</b>	<b>48</b>

## Glossary

EDC – European Distribution Centre

EDI – Electronic Document Interchange: a system of standardised message protocols for exchanging commercial information between companies

LSP – Logistics Service Provider

RDC – Regional Distribution Centre

VAL – Value Added Logistics

XML – eXtensible Markup Language: a language designed especially for Web documents. It allows designers to create their own customized tags (commands), enabling the definition, transmission, validation, and interpretation of data between applications and between companies

# 1 Introduction and background

The Directorate-General for Telecommunications and Post (DGTP) of the Dutch Ministry of Transport, Public Works and Water Management, has asked TNO-STB as participant of the Telematica Instituut to carry out a study to assess the impacts of electronic commerce in the transport and logistics sector.

DGTP commissioned this study in the context of the work initiated by TNO-STB and the Telematica Instituut in the Impacts and Perspectives of Electronic Commerce (IPEC) project and subsequently transferred to the Electronic commerce Business Impacts Project (EBIP) which is currently being done by TNO-STB as participant of the Telematica Instituut and in collaboration with the OECD. The revised and enlarged IPEC methodology was adopted by the OECD last year as the basis of its multi-country study of e-commerce in business-to-business contexts.

## 1.1 Assessing the dynamics in the value chain

The EBIP methodology is oriented towards two principal questions:

- (1) How does the introduction of electronic commerce affect the control that firms can exercise over the organisation and operation of value chains?
- (2) What are the implications of changing patterns of control in e-commerce for business practice and public policy?

Electronic commerce is defined broadly in the EBIP context as the application of information and communication technologies (ICT) to any of the activities involved in making commercial transactions. The potential importance of electronic commerce has been widely acknowledged, particularly in an Internet environment, and it is expected that e-commerce will have profound social and economical impacts.

The driving force behind our interest in electronic commerce is the Internet. In principle, the Internet offers possibilities to transfigure economic and industrial practices. The 'closed' business network paradigms of the past could be replaced by the 'open' environment of the Internet, or otherwise be replaced by a new logic of open commercial networking. Most often, the most visible effects of new business technologies are related to the new ways in which business functions are performed. In today's economy, for example, there is a growing demand for customisation, service and speed, all of which can be facilitated by ICT. Developments such as individualisation and globalisation are prominent among the driving changes in business concepts and in the business environment.

Although many predictions are being made about the impact of electronic commerce, an empirically grounded understanding is still at an elementary stage. Much of our knowledge about the dynamics and impacts of e-commerce are based on anecdotal experience, short-term observations of individual behaviour and selective case studies that have not been viewed in the context of the economy as a whole, or even in terms of industry sector and asset characteristics.

The EBIP project proposes a more systematic approach to case study research. It is based upon a conceptual framework that was developed for assessing the dynamics and impacts of electronic commerce in the value chains of products and services (a copy of the conceptual and methodological paper is included as a supplement to this report).

The EBIP approach focuses on examining technical changes in transaction structures and how this relates to the evolution of electronically mediated business relationships in the rapidly developing Internet environment. This approach works outward from the observation of *proactive* firms, defined as firms who are pivotal in their respective sectors and who have already implemented e-commerce solutions. Although we do not assume that all other firms in the sector will follow these leaders necessarily, there are substantial theoretical and empirical reasons to expect that the behaviour of these firms will substantially influence future directions in e-commerce adoption in their sectors.

The basic conceptual framework was first applied in several case studies of Dutch industrial sectors - flowers, music, textiles and job mediation – as part of the IPEC project. These sector studies were finished in September 2000. Some of the more significant and in some cases counterintuitive conclusions were<sup>1</sup>:

- Most business to business electronic commerce still occurs in closed proprietary networks. The use of the Internet is at this point confined mainly to additional of supplementary communication and information services.
- With few exceptions, most of the observed effects were concentrated at the level of process and relational innovations, not on product innovation.
- Industry and asset-specific characteristics influence the concentration of electronic commerce activity in the value chain.
- Electronic commerce does not have automatic positive effects on market access and competition.

## 1.2 The EBIP project: gathering empirical data on an international scale

Results such as the above from the IPEC studies in the Netherlands generated interest in the OECD to using the IPEC approach, methodology and conceptual framework as a basis for comparative case study work that would be international in scope. Applying the methodology internationally offers the opportunity to examine many of the assumptions about e-commerce impacts in different commercial and market environments. This increases the likelihood of that we could isolate systemic effects and impacts from purely local and perhaps product specific effects.

In 1999, the OECD secured the co-operation of Ministries in several member countries to participate in the research and to apply the methodology across a range of industries. At the present time, 11 countries are involved in this research – France, Spain, Italy, Portugal, Norway, Sweden, Canada, Mexico, South Korea, the UK and the Netherlands.

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<sup>1</sup> IPEC, General conclusion: building scenario's for electronic commerce, TNO-STB, <http://www.stb.tno.nl/projects>

Owing to administrative hurdles, the US was unable to participate directly in the first round of studies, but the US Department of Commerce participated in kind by forging links with complementary projects at the Brookings Institute and the Berkeley Round Table on the International Economy (BRIE).

Each of the participating EBIP countries selected several industries for research. The research projects were financed by various Ministries and carried out by consultants and research organisations. The Ministries and researcher teams were visited and trained in the methodology by OECD and TNO-STB personnel. The first draft of the EBIP results is expected in July 2001. The Dutch Ministry of Economic Affairs is a key EBIP participant, and funds TNO-STB to do the international co-ordination and reporting for this project. This involves maintaining a help-desk function, as well as collecting, comparing and analysing the national findings.

Although all of the EBIP countries have an interest in the results of the international study, most also have domestic agendas. These are reflected in the choices of sectors for study, which often are sectors of special importance or interest to national Ministries. The EBIP methodology has the advantage of being constructed on a state-of-the-art assessment of a wide range of current theoretical and empirical work in electronic commerce. As a result, the research instrument focuses on questions that have a high likelihood of yielding new and objective observations of emerging behaviours in e-commerce adoption and operation, along with scope to collect significant numerical data in cases when and where these are available.

All of this together makes the EBIP instrument as useful for assessing individual sectors in individual countries as it is for assessing international and inter-sector developments and trends. The present project and report fills this dual role – it comments on the specific dynamics of a selected range of banking services in the Netherlands, and it also forms one of the inputs from the Netherlands into the wider EBIP study.

### **1.3 The transport and logistics study**

The DGTP study on transport and logistics is designed to be coherent with EBIP such that its findings can be incorporated into the EBIP database. But it is also directed at the knowledge requirements of the DGTP for policy analysis and planning purposes. For DGTP there is an intrinsic motive for collaboration with the EBIP project. Ultimately, the EBIP methodology offers a unique opportunity to assess these consequences in a comparative setting. When the EBIP study is available later in 2001, indications may emerge regarding the position of the Netherlands in e-commerce relative to what has been occurring in other countries, thus adding scale and scope to the future analysis of e-commerce planning issues for the DGTP.

### **1.4 Electronic commerce in logistics and transport**

The aim of this sector study is to provide insights into the effects of electronic commerce for the Dutch transport and logistics sector.

The study is oriented around three questions:

*1. What are the value-added characteristics of transport and logistics products and services?*

Transport and logistics services constitute an intermediate good – i.e. a facility that is used by other enterprises to produce and (especially in this case) to distribute other goods and services. In this context, it is difficult to define the sector in terms of where the value is created or exchanged. Accordingly, the report begins by setting out the main conditions, dynamics and trends in this industry, particularly as related to ICT and electronic commerce.

As transport and logistics are always tied to the various product groups to which they are applied, it is virtually impossible to describe the dynamics of the sector without reference to at least one of these other product groups. Thus, discussion and development of the transport and logistics value chain makes frequent reference to the dynamics of other sectors, which act as observation points from which we can describe the characteristics of transport and logistics as a product group in its own right, as well as the characteristics of its transaction structure (i.e. how transport and logistics services are actually traded). The focus in all cases is on value-added activities in transport and logistics.

*2. What is the influence of electronic commerce on the value-added structure of the transport and logistics market?*

Proactive companies are examined in the study in terms of their current and potentially evolving positions in the transport and logistics services value-chain. Owing to the special nature of the sector, not all of the purveyors of these services are transport and logistics companies as such – i.e. any producer can and typically does provide at least some of these services to clients. Sometimes these services are part of the product package.

The value chain itself is described in generic terms, such that fundamental areas of value-added can be identified. Within this chain, it is assumed that a range of new value-added activities is possible, possibly using new intermediaries, which could reshape the alignment of actors within the existing value chain. At the analysis stage, the observed changes are depicted on a model ‘footprint’ that relates innovation in the transaction structure with various effects on business practices and functions.

*3. What are the consequences for public policy and for DGTP in particular?*

Changes in the structure of the market could have important policy consequences, e.g. with regard to competition, concentration, pricing, and innovation enhancement. For the DGTP, these effects and trends have important implications for the planning and management of both the electronic and the physical infrastructure.

## 1.5 Structure of the study

The results of this study are grouped in the following way:

- An analysis of the sector transport and distribution.
- A presentation of five case studies.
- A comparative analysis of the case studies along with a critical overview of observations, trends and possible future scenarios.
- Conclusions and considerations for public policy.

## 1.6 Research approach

The research approach is described in detail in the *Study plan and Questionnaire for Firm-level Case Studies* developed for EBIP (a copy of this document is included as a supplement to this report). To summarise, the research protocol includes:

- desk-research (review of documents and reports)
- face to face interviews with proactive firms.

## 1.7 Reason for choosing the logistics and transport sector

The Dutch economy can not function without a good, efficient and sustainable logistics and transport infrastructure. Moreover, the Netherlands is regarded internationally as having a comparative advantage in this sector, due to its high concentration of logistics activities, good logistics performance, and high degree of technical innovation. The Dutch policy makers consistently emphasise the importance of logistics and transport for the Dutch economy with their slogan “Netherlands distribution country” (Nederland Distributieland). In recent years, both the public and private sectors have begun to invest in an ‘intelligent’ transport management philosophy, where a sustainable factor also plays an important role. The “brainport” concept is an example.

A large public and private budget is allocated to overcome existing barriers in the logistics and transport infrastructure. Public and private actors and researchers are working on a continuous basis to develop new business and logistics concepts in a changing market and market environment. During the 1990s however, policy concerns about logistics and transport became more closely tied with environmental awareness (particularly vehicle emissions and impacts on spatial planning. Hence, it became necessary for policy-making in the transport and logistics arena to take account of an ever more complex range of interests and stakeholders.

The application of electronic commerce offers new opportunities for public and private institutions to improve the logistics and transport process and infrastructure. The results of e-commerce can be new distribution channels, new goods delivery concepts, and new networked configurations between goods producers and the suppliers of transport and

logistics services. A critical question is how the Internet effects the way market players exercise control over these concepts and facilities, and how they respond to control as exerted by other actors in the value chain.

## 1.8 Relationship to previous work on logistics and e-commerce in the Netherlands

Certainly, the Internet offers plenty of opportunities in the transport and logistics sector, but our understanding of its effects is still at an elementary stage. Several studies of ICT applications in the transport and logistics sector have been commissioned recently in the Netherlands. As a prelude to presenting the findings of our own research, it is instructive to review some of their overall findings and conclusions.

- ***The KPMG Study***<sup>2</sup> – KPMG examined the ICT strategies of companies in the transport sector with the objective of further defining the implications of these strategies for the Ministry of Transport, Public Works and Water Management. KPMG concluded that technology adoption is quite unbalanced, and that most companies do not use very sophisticated technologies. Most activity is based on EDI protocols. Mainly (the early adopters among) third and fourth party logistics providers use advanced ICT, but relatively few logistics providers use Internet applications. Drivers-owners (eigen rijders) use generally the less advanced ICT. Where the Internet is used at all, use is mainly confined to information exchange.
- ***The TLN study***<sup>3</sup> – Transport and Logistiek Nederland (TLN) is the umbrella organisation for the logistics industry in the Netherlands. The focus of their study is on the use of space and the evolving requirements for road transport in the near future. Their study estimated that 3.5 million tonnes of goods will be sold through the Internet by 2005. Because of the increased use of smaller vehicles, the number of journeys will increase by approximately 8% in the consumer segment and 9% in the business-to-business segment. These findings have come under strong criticism from various parties; most of the criticism focussing on the exclusion of possible efficiency gains from the impact analysis and on the non-scientific approach of the study. Another aspect not addressed in the study is the fact that new concepts can lead to more (transport) efficiency. An example is the delivery of goods through lockers that leads to logistical concepts like bundling.
- ***The Transport Research Centre (AVV) study***<sup>4</sup> – The AVV study (to be published later this year) is mainly based on documentary research and some interviews. The study concludes that electronic commerce in the supply chain leads to more transparency in the transport and logistic markets. It concludes also that the largest e-marketplaces in the supply chain are not yet mature, and that the future for consumer-oriented markets is even more difficult and uncertain. Another important conclusion is that the effects of e-commerce on transport seem to be rather modest,

<sup>2</sup> KPMG Consulting (under authority of Ministry of Transport, Public Works and Water Management - DGTP), *ICT in transport en logistiek*, Rotterdam, 2000

<sup>3</sup> Transport en Logistiek Nederland, *Nieuwe wijn in oude zakken*, Zoetermeer, 2000

<sup>4</sup> Adviesdienst Verkeer en Vervoer, *Verkennde studie naar e-commerce*, draft version.

because these effects generally are accommodated with existing logistical solutions. The complexity of goods delivery, and the difficulty of establishing relationships with consumers with respect to the electronic acquisition of goods were cited as the main issues.

- ***The Dialogic study***<sup>5</sup> – This study was commissioned by AVV to summarise their main findings and to complement them with a short analysis of changing relationships between logistics and e-commerce with consumers. Dialogic observes some trends in how logistical processes change because of e-commerce. However, the extent to which logistics actually drive or restrain e-commerce is not really investigated. The paper concludes that insight is still needed about how logistic value chains will evolve.

Missing from all of these studies is a detailed investigation of how and why firms use electronic networks in commercial transactions. In some respects, the transport sector is actually an historical leader in ICT applications. The question is really whether or not this leadership will be maintained in an Internet environment. Or, for that matter, whether the Internet actually offers any concrete advantages for this industry. Most previous activity in the sector was based on EDI, but a good commercial case must be constructed that migration to new platforms are possible and-or desirable.

Most of the existing studies on this subject have a micro level focus (case specific). A thorough macro level study is simply not existing, mainly due to the fact that reliable data are not available. This study focuses on the meso level (sector specific) and combines evidence from the sector itself with the EBIP findings.

## 1.9 **Orienting industry dynamics to a value chain**

The focus of the EBIP methodology is on industry motivations and practices, and particularly on how they relate to the structural aspects of the commercial environment. It is likely that e-commerce will have some impacts in terms of changing this environment, but it is likely also that e-commerce may be shaped by the specific commercial environments in which it operates.

As explained above, transport and logistics is an intermediate sector, the dynamics of which always bear some relation to the product or service being distributed. Thus, for example, the logistics for perishable goods displays different characteristics than logistics for durables. The value chain for transport and logistics is therefore always closely tied to the value chains of various distributed goods.

Value chains are oriented primarily to distinct product or service groups, and not necessarily to sectors as such. A value chain can (and typically does) involve inputs from several supply chains located in different sectors. The research focus of the EBIP

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<sup>5</sup> Dialogic Innovatie & Interactie (under authority of Ministry of Transport, Public Works and Water Management - AVV), *Logistiek: van barrière tot aanjager van e-commerce*, Utrecht, 2000

approach is on innovations that occur in the transaction structures that links various tiers in value chains. As such, the approach has a 'product' rather than a 'sector' orientation, but with the understanding that sectors are defined largely by the product groups they include and exclude.

A methodology problem of sorts arises because transport and logistics is a business process that is found to some degree in virtually every enterprise in every sector. Thus, separating out the actual added value of transport and logistics is often not straightforward. As clearly it is not possible to study the logistics structure of every sector or product, the approach taken was to outline a very generic value chain which would illustrate the value added relationships between processes, rather than necessarily indicate specific levels of value-added.

## 2 Background to the Transport and Logistics Sector

### 2.1 Size and dimension of the logistics and distribution market

It is important to stress that most of the current data about the logistics market looks primarily at carriers. Separate figures about companies who are dedicated to logistical added value (LSPs), but who do not own transport assets (an important distinction) are hard to find, especially for Dutch companies. This is due to the fact that the Netherlands has a long history of integrated transport companies – i.e. there are relatively only a few logistics companies who do not own transport assets.

According to the CBS (1999) transport and logistics generate some 7.4% of the Gross National Product. However, ‘driver-owner-businesses’ and logistic activities in other industrial sectors are not taken in account in these data – according to TLN (the Dutch logistics industry organisation) the 7.4% figure underestimates the role of logistics and transport for the Dutch economy. They would set a more realistic adjusted figure at closer to 15%, but the true figure is impossible to determine on the basis of available data. In the CBS statistics, three general modalities are distinguished. Road transport (including railway), water transport and air transport. In 1999 companies in the road transport modality accounted for a DFL 13 billion turn over, i.e. 23% of the overall 7.4% share of GNP.

The transport and logistics sector employs 400.000 people (according to the CBS definition for this sector) but the actual figure may be more if broader definitions are accepted. Table 1 shows some developments in the growth of companies and employment in each modality. The figures show a gradual increase in the number of companies entering the market. Air and sea transport companies tend to be small, (<50 employees) or very small (<5 employees). Some 70% of road transport is populated by very small companies (CBS 1999).

*Table 1: Growth in Logistics segments*

	Year	Companies (x100)	Employees (x100)
Road transport <sup>6</sup>	1994	74	960
	1996	106.8	1241
	1998	120.2	1404
Sea transport <sup>7</sup>	1994	3.8	105
	1996	5.1	103
	1998	5.1	101
Inland water transport <sup>8</sup>	1994	41	116
	1996	39	115
	1998	38	114

<sup>6</sup> SBI codes 6024, 64122 and 6321 (for 1994 only 6024 available)

<sup>7</sup> SBI code 6110

<sup>8</sup> SBI codes 61201, 61202 and 61203

Air transport <sup>9</sup>	1994	n.a.	n.a.
	1996	0.1	314
	1998	0.1	339
Service providers <sup>10</sup>	1994	25.6	430
	1996	25.2	445
	1998	24.5	493

Source: CBS Statline

The international orientation of transport and logistics is obvious for the Netherlands. With 16 million inhabitants the Dutch home market is too small to absorb a high portion of the domestic product. In 1999 the total value of imports was around Fl. 388 billion, and the total value of exports was Fl. 414 billion. This indicates the importance of international trade in relation for the transport and distribution industries. The transport modalities are strongly focused on foreign markets. According to the NIWO (Nationale en Internationale Wegvervoer Organisatie), in 2000 some 60% of the carriers has a permit to perform international transport (56% in 1997). The Netherlands is the home base of many EDC's. In Europe there are more than 1000 EDCs, but more than 550 are based in the Netherlands (TLN 2000). Many multinationals that perform transport and logistics have their head office located here. This creates a market for shippers, carriers and LSPs (TLN 2000).

Most of the Dutch transport and logistics companies can be classified as asset based providers or carriers (90% of road transport companies, 99% of the inland waterway transport companies and 83% of the sea transport companies). As far as we know there are no Dutch 4PL providers. Most of them are from the USA.

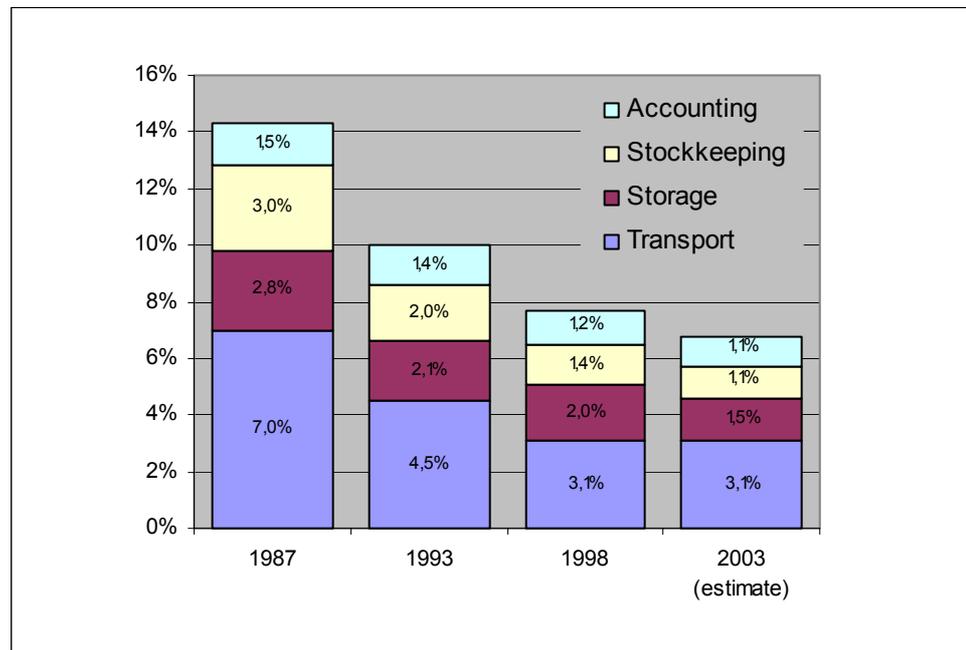
When looking at the road freight transport companies in the Netherlands, almost 30% are driver-owner businesses ('eigen rijders'). In total 58.3% of the companies has up to four trucks transporting freight. Only 2.3% of the companies have more than 50 trucks (TLN 2000). Most of the LSPs have developed from transport companies. Not only do they perform storage and transshipment (activities performed by many transport companies too), but also activities related to a European distribution function. According to a study of the ING Bank (1999) there are some 120 carriers with storage and transshipment activities in the Netherlands. Half of them are members of the Physical Distribution Group (PDG), which is an organised interest group of independent logistical service providers based in the Netherlands. Carriers who include storage and transshipment activities are generally large companies. The average number of employees in this segment is 255, and a total of 30,600 employees are employed here. The average number of vehicles is 270.

As shown in Figure 1, the cost of logistics has fallen dramatically since 1987. Transport and stock keeping have become relatively cheaper. This is mainly because of containerisation and more efficient transport management (also due to use of sophisticated ICT solutions). Particularly stock-keeping has gained in efficiency due to the use of ICT. Another trend that can be derived from Figure 1 is that the total percentage of transport as part of the total selling price has dropped considerably: from more than 14% to less than 7%.

<sup>9</sup> SBI code 6200 (for 1994 no data available)

<sup>10</sup> SBI codes 6311, 6312 and 63401 (transshipment, storage, expedition and chartering)

Figure 1: Development of logistics costs in Europe (as percentage of selling price)



Source: European Logistics Association (as quoted by TLN, Transport in cijfers, 2000)

According to TLN, margins between the cost price and the actual transport price have become smaller during the last five years. Where the transport price has stayed relatively stable, the cost price has risen due to cost of personnel and the rise of the diesel price from 1999 up till now. However, this depends on whether a company is engaged in international transport, because productivity gains in national transport have been higher. Also, it depends on the size of the company – most of the productivity gains have been in larger companies. According to TLN, the cost of personnel is the main component of the cost price (51% for national and 43% for international transport). In contrast to the transport companies, LSPs have achieved relatively high productivity during the last years, and this is increasing. There is variety in logistics activities, and shippers see these activities as extra services worth paying for.

## 2.2 Government policy

The Dutch government considers transport and logistics to be a main pillar of the economy. It is even formulated as such in the coalition agreement. From the 1980, the focus of the government has shifted from stimulating the transport sector as a whole to supporting high-quality transport and logistics activities. Although huge flows of transport are necessary to maintain a position as a major distribution country (the port of Rotterdam as the biggest in the world and Schiphol Airport is ranked fourth in Europe), investments have to be made in high-value transport, VAL and the further development of 'brainports'. The latter is a concept focussing primarily on smart logistics management through the use of ICT.

Debates have been going on at official and political levels as to whether the Netherlands should aim at becoming a country where the management of transport and logistics

takes place, while leaving the actual transport and distribution function more and more to other countries. Debates like this are always nourished by the ever-increasing congestion problems on the national road network, and by environmental concerns. The problem in this case is that probably much of the current knowledge of logistical management in the Netherlands stems more from the 'hands-on' side than from the overall management and logistics direction side. Nevertheless, the government recognises the necessity to invest in the use of new technology and to find ways to make transport and logistics more efficient and more environmentally friendly.

## 3 Constructing a transport and logistics value chain

### 3.1 Product and transaction characteristics

Product/service characteristics influence buyer-seller relationships throughout the value chain and they can help to define the likely quality and extent of electronic commerce application in given sectors. Transaction characteristics relate to the primary modes in which commercial transactions are conducted.

The price of logistics services can be fixed or flexible. Most companies who offer transport have three different variables on which prices depend: weight, speed of delivery and time guarantee. The highest margins are achieved for smaller, faster deliveries at a more precise point in time. Prices can be negotiated for more frequent packages and for more unusual weights, speeds of delivery and time guarantees.

Transport is mainly a physical process, but information plays a very substantial role in logistics systems, which can be enhanced by ICT applications. Indeed, the main advantage of e-commerce in relation to freight transport lies mostly in the supporting logistics – dispatching, tracking, monitoring etc. However, transport services can also be traded as such. Different companies can bid for different types of services at different rates dependent upon volumes, frequency, the type of goods shipped etc. In most cases, large producers can negotiate individual prices more easily than can smaller producers. At issue is whether the Internet will act to extend price negotiation advantages to smaller firms.

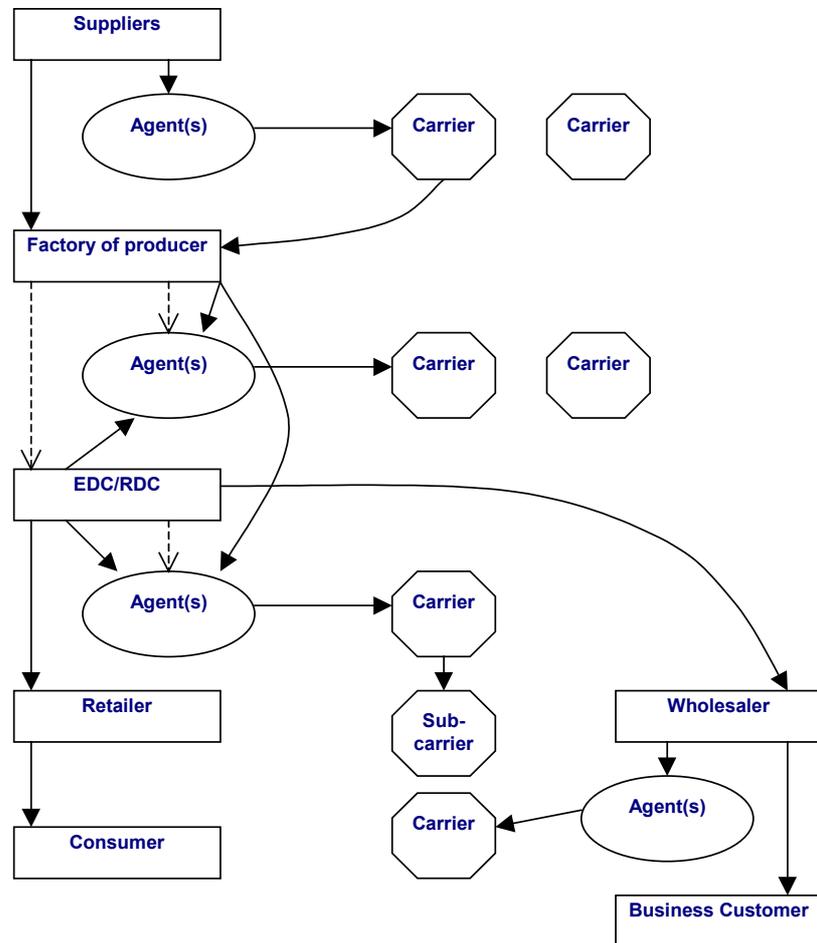
Of course not only price is leading when choosing a logistics provider. Another aspect of increasing importance is reliability, because of time-critical production processes. This forms quite a switching barrier.

### 3.2 Constructing the logistics and distribution value chain

As a prelude to constructing a generic value chain, it is instructive to examine the actual flow of a typical logistics process. Between each of the basic actors involved in the process, various intermediaries perform transport and logistics functions. Each of these functions defines a marketplace, as illustrated below in Figure 2.

Marketplaces are virtual or real places where goods and services are exchanged. Services intervene between producers who typically are located in different value-added tiers. Also, services are exchanged within the logistics process between agents and carriers. The carrier might even exchange services with a sub-carrier. In the case that the EDC and/or RDC are not directed by the producer centrally, services could be exchanged between the factory and the EDC/RDC (as indicated on the diagram by a dotted line). Contact occurs not only between the factory and the agent who is made responsible for transport to the EDC/RDC, but also between the EDC/RDC and a second agent responsible for transport to the retailer or wholesaler.

Figure 2: Marketplaces for logistics services



To summarise the above diagram at a more generic level, it is clear that getting merchandise from one point to another – i.e. from the origin of the product with a manufacturer (the ‘shipper’ in logistics terminology) to its destination (the customer) – usually requires the following steps, each of which constitutes a tier in a generic value chain:

- **Processing** – involves receiving and processing customer order, planning the distribution of the merchandise, and packing the merchandise for its destination (e.g. on pallets or in containers).
- **Transport** – involves moving the merchandise from place to place, either directly to its final destination, or to an intermediate position in the logistics chain
- **Storage and/or VAL** – is an optional intermediate stage in the process that can be used to add further value to merchandise through value added logistics activities (VAL).

All of the above steps can have varying degrees of contact with two ‘vertical’ tiers in the value chain (i.e. tiers that to some extent can relate to any or all of the three basic processes described above).

- **Process management services** – like tracking and tracing capabilities.
- **Logistics solutions** – involve advisory and consultancy services concerning the logistics options that are available in any or all of the above tiers relative to the needs of specific clients and product types.

The above steps can basically be seen as tasks or functions, which various actors perform in adding transaction value. For explanatory purposes here, these tasks or functions are described only on a very general level. In practice, the tasks and functions can be broken down into many specific value added tasks (ING bank, 2000). This is especially true for *logistics*, which involves planning, management and co-ordination of the distribution process. Information plays an important role for planning, management and co-ordination and many added value tasks can be generated. The *distribution* part is less complex and mainly involves the physical transport.

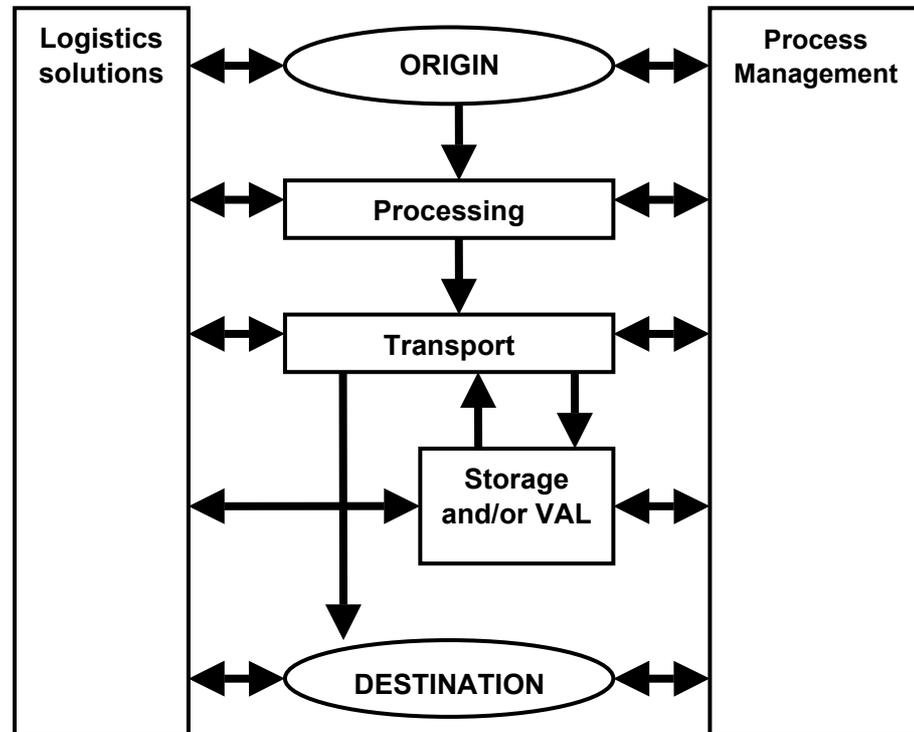
Again, at a general level, four basic actor groups are involved in logistics and distribution. The **shippers** are the suppliers and producers located upstream in the chain. They can do the transport and logistics by themselves, or outsource this work to carriers or logistics service providers. The increasing complexity of distribution in many sectors has accentuated the role of **logistics service providers** (LSPs). They perform planning, co-ordination and management tasks and in many cases are involved in transport as well. Their role is to develop and implement efficient logistics concepts. LSPs are generally very innovative in the application of ICT to respond to continuous changes in the market due to competition and changing consumer behaviours. The **carriers** mainly just transport goods from A to B. However, many carriers do more (e.g. storage and shipment) and some of them migrate gradually to becoming LSPs. The **traders** are wholesalers and retailers. Basically they are the customers of the shippers. The traders are the end point of the distribution process and play an important role as customer, but also sometimes as motivating and organisational forces in the logistics chain. The number of customers who play this powerful role is generally on the increase.

Logistics providers are often categorised in various groups. Examples of these groups are integrators, asset based providers and network operators. The definitions vary so much in scope that there is no relevancy to try and give definitions. In the scope of this study Third Party Logistics Providers (3PL) and Fourth Party Logistics Providers (4PL) are mentioned. The definitions of these groups are more or less strict. In this study the definitions of the Holland International Distribution Council (NDL, European Logistics, 2000) are used. 3PLs usually provide warehousing and/or logistics control services, with shipper and consignee being the first and second party. 4PLs are managing or orchestrating other (third party) providers.

Within this basic scheme, there is a wide array of possibilities concerning which actor ultimately is responsible for which activity. A producer can take responsibility itself for the whole process, or it can distribute most of the functions through various outsourcing arrangements. There is also a wide array of relationships between shippers, carriers and LSPs.

Based on the above, Figure 3 illustrates the complete generic value chain for transport and logistics services.

Figure 3: Generic Value Chain for Transport and Logistics



## 4 Case studies

The case study subjects were chosen in order to fulfil the following criteria:

- The firms must be significant purveyors of logistics services.
- Given the international characteristics of logistics services, the group of firms should represent a selection of domestic and internationally based firms.
- The firms must be proactive in at least some aspects of e-commerce.

According to these criteria, five players in the Dutch logistics sector were chosen:

- Compaq Distribution Centre Europe
- Vos Logistics
- Van Gent & Loos / Deutsche Post
- Ryder Europe
- DHL Netherlands

Compaq is not a logistics company as such, but it does provide a substantial range of vertically integrated logistics services to its customers. Also, it provides a direct link to a specific product group – i.e. the Personal Computer. Van Gent & Loos and DHL are major logistics groups that perform a range of functions that are relevant in a distributed (i.e. non-vertically integrated) logistics environment. Although these two firms are both considered being ‘postal-type’ companies (i.e. package distributors), they represent somewhat different aspects of the market. Van Gent & Loos is a Dutch parcel and pallets transporting company focussing on the Benelux countries, whereas DHL is an express post service provider with an extensive global logistics and information infrastructure.

Representation of the spectrum of transport and logistics companies in the Netherlands is not complete without at least one strong logistics provider that owns its own assets and one that does not. Vos Logistics is a major asset-based general transport provider, but one that has ambitions to evolve into a logistics solutions provider as well. Ryder Europe, is one of the few Netherlands-based companies that is a true logistics solutions provider, but with no asset portfolio (at least not in the Netherlands).

All of the above companies have implemented e-commerce to a certain degree into their business activities. The variety represented within and among these companies provides us with a general overview of the dynamics of the logistics sector value chain and the evolving role of e-commerce. The results of the case studies do not give insight to all kinds of businesses and relationships, something that would be far beyond the scope of this study. The ambition of the case studies is to highlight the general outlines of the issues at hand.

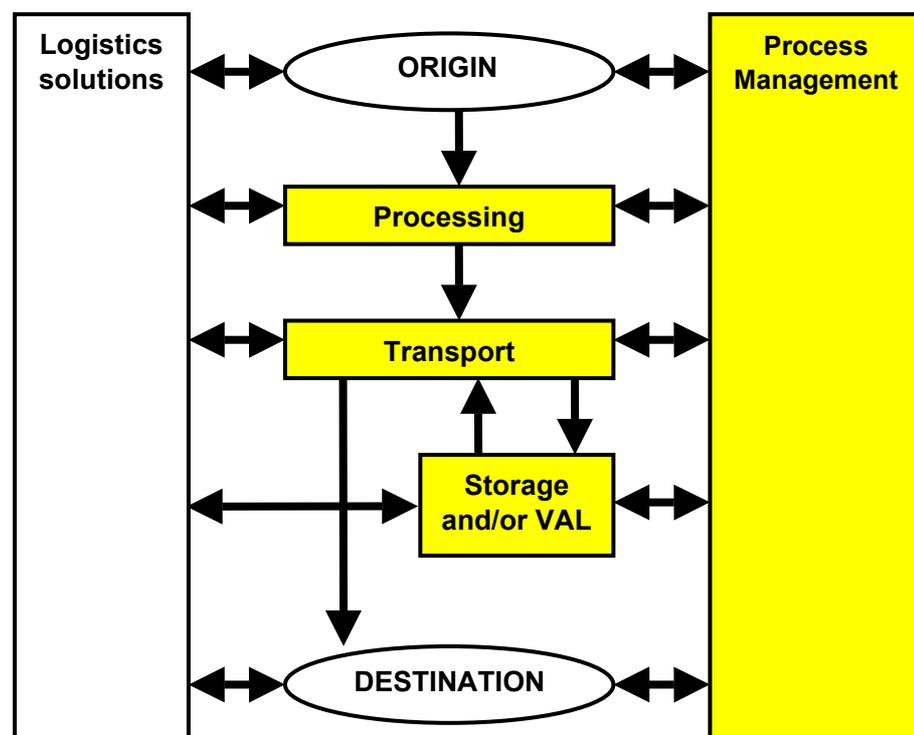
#### 4.1 Case study 1: Compaq-Distribution Centre Europe (DCE)

Compaq is the leading personal computer producer in the world. The company maintains several regional distribution centres around the world to manage the distribution of its products. One of these is the Distribution Centre Europe located in the Netherlands. It is quite common among companies like Compaq who distribute production globally to structure product delivery around regional centres. The Netherlands plays an important role in this structure in Europe. For example, in all, some 90% of all US-based companies operating in Europe have located their distribution centres in the Netherlands.

##### *Positioning Compaq DCE in the logistics sector value chain*

Compaq-DCE has a unique status in comparison with the other interviewed companies. This is because Compaq-DCE is both a distribution centre and a carrier. Indeed, by our definition above, the company is also a shipper. Furthermore, as shown in Figure 4, Compaq-DCE is responsible for the whole logistics chain (shaded boxes). The only thing Compaq does not do is provide logistics solutions, because essentially this would involve only providing solutions for itself. The company is also responsible for its own process management.

*Figure 4: Compaq-DCE in the logistics value chain*



However, one has to consider that Compaq is also a production company. The hardware and software is bought from suppliers and assembled (partially) in the production facilities in the UK. Receiving orders is done in the UK through various channels

(dealers, wholesalers, Internet). Packing is of course also done in the UK. The product is then transported by the company's own vehicles to its various distribution centres (like Compaq-DCE). At the distribution centre, further value is added to the product, in that it is at the distribution centre where operating systems are installed, and peripherals (like a monitor or a mouse) are attached. Installations of these kinds occur in the regional distribution centre owing to the need to install products in different languages. The customer-ready product is then stickered and repacked for shipment to the customer.

### ***Relations with suppliers***

In this case, the main supplier of Compaq-DCE is the Compaq factory in Scotland. The factory supplies nearly finished computers and some of the peripherals, which are transported to the DCE in Compaq's own vehicles. The rest of the peripherals (like keyboards) are supplied by various companies around the world and are transported to the distribution centre by other carriers.

### ***Relations with customers***

The customers of Compaq-DCE can be divided into four different groups:

- *Dealers*: There are more than 1000 Compaq dealers around Europe (e.g. Dynabyte in the Netherlands)
- *Resellers ('dozenschuiwers')*: These firms negotiate exclusive contracts with several personal computer suppliers to resell in very large volumes (e.g. Ingram)
- *Wholesalers*: Various firms in Europe buy personal computers in quantity for distribution to retailers.
- *Retailers*: This is the largest group, encompassing various outlets (e.g. Dixons and Dunnet in the Netherlands) for direct sales to consumers.

In the current business climate, many resellers and dealers are setting up joint ventures, such that Compaq is becoming involved with fewer and fewer firms in the distribution channel. In Europe generally, Compaq has 10 very large customers (of which Ingram is one) who together represent 60-70% of the total volume sold.

### ***Business profile of Compaq-DCE***

Within Compaq-DCE there are three divisions: consumer, desktop and enterprise. Looking at the relationship between volume and value of the products shipped by Compaq, the following chart can be drawn (Table 2). It shows clearly that the highest value segments of the operation are also the lowest volume segments.

*Table 2: Value and volume rankings of Compaq computer products*

<b><i>Division</i></b>	<b><i>Product</i></b>	<b><i>Volume ranking</i></b>	<b><i>Value ranking</i></b>
Consumer	Presario, laptops	2	3
Desktop	Business desktops, laptops	1	2
Enterprise	Network solutions	3	1

Compaq wants to distinguish itself from other computer producers by, among other things, a higher level of logistical services – i.e. shortening the elapsed time between

ordering and delivery for all of its products. For the whole of Europe, Compaq deals with ten carriers. A different carrier is contracted for each region. These are carriers capable of handling both pallets and parcels. Only for occasional express deliveries a courier service is used.

### ***Technology profile of Compaq-DCE***

Compaq operates a range of electronic business solutions, but most of these are in the general field of IT Operations Management. As such, they are not tied specifically to the logistics process. However, Compaq has created 'i-track' tool with which customers can monitor the process by which their order is fulfilled. Also, Compaq created an Internet based quality system through which customers can register complaints.

### ***Motivations and expectations***

Compaq-DCE is in transition from use of EDI to XML solutions. The company expects that this will lead to at least the same, or even more efficiency, but with lower costs. Also it is expected that more direct deliveries can be processed through Internet sales. This is part of the company strategy to position itself closer to one of its main rivals – Dell – in the field of Internet sales.

### ***Obstacles and advantages***

One of the advantages of using more Internet based solutions is greater transparency in the fulfilment of the order – the i-track tool was developed for this purpose. An obstacle is to overcome the fragmentation of orders that can be caused by e-commerce as more orders are received from more diversely distributed groups of customers. This is one of the main areas in which logistical planning needs to be adjusted.

### ***Effects***

Almost all of the effects of e-commerce noted to date have been related to improved business processes. As such, e-commerce does not appear to create increases in volumes of goods transported. There is at present no policy to measure the effects of e-commerce within Compaq itself. However, it is quite easy for the management to 'feel' the effects in the day-to-day management process. Compaq notes that e-commerce has a major impact on distribution. At first, e-commerce solutions were directed towards dealers and resellers, but now carriers have come under scrutiny as well. Carriers have to be very flexible in an electronically enhanced logistics system. Compaq has recently evaluated the performance of its carriers, each of which has to be linked up with i-track to ensure the highest possible level of customer service for Compaq products. The policy is to oblige third-party carriers to use the same tracking tools as used by Compaq-DCE.

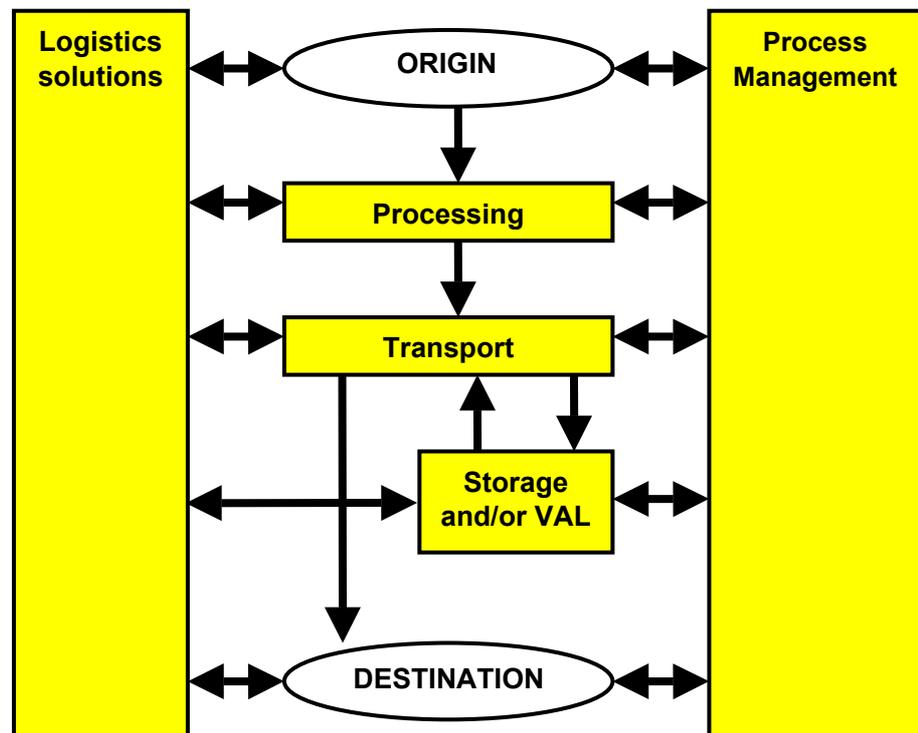
## 4.2 Case study 2: Vos Logistics

Vos Logistics is a Dutch transport and logistics company. It is one of the larger companies in Europe with 3,600 employees and 30 branches throughout the continent. Vos Logistics owns its own physical assets, including 3,000 trucks and 2 rail service centres. Vos Logistics owns its own assets, comprising 2,000 trucks and 2 rail service centres. The company is specialised in full truckloads and utilises a variety of transport solutions, with goods being shipped by means of road, water, rail and pipeline. It also offers a wide range of value-added logistics (VAL) activities. The company has cargo, bulk and tank divisions, but our focus here is on the cargo operation.

### *Positioning Vos Logistics in the logistics sector value chain*

The Vos Logistics cargo division provides transport and warehousing (including VAL). As shown in Figure 5, Vos concentrates on the transport and storage tiers in the generic logistics value chain. Depending on the customer, Vos Logistics usually covers most of the shaded tiers in Figure 5. For some customers, storage and VAL is necessary. Other customers may want their shipment transported directly from the firm with which they placed the order. The firm also provides logistics solutions consulting services.

Figure 5: Vos In the logistics value chain



### ***Relations with suppliers***

As is almost always the case in the logistics sector Vos Logistics has no relation with suppliers who add value directly to the logistics process as such. Of course, the firm buys assets like trucks and storage facilities, but these items are part of the logistics infrastructure rather than part of the value chain. As an intermediary, the role of a firm like Vos is to add value to the products manufactured and shipped by other firms.

### ***Relations with customers***

Vos has many customers in various sectors. Main customers include Philips, Dow, BASF, Scania and Sony. In this sector, trust and sustainable relationships are very important. These factors tend to foster very stable relationships between shippers and logistics providers.

### ***Business profile of Vos Logistics***

The organisation is split into three divisions: cargo, bulk and tank. Each division has its own particularities. All three offer services like transportation and warehousing. The cargo division is specialised in consumer electronics, automotive products and paper products. The bulk division transports dry bulk products mainly for the petrochemical and plastics industries. The tank division transports liquid substances. These can be chemical or food products. Vos Logistics is basically a transport company that has the ambition to develop further into a full-service, asset-based logistics provider. In 2000, 33% of the turnover (€ 500 million) was generated by logistical services. This is expected to grow to 50% by 2004.

### ***Technology profile of Vos Logistics***

Vos Logistics uses an e-commerce system called LOVOS. This consists of three parts. The first focuses directly on customer services – the customer can enter orders and then track and trace the fulfilment process. The second part – ‘load planner’ – is used to ensure maximum use of the available transport capacity. The last part – ‘fleet manager’ – gives the firm the capability to respond to changes in customer specifications (e.g. due to modifications in the transport schedule).

### ***Motivations and expectations***

Much of the motivation for innovation in the logistics structure has been driven by changing production philosophies whereby customers determine the rate and flow of goods, not producers. New logistics requirements are for ‘just-in-time’ delivery that is co-ordinated with production schedules. Customers seek to reduce stock levels and this puts pressure on the logistics companies to respond. As this occurs, more-and-more transport and logistics activities will be outsourced as part of integrated co-operation and service level agreements. The logistics industry expects that these developments will lead to an increased focus on e-commerce in order to respond to growing pressures on prices and margins, progressively shorter lead times and quality improvements. Vos Logistics believes that the development of all-embracing logistical concepts is one of the best ways of continuing to meet customer wishes in the long term. For that reason, the company has begun to specialise more in supply chain management – controlling,

supervising and monitoring the entire logistical chain for customers. Another motive is that Vos expects Internet to be cheaper and more transparent than EDI.

### ***Obstacles and advantages***

A significant obstacle to e-commerce is the investment required. The transport sector works on low margins and therefore cannot take investment risk with only the expectation of eventual returns. Furthermore, the actual extent of customer demand for these e-commerce services is not certain. Firms like Vos invest very carefully in ICT and e-commerce, but acknowledges that its goals to expand beyond the operational transport process will involve a sophisticated e-commerce system. Another obstacle is the lack of maturity of electronic marketplaces in the sector. For the present, these marketplaces concentrate on matching spare capacity in transport vehicles with loads seeking transport. The problem is that, for commercial reasons, transport companies are reluctant to share information on volumes and customers, thus limiting the value of this service.

A potential advantage is that consignment handling will be cheaper, because of the acceleration of the process. The track & trace tool allows 'Key Performance Indicators' to be identified which can assist Vos in motivating employees to work more efficiently.

There is also an imperative that is driving Vos towards e-commerce. The Vos strategy is to further evolve from being mainly an actor in the operational transport process, into a leading provider of a full range of asset-based logistics services. A sophisticated e-commerce system is an essential tool in this process.

### ***Effects***

Few clear effects and impacts are visible at the moment. However, the efficiency gains with respect to consignment handling are already beginning to be evident. E-commerce has resulted in acceleration and increased transparency of the logistics process and therefore the period of time is shortened during which a consignment is actually in the Vos system. This frees up storage and transport capacity for accepting additional business.

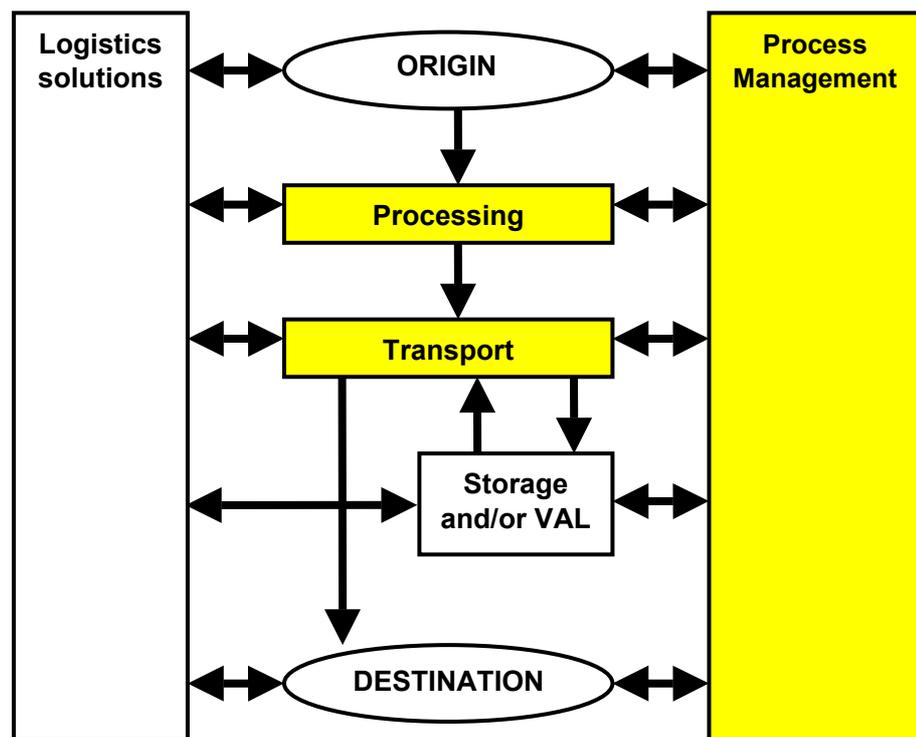
### 4.3 Case study 3 Van Gend & Loos (VGL)

In 1999 VGL was taken over by Deutsche Post World Net and became a 100% - owned subsidiary operating under the name Van Gend & Loos Euro Express. VGL is the leading company in the Dutch business-to-business parcel delivery market, and a main player in the consumer parcel delivery market. VGL provides an extensive range of e-commerce services and continues to develop other services. The basic activity is providing logistical services.

#### *Position of Van Gend & Loos in the value chain*

Van Gend & Loos operates in a response mode – levels of (mostly standard) services are made available to any customer who requires delivery of a parcel or pallet. Figure 6 illustrates the position of VGL in the generic value chain.

Figure 6: VGL in the logistics value chain



The service is made available immediately the order is received from the customer. After receiving the order, VGL transports the product to the other party. This process is monitored and the information is made available online by VGL.

#### *Relations with suppliers*

As stated for the previous case study, logistics firms have no relations with suppliers who add value directly to the logistics process as such. The firm buys assets like trucks and storage facilities, but these items are part of the logistics infrastructure rather than

part of the value chain. As an intermediary, the role of a firm like VGL is to add value to the products manufactured and shipped by other firms.

### ***Relations with customers***

The main customers are business offices, retailers and producers. The electronics sector is the most important source of business for VGL. Transactions with customers are mostly standardised and offered at published fixed prices. Only high volume customers can negotiate exclusive contract terms.

### ***Business profile of Van Gend & Loos***

The VGL organisation has two sides: 'System' and 'Non-System'. The 'System' side is responsible for systemised transport in supply chains. The Non-System side has four Business Units: Innite & Logistics, Courier Line (Courier service), Pharma (Correct Express) and Selectvracht (a business-to-consumer service). Before the take-over by Deutsche Post in 1999, both Selectvracht and VGL were independent divisions of Royal Nedlloyd. As part of VGL, Selectvracht focuses on the consumer market, whereas the rest of VGL mainly addresses the business market. The market in which VGL operates has become more dynamic over the last few years. In Europe, the Netherlands-based TNT Post Group, the UK-based Consignia (former British Post) and especially the German Deutsche Post are taking over postal businesses or forming joint ventures. The continuing liberalisation process in Europe for these services is expected to increase competition.

### ***Technology profile of Van Gend & Loos***

VGL has developed a whole range of "i-Services". Its SHIP system enables customers to prepare a shipment over the Internet. During shipment, freight letters are replaced by 2-dimensional barcodes, with which VGL is able to track the shipment along the logistic chain. There are also so-called e-commerce 'utilities' with which the shipment can be tracked. Thus, customers can track shipments through the Internet or through a WAP telephone. VGL customers who are on-line businesses can use VGL facilities to allow their own customers to track their orders.

### ***Motivations and expectations***

The main reason for investing in e-commerce solutions was to improve customer services and to make internal process management more efficient. Customers would be able to order in a more efficient way and to track their shipments in real time. It was expected that this would reduce operating costs for VGL, and also for their clients.

### ***Obstacles and advantages***

VGL did not cite any particular obstacles to e-commerce adoption, other than the usual costs and problems of adopting new systems. On the other hand, the advantages were very clear. Implementing e-commerce services was viewed as a necessary step in the evolution of postal-type services. Thus, VGL expected to become vulnerable to competition if it did not take proactive steps to implement these systems.

### *Effects*

Real effects are not really noticeable yet to any measurable extent. However, as with all interviewed enterprises, VGL has the perception that e-commerce has contributed to overall business efficiency. For example, VGL has observed that as e-commerce makes it possible to deal more efficiently with logistic flows, the number of logistics suppliers reduces. For example, the big Netherlands wholesaler Makro used to require 40 different deliveries per day in order to supply it with the full range of goods in which it deals. With the help of e-commerce, Makro was able to reduce this to just three deliveries per day, while retaining the same range of goods.

A somewhat circular effect would appear to be that e-commerce generates new customer expectations, which then require new investments. A case in point is at-home delivery for consumers, which increases by definition in an e-commerce environment because e-commerce customers do not transport their own after-sale goods. Business clients are usually satisfied to receive deliveries at their place of business during working hours, but consumers expect more flexible delivery schedules that fit in with the times they are at home. All of this requires further investment in improved facilities and systems – VGL has been experimenting with solutions like home lockers.

A further effect is increased opportunities to enhance the information flows to customers. For example, e-commerce enables not only the delivery of real-time information to clients, but it also facilitates personalised information flows.

#### 4.4 Case study 4: Ryder Europe

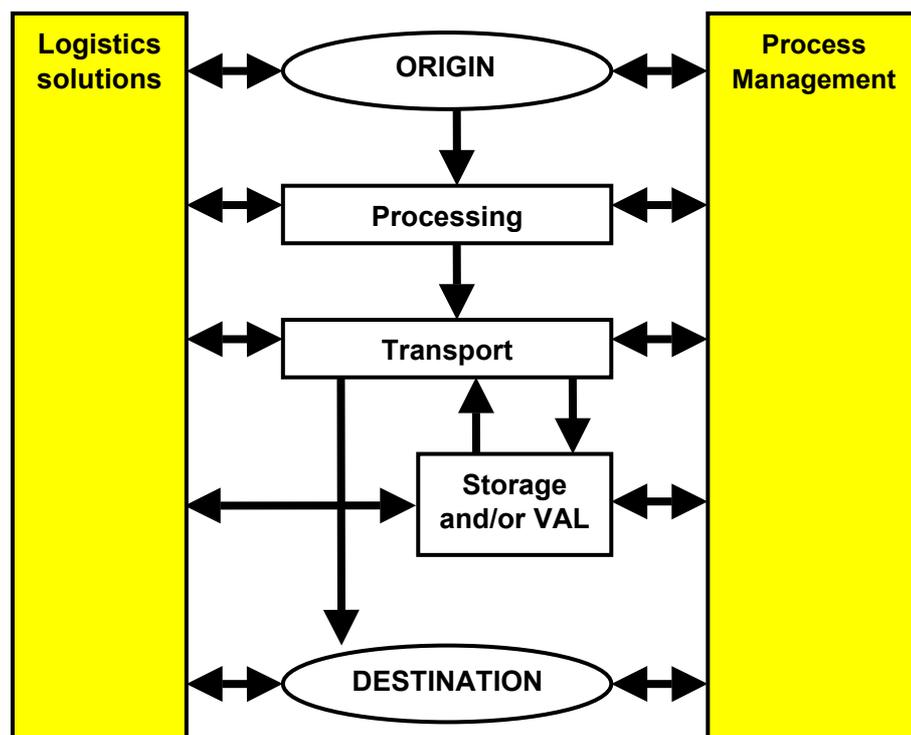
Since its founding in 1933, Ryder has become a leading provider of integrated logistics and transportation solutions. Originally a truck rental & leasing company (a business it still operates in the US and the UK), Ryder now also custom-designs logistics solutions for specific businesses. Ryder employs 35.000 people worldwide (Ryder operates in North and South America, Europe and Asia), 4000 of them in the Netherlands. The company has an annual revenue of ca \$5 billion and assets of \$5.8 billion. The company ranks 309th on the Fortune 500, and is one of the 20 stocks that comprise the Dow Jones Transportation index.

In the Netherlands, Ryder services include mainly consultancy, oriented to the design of logistics solutions. However, sometimes the company operates an entire logistics flow for a customer. This is the case for example with Nissan in the UK where Ryder provides all of the inbound logistics. Transport management services are offered also (billing and payment, negotiation, performance etc.), giving the customer the advantage that all services are presented on a single bill. On the whole, Ryder tries to distinguish itself in the market by providing customised customer services.

##### *Positioning Ryder Europe in the logistics sector value chain*

Figure 7 positions Ryder in the value chain only as it applies to the business conducted in the Netherlands. This is restricted to services that are not based on physical assets. In other markets (the UK and the US, for example) the company provides a much fuller range of services.

Figure 7: Ryder in the logistics value chain



### ***Relations with suppliers***

As stated for the previous case studies, logistics firms have no relations with suppliers who add value directly to the logistics process as such. The firm buys assets like trucks and storage facilities, but these items are part of the logistics infrastructure rather than part of the value chain. As an intermediary, the role of a firm like Ryder is to add value to the products manufactured and shipped by other firms.

### ***Relations with customers***

Ryder Europe has 30 big customers, mainly in the automotive and consumer electronics sector, including Nissan, Daewoo and Ericsson. The rest of Ryder's client base is comprised of smaller customers, who have a relatively stable relationship with the firm. Especially in the case of inbound logistics, the relations between Ryder and its customers are closely knit. Many of the relationships with customers have been reinforced over the years by EDI links and by integration of Ryder services into customer business profiles (see below). Because the solutions offered are almost always customised, Ryder has a relatively lasting relationship with the customer, with contracts re-negotiated from time to time.

### ***Business profile of Ryder Europe***

The business profile is product driven. The organisation is split up into Financial Management Solutions (Financial MS), Fleet MS, Transportation MS, Distribution MS, Distribution MS, Supply Chain MS and E-commerce Solutions. As Ryder services move up from fleet management, through transportation/distribution management, to supply chain management, the company becomes more 'integrated' into the operations of the customer.

Ryder has experience with on-line transport marketplaces (Internet and Extranet) that are both run by transport companies and aimed at transport companies. Entry to many of these marketplaces is restricted for commercial reasons. Trust is a keyword in the transport sector, and business relationships tend to be long-term. Thus, according to Ryder, these kinds of platforms will likely stay under the control of a small group of companies.

### ***Technology profile of Ryder Europe***

In the transport sector, generally EDI is widely used, and some customers have invested in this technology along with the logistics companies. EDI is now offered through the Internet, and Ryder expects that EDI solutions will persist for at least five years. Large companies with complex logistical needs are beginning to use Internet-based (mainly extranet) applications. Extranet applications have the advantage of making possible the management of different processes through one platform. The interactivity of Internet solutions is becoming important for Ryder's client relations profile.

Ryder provides customers with a variety of application tools. With RyderTrac a customer can track and trace his order. RyderShip allows Ryder to match shippers freight volumes with available and carrier capacity. RyderFlow provides inventory visibility in terms of shipments or inventory location status. RyderEntry is a web-

enabled system that allows customers to enter orders, while at the same time allowing the freight carrier to update load status.

### ***Motivations and expectations***

Ryder's main expectations were in the field of billing and payment. Providing clarity for the customer and acquiring the ability to interact effectively with the customer were also strong motivations. Information management is a core business of Ryder, and it was expected that e-commerce would make the information flow more efficient and effective. Customers ask for total solutions and through e-commerce a 'smart' integrated package can be offered.

### ***Obstacles and advantages***

The company maintained that issues of trust and habituation inhibit the growth of e-commerce in Europe. Paying by credit card is still a problem for many European consumers, for example. Another obstacle is that in practice the EU is still not yet a union without frontiers. Each country has its own bureaucracy that makes the free flow of goods quite difficult. Ryder finds that this negatively effects the development of e-commerce.

A potential danger was noted if companies merely adopt e-commerce because it appears to be a trend. According to Ryder, it is very costly to implement e-commerce, but it is likely to be ineffective if not tied to a well-grounded strategy based on an assessment of the value it is expected to create. It was noted how SMEs often just go with a particular trend, thereby getting locked-in to systems that restrict their future choices of suppliers and service providers.

Other than this, e-commerce is seen as an obvious development of Ryder's core business, which is to provide information-based solutions to logistics problems. Furthermore, Ryder finds that technical advances are having a positive impact on the development of e-commerce. For example, in the UK the consumer can now sign for the delivery of an on-line purchase on a Palmtop. Thus, the processing of administrative data is faster and more accurate. As easier-to-operate and more secure transaction media permeate the e-commerce environment, companies with e-commerce strategies will be poised to exploit the opportunities.

### ***Effects***

Measurements of the effects of e-commerce are not yet available, but there are many strong perceptions of positive effects that may be quantifiable in the near future. Ryder warned, however, that the impacts of e-commerce might not be as revolutionary as some believe. By far most of the effects are perceived to be in process efficiency which is linked to cost reductions and enhanced communication with clients. In terms of the general discussion about how e-commerce might effect transport flows directly, the Ryder view is that these flows may not change all that much in terms of management and volume, at least not in the short to medium term. What is changing is the ways customers interact in the logistics process. It remains to be seen how much this might increase production and put greater pressures on distribution channels.

#### 4.5 Case study 5: DHL Netherlands

DHL Worldwide Express was founded in 1969 by the Americans Dalsey, Hillblom en Lynn (DHL). They introduced a new concept in the transport of goods and documents: door-to-door express transport. In a relatively short time, the company expanded into a multinational corporation. Its Dutch office was established in 1975, and there are currently 14 branches throughout the Netherlands. Today DHL offers services through its own network in 228 countries.

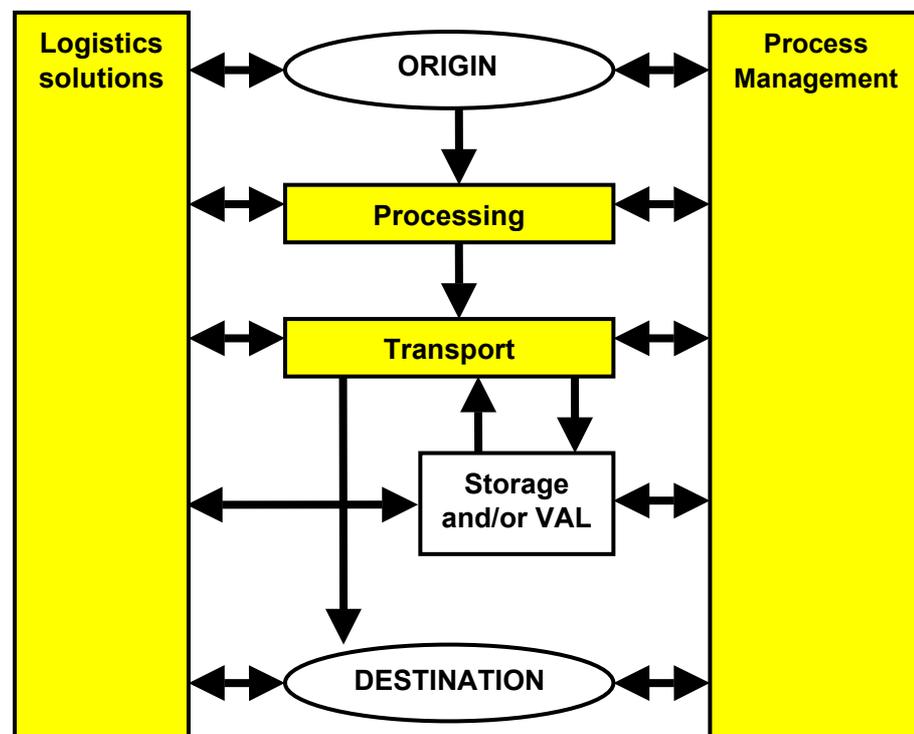
DHL is the global market leader in the express delivery sector. In 1998 Deutsche Post acquired 25% of DHL. In 2001 Deutsche Post increased its stake to 51%. In the Netherlands, DHL shares its market leadership with the Dutch TNT Post Group. UPS is another important competitor. Table 3 shows that DHL has grown considerably, especially in the Netherlands.

Table 3: DHL growth in the Netherlands

Turnover	1996	1997	1998	1999
World wide (USD)	4.0 bn	4.7 bn	5.1 bn	5.5 bn
Netherlands (DFL)	192 m	243 m	285 m	344 m

#### Positioning DHL Netherlands in the logistics sector value chain

Figure 8: DHL Europe in the logistics value chain



The position of DHL in the generic logistics value chain is illustrated in Figure 8. DHL is primarily a provider of postal-type (i.e. courier) services. As such, its main activities are transport. After receiving the order from the customer, the product is transported as quickly as possible to its destination. As the business model is based on speed, there is no requirement for storage (other than temporary in 'staging' locations like airports), and the company does not offer VAL service. Goods are packed by customers and merely picked up and dispatched by DHL. The transport process is however managed by DHL and information is made available on-line. DHL provides occasional logistics solutions, but it is by no means its core business.

### ***Relations with suppliers***

As with the other cases, DHL has no suppliers in the sense that they add value to the logistics chain.

### ***Relations with customers***

DHL categorises its customers in roughly three types:

- ad hoc customers (biggest number, small quantities)
- regular customers (more than some 5 orders per month)
- advantage customers (some 40 top customers).

Ad hoc customers are mainly private persons or small businesses, and they pay fixed prices. Regular customers are mainly medium to larger sized companies. They pay fixed prices too, but sometimes special pricing arrangements can be negotiated. Advantage customers negotiate exclusive contracts.

### ***Business profile of DHL Netherlands***

DHL started by setting up country based firms, each driven by conditions in its own national market and serving primarily a national client base. These were linked together by DHL's international infrastructure. From June 2001, the 70 biggest customers who operate globally are supported by a special DHL subsidiary based in San Francisco.

From 1 July 2001 most country operations will have a organisational structure that allows for various sales-oriented Business Units linked to a customer interface and a call centre. The operations department has the overall responsibility for the actual transport (route planning, management of assets, delivery etc.).

### ***Technology profile of DHL Netherlands***

The internal system is called DHL WorldNet. This is an extensive Intranet, linking all DHL offices. To date it is used primarily for information capture, but it will become more an operational tool in the near future. For clients who place orders on a regular basis, DHL has developed various e-commerce tools. Speedbooking is for easy and fast access to DHL delivery services. WinShip is for regular but relatively small clients. It is installed in collaboration with the client and replaces such instruments as freight letters. EasyShip is an extension of WinShip, developed for customers with more than 100 orders per month. SmartView is a service for global customers who use EDI platforms. It has extensive tracking and tracing features, can be integrated in the web page of the customer, and it has some extranet functionality.

### ***Motivations and expectations***

The main motivations of DHL were internal efficiency (e.g. less telephone operators, less administrative faults), transaction transparency, faster fulfilment at transport units, and better sharing of information. Some of this was further motivated by the increased integration of DHL and Deutsche Post World Net, which increased requirements for intra-business information flows.

### ***Obstacles and advantages***

DHL encountered no real obstacles in implementing e-commerce internally. Possible problems with customers were anticipated, but these were dealt with beforehand by a technical team in London.

One main advantage was that DHL was big enough that they could afford not to be among the first wave of e-commerce adopters. This wait-and-see approach allowed the firm to learn from competitor's mistakes.

### ***Effects***

DHL remains cautious about the impacts of e-commerce, and on the need to be especially proactive. Some effects have been dramatic – some 80% of DHL orders are now placed electronically. However, these effects must be put into perspective. The impacts on areas not related primarily to 'process' management (sales and marketing, for example) have been very modest. Indeed, the payoff from e-commerce is emerging more slowly than most predictions would suggest. DHL continues to operate in its main established markets and these appear to be the markets where the potential of e-commerce is greatest. DHL has tried to develop the 'consumer side of the business on-line, but this has proven to be too small a market to support in a viable on-line business segment. The noticeable effects overall are faster and more efficient internal and external communication.

## 5 Analysis

This section discusses the research findings with reference to the first two research questions as posed above in section 1.4. It should be recalled at this point that these questions were generated from observations first made nearly two years ago in the original IPEC project (the forerunner of the EBIP approach used here). These observations were to the effect that the impacts of e-commerce implementation were closely related to existing industry practices and trends, market structures, and to the asset characteristics of particular sectors.

It is instructive to use these relatively early observations as a base line from which to assess the observations made in the present study. Most of the impacts observed in IPEC related less to the competitive structure of the market (entry and exit conditions, prices, new product development etc.) and more to the efficiency of business enterprises, particularly as regards internal and external information flows. It is worth noting also that most of the effects observed in IPEC were ‘potential’ rather than ‘actual’ – i.e. most firms had not yet learned to map and measure the impacts of e-commerce in any comparable way.

### 5.1 The value-added characteristics of the transport and logistics sector

The selection of firms interviewed covers a reasonably indicative range of functions, relationships and practices in the sector, and encompasses activities that are dependent upon both physical and intangible assets.

Although it was possible to represent the generic transport and logistics functions in a value chain hierarchy, it is clear that the actual value-added structure of any specific logistics related activity is determined largely by the type of goods being distributed, and the relative intensity of logistics needs (e.g. whether requirements are occasional or on-going, basic or value-added etc.).

The Compaq case was instructive in that it showed how vertically integrated logistics structures can still be viable (even necessary) in some commercial situations. In other cases, however, the delivery of similar product ranges was outsourced (Vos customers include major electronics firms, for example). The key factor in this respect appears to be the value-added logistics requirements of individual products. Where otherwise standard products must be altered in some way within the logistics process in order to fit local market conditions (as with computers), there may be more of a case to maintain in-house control over more of the logistics chain in order to maintain quality control and/or to respond better to fluctuations in demand.

Much of the logistics industry as oriented to supply chains is structured around long-term relationships, based on client trust as built upon historical experience with individual logistics firms. Particularly in the higher value-added segments – like logistics management and solutions consultancy – some logistics companies become virtually integrated into the operational structures of their client companies. Dynamic market entries and exits appear to be rare except for casual delivery services, and switching costs can be high.

One would expect that the recent recession in the dotcom business would have an impact on the transport companies carrying ordered products to customers. However, most of the 'dotcom transport' is handled by a select group of carriers (such as TPG). Therefore the interviewed companies did not mention losing volume (assuming that the impact would be negative) because of this recession.

Although logistics companies may need to acquire greater ranges of capabilities in order to position themselves competitively should new market segments emerge, it is clear that they do not necessarily need to exploit every capability in every market. The Ryder case demonstrated this segmentation strategy very well, choosing to concentrate its European operations (excluding the UK) only in the highest value-added tiers.

## 5.2 **The influence of e-commerce on the value-added structure of the transport and logistics market**

Our general findings indicate that although the logistics sector is evolving to meet changing customer requirements, separating the specific effects of e-commerce on this evolution is actually very difficult. Most of the cases show that e-commerce was implemented as a response to a problem, rather than as a strategic tool in its own right.

To an extent, this is understandable as the sector is basically in the business of responding to customer requirements. It is highly unlikely that a major producer of goods would be inclined to re-shape its business according to conditions laid out by its logistics suppliers, even though it may consult with these suppliers from time-to-time. The reverse is more likely, and the evidence in this study indicates that where logistics suppliers are gearing up with e-commerce solutions, the catalyst is change in user needs. Arguably, it is probably desirable that the motivation for change comes from the users of logistics services as this will tend to keep the service providers in touch with logistics needs in respective client markets.

In order to unravel some of the effects of e-commerce from other ambient effects, we first have to summarise our observations in a systematic way. The EBIP approach treats e-commerce as an 'innovation' in the transaction structure. In other words, e-commerce enables transactions in various marketplaces to be carried out in different ways than before. Innovation is widely held to be of three types:

- *Product innovation* involves the development of new products and services and/or new product/service features;
- *Process innovation* refers to how products and services are designed and made;
- *Relational innovation* refers to new modalities and methods for buyer-seller interactions in the marketplace.

The transaction structure to which innovation is applied, or in some cases, in which the motivation to innovate is generated, is likewise composed of three distinct elements:

- *Transaction preparation* involves placing information about products and services in the market, and retrieval of this information by market participants;

- *Transaction completion* comprises two components: settlement and logistics. 'Settlement' refers to ordering, billing and the transfer of payments. 'Logistics' refers to the transfer of products and services from sellers to buyers both within supply chains and with final customers;
- *Production support* relates to the capture and use of transaction-related data to assess market trends, and to support the development, production and marketing of products and services.

As shown in Figure 9, the three generic innovation types can be related in a matrix to the three specific elements of e-commerce innovation.

Figure 9: Mapping the effects of electronic commerce

	Electronic Commerce Innovations		
	Transaction Preparation	Transaction Completion	Production Support
Product Innovation			
Process Innovation			
Relational Innovation			

For most producer sectors, it is possible further to break down each category in the Figure 9 matrix into specific operations or functions. The possibilities of doing this for the logistics sector are somewhat limited in that the 'product' is an intermediate service in its own right, which, by the definitions governing the matrix, lies primarily in the transaction completion area. Nevertheless, by using only the generic definitions, it is possible to characterise the effects and impacts noted in this study as a 'footprint' within the above scheme.

The result of this footprint exercise is shown in Figure 10. To summarise the diagram, by far most of the effects were considered by interviewees to lie in the *process innovation* area, mainly as related to transaction completion and production support. This is consistent with the structural role of logistics as a business function within any individual producer firm. A producer that does its own logistics would consider most of the innovations in this area to be process enhancements, and is likely to regard similar innovations in logistics services firms in a similar light.

Few of the interviewed companies could quantify any effects of e-commerce, and none made the claim that e-commerce has increased revenues by increasing the customer base. However, they all shared the same feeling that e-commerce has had, or soon will have positive impacts on process efficiency and client care. More specifically, the interviewees note better internal and external communication, better integration of business processes, more transparency in business processes, more transparency in the logistics process for the client, and generally more flexibility in the logistics process.

The precise significance of these impacts was open to wider differences of opinion. Some firms advised that the magnitude of these effects should not be overestimated, and even that first mover strategies may not always be desirable. Most recognised, however, that e-commerce solutions were an integral part of moving into markets for higher value-added services. The overall expectation is that e-commerce will improve business prospects by saving costs and making services more convenient and efficient for customers, rather than necessarily by increasing sales volumes as such.

Figure 10: Footprint of e-commerce effects in logistics

Electronic Commerce Innovations			
	Transaction preparation	Transaction completion	Production support
Product Innovation			
Process Innovation			
Relational Innovation			

Firms were noted also to be active to varying extents in *product innovation*, mostly in connection with specific interfaces and systems (e.g. ordering, tracking and tracing etc.) that are made available to clients as part of the overall logistics package. Both process and product-related activities require some degree of complementary action in the production support area. Many of these innovations are oriented to performance monitoring, profit margin maintenance, and quality control. In the logistics sector, activity in the transaction preparation arena is confined at the moment mostly to experiments with on-line matching of loads with spare capacity. However, this was reported to be at the experimental stage with as yet little impact on a sector basis.

The relatively small incidence of *relational innovation* is consistent with remarks that many logistics relationships (especially in the supply chain) tend to be long-term. Most of the innovation in support of new client service requirements is directed at process or product innovation, rather than at restructuring relationships with clients and other

logistics suppliers as such. However, there is some indication that logistics firms are beginning to exploit the capabilities of their new client-oriented tools to increase customer loyalty, thus possibly inducing users to become locked in to relationships with particular logistics suppliers. But this may be a device that is easier for producers to use than it is for logistics suppliers. A firm like Compaq is mainly a major supplier of goods, and it can therefore oblige its suppliers and many of its customers to adopt its own particular e-commerce protocol. For general logistics concerns, however, locking some clients in may result in locking others out. There is an overall logic in much of the sector for providing relatively open and flexible user interfaces, and this is likely to guide many future e-commerce developments.

Nevertheless, relational factors historically are closely bound up with technological paradigms. In the transport sector, EDI is still widely used but this is a closed system, available only to pre-defined user groups. Typically, this was the system used by logistics firms to communicate with each other, and/or with large regular clients or institutions (like customs and excise offices). There is some evidence of migration to an Internet platform (e.g. using XML), but other than for activities like advertising and information services (mainly tracking and tracing facilities), it is not yet clear how Internet-based solutions can be exploited most effectively in this sector. Several interviewed firms stressed the dangers of moving decisively to new technology environments before the commercial implications of the inevitable new ways of working could be understood.

There are indications throughout the case studies of a general trend for individual logistics firms to embrace more of the value chain, especially where the higher value-added tiers are concerned. These tiers are largely based upon intangible assets – i.e. the knowledge, experience and reputations of the logistics firms. However, some of the interviewed firms noted that much of the motivation for change in this respect came from the newer production philosophies and procurement practices of client firms – inventory reduction, customised production, just-in-time production schedules etc. Arguably, some of these new practices are connected with e-commerce implementation in the value chains of producer sectors, to which logistics firms may have to respond.

In terms of the findings of other recent work on the Dutch logistics sector (section 1.8), our findings tend to confirm some observations and question others. Certainly we concur with the KPMG study that technology implementation is unbalanced, but we found no reason to believe that the industry as a whole is necessarily disadvantaged by the current state of technology adoption. There may be instances where this is so, but our findings tend to suggest that the main problems in the short-to-medium term will concern the co-ordination of various already existing proprietary systems and interfaces. In all, we encountered an industry that is well aware of the potential of electronic commerce, but that is otherwise cautious about the risks of over-investment until such time as concrete assessments can be made of the actual economic impact of e-commerce systems. Most firms have only rudimentary methods (if any) for calculating these impacts, and, in any case, due to the special network dimensions of e-commerce, many of the impacts can probably only be assessed in a much broader inter-firm, and likely inter-sector context.

Our findings tend to add empirical weight to some of the findings of the AVV and Dialogic studies. In particular, they confirm the difficulties of establishing electronic relationships with customers and of developing new electronic marketplaces. They also

confirm that logistics processes are becoming more transparent to the user, even if the overall effects on the transparency of markets is not yet shown.

Our study focussed on the business dynamics of e-commerce rather than specifically on some of its broader effects – like the impact of new electronic transaction environments on the logistics infrastructure as a whole. As such, we could neither confirm nor cast doubt on the TLN findings. However, some of the insights into how e-commerce is motivated in the sector may give clues as to how future impacts on the macro-infrastructure may be generated. The one specific mention of effects on transport volumes and frequency suggested that the efficiency of e-commerce systems these may actually depress the number of daily deliveries required by a logistics customer (see the VGL case study). However, this is only one instance in a very specific context.

From the evidence we were able to gather, the clear strategy of the logistics providers is to gain advantage in the market by making logistics processes and customer services more efficient. Efficiency can lead to the consolidation of shipments (thus potentially reducing their number between individual parties), but in the longer run this may contribute also to growth in client businesses, leading eventually to greater aggregate demands on the logistics infrastructure. Probably the main observation to be drawn from the study is how e-commerce appears to be linking the fortunes of logistics providers and clients in ever more interactive and dynamic ways.

## 6 Conclusions and policy implications

Considering the very high profile of e-commerce in recent years on governmental and intergovernmental agendas, it is somewhat striking that the companies interviewed made virtually no substantive comment on the role or current implications of public policy for e-commerce adoption. For example, although much is made in the policy documentation of the need to facilitate e-commerce through enhancing the telecommunications infrastructure, or overhauling the market governance regime, our interviewees cited none of these factors as being substantive issues when engaging with e-commerce.

This could be because of failings in communication between the public and private sectors on this subject, but our findings indicate that it is more likely because market agendas for e-commerce development follow their own logic. The technical and governance infrastructure may well be inadequate to support optimal levels of e-commerce (assuming that a definition of 'optimal' could be agreed), but we found no evidence to suggest that firms decide not to adopt e-commerce solutions on the basis that the ambient infrastructures and/or policies are either not in place or inadequate. Rather, they act according to their understanding of their own markets, thereby creating demand for adjustments in these infrastructures and policies.

The policy task should probably be seen in this light. Heretofore, most national government (and EU) policies for e-commerce have tended to focus on defining best practice paradigms, and on technology development and/or adoption programmes. Our findings tend to show that the market can generate solutions like these fairly efficiently. Of concern to economic policy-makers is ensuring that the adoption of any of these solutions does not create inequities that bias the market and restrict the supply of viable solutions.

More recently – particularly, but not exclusively in the Netherlands – some of the policy attention has been diverted to issues of infrastructure planning, especially the integration of physical and electronic infrastructures. For policy makers who have responsibility for infrastructure and spatial planning, the problem is to anticipate the consequences of e-commerce in the context of emerging trends in the logistics services markets.

The following general conclusions have particular implications for both economic and infrastructure policy.

- The e-commerce technology of the logistics sector is likely to evolve as the logistics requirements of specific client groups change. A few of the larger logistics firms have moved or are moving up the value-chain into business areas that are built around the intangible asset base of the logistics firm. In doing so, they tend to become more closely integrated into the operations of client firms. However, many logistics firms are small and do not interact at this level. Thus, although much more efficient logistics solutions can be designed at the top end of the value chain, they can meet resistance once they must be operationalised in the lower value-added tiers where established practices may not be able to conform to new logistics design concepts.

- The current technology environment in the sector is fluid, with many tools being developed that are proprietary to specific logistics suppliers, but which also are accessible to clients (e.g. tracking and tracing). This has potentially significant implications for a country like the Netherlands that has an important function as a distribution hub (i.e. some 45% of the goods that go into the Dutch logistics system do not stay in the Netherlands). At some point, technology proliferation may present the market with co-ordination problems, especially where inter-modal transport is concerned, or where configurations of different logistics providers are required (e.g. one firm for long-haul shipments and another for local delivery). This possibility has already created a market for end-to-end co-ordination services (for example, DHL handles the needs of its 'global' customers through one US-based division). Problematically, 'smart' business segments based around intangible assets (which perform much better in revenue terms than those based on tangible assets) are likely to move offshore if there is no complimentary 'smart' advantage in the domestic logistics infrastructure. This observation tends to confirm and reinforce the rationale behind the current 'brainport' strategy in the Netherlands.
- Our study showed quite conclusively that the 'transparency' added to the logistics system by e-commerce lies almost entirely within the logistics process. As such, a transparent *market* for logistics services has not developed. Thus, clients can use transaction generated information to 'see' a specific logistics process once it has been purchased, but opportunities for clients to see where the costs of individual segments may be higher or lower are still limited. Arguably, this reduces their ability to make the most efficient and rational use of the logistics system. The development of on-line marketplaces, which might increase the efficiency and lower the cost of transport by promoting more rational use of available capacity have so far failed to have an impact. This is due mostly to commercial sensitivities in sharing information between logistics firms. The process could become even less transparent if these marketplaces are in future controlled by groups of firms who agree only to share selected information with each other. By acting as stand-alone competitors rather than as participants in a larger logistical scheme, logistics providers may impede future overall efficiencies in load and route planning.

A major concern of the Ministry is eventually to be able to assess the actual impact of e-commerce on items like total tonkilometres per year, total number of journeys, and shifts in the overall asset base (including from tangible to intangible). Moreover, this must be assessed with respect to several transport modalities. Our study has shown that the primary effect of e-commerce to date has been to provide new avenues by which producers and logistics providers can interact more directly throughout the various stages of the logistics process. Therefore, our view is that the real impacts of e-commerce in this sector cannot be determined by looking only at the systems and approaches developed by logistics companies.

At some point, the impacts of e-commerce on logistics will have to be assessed in terms of the increasingly *reflexive* relationship between producers and logistics providers. Indeed, it may be wise in future to investigate the problem primarily from the customer-side. As producer firms determine production rates, they also largely define the requirements for logistics capacity and capabilities. Moreover, it should be remembered that logistics provides producers with probably the most widespread of all make-or-buy opportunities. Some producers still choose to distribute their goods themselves. Efficiency gains through e-commerce may make this more attractive for more firms –

especially where value-added logistics becomes more of a factor. There are now many instances, for example, of businesses bundling their merchandise for transport to a client.<sup>11</sup> This is likely only possible through the use of e-commerce. But the effects of practices like these on the logistics system as a whole require further investigation.

In an e-commerce environment, more and more logistics firms may elect to concentrate on exploiting their intangible assets, concentrating on areas like regional and global inter-modal co-ordination, but leaving more of the actual physical logistics assets in the hands of logistics users. To understand this evolution it would be informative to look more closely at evolution in the internal processes of logistics customers, and how their production and logistics functions are or are not co-ordinated. It is necessary to examine the source of their logistical needs, and to consider the rationales and means they employ in trying to reduce logistics costs.

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<sup>11</sup> The Distrivaart initiative, presented on the Nationale Distributiedag 2001, is a good example.

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### **Background information on interviews**

The case studies are based on interviews with key representatives of the companies. Information was obtained during interviews with:

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Mr. Hans Metzlar, Coördinator Commercie & Marketing, Vos Logistics – Vos MLD, March 28, 2001

Mr. Jean Paul Duurland, Manager CRM & e-Commerce, Van Gend & Loos, April 6, 2001

Mr. Rob Snijders, Logistics Project Manager, Ryder Europe, April 20, 2001

Mr. Rinus de Kok, Country Logistics Manager, and Mr. Bert-Jan Bonhof, Product Manager E-Commerce, DHL International, June 1, 2001

Concept versions of the cases were send to the interviewees. We have asked them to identify confidential information and misinterpretations. The comments have been worked on in July 2001.

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**Information from websites**

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[www.ryder.nl](http://www.ryder.nl)

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[www.voslogistics.com](http://www.voslogistics.com)