The impact of e-commerce on transport in Europe and possible actions to be taken to meet increased demand
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EXECUTIVE SUMMARY

For Europe it is important to understand the developments in e-commerce and the impact they have on Europe as a whole and its economic sectors. On the one hand, it is important to support the development and adoption of advanced e-commerce solutions that may contribute to the competitiveness of European enterprises. On the other hand, it is important to mitigate possible negative consequences for the citizens, the companies and the environment.

The purpose of this study is to formulate a basis for transport policy for the European Parliament’s Committee on Regional Policy, Transport and Tourism. The input is formulated on the basis of the most reliable forecasts possible on the growth of e-commerce induced freight traffic in the medium term. In addition, the study should generate suggestions to cope with the anticipated increase in the volume of traffic.

The four main questions to be answered in this study are the following:

*Question 1: To clarify the annual e-commerce-related growth in absolute figures in relation to EU-trade in the medium term.*

E-commerce has a negligible share in total trade. In 1999, the B2B and B2C related e-commerce revenues of EU-15 have no more than 0.3% share in the total European trade (intra EU trade and trade with the rest of the world). Although this number may vary in accordance with the scope of the definition of e-commerce, such a small volume does not significantly amount to total trade in quantitative terms. Several sources expect that B2C e-commerce sales will contribute to total retail spending with 5% by the year 2005, for B2B no clear forecasts are available.

*Question 2: To quantify the impact of e-commerce on freight transport as regards of the mode of transport and transport routes.*

Actual scenario studies do not identify e-commerce as a significant factor that influences transport routes, transport modes, goods flows in tonnes, nor in distances (TRT & TNO Inro, 2001). Currently, any quantified data on this relation is not available. In general, the modal share of international freight transport in the EU is expected to be as follows in 2020 (ECMT, 2020):
- road is growing from 43% to 45%,
- maritime shipping keeps a stable share of 24%,
- inland waterways a stable share of 15%,
- and rail stagnates at 7%.

ICT tools can optimise transport flows. This optimisation can take place in the planning process, thus before the transport takes place, and during the transport by using sophisticated communication tools. And through a more efficient use of truck capacity for example, trips can be minimised, which may affect the total distance travelled. Although statistics for the EU are unavailable, NERA (2000) estimates that bringing in more IT into the freight sector (route planning and scheduling, freight exchanges etc) will lead to a 17% and 19% reduction in vehicle mileage for the UK by 2005 and 2010.
Question 3: To assess the impact of e-commerce on the use of conventional delivery services and the mode of delivery.

E-commerce has a minor influence on conventional delivery systems and the mode of delivery.

As far as B2B e-commerce is concerned, transport operators and logistics service providers bring the usual modes of transport (especially trucks) into action.

As regards B2C e-commerce, dedicated delivery networks and courier services are often used. These dedicated delivery networks are usually fitted to the conventional systems, because of the high investments involved and to avoid business risks. As long as the products bought electronically fit in the letterbox, the logistical structure and the modes used will not likely change. When the products ordered become larger in future (more three-dimensional), changes in the distribution structure will be necessary.

Home delivery of digital purchased products and the use of collection points in the distribution network may have some influence on the modal split, although current statistics do not reveal such a trend.

E-commerce usually demands highly flexible supply chains, whereas rail and sea transport are the least flexible modes with high infrastructure costs and a reliance on regular volume shipments. However, when one breaks down road transport to the different kinds (i.e. capacities) of trucks and vans, e-commerce may lead to a change in this ‘road split’. When e-commerce affects the distribution by demanding that deliveries take place more frequent, a shift is to be expected from the large trucks to smaller vans.

Question 4: To put a figure on the avoidance of physical freight transport resulting from dematerialisation.

Dematerialisation hardly avoids physical freight transport. Dematerialised volumes are too small to obtain a significant effect. Although the Internet has made possible that letters, reports, memos and other business correspondence can be formatted and sent in a digital way, the mail is collected anyway and the product replaced has a relative low weight. And even though software, music, movies, books can be downloaded in stead of sent and received in a physical way, the moment that a customer puts the digital data on a physical record, blank CD-ROMs, paper etc. must be bought. These activities result in other good flows. Thus, dematerialisation therefore initiates several substitution effects.

Possible actions

On the basis of the results found in this study, the question is “what transport policy measures should be taken at Community level with regard to existing environmental standards in order to cope with any anticipated increase in demand for transport services?”

Given the current situation, in which quantitative data is lacking, the answer would be “none”. Effects, if at all present and measurable, are very small. More results may be possible in stimulating/mitigating other factors influencing transport. As the ECMT puts it: The globalisation of trade, the reorganisation of distribution and the concentration of warehousing points, the specialisation of production units, the efficiency of transport, the performance of road, rail, air, sea, and waterways are probably the causes that should be factored into trends.
This may be an unsatisfactory result, and the situation for 2010 may be such, that current intervention by policy makers is worthwhile. A first step is to recognise and acknowledge the e-commerce and Internet-related developments. In this respect it is striking to see that in the new European white paper on transport (European transport policy for 2010: time to decide COM (2001) 370), ‘e-commerce’ is not mentioned and ‘Internet’ only twice!

While it is difficult to measure and predict the isolated impact of e-commerce on transport, it should not be treated separately. Integration of policy, from different directorates within the European Union and from different policy levels (National, European, supranational) is necessary.

Leaving all developments to the private market without guidance may lead to undesired negative effects. ‘Doing nothing’ is therefore not the most useful approach.

Suggested actions that the Parliament may undertake or support are:

- **Stimulate and support the development of an e-commerce or ICT-monitor** that measures in an unambiguous fashion the effects of e-commerce on traffic and transport in Europe.

- The European SME’s generate the bulk of production in Europe. They are however lagging behind in the use of e-commerce. *The Parliament can support initiatives to educate and help SME’s getting on the Internet.* A stimulus in this respect can be the development of the ‘e-government’ concepts, in which the European Union can be in the lead.

- The use of ICT within the supply chains has great potential in improving transport efficiency (route optimisation, reduction of empty returns, etc.). This potential is clearly not used to its full extent, in particular by smaller transport companies. *The Parliament can support initiatives to educate and help transport companies using ICT-tools to their benefit.*

- E-commerce is passing its hype-stage. *It is therefore important to take the ‘e’ out e-commerce.* By this we mean that e-commerce effects should be seen in the context of other developments and treated in an equal fashion with the other developments. As stated above, e-commerce will reinforce ongoing trends. Accommodating those trends may sort more effect than a focus on e-commerce as a single entity.

- For many people and companies, the view on e-commerce developments is blurred by the many different possibilities and approaches that exist in the use of e-commerce. The use of e-commerce may be stimulated through *supporting the standardisation of concepts, technologies, the body of knowledge, etc.*

- In addition to the previous item, the Parliament can focus on *preventing the ‘digital division’* between those who use the technology, and those who cannot or do not want to use it.

- The parliament can accommodate the use of e-commerce by *changing or developing new legislation.*
  - With respect to e-commerce transactions the following issues are relevant (UNCTAD, 2001):
    - Finding global solutions for global transactions
    - Setting global laws for digital disputes
    - Setting a clear framework to protect the e-commerce consumer
    - Taking care of data protection and privacy
    - Finding solutions for digital signatures
- “Cybertaxation”: a clear position and directive on the way taxes on international e-commerce goods- and services flows are levied, will support the development of e-commerce.

The Parliament can join the developments by supra-national organisations like the UNCTAD and the OECD, but should also develop its own vision and policy in this respect. With respect to e-commerce deliveries, two categories of legislation are important\(^1\):
- Product related legislation.
- Vehicle operation legislation.

INTRODUCTION

Problem Sketch

Context
Many developments determine the way we organise our society. Large and frequently mentioned trends are globalisation of commerce and trade, a constant increase in mobility of people, shifts towards a ‘knowledgeable Europe to compete in the Digital Economy’ (IPTS-JRC, 2000), mass-individualisation and ageing of people in Western societies.

Next to these ‘autonomous’ trends are the developments in Information and Communication Technology (ICT), and in particular e-commerce and m-commerce, also large determinants for the organisation of our society. On the one hand it concerns changes which directly (at the micro-level) steer our activities, like the replacement of manual labour by automated systems. On the other hand it concerns more fundamental changes of the structure of economic sectors at the meso and macro level.

ICT influences transport in Europe at the micro and macro level, which is, highly simplified, represented in the figure below.

![Figure 1: The impact of e-commerce and ICT on transport networks](image)

Problem
In 1999 and 2000 the attention for e-commerce was mainly triggered by the success of many Internet-initiatives. From 2000 until today, the attention springs from the downfall of many initiatives. This has blurred the view on more fundamental questions like:

− What is the true size of e-commerce-related trade?
− Does e-commerce fundamentally change sectors and the way people do business?

Many companies and governmental bodies struggle with these questions, given the amount of e-commerce-related events and conferences. Also at the policy level attention is given to the relation between e-commerce and transport. There is a general feeling that policy attention to the consequences of e-commerce is necessary, but clear data on the direction and impact of e-commerce are lacking.

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2 For example, the OECD and ECMT jointly organised at 5 and 6 June 2001 a seminar on ‘the impact of e-commerce on transport’ with the purpose ‘to analyse the interaction between e-commerce and transport, and assess the implications for transport of the growth in e-commerce’.
Objective

For Europe it is important to understand the developments of e-commerce and the impact it has on Europe as a whole and its economic sectors. On the one hand, it is important to support the development and adoption of advanced e-commerce solutions that may contribute to the competitiveness of European enterprises. On the other hand, it is important to mitigate possible negative consequences for the citizens, the companies and the environment.

The purpose of this study is to formulate a basis for transport policy for the European Parliament’s Committee on Regional Policy, Transport and Tourism on the basis of the most reliable forecasts possible on the growth of e-commerce induced freight traffic in the medium term. In addition, the study should generate suggestions to cope with the anticipated increase in the volume of traffic.

The main questions to be answered in this study are the following:
1. To clarify the annual e-commerce-related growth in absolute figures in relation to EU-trade in the medium term.
2. To quantify the impact of e-commerce on freight transport as regards of the mode of transport and transport routes.
3. To assess the impact of e-commerce on the use of conventional delivery services and the mode of delivery.
4. To put a figure on the avoidance of physical freight transport resulting from dematerialisation.

The answers to these questions will form the input for the recommendations, which stem from this study.

Approach

Given the scope of the project, the focus is on gathering all recent information and data possible. The approach is on fact finding from public sources, libraries, conferences, and census offices (such as Eurostat) and through searches on the Internet. Data available from different sources is compared and analysed to find solid trends. In addition, the information is filtered to make a difference between existing predictions and assumptions on the one hand and statistics on the other hand. This study focuses on the statistics.

E-commerce is not the only trend with an impact on transport. To clarify the relation between non e-commerce trends, e-commerce and their impact on transport, a framework is made which is presented in the next chapter.

Reading Guide

In this chapter the objective and approach is sketched. In the next chapter, the analysis framework, as well as fact and figures on the actual use of e-commerce are presented. In chapter three, the relation between e-commerce and traffic and transport is elaborated and supported with quantitative evidence where possible. Chapter 4 describes our observations and presents recommendations.
1 EXISTING FACTS AND FIGURES ON E-COMMERCE

1.1 Definition of e-commerce

According to the OECD, e-commerce refers generally to all forms of transaction relating to commercial activities, involving both organisations and individuals, which are based upon the processing and transmission of digitised data, including text, sound and visual images. It also refers to the consequences that the electronic exchange of commercial information may have on the institutions and processes that support and govern commercial activities.

The OECD definition covers different kinds of applications of electronic transactions. E-commerce can also be defined in a more limited way. The most limited definition is: ‘selling products or services via the Internet’. This is what is also called e-tailing. If the exchange of product information and payments and different electronic media are also included, the following definition can be used:

*The exchange of information, services, products and payments by an electronic medium (Internet, digital telephone network or cable television network).*

E-commerce is part of a larger concept, named e-business. E-business goes beyond e-commerce being much more than the current technological focus of online trade (PriceWaterhouseCoopers, 2000). It encompasses all aspects of an organisation from strategy, process, organisation and systems to its trading partners and the final customer (see the figure below).

![E-business and E-commerce Diagram](image-url)

**Figure 2: E-business is more than e-commerce**

The following forms of e-commerce are usually discerned:
- **E-shop:** ‘web marketing’ of a company or a shop. In first instance this is done to promote the company and its goods or services. Increasingly added is the possibility to order and to pay. Benefits sought for the company are increased demand, a low-cost route to global presence, and cost-reduction of promotion and sales. Benefits for the customers can be lower prices compared to the traditional offer, wider choice, better information, and convenience of selecting, buying and delivery.
- **E-procurement:** electronic tendering and procurement of goods and services. Benefits sought are to have a wider choice of suppliers which is expected to lead to lower costs, better quality, improved delivery, reduced cost of procurement. For suppliers the benefits are a higher service levels (by means of sharing more information) and possibly a more durable interaction (i.e. integration) with customers as for already established relations.
e-commerce

- E-marketplace: an electronic implementation of the offering and bidding mechanism known from traditional marketplaces. As for goods, the bidding process may also be integrated with contracting, payments and delivery. As for services, carriers and logistics service providers can for example offer capacity which could be specified in origin, destination, and product / transport characteristics. Benefits for suppliers and buyers are increased efficiency, and timesavings (e.g. ‘last-minute options’. Buyers also benefit from the competition between suppliers of the same kind of product.

The electronic medium used is relevant, but hardly makes a difference to the definitions. Currently, the Internet is the most relevant electronic medium for e-commerce. The Internet is therefore the first cited medium for e-commerce. Other media are also starting to play a role. These new electronic media for e-commerce include digital television (iDTV) and mobile telephones, such as the Wireless Application Protocol (WAP) phones in Europe and the Japanese internet mobile phones (IMPs). E-commerce with mobile phones is often called m-commerce. M-commerce is defined as: The delivery of transaction services by mobile terminals for the purpose of exchanging goods and services between consumers, businesses and financial institutions, regardless of place and time by making wireless networks (Nijhuis, 2001).

We focus on business to business (B2B) and business to consumer (B2C) e-commerce:
- Business-to-business (B2B): financial transactions and exchange of information between companies. Important forms include: Electronic Data Interchange (EDI) and virtual marketplaces.
- Business-to-consumer (B2C): presentation and delivery of goods and services by companies to consumers. This is also referred to as tele-shopping.

The figure below depicts the possible B2B relations and the B2C relations in a production chain.

![Figure 3: possible B2B and B2C relations in a production chain](image)

1.2 An e-commerce framework

1.2.1 The relation between trends, e-commerce and transport
Not only e-commerce influences transport. To put its role into perspective, a framework is made which the basis of the analysis of the research questions. The framework is given in Figure 4 and consists of three parts.

In the first part, several trends can be identified that have an influence on the actual environment, i.e. economic development, spatial development, technical development, and other developments, such as demographic and cultural trends.
The second part consists of the actual environment, which is the existing set of business structures, infrastructures, ICT-networks, goods and passenger flows, et cetera, at a given, i.e. the present, time. This actual environment can change as a result of the above mentioned developments. In the actual environment, ICT-networks and e-commerce is already in use. This study will focus on the present situations of these aspects.

The behaviour of companies and individuals in the actual environment determines spatial planning, influences traffic and transport and the way logistical structures are developed. These are components of the third part of the framework.

![Influence of policy makers diagram]

Figure 4: Impact of general developments and e-commerce on traffic and transport

1.2.2 Trends and developments

The following trends are identified, which have influence on goods flows and transport in general:

**Trends in economic development:**

A - The growth of GDP. The GDP growth gives indication on the willingness of business to invest in, exploit and use e-commerce. Prognoses of the GDP growth rate for the years 2000-2010 lie between 2.3% and 2.6% (ECMT 2001; TRT & TNO Inro, 2001). Figure 5 gives an EU-9 comparison (EC, 1999). In the aftermath of the attack on the WTC in New York of 11 September 2001, it has become clear that EU-economies have slowed down their growth pace.

B - The growth of disposable income. The growth of disposable income says something about the willingness of consumers to purchase computer, about the internet availability, and the growth of online shopping. Growth of disposable income is related to growth of GDP.

C - Explication of costs. The transport costs that are taken into account in cost calculations are mainly direct costs: the costs of the vehicle, fuel and labour. In the context of internalising external effects of transport, three kinds of cost will also affect e-commerce induced transport:

– Delivery costs of digital purchased (physical) products can either be specified or not. If specified, vendors may invoice a percentage, a fixed sum of money, or may higher the product price. Sometimes different means of transport can be used to deliver the order.
In that case, the transport time and related costs are specified. On the basis of these attributes, a customer can choose its transport mode.

- Environmental costs can make transport become more expensive, so that shifts may take place.
- Congestion costs can also make transport become more expensive, so that shifts may take place.

![Graph: EU-9 Comparison: Real Gross Domestic product (GDP) per country]

Figure 5: EU-9 Comparison: Real Gross Domestic product (GDP) per country

D - Pressure on the cost per transport mode. The severe competition and excess capacity in the European transport market keep the transport prices under a constant pressure. Changes in the proportions of the costs per modality can initiate shifts in the modal split.

E - Changing over to the Euro. While ten countries start using the Euro, price differences of products offered via the Internet become more clearer as a result of transparency. This could impact the goods flows in distances (i.e.: it is cheaper to buy a product from abroad).

**Trends in spatial development:**

A - Geographic (de)concentration of companies. Geographical concentration can take place in three ways. First, parties that trade in one supply chain can concentrate next to each other at the same physical location. One finds this clustering for example in the automotive sector, where Original Equipment Manufacturers (OEMs) and service providers settle next to the factory of the producer. Second, parties with the same kind of product or equal activities can (geographically) concentrate. Third, complementary parties can concentrate to each other. Examples hereof are industrial ecosystems, where the industrial residues of one production process can be used as material in another process (e.g. cooling water).

B - (De)urbanisation of companies. (De)urbanisation is the concentration of companies in the vicinity, but not within an urban area. This influences networks and because of this goods flows in distances.

C - Responsiveness. Responsiveness reflects the extent to which firms are capable of accommodating unique and/or unplanned customer requirements (CLM, 1999). Relevant aspects of responsiveness in relation to freight transport are delivery time, delivery frequency, reliability, route planning, distance, et cetera. E-commerce could increase responsiveness, because it makes it easier to find products, vendors, producers (also partners, such as in co-makership relations).
D - Congestion. Congestion may come down to stagnation of traffic and infrastructural capacity. Congestion stands goods flows in the way.

E - EU enlargement. The EU enlargement could reduce trade barriers. Because of this, trade can increase and goods flows (in tonnes and distance) can increase.

Trends in technical development:
A lot of trends take place in the field of technology.
A - ICT–related examples are:
− **Evolving global computer and communication networks.** The Internet, in particular the worldwide web, is most prominent in its development, but also high performance communication (data and speech) networks develop fast. This allows for (centralized) control of global supply chains. A basic problem in the development is the establishment of harmonised or standardised network operating systems.
− **The fixed networks are joined by semi-mobile and mobile networks and applications.** In the (near) future ubiquitous and roaming computing and communication will be common practice. This already leads to better control of goods and vehicle flows in the transport sector while it allows for tracking and tracing. It is particularly useful in rural areas and areas where technological advances are behind, like Eastern Europe. A Dutch department already introduced the term ‘M-commerce’ (mobile commerce) as a step further than e-commerce (MinV&W, 2001).
− In the area of hardware, **miniaturisation** will continue, not only for chips, but also for devices, like mobile phones, laptop computers and palmtop computers. **Integration of functionalities** also evolves. The consequence of shrinking sizes is not only an increase in ease of use, but also continuing declining costs. This will lead to new areas of application, for example the use of plastic chips as tag and price label on products.
− **Communication tools** (e.g. virtual shopping, e-procurement, communication) Cell phones, palmtops and organisers shall change dramatically in near future. Internet shall be integrated in all kinds of equipment and machines: on the street, in shops, in the car or truck, et cetera.
− **Planning tools.** Planning tools can be used for optimising transport flows.

B - Dematerialisation. As a result of dematerialisation, digital products and services do not require physical distribution (e.g. books, music)

C - Home delivery of digitally purchased goods, both on the field of planning (distribution networks) and on the field e-commercialised internet sites. Important issues are:
− Considering whether the physical distribution channel will need to change
− Considering whether the product requires that the customer is present at moment of delivery

D - Infrastructure. The actual infrastructure provides the maximum transport capacity for each modality. Developments in infrastructure influence capacity and the modal split

Other developments:
The use of e-commerce and the impact on traffic and transport is also influenced by the following developments:
A - Globalisation: for long, production and consumption were country-specific. Nowadays, parts are still of a local nature, but other parts are more common. Globalisation and enlarging of the European Community will determine the use of e-commerce.
B - Demographic development:

− The size of the population. As a result of population growth, the number of Internet users will increase.
− Ageing of society. The society in Western Europe is ageing: less children are born and the average age rises. As a consequence, the consumer needs change, both in terms of products and services required, as well as in the way e-commerce will be used.

1.2.3 Policy making

Not only ‘autonomous’ developments determine the use of e-commerce and its impact on traffic and transport. Also policy will influence it. Policy can be seen as mechanism to set the context for the actual environment (for instance by means of legislation) and can also directly influence parts of the actual environment (for instance by means of directives and guidelines). As such policy can impact on all components of the framework. Policymaking takes place at many different levels: from local, national, European to world wide (for instance in the context of the WTO and the OECD). The policy levels influence and interact with each other. Hence, policy at the level of the European Parliament will influence and be influenced by national policies and supra-European policy.

1.3 Facts and figures for the actual environment

In this section we present facts and figures on the current use of e-commerce at a generic level, and bring them in relation to sales and trade at the European level.

1.3.1 Internet use

The availability of PC’s and connection to Internet (that is the availability of telephone lines and Internet hosts) is a prerequisite for e-commerce. Although the USA set the trend in this sector, the attention for Information and Communication Technology in Europe is likely to produce productivity gains in the coming decade. However this will not be the case for all Europe. While Northern Europe is already highly wired, the Internet penetration in the south and the especially in the east of Europe is still close to zero. This section gives an indication of the use of Internet by individuals and by businesses in the European Union. This is an indicator for the e-commerce market. However, the relation between Internet users and e-commerce is not direct. After all e-commerce is about Internet users that buy (and sell in the case of businesses) on the Internet, and not about users that use the Internet only for e-mail or surfing. This is one of the reasons that statistics about Internet use differ so much. Some researchers count Internet users as someone who may have been online in the past month or sometimes past year. Some researchers include people who use e-mail or age groups are different (only 18+, 10+ or even 2+)

Individuals

Nua publishes month-by-month use of the Internet (www.nua.com). The latest estimate on Internet use is for August 2001. Worldwide use is estimated at 513.41 million users, for Europe the estimate is 154.63 million. In the table below, the estimates for the countries of the European Union are given in number and percentage.

<table>
<thead>
<tr>
<th>Member State of the E.U.</th>
<th>Number</th>
<th>% population</th>
<th>date</th>
</tr>
</thead>
</table>

Table 1: Internet users in the European Union, August 2001
From the table we learn that the use varies, where Sweden is in the lead and Spain, Portugal and Greece are lagging. On average, the Internet use of other countries in Europe is at the lower end, ranging between 1% and 25% of the population.

**Business access to Internet**

Surveys of European business show that 16% (Dataquest, 1999) to 37% (NOP Research Group, 1999) had some form of Internet access in 1999. Penetration rates are especially high for large companies. NOP Research shows that companies with more than 200 employees have an average Internet user incidence of 75%. For small companies (<10 employees) this is 32%.

Figure 6: European business online, by country, for 1999 (as a % of all businesses)

From the above figure we learn that, as for individuals being online, the Internet use by businesses also tends to be higher in the northern part of Europe.

### 1.3.2 Total e-commerce sales

Like the variation in estimates about Internet users, the estimates for e-commerce revenues show a considerable variation (see the figure below). As already indicated in the first section, the main explanation for this is the difference in interpretation of the definition of e-commerce.

<table>
<thead>
<tr>
<th>Country</th>
<th>Users</th>
<th>Internet Use</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sweden</td>
<td>5.64 million</td>
<td>63.55</td>
<td>July 2001</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>33 million</td>
<td>55.32</td>
<td>June 2001</td>
</tr>
<tr>
<td>Denmark</td>
<td>2.93 million</td>
<td>54.74</td>
<td>July 2001</td>
</tr>
<tr>
<td>Netherlands</td>
<td>8.7 million</td>
<td>54.44</td>
<td>Aug 2000</td>
</tr>
<tr>
<td>Finland</td>
<td>2.27 million</td>
<td>43.93</td>
<td>Aug 2000</td>
</tr>
<tr>
<td>Austria</td>
<td>3 million</td>
<td>36.9</td>
<td>Oct 2000</td>
</tr>
<tr>
<td>Germany</td>
<td>28.64 million</td>
<td>34.49</td>
<td>Aug 2001</td>
</tr>
<tr>
<td>Italy</td>
<td>19.25 million</td>
<td>33.7</td>
<td>Aug 2001</td>
</tr>
<tr>
<td>Ireland</td>
<td>1.25 million</td>
<td>32.54</td>
<td>July 2001</td>
</tr>
<tr>
<td>Belgium</td>
<td>2.7 million</td>
<td>26.36</td>
<td>Sept 2000</td>
</tr>
<tr>
<td>Luxembourg</td>
<td>100,000</td>
<td>22.86</td>
<td>Dec 2000</td>
</tr>
<tr>
<td>Portugal</td>
<td>2 million</td>
<td>19.9</td>
<td>Dec 2000</td>
</tr>
<tr>
<td>France</td>
<td>11.7 million</td>
<td>19.65</td>
<td>Aug 2001</td>
</tr>
<tr>
<td>Spain</td>
<td>7.38 million</td>
<td>18.43</td>
<td>July 2001</td>
</tr>
<tr>
<td>Greece</td>
<td>1.33 million</td>
<td>12.42</td>
<td>Oct 1999</td>
</tr>
</tbody>
</table>

Source: [http://www.nua.com](http://www.nua.com)

Source: eMarketer 2000
In the e-commerce revenues especially Germany and the UK have a relative high share (around 30 and 25% respectively) in total European e-commerce revenues (IDC, 2000). Forrester Research projects western European e-commerce will account for 6% of total sales by 2004. Expectations for the Netherlands are very high, namely 10% of total sales.

### Figure 7: Comparative estimates: Western European total e-commerce revenue in 1999, 2000 and 2003 (in billion $)

<table>
<thead>
<tr>
<th>Source: eMarketer 2000</th>
</tr>
</thead>
<tbody>
<tr>
<td>e-Marketer</td>
</tr>
<tr>
<td>Wallburg Dillon Read</td>
</tr>
<tr>
<td>Andersen Consulting</td>
</tr>
<tr>
<td>IDC</td>
</tr>
<tr>
<td>Forrester</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>1999</th>
<th>2000</th>
<th>2003</th>
</tr>
</thead>
<tbody>
<tr>
<td>All</td>
<td>16.8</td>
<td>33.6</td>
<td>420.3</td>
</tr>
<tr>
<td>NL</td>
<td>18.9</td>
<td>49.3</td>
<td>430</td>
</tr>
<tr>
<td>UK</td>
<td>19</td>
<td>36</td>
<td>430</td>
</tr>
<tr>
<td>DE</td>
<td>18.9</td>
<td>49.3</td>
<td>430</td>
</tr>
<tr>
<td>IT</td>
<td>19</td>
<td>36</td>
<td>430</td>
</tr>
<tr>
<td>FR</td>
<td>24.4</td>
<td>69.5</td>
<td>511.1</td>
</tr>
<tr>
<td>IT</td>
<td>36</td>
<td>87.4</td>
<td>853.3</td>
</tr>
</tbody>
</table>

### Figure 8: Projected Western-European e-commerce as a % of total sales, 2004

The above figures give an indication of total e-commerce revenues. As the amount and structure of the e-market differs considerably between the B2B and the B2C segment, we will focus in the following subsections on these segments separately. In the figure below can be seen that estimates are that most of the e-commerce revenues are generated in the B2B segment.

Source: Forrester research, 2000

<table>
<thead>
<tr>
<th>Region</th>
<th>2004 Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>All</td>
<td>6.0%</td>
</tr>
<tr>
<td>Netherlands</td>
<td>9.2%</td>
</tr>
<tr>
<td>UK</td>
<td>7.1%</td>
</tr>
<tr>
<td>Germany</td>
<td>6.5%</td>
</tr>
<tr>
<td>France</td>
<td>5.0%</td>
</tr>
<tr>
<td>Italy</td>
<td>4.3%</td>
</tr>
<tr>
<td>All other</td>
<td>6.0%</td>
</tr>
</tbody>
</table>
B2B revenues
As in the US and the rest of the world, the majority of e-commerce in Europe is in the B2B sector. Over time, similar what is happening in the US, it is expected that the B2B share will increase further from 77% in 1998 to 85% of total e-commerce in 2003 (Emarketer, 2000).

According to Gartner Group, B2B e-commerce in Europe is 12 to 18 months behind the US. Although several impediments to growth, Gartner Group points out that the strongest regional growth in B2B e-commerce market is in Europe and forecast a growth of 7200%. Underlying assumption for the prospective estimates is a major shift from EDI to Internet, as well as pressure on small and medium enterprises to buy and sell through the web.

B2C revenues
According to eMarketer, consumer e-commerce revenues in Europe nearly tripled in 1999 to $3.5 billion from $1.2 billion in 1998. They climbed to nearly $6.4 billion in by the end of 2000 and will climb to $63 billion by 2003. Forrester even shows a higher estimate: $74.8 billion in 2003. Like B2B, B2C e-commerce lags behind the US, by 1.5 to 2 years. According to the Boston Consulting group, online retailing accounts for only 0.2% of total European retail market, while 1.2% of retailing in the US takes place on Internet.
In the online retail revenues especially Germany and the UK have a relative high share (32.2% and 27.9% respectively). The table below gives an indication of the absolute B2C sales per country and per capita. In total sales the UK, followed by Germany and France show the highest sales. Per capita Finland and Denmark spent the most. As can be seen from the table, total spending in 1999 already amounted to $15 billion. This is rather high in comparison with the estimates for 2000 as given in the figure above.

Table 2: Online B2C sales per country, 1999

<table>
<thead>
<tr>
<th>Country</th>
<th>Euros (in millions)</th>
<th>Euro (per capita)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Denmark</td>
<td>700 ($665$)</td>
<td>160 ($152)</td>
</tr>
<tr>
<td>Finland</td>
<td>800 ($760$)</td>
<td>200 ($190)</td>
</tr>
<tr>
<td>France</td>
<td>3,400 ($3,230)</td>
<td>80 ($76)</td>
</tr>
<tr>
<td>Germany</td>
<td>3,600 ($3,420)</td>
<td>50 ($48)</td>
</tr>
<tr>
<td>Ireland</td>
<td>100 ($95)</td>
<td>40 ($38)</td>
</tr>
<tr>
<td>Italy</td>
<td>1,100 ($1,045)</td>
<td>20 ($19)</td>
</tr>
<tr>
<td>Spain</td>
<td>400 ($380)</td>
<td>10 ($10)</td>
</tr>
<tr>
<td>Sweden</td>
<td>700 ($665)</td>
<td>100 ($95)</td>
</tr>
<tr>
<td>UK</td>
<td>5,300 ($5,035)</td>
<td>110 ($105)</td>
</tr>
<tr>
<td>Total</td>
<td>16,100 ($15,295)</td>
<td>60 ($57)</td>
</tr>
</tbody>
</table>

Source: Empirica, 1999

1.3.3 E-commerce related to trade

When the e-commerce revenues (B2C and B2B) are related to European trade (intra EU trade and trade with the rest of the world) it becomes clear that the percentage of e-commerce in trade was in 1999 a negligible share of total sale (see Table 3). Colin (2001) concludes the same for world e-commerce as a percentage of world trade. Although numbers vary by a factor 1 to 4 (according the scope of the definition of e-commerce), a small volume that varies by this factor does not amount to total trade very much in quantitative terms, as can be seen from the table below.

Le journal du Net (in Collins, 2001) gives estimates for the share of electronic commerce in world sales in 2004. Behind the Rest of the World and South America with shares of 2.4% each, Europe comes in sight with an expectation of 6% of world sales in 2004. North America and Asian Pacific show the highest shares with of 12.8% respectively 8%.
Although the above numbers give estimates about the share of e-commerce in trade a more detailed analysis is needed to make forecasts. Because the market sectors B2B and B2C differ so much we will make a separate analysis in the next paragraphs.

Table 3: E-commerce and external trade per country, 1999

<table>
<thead>
<tr>
<th>Country</th>
<th>E-commerce revenues (billion Euro)</th>
<th>Total trade (billion Euro)</th>
<th>Percentage of e-commerce in trade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belgium</td>
<td>0.19</td>
<td>382.0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Denmark</td>
<td>0.35</td>
<td>103.7</td>
<td>0.3%</td>
</tr>
<tr>
<td>Germany</td>
<td>3.94</td>
<td>1139.3</td>
<td>0.3%</td>
</tr>
<tr>
<td>Greece</td>
<td>0.05</td>
<td>41.9</td>
<td>0.1%</td>
</tr>
<tr>
<td>Spain</td>
<td>0.53</td>
<td>275.2</td>
<td>0.2%</td>
</tr>
<tr>
<td>France</td>
<td>1.50</td>
<td>712.6</td>
<td>0.2%</td>
</tr>
<tr>
<td>Ireland</td>
<td>0.09</td>
<td>137.7</td>
<td>0.1%</td>
</tr>
<tr>
<td>Italy</td>
<td>0.61</td>
<td>513.2</td>
<td>0.1%</td>
</tr>
<tr>
<td>Luxembourg</td>
<td>0.01</td>
<td>21.2</td>
<td>0.0%</td>
</tr>
<tr>
<td>The Netherlands</td>
<td>1.13</td>
<td>478.5</td>
<td>0.2%</td>
</tr>
<tr>
<td>Austria</td>
<td>0.16</td>
<td>150.0</td>
<td>0.1%</td>
</tr>
<tr>
<td>Portugal</td>
<td>0.06</td>
<td>66.6</td>
<td>0.1%</td>
</tr>
<tr>
<td>Finland</td>
<td>0.82</td>
<td>86.9</td>
<td>0.9%</td>
</tr>
<tr>
<td>Sweden</td>
<td>0.94</td>
<td>173.3</td>
<td>0.5%</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>3.34</td>
<td>671.9</td>
<td>0.5%</td>
</tr>
<tr>
<td>EU 15</td>
<td>13.71</td>
<td>4954.0</td>
<td>0.3%</td>
</tr>
</tbody>
</table>

Source: Eurostat, eMarketer

**B2B**

The B2B e-commerce market contains all the electronic transaction between and within sourcing, production and distribution. Two exemplary cases are (1) that the wholesaler makes transactions with retailers and (2) that companies producing semi-finished goods make transactions with companies that produce the consumer products. These electronic transactions can be between countries or inside countries. To make an estimate about B2B e-commerce as a percentage of total trade one needs first an indication of the total B2B market (electronic plus non-electronic). The main indicators are:

- Total B2B trade in value and growth rates
  - Domestic trade between companies
  - Foreign trade between companies
- E-commerce trade in value and growth rates
  - Domestic e-commerce trade between companies
  - Foreign e-commerce trade between companies

As the e-commerce data is formulated as e-commerce revenues per region (i.e. country, Western Europe, Europe), only export has to be taken into account, since revenues of import are counted by the e-commerce regions of the destination region. Table 4 depicts the estimated growth of B2B e-commerce trade. One can notice that the growth roughly doubles each year.
Table 4: Estimated growth of B2B e-commerce trade 2001 - 2005

<table>
<thead>
<tr>
<th>Western Europe B2B projections (billions euro)</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private trading networks</td>
<td>50</td>
<td>130</td>
<td>334</td>
<td>752</td>
<td>1476</td>
</tr>
<tr>
<td>Storefronts</td>
<td>109</td>
<td>235</td>
<td>402</td>
<td>583</td>
<td>738</td>
</tr>
<tr>
<td>Net Markets</td>
<td>46</td>
<td>135</td>
<td>289</td>
<td>471</td>
<td>702</td>
</tr>
<tr>
<td>total</td>
<td>205</td>
<td>500</td>
<td>1025</td>
<td>1806</td>
<td>2916</td>
</tr>
</tbody>
</table>

Source: Jupiter MMXI: Online trade, quantifying the benefits

Assumptions for this estimate:
1 euro = 0.96 dollar
Western Europe includes Austria, Belgium, Finland, France, Germany, Ireland, Italy, Switzerland, UK, Sweden, Norway, Denmark, Luxembourg, the NL, Spain, Portugal and Greece

In Appendix A, an overview of estimates of online business trade for a typical, European company with sales of € 30 Billion is given (as projected by Jupiter MMXI).

**B2C**

The B2C e-commerce market contains all the electronic transaction between consumers and companies. Currently, the main supplier in the B2C segment is the retail sector. However in the near future it is possible that also more producing companies will offer B2C services. This will not be the case in product groups where consumers buy a range of products (e.g.) groceries but can be the case in the more speciality product groups like electronic devices.

The consumer can buy products locally (i.e. in their own country) or from other countries. In the last case it is still possible that the products are already in inventory in the country of the consumer. In other cases the products will be shipped after order to the country of the consumer.

To make an estimate about B2C e-commerce as a percentage of total trade first we need an indication of the total B2C market (electronic plus non-electronic). The main indicators are:
- Total B2C trade in value and growth rates
  - Domestic trade between companies and consumers
  - Foreign trade between companies and consumers
- E-commerce trade in value and growth rates
  - Domestic e-commerce trade between companies and consumers
  - Foreign e-commerce trade between companies and consumers

According to the Boston Consulting Group, on line retailing (B2C) is currently focused on national markets. European-based online retailers generate 93% of their sales from local markets. Only 5% of sales are currently derived from other European countries and 2% from countries outside Europe. European consumers are increasingly buying from local vendors. According to a study by Europay International and Jupiter Communications 5% of European shoppers polled brought from European retail sites in 1997 compared to 15% who bought locally in 1999. This is partly explained by the fact that US retailers introduce local European sites as www.amazon.nl. Of those transactions made in European retail outlets, 80% were made in the customers’ own country. Localised approaches are therefore an important success factor for European online retailers. For B2C commerce as a percentage of trade it is therefore important to relate this for a considerable part to *domestic retail trade*. In the table below, B2C as a percentage of retail sales is given for 1999. An important remark is that the sales represent both products and services, which will have different impact on transport and traffic. This issue will also be addressed in the next chapter.
Table 5: B2C e-commerce sales as a percentage of retail sales

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Western Europe</td>
<td>(Calculated)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Germany</td>
<td>375,000</td>
<td>1125</td>
<td>0.30%</td>
<td>200%</td>
</tr>
<tr>
<td>UK</td>
<td>263,784</td>
<td>976</td>
<td>0.37%</td>
<td>280%</td>
</tr>
<tr>
<td>France</td>
<td>231,429</td>
<td>324</td>
<td>0.14%</td>
<td>215%</td>
</tr>
<tr>
<td>Sweden</td>
<td>32,059</td>
<td>218</td>
<td>0.68%</td>
<td>170%</td>
</tr>
<tr>
<td>Italy</td>
<td>202,222</td>
<td>182</td>
<td>0.09%</td>
<td>145%</td>
</tr>
<tr>
<td>NL</td>
<td>50,294</td>
<td>171</td>
<td>0.34%</td>
<td>210%</td>
</tr>
<tr>
<td>Switzerland</td>
<td>41,034</td>
<td>119</td>
<td>0.29%</td>
<td>110%</td>
</tr>
<tr>
<td>Austria</td>
<td>39,130</td>
<td>90</td>
<td>0.23%</td>
<td>210%</td>
</tr>
<tr>
<td>Belgium</td>
<td>48,125</td>
<td>77</td>
<td>0.16%</td>
<td>420%</td>
</tr>
<tr>
<td>Spain/Portugal</td>
<td>110,000</td>
<td>66</td>
<td>0.06%</td>
<td>185%</td>
</tr>
<tr>
<td>Norway</td>
<td>21,923</td>
<td>57</td>
<td>0.26%</td>
<td>200%</td>
</tr>
<tr>
<td>Finland</td>
<td>21,818</td>
<td>48</td>
<td>0.22%</td>
<td>160%</td>
</tr>
<tr>
<td>Denmark</td>
<td>21,500</td>
<td>43</td>
<td>0.20%</td>
<td>220%</td>
</tr>
<tr>
<td>Totaal B2C</td>
<td>1,456,667</td>
<td>3496</td>
<td>0.24%</td>
<td>200%</td>
</tr>
<tr>
<td>Average growth</td>
<td></td>
<td></td>
<td></td>
<td>9439</td>
</tr>
</tbody>
</table>

Note: excluding automotive and collectibles/auction categories
Source: Adapted from Boston Consulting group

One can conclude that e-commerce grows very fast. Electronic transactions double each year. If the expansion in e-commerce continues at this rapid pace, as is expected, then e-commerce transactions between B2B and between B2C will account for about 5% of inter-company transactions and retail sales respectively (Coppel, 2000).

1.3.4 Dematerialisation

E-commerce makes dematerialisation of products possible, on both B2C and B2B level. B2C e-commerce can also lead to a decrease in trade and transport volume because products can be downloaded from the Internet (sometimes free of charge). Music can be listened via the Internet and books can be read on the Internet. However, many people still prefer to make it a ‘physical’ product by copying it onto empty compact discs or paper.

Dematerialisation leads to changes in distribution. The direct delivery of CDs, tapes, videos and software is transformed into distribution via the Internet. It is predicted that ‘entertainment’ products will increasingly be downloaded through the Internet rather than physically transported. It has been forecast that by 2004, 8% of all recorded music sales will be downloaded via the Internet and that by 2010 this proportion will have risen to 20% (MTI, 1999, quoted in the Financial Times 16/5/99). Paper-based media will be subject to a similar trend, though its net effect on freight traffic volumes is likely to less pronounced and it will be partly offset by a growth in paper sales for home printing.

However, the sales in music still show an increase. The statistics shown in Figure 12 are for the United States. Although sales in units increase just a little in 2000 (0,4%) the net value still increases with 3,1%. One cannot speak of a declining music industry due to the Internet.

The International Federation of the Phonographic Industry (IFPI) \(^3\) states that the value grew with 4% in the UK, the third largest market in the world. Austria, Denmark, Ireland, Portugal

\(^3\) http://www.ifpi.org/site-content/publications/rin_order.html
e-commerce

and Spain also showed a growth in sales. IFPI claim that Germany, France, Italy and Belgium felt the effects of CD burning, but numbers are not available.

![Figure 12: Music sales in units in the United States (http://www.riaa.com/)](http://www.riaa.com/)

As such, the effect of dematerialisation on music is minimal so far. The popularity of Napster and the fact that several new music sites, like Kazaa and Gnutella, have emerged after the lawsuit against Napster indicate that new developments are to be expected in the music industry. The debate on copyrights will take a long time and until then, the effect of dematerialisation is difficult to predict.

E-commerce can also affect transport on B2B level. Nowadays, for example, businesses use electronic mail (e-mail) and videoconference to communicate with each other. Especially the usage of attachments on e-mails can avert physical mail deliveries.

At a macro-level we see an ongoing shift in demand from goods towards services. At a micro-level we see a replacement of the form of the product. This traditionally started with computer software, but new forms find their way very quickly, such as business reports, books and brochures. Electronic document delivery is impacting the growth of express and courier markets (Key Note 2000). However, the low weight and volume of the products replaced may mean that the logistics impact is relatively insignificant.

*In conclusion, the little dematerialisation so far and the low volume of products and services indicate that the effects on transport are expected to be insignificant.*
2 THE IMPACT OF E-COMMERCE ON TRANSPORT

2.1 The relations between e-commerce and transport

This chapter discusses the impact of e-commerce on transport. As depicted in Figure 4, e-commerce influences the logistical structures, the spatial behaviour and the transport and traffic effects. The next section describes the influences of e-commerce on the logistical structures and spatial behaviour. This is described for both business to consumer and business to business-relations.

The third section of this chapter discusses the effects of e-commerce on traffic and transport.

2.2 Effects on logistics structures and spatial behaviour

The logistical configuration is a model that shows the structure of the physical goods flow. The main elements are the primary processes from producers to consumers, the location of inventory and the flows of goods between processes and inventory points (Van Goor et al, 1999). This means that the logistical structure is also influenced by spatial behaviour.

The primary processes from producers to consumers are in this case the location of producers and consumers, determined by spatial behaviour. Furthermore, spatial behaviour is also important in locations of inventory. Together, locations of producers, points of inventory and the location of consumers make up the logistical structure. The flows of goods are discussed in the next section.

The logistical structure is the network used for delivering goods. The question is: ‘Does e-commerce influence spatial behaviour and delivery networks and if so, how?’

2.2.1 Spatial behaviour and delivery networks in B2C- relations: the last mile

The delivery strategy that e-commerce companies choose for B2C goods determine the (change in) delivery networks. Different companies can choose different solutions, but they all have a common problem: the last mile of delivering goods to consumers (Smidts and Maltha, 2001), this is illustrated in Figure 13.

![Figure 13: Spatial behaviour and logistical structures in Business-to-Consumer e-commerce](image-url)
Many see passing the ‘last-mile barrier’ as a strategic opportunity for e-commerce companies to enhance the added value. However, companies need to cope with at least the following issues (Laseter et al., 2000):

− limited online sales potential,
− high cost of delivery,
− a selection-variety trade off and existing,
− entrenched competition

First, the sales are spread across lots of ‘last miles’. Even in the case of the most positive prediction of future online sales, that much home delivery volume will not provide enough sales density to alter fundamental delivery economics. This is called limited online sales potential. It is illustrated by the results on the currently small share of e-commerce in trade (see Table 5).

A second challenge is the high cost of delivery (Laseter et al., 2000). The consumer today pays the cost of the home delivery, consisting of time and delivery costs (Yrjölä, 2001). In electronic grocery shopping (EGS), the grocery chain will pay for the costs of the ‘last mile’ and then charge it to the consumer as a service charge or as a part of the price of the products. So these delivery costs are made more explicit. It will, however be very difficult to get the consumer to realise that driving to the supermarket actually costs something and to make a true comparison between the two value offerings (Yrjölä, 2001). Various solutions in overcoming the last mile work only on a small scale and large-scale initiatives have not been successful so far. The impact of the delivery cost depends on the value of the package being delivered. The two product categories covered by e-commerce cause individual orders to have low values. This means that more orders cause more delivery costs.

Third, e-commerce involves a new trade-off between speed and variety. Instant gratification goes at the expense of limitless offerings. To achieve fast response, products must be held locally rather than in large national distribution centres, as category killers and large catalogue retailers do. Thus, variety is lost. Only high volume products are worth the trouble of stock keeping, but they provide the least profit per unit because of heavy price competition.

The fourth issue mentioned by Laseter et al. is entrenched competition. This indicates the presence of postal services, logistics service providers like UPS or DHL, or bricks & mortar retailers (see below). Note that this argument is only true for e-tailers that deliver themselves, there are various examples of e-commerce initiatives collaborating with postal services or bricks & mortar companies that become clicks & mortar.

The above mentioned issues mean that large scale B2C e-commerce is not yet here and will not be here for a while, thus little change in spatial behaviour or delivery networks is expected. Initial research shows that EGS can reduce city traffic with private cars and have favourable environmental impact (Yrjölä, 2001). However, other evidence does not support this yet.
If an organisation does decide to use e-commerce, there are a couple of factors that determine the strategy for delivery and spatial behaviour: the store type, the product type and the customer type (Smidts and Maltha, 2001).

Three types of stores can be distinguished,
- ‘clicks-only’: only sell through the internet,
- ‘bricks & mortar’: only sell in physical outlets.
- ‘clicks & mortar’: sell on the internet as well as in regular stores

The type of product, determined by its characteristics (for example expiration of products, large volume or valuable goods) is very important in choosing a delivery-strategy. Most of the e-tailers tend to focus on a mix of two product categories, immediate gratification/impulse items, such as videos, music, books and magazines, and routine necessities, like grocery and household items (Laseter et al, 2000). The main characteristic is that the products have a known and steady perceived value. Currently, the consequence is low volumes and low value of the products bought. The type of product also determines if it is necessary to be (physically) close to the consumer.

The type of clients determines the delivery demands: the elderly woman who cannot walk very well may values home delivery, while the busy business man who is not often at home values reliability of delivery.

Despite the difficulties in solving the last mile-problem, there are many initiatives. Most of them on a small scale, some larger. Figure 13 shows the connection between the last mile solutions, criteria for the success of solutions, spatial behaviour and the logistical structures. The last mile can be accomplished in several ways (Smidts and Maltha, 2001):
- Using existing stores
- New points of delivery
- Newly build facilities
- Home delivery

The first two options are two groups of collection points (DTZ Research, 2001). DTZ Research has set a number of criteria to evaluate each choice for a collection point. The criteria are summarised in Table 6.

Table 6: Criteria for evaluating collection points.

<table>
<thead>
<tr>
<th>Access/trip generation</th>
<th>Market structure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Convenience</td>
<td>Value added</td>
</tr>
<tr>
<td>Geographic coverage</td>
<td>Planning/traffic</td>
</tr>
<tr>
<td>Opening hours</td>
<td>Returns</td>
</tr>
<tr>
<td>Management expertise</td>
<td>Mindset</td>
</tr>
<tr>
<td>Capacity</td>
<td>Branding</td>
</tr>
</tbody>
</table>

These criteria can be used in evaluating the likelihood of a certain solution to be widely used. The more likely a solution is, the more the influence on spatial behaviour and delivery networks should be taken into account. A description of the criteria is given in Annex B.
Example of solving the last mile-problem through existing facilities

There are a number of possibilities for using existing facilities, as shown in Table 7. Each option is evaluated, resulting in a score which is 12 at most.

Table 7: Existing facilities and their score on the evaluation criteria (DTZ Research, 2001)

<table>
<thead>
<tr>
<th>Facility</th>
<th>Score</th>
<th>Facility</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Existing retail outlets</td>
<td>0</td>
<td>Convenience/Co-ops</td>
<td>10</td>
</tr>
<tr>
<td>Food superstores</td>
<td>10</td>
<td>Shopping centres</td>
<td>7</td>
</tr>
<tr>
<td>CTNs^4</td>
<td>9</td>
<td>Retail parks</td>
<td>4</td>
</tr>
<tr>
<td>Petrol Filling Stations</td>
<td>6</td>
<td>Public transport nodes</td>
<td>9</td>
</tr>
<tr>
<td>Post/sorting offices</td>
<td>5</td>
<td>Schools/Higher Education</td>
<td>2</td>
</tr>
</tbody>
</table>

Bruna

Bruna is a bookstore with 500 stores in the Netherlands (Smidts, Maltha, 2001). In the table, this is an example of using a shopping centre as a collection point, which scores 7 out of 12.

Customers can order books on the internet and choose to come and get it at one of the stores or have it delivered. No costs are charged when picking up the books in the store and the consumer can choose which store to go to. As soon as a consumer orders on the internet, the chosen store receives a fax with the necessary data. The products are set aside or ordered at the supplier. The order is ready at the store in 5 days on average. With foreign titles, it can become several weeks.

The order can also be delivered by PTT Post, the national postal service, at work or at home. In case the consumer is not at home, the package is delivered at the closest post office. Books are delivered two days after payment. Per order fl 3,50 (1.59 Euro) is charged for delivery costs.

When using an extra distribution channel, the store, the benefits are not very clear. Consumers even have to wait longer for their order. An advantage is that no delivery costs are charged and cash payment is also possible. But what is the benefit in comparison to going to the store and getting your books right away instead of waiting for 5 days? The advantage for Bruna is the return-channel of wrong or broken products. A consumer can go back to the store and receive cash. For Bruna, little organisational adjustment is needed because the stores are already used to handle return flows and the distribution system is designed for it.

This solution presented in this example is not expected to be widely used (evaluation score is 7). But it does illustrate that using existing stores do not influence spatial behaviour. Furthermore, delivery networks are not changed. The consumer is still driving to the store or the postal service takes a package to the consumer, this means the existing network is used. Traffic is the same or a little more, because of the postal service driving where they otherwise would not.

Example of solving the last mile-problem through new points of delivery

Texaco, UPS, e-tailers

Petrol filling stations are high traffic point (Smidts and Maltha, 2001). A petrol filling station is an existing facility, but at the same time a new point of delivery. Petrol filling stations score 6 out of 12.

Every day 500 to 1000 people stop at an average filling station to get petrol, wash the car and buy some cigarettes. For the future a growth in such services is expected, even up to 70% of profits, because the margins on petrol are decreasing. Texaco came up with the idea to use these high traffic points as pick up/drop off points. They think this is especially useful for

^4 CTN= Confectioners, Tobacconists and Newsagents
products that are too large for the mailbox. The consumers targeted are higher educated people between 18 and 45. They are online most and often drive a car.

A consumer places an order on a website of an e-tailer. For delivery, home delivery or pickup at a filling station is chosen. UPS picks up the package at the e-tailer and takes it to the filling station. As soon as the package arrives there the consumer receives an email or SMS. The consumer then picks it up at the Texaco’s. Texaco keeps the products stored for 14 days and if they are not collected, UPS takes them back to the e-tailer. The e-tailer pays UPS for logistical services and UPS pays Texaco for delivery.

The advantage for Texaco is that more people come to them and while they are there might buy ice cream and fill the tank. UPS saves on costs, instead of delivering 10 packages to 10 different addresses, they can all be dropped at the same address. Furthermore, major savings are achieved in return-flows. By organising a network of drop-off points, consumers can leave their return-goods at filling stations, UPS was driving by anyway. The main benefit for consumers is that they do not have to stay home for receiving their order.

*The structure of delivery networks is changed by this initiative. Instead of going to the store, consumers have the products delivered at home or they drive to Texaco. This means a new node is created in the delivery network. The spatial behaviour is not changed, because the Texaco stations are existing.*

*Traffic might be less, because consumers have to get petrol anyway and UPS can deliver more packages to one address instead of all consumers driving to the store.*

*Example of solving the last mile-problem through newly build facilities*

There are a number of possibilities for using new build facilities, as shown in Table 8. Each option is evaluated, resulting in a score which is 12 at most. The details of the evaluation can be viewed in Appendix 1.

Table 8: Newly build collection points and their score (DTZ Research, 2001)

<table>
<thead>
<tr>
<th>Facility</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dedicated collection points</td>
<td>11</td>
</tr>
<tr>
<td>Shared warehouses</td>
<td>8</td>
</tr>
<tr>
<td>Park &amp; Ride</td>
<td>8</td>
</tr>
<tr>
<td>Major employment sites</td>
<td>9</td>
</tr>
</tbody>
</table>

*Albert*

*Albert* is a co-operation in the Netherlands of five companies of Royal Ahold: Albert Heijn (supermarket), Etos (drug stores), Gall&Gall, (liquor store), De Tuinen (natural care and wellbeing) and Deli XLShop (wholesale business for consumers and small and medium enterprises). This service is started instead of the existing AH Thuisservice, supermarket home delivery and Gall-webwinkel, home delivery of liquor. The reason is the multi-channel-thinking and offering the consumer a unique selection of products. Especially for this service, three new distribution centres have been built. They are divided over the area covered by the service, which is approximately 50% of the Netherlands.

Consumers can order products from all five companies in one system. The products are delivered through the common system of home delivery 6 days a week within 24 hours and the consumer only has to pay once.

*Spatial behaviour is very important in case of new build collection points. In this case three locations near the consumers were chosen. The motivation is not clearly stated, but the speed of delivery and the perishable products are obvious reasons.*

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5 www.albert.nl; www.ahold.nl
The delivery network was changed due to adding inventory points. By this, traffic will probably increase.

Example of solving the last mile-problem through home delivery
Home delivery is a third way in filling in the last mile. There are many solutions, like pizza couriers, mini-vans and parcel delivery companies. One of the few that is successful is Tesco.

Tesco
Tesco, a chain of groceries home-based in the UK, is the only successful e-tailer in home delivery. Tesco.com is an Internet version of the local Tesco supermarket, only much bigger. Because they are on the Internet, more choice and more products can be offered than could fit in a supermarket. Also Clubcard points can still be earned with every purchase. There are 7 major stores within Tesco.com, grocery, books, entertainment, baby & toddler, home & living, electricals and clothing. At the moment groceries can only be delivered to the address registered, but they can send goods bought from all of the other online stores to almost any home within the UK (e.g. to send a book or CD as a gift). Consumers can cancel or change any of their current orders online up until 4pm on the day before delivery, Monday to Saturday. Products are delivered from local supermarkets or Tesco warehouses. Delivery costs are set different for every store, groceries are £5 (8.05 Euro), books £2.25 plus 50p per item (3.60 Euro and 0.80 Euro). For returning goods, a service number has to be called. The advantages for consumers are easy ordering, still earning Clubcard points and of course home delivery. Disadvantage is that the delivery address can only be specified once and someone has to be home for reception of the package. It is not clear if Tesco consolidates packages from different stores nor what happens if the consumer is not at home. Tesco delivers an extra service and meanwhile does not have to change the organisation. Policies for stock keeping and delivery of supermarkets and warehouses can remain the same. When returning an article, the closest store can be looked up. The downside is that Tesco has to overcome the last mile and thus attract personal and buy mini-vans or contract logistical service providers for example. It is not clear if the service charges cover the costs of delivery.

Delivery networks are not changed by home delivery. If the consumers substitute the online grocery store for their usual shopping, vehicle movements hardly change either. If consumers go shopping anyhow, online shopping generates more traffic.

Conclusions
The cases show that several options for filling in the last mile have different strengths and weaknesses. The technology for implementing e-commerce is readily available, but the problems with delivery are such that B2C e-commerce nevertheless does not have a glorious future yet. In the near future, different tailor-made and small-scale solutions will emerge. The successful ones will try to grow into large-scale operations. Delivery networks therefore will barely be influenced. Traffic movements will most likely increase, because more traffic will be generated in delivering the online ordered goods, especially mini-vans for delivering small volumes quickly in urban areas.

2.2.2 Delivery networks in Business-to-Business relations
Business-to-business e-commerce exists in different varieties. The most common initiative is an e-marketplace, where two parties get together to arrange their transactions. By bringing buyers and sellers together electronically, these new e-commerce marketplaces hope to dramatically reduce supply chain costs. An e-marketplace is built for back-haulage, listing

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6 www.tesco.com
available truckloads into, out of and across. The marketplace intends to reduce the empty runs and low capacity runs for vehicles. There are three kinds of e-marketplaces, neutral vertical marketplaces, buyer or seller consortia and transportation hubs (Business Week, 2001). An important distinction is open or closed marketplaces. Open marketplaces are public and accessible for all. Closed marketplaces are for example open for a producer and a determined set of carriers.

Business-to-business fulfilment can be more difficult than business-to-consumer e-commerce. The reason is that B2B has more dimensions of complexity, such as shipment size, variety of shipment frequencies, multiple distribution channels, uneven breadth of carrier services, less mature carrier e-commerce offerings and more e-commerce transaction places.

Wiley, of Agribuys.com, suggests that electronic transportation exchanges can help some of the empty back hauls while they simultaneously provide faster service for the needs of expedited shipments (Business Week, 2001). Cranfield University’s Mike Clarke says online freight exchanges can bring economies of scale, cut down administration and improve efficiency by using up spare capacity of distribution firms, whether this is in vehicles or warehouses (Nash, 2001). However, clear evidence is lacking.

The most fundamental change is that logistics operators are used to working with particular companies in long-term contracts. But now those relationships are becoming distanced and contract are dealt with through trading platforms. This change probably will not happen completely for another 5 or 10 years, as distribution firms are currently locked into contracts.

Watkins from Frigoscandia on the other hand thinks that freight exchanges have a role to play, but time will tell to what degree they can actually help the logistics industry (Nash, 2001). Many distribution companies of all shapes and sizes believe they would use a return loads or a tender service over the web as long as the process was secure and rates were not driven down.

**Toshiba Information Systems**

Toshiba, a world leader in high technology, is an integrated manufacturer of electrical and electronic products. TUI-Consumer Product Division is a wholly owned subsidiary operating in the UK which specialises in the manufacture and supply of such products to multiple, mail order and independent resellers. The infrastructure consists of an NDC in the North of England and a satellite operation attached to the Head Office in Camberley, Surrey.

The requirement was to establish a cost effective transport procurement solution that delivered the capability of handling the seasonal peak between October–January. The then used concept was making several telephone calls to local hauliers using their predefined rate schedules.

The solution, provided by eLogistics, was a sophisticated system that was easy to operate, utilising Internet Explorer as the gateway to the platform. The carrier lists, customer delivery points and specific requirements are set up as templates. Jobs are then posted on the platform. The initial bid is held pending further quotes from alternative carriers until the deadline is due to expire, allowing the opportunity of a more competitive price for the job to be made. As a pilot, this system was installed at 6 carriers.

By allowing all the jobs posted on the platform to be visible to the defined carrier-base simultaneously, work was consistently awarded to carriers operating out of their traditional

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7 www.eurohaul.net
8 www.elogistics.com (Case study Toshiba Information Systems, white paper)
areas by taking the advantage of back load situations at a lower rate. Trading on the platform has allowed Toshiba to select the most competitive price for a job without losing the quality of carrier fulfilment. On average, they have seen a drop in their transport costs of 5% and in some cases as much as 25%. The carriers that adopted the solution have benefited by getting more work.

There are many platforms for B2B carriers. This case shows that such a platform can have very positive results. Companies can achieve lower transport costs, which contributes to becoming more competitive. Furthermore, carriers can obtain more back loads and in that way also serve more clients. But they do have to accept lower rates, so the end-result for carriers is still insecure.

*Spatial behaviour is not relevant in this case and the delivery network was not changed. The only effect might be that there is less traffic because of vehicle efficiency.*

**Conclusions**

Currently, the business to business e-commerce market is bigger than the business to consumer market, and it is expected to be even more so in the future. The benefits of e-commerce, better communication, improved tracking, shared information to improve freight efficiency, are already starting to emerge.

But it seems from the scarce evidence that B2B e-commerce is a substitute and improvement for phone and fax, and/or it is complementary to phone and fax, rather than that it is generating more business and thus more transport or changing the infrastructure. This is illustrated in Figure 14.

**2.3 Possible impacts: Traffic and transport effects**

In this section we discuss the impact of e-commerce on goods flows in tons, goods flows in distance, modal split and traffic flows. Again, where possible, the impact is illustrated with quantitative material

**2.3.1 Goods flows in tons**

The figure below depicts the e-commerce related influencing factors on the subject of goods flows (in tons) and their relations.
E-commerce related influences

E-commerce affects the goods flows in tons in the following way. For B2B, the Internet has made possible that letters, reports, memos and other business correspondence can be formatted and sent in a digital way. Although the mail is collected anyway and the product replaced may have a low weight, the dematerialisation of correspondence can diminish the goods flows in tons.

The B2C digital purchase of digital products can diminish the goods flow. Software, music, movies, books can be downloaded instead of sent and received in a physical way. However, the moment that a customer puts the digital data on a physical record, blank CD-ROMs, paper etc. must be bought, which results in other good flows in the whole supply chain. Thus, dematerialisation can therefore initiate several substitution effects.

Increased information about goods availability, and, potentially, lower transport costs from an electronically optimised logistics chain, could also stimulate higher consumption, with a consequent increase in the total volume transported. A recent McKinsey study (Calkins, 2000) presents the case of a UK retailer selling both on-line and from shops that found out that customers using both media increased their total purchases by 10% compared to those not using the Internet. It also noted that the best e-tailers are achieving average purchases up to 20% greater than comparable ‘bricks and mortar’ competitors. However, it is uncertain whether this represents a shifting, or net increase, in consumption. McKinsey attributes the findings to a greater percentage of premium products, the bundling of products and services and easier cross-selling in e-retailing.

The explication and invoicing of the delivery costs can cut down digital purchases in the B2C market. When customers buy goods in normal shopping centres, they pay their own transport in an indirect manner. But when goods are digitally purchased and delivered to the home, the customer is faced with the delivery costs. The customer may decide to either not buy it (with no resulting goods flow) or to buy it in a normal shop after all (resulting in that the goods are transported by the customer).

No real quantitative evidence is found for the support of the impact of e-commerce on goods flows in tons. Most reasoning is based on case-material and circumstantial evidence.

Other influencing factors

Although e-commerce will have an impact on the goods flows, there are many other factors that can have an influence on the goods flows in tons. Regarding the trends identified in chapter 2, the following factors have an influence:

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9 Which is not accounted for in freight transport, but ‘ordinary’ traffic.
E-commerce

- Economic factors:
  - Growth of GDP, freight in tons increase
  - Growth of disposable income, freight in tons could increase
  - Explication of environmental costs, freight in tons could decrease (or a modal shift takes place)
  - Explication of congestion costs, freight tons could decrease (or a modal shift takes place)
  - Changing over to the Euro, freight tons could increase
- Spatial factors:
  - Congestion, freight tons could decrease
  - EU enlargement, freight tons could increase
- Demographic factors:
  - Population growth, freight tons could increase

Future goods flows
According to the ECMT (2001), the tonnage carried increases by 76 per cent over the period 1995-2020, i.e. by less than the increase in economic activity in Europe, which is 85 per cent on average, giving an elasticity of less than one. Broken down to a more detailed level, the tonnage numbers for intra-regional traffic account for a substantial proportion of total tonnage:

of a total of 11 billion tonnes of European trade,
- intra-regional trade accounts for 5 billion tonnes,
- inter-regional trade within the EU for 3 billion tonnes,
- trade between EU Member States for 1 billion tonnes,
- and extra-Community trade – much of it in commodities, including oil – for 2 billion tonnes.

The overall trend is therefore composed of intra-regional, inter-regional and international traffic flows. This shows large variation in growth from 1995-2020:
- intra-regional traffic increases by less than 50 per cent in tonnes over the period (elasticity close to 0.5),
- while inter-regional traffic doubles (elasticity around 1.3)
- as does international traffic, though at an even faster rate with countries of Central Europe (elasticity between 2 and 3).

2.3.2 Goods flows in distance
A possible driver of an increase of goods flows are more geographically extended supply patterns, and a correspondingly higher average length of haul. The Trilateral Logistics Europe project, performed for the European Commission and the OECD, concluded that this would be the likely effect of e-commerce and related developments in B2B relations (Trilog, 1999). E-commerce has also been identified as an important factor in the high rate of growth of airfreight, which is being partially driven by e-commerce (Lobo and Zairi 1999). On the other hand, by providing more information about potential sources of supply the e-economy could make it easier to source requirements locally, so that total tonnes-kilometres are reduced.
The figure below depicts the e-commerce related influencing factors on the subject of goods flows (in distance) and their relations.

Figure 16: E-commerce related influences on goods flows in distance

**E-commerce related influencing factors**

Digital purchase of both physical and dematerialised products and the impact of delivery costs can influence the goods flows. These factors are already discussed in the previous section. Other factors, which relate to e-commerce, influence goods flows (in kms) in the following way.

E-commerce related responsiveness can influence goods flows in distance in three manners. First, companies can choose to bring a dedicated distribution centre into action in the supply chain, as mentioned before in this chapter. Being an extra link in the chain, the total transport distance shall probably increase. Second, e-commerce influences shifts in urbanisation and de-urbanisation. An urbanisation shift could take place, as a result of the settlement of service points near the consumers. De-urbanisation takes place simultaneously, as a consequence of the settlement of back-offices and outlets in sub-urban areas. The influence on transport distances consists therefore of substitution, increasing and decreasing effects. Third, e-commerce influences concentration and de-concentration shifts. Concentration takes also place in non-congested areas, where companies want to profit from economies of scale. Because of the fact that e-commerce has stimulated global sourcing and e-procurement, a sourcing network of companies can get de-concentrated. De-concentration shifts can also be found in congested areas, where service points must be located near the customer.

ICT-tools can make a network to operate in a more efficient way. Routes can be optimised through planning on beforehand and, during a transport process, through Assisted GPS (A-GPS) and communication facilities, with less transport distances as a result.

E-commerce has also made possible the utilisation of market places. Especially the B2B market places enable companies to optimise their transport. For example, shipments can be consolidated and back-haulage can be found via the Internet.

**Figures**

After all these expected patterns in relationships, the major question is whether e-commerce trade leads to changing transport and traffic patterns. The Internet offers the potential to buy and sell products all over the world, which leads to the expectation that average transport
distances will grow. An interesting survey by Pro Active international shows that in the Western European countries on average only 19% of B2B online purchases are made in other countries with Belgium as an exception (see the table below).

Table 9: Percentage of last B2C purchases bought at foreign websites

<table>
<thead>
<tr>
<th>Country</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Europe</td>
<td>19%</td>
</tr>
<tr>
<td>Belgium</td>
<td>59%</td>
</tr>
<tr>
<td>Denmark</td>
<td>22%</td>
</tr>
<tr>
<td>Finland</td>
<td>14%</td>
</tr>
<tr>
<td>France</td>
<td>18%</td>
</tr>
<tr>
<td>Germany</td>
<td>15%</td>
</tr>
<tr>
<td>UK</td>
<td>15%</td>
</tr>
<tr>
<td>Italy</td>
<td>23%</td>
</tr>
<tr>
<td>Poland</td>
<td>15%</td>
</tr>
<tr>
<td>Spain</td>
<td>28%</td>
</tr>
<tr>
<td>Sweden</td>
<td>20%</td>
</tr>
<tr>
<td>Switzerland</td>
<td>42%</td>
</tr>
<tr>
<td>The Netherlands</td>
<td>18%</td>
</tr>
</tbody>
</table>

Source: Pro Active International - the Internet monitor, summary of highlights Q2 2001

As for B2C purchase, Pro Active international also made a survey on the nature of B2B purchases. As can be seen from the table below, in the Western European countries on average only 23% of B2B online purchases are made in other countries, with Belgium as an exception. An important consequence and conclusion is that transport will mainly be of an intra-country (‘local’) nature.

Table 10: Percentage of last B2B purchases bought at foreign websites

<table>
<thead>
<tr>
<th>Country</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Europe</td>
<td>23%</td>
</tr>
<tr>
<td>Belgium</td>
<td>68%</td>
</tr>
<tr>
<td>Denmark</td>
<td>32%</td>
</tr>
<tr>
<td>Finland</td>
<td>19%</td>
</tr>
<tr>
<td>France</td>
<td>17%</td>
</tr>
<tr>
<td>Germany</td>
<td>14%</td>
</tr>
<tr>
<td>UK</td>
<td>25%</td>
</tr>
<tr>
<td>Italy</td>
<td>28%</td>
</tr>
<tr>
<td>Poland</td>
<td>44%</td>
</tr>
<tr>
<td>Spain</td>
<td>41%</td>
</tr>
<tr>
<td>Sweden</td>
<td>23%</td>
</tr>
<tr>
<td>Switzerland</td>
<td>34%</td>
</tr>
<tr>
<td>The Netherlands</td>
<td>29%</td>
</tr>
</tbody>
</table>

Source: Pro Active International - the Internet monitor, summary of highlights Q2 2001

Other influencing factors

Although e-commerce has a certain impact on the goods flows, there are many other factors that can have an influence on the goods flows in tons. Regarding the trends identified in chapter 1, the following factors may have an influence:

- Economic factors:
  - Growth of GDP: distances could become larger
  - Growth of disposable income: distances could become larger
  - Explication of environmental: distances could become shorter
  - Explication of congestion costs: distances could become shorter
− Changing over to the Euro: distances could become larger
− Spatial factors:
  − Congestion: distances could become shorter
  − EU enlargement: distances could become larger
− Technical factors:
  − More adequate infrastructure: distances could become larger

**Future goods flows**

It is difficult to find quantitative data on goods flows on distance, since most statistics are using tonnes-kilometres as measurement unit. The ECMT (2001) states that the average distance travelled is increasing substantially for freight, due to firms’ longer supply and distribution distances. For freight transport, often more than half the rise in tonnes-kilometres can be put down to shipping distances.

Regarding figures in tonnes-kilometres, freight traffic (including road, rail, and waterways) grows almost at the same pace as GDP (EC, 1999). This means that long term income elasticities of freight transport demand are close to one (in line with values for example in some OECD studies). According to Figure 5 and Figure 17, freight transport demand is growing significantly slower than GDP in only two countries: Germany and Ireland.

![Figure 17: EU9 Comparison of trends in total freight transport demand (in tonkm) per country (EC, 1999)](image)

Figure 17: EU9 Comparison of trends in total freight transport demand (in tonkm) per country (EC, 1999)

**2.3.3 Modal-split**

E-commerce usually demands highly flexible supply chains, whereas rail and sea transport are the least flexible modes with high infrastructure costs and a reliance on regular volume shipments. This inherent disadvantage is compounded by the limited application of e-commerce within the rail and maritime sectors. The latter is particularly slow in moving to the electronic documentation, which could reduce costs and wastage and, more importantly, increase speed, reliability and customer confidence in delivery times.

Figure 18 shows the influences that relate to e-commerce, on modal split and their relations.
Figure 18: E-commerce related influences on modal split

**E-commerce related influences**

E-commerce affects the modal split in the following way. E-commerce could reduce demand for goods through dematerialisation. Technology is creating the option of delivering some products such as music, film, software and documents in electronic rather than physical form. When physical goods are purchased via the internet, the goods must be delivered at home or made available at collection points as soon as possible. To do so, service providers use dedicated delivery networks, as discussed section 2.2. The delivery of digital purchased goods can result in delivery costs. As already described, the explication of these costs can decrease the digital purchase. Additionally, delivery costs can relate to the costs per transport mode, if the customer can choose its transport mode associated delivery time.

Besides the delivery costs that are invoiced to the customer, the actual transport costs must be paid. For a company that exploits e-commerce, these costs can be the basis of a selection of transport modes. As result of this selection, a change in the modal split (road, air, sea, rail, and waterways) can result.

For policy-makers, the costs per transport mode are an ideal instrument to influence the modal split. Relative shifts in price of one mode against another, and particularly about the price of rail as opposed to road, can promote favourable transport modes above others. However, such price policies do not relate with e-commerce.

When one breaks down road transport to the different kinds (i.e. capacities) of trucks and vans, e-commerce may also lead to a change in this ‘road split’. When e-commerce affects the distribution by demanding that deliveries take place more frequent, a shift is to be expected from the large trucks to smaller vans. The reason hereof is that a more frequent delivery scheme can decrease the goods flows in tons per delivery, and that these deliveries may fit into a van. And companies shall choose this strategy, since transport costs of vans are lower than the costs of trucks. Besides, vans have various advantages in congested areas, when the economies of scale are just in a minor place.

Another issue is the distinction between transport and traffic. Home delivery is imputed to goods flows and thus to transport. When a customer must collect its order(s) at dedicated collection points however, the customer transports its goods probably by car, bicycle, or on foot. So transportation of goods from collection point to the home is imputed to traffic. Although this could be seen as more a methodological issue, it does has it effects on quantitative analysis and figures.

**Other influencing factors**

Although e-commerce has a certain impact on goods flows, there are many other factors that can have an influence on the modal split. Regarding the trends identified in chapter 1, the following factors may have an influence:

- Economic factors:
  - Explication of environmental costs
  - Explication of congestion costs

- Spatial factors:
  - (De-)urbanisation
  - (De-)concentration

- Technical factors:
  - ICT tools, e.g. in the field of Intelligent Logistics Concepts
  - Infrastructure improvements (per modality)
Future modal split
Trends in transport prices and costs have a major bearing on mobility levels and especially on modal split. Here, the ECMT (2001) stresses a prime concern of most policy-makers involved in long-term development.

![Figure 19: Total modal split of 1999 for EU-15 (tkm in %) (Eurostat, 2001)](image)

According to the ECMT (2001), the modal split (measured in tonnes) is significant for intra-regional road transport for the period 1995-2020, given the short haulage distances: of the order of 95%. The share of intra-regional rail transport is circa 3%. For internal inter-regional trade, the share of road transport increases from 81% to 83%, leaving rail in tonnes falling from 10% to 9%.

In the international transport sector, the modal split is between road and maritime transport, with inland waterway and rail also account for a share. Inland waterway carries a very substantial share of bulk traffic along the main waterways. Road still has a large share, increasing from 43% to 45%, inland waterway’s share would remain constant at 15% as would maritime transport with 24% and rail transport with 7%.

Figure 20 depicts a 2000-2010 forecast for the total modal share of trucks. The particularly low modal share in Finland and the Netherlands can be explained by the importance of respectively coastal shipping and waterway transport.

![Figure 20: EU9 Comparison: Modal share of trucks in freight transport (EC, 1999)](image)

The opportunities which e-commerce creates for improved management and optimisation of logistics may require equivalent integrated organisations. The development of inter-modal transport, for example, may only grow substantially with the development of centralised
trans-modal ‘infomediaries’ who can, inter alia, provide an integrated tracking service over all transport modes.

2.3.4 Traffic flows
Traffic consists of actual means of transport that make use of existing infrastructure. Therefore, a distinction between goods flows and passenger flows can be made, but a traffic analysis must take both flows into account. Figure 21 depicts the factors that influence traffic.

![Figure 21: Factors that influence traffic](image)

In ‘Time to decide’ the European Commission (2001) stresses that economic growth will almost automatically generate greater needs for mobility, with estimated increases in demand of 38% for goods services and 24% for passengers. If nothing is done, heavy goods traffic will increase by 50%.

Most passenger and goods traffic uses road. In 1998, road transport accounted for nearly half of all goods traffic (44%) and more than two-thirds of passenger traffic (79%). Road's share of the goods market has been growing constantly, from 41% in 1990 to 44% in 1998, and, if no action is taken, is expected to reach 47% by 2010 (EC, 2001).

Goods flows
Increased information from electronically integrated supply chains, vehicle tracking and other sources might allow better matching of capacity with loads, and enable a higher degree of reverse logistics. In this case, the traffic becomes more optimised, which could result in a moderation of traffic growth. On the other hand, electronically-enabled production moves to ‘just in time’ production, which could increase the number of partially loaded vehicles on the roads.

Another important variable is load consolidation through sharing of distribution facilities and delivery vehicles. For example, a Swedish study examined all deliveries to 15 shops, restaurants, schools and day nurseries and compared this to an ‘ideal’ pattern involving trip optimisation and shared use of delivery vehicles. They found that the latter could produce a 39% reduction in distance travelled, a 42% reduction in the number of vehicles used and a 58% reduction in the number of journeys (IST 2000).

Passenger flows
In the US home shopping was driven by a number of ‘dot com’ companies who attempted to establish alternative channels to established retailers. However, all of these have either gone out of business or been taken over by existing retailers and the European model of ‘bolt on’ home shopping by existing retailers is now being adopted in the US. This is much cheaper in the short and medium term because it can take advantage of the existing store infrastructure, although as volumes rise there may be a need for more dedicated ‘picking centres’. Some of the centres may be co-located with supermarkets but most are likely to be developed in low-
cost warehousing locations. In some cases, dispersed picking centres may deliver in relatively large vehicles to local ‘van centres’, from where smaller vans will deliver to homes (Foresight 2000). As the number of returns is another key factor in the economics of home shopping, its development is also likely to create pressure for more evening and weekend deliveries. Finally, there is likely to be development of local distribution centres where goods can be dropped if people are not at home, or by request (which might be stimulated by lower delivery charges for home delivery).

Complete replacement of car-based shopping trips by Internet ordering and van-based delivery could certainly reduce distance travelled – by 70 to 80% according to one simulation (Cairns 1999). However, complete replacement is unlikely as consumers could use the spare time and vehicle availability to make other journeys whilst providers can offer very different kinds of distribution service. The retail sector also has a strong interest, and new techniques, to divert time and cost savings into further shopping. People shop not only to buy specific goods, but for a variety of other reasons such as social interaction, excitement and creating and maintaining a personal identity. It is also possible that the Internet might produce an ‘unbundling’ of multiple orders which, for convenience, were previously made from a single location. This could mean that a single car trip is replaced by a number of van deliveries, leading to a major increase in delivery units (Marker and Goulias 1999).

Two aggregate forecasts of the transport impact of electronic home shopping have recently been reported:

In the UK, NERA (2000) have estimated that home shopping will reduce car based shopping travel by 5% by 2005 and 10% by 2010. This outweighs a forecast increase in delivery traffic of 0.25% by 2005 and 0.5% by 2010. The study also estimates that bringing in more IT into the freight sector (route planning and scheduling, freight exchanges etc) will lead to a 17% and 19% reduction in goods vehicle mileage by 2005 and 2010.

A Netherlands study by the Dutch Road Haulage Association TLN (TLN 2000), has estimated that 11.5% of total retail sales - approximately 3.5 million tonnes of goods - will be purchased on-line and home delivered by 2005. In the urban Netherlands this will often substitute for cycle or foot trips, which are currently the two most frequent modes of transport for shopping. The net effect is forecast to be a 17% increase in road vehicle movements over the next 5 years.

**Infrastructural capacity**

Both existing infrastructure and actual traffic determine the infrastructural capacity

Another effect of both B2B and B2C e-commerce has been increased demand for warehouse space. In the USA the market for rented warehousing has been growing by 10-15% per annum, much of it driven by e-commerce vendors. In the UK, e-commerce warehousing is mainly concentrated in the Southeast, where the surveyors FPP Savills have estimated that e-retailing accounted for 2 million square feet in 1999, or 10% of the available space. A study by Lambert Smith Hampton has also found that there is now a shortage of suitable sites in several areas of the country.

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10 www.werc.org

11 www.lsh-ni.co.uk/
e-commerce
3 RESULTS AND RECOMMENDATIONS

3.1 Summary of results

This report focuses on the relation of e-commerce with trade and the impact of e-commerce on traffic and transport. As stated in chapter 1, the focus was on fact finding and analysis of existing data. Going through the results presented in chapters 2 and 3, the first conclusion should be that actual data currently gives little support to answer the questions set in the objective and the study cannot obtain the results asked for at the current time. This is due to two reasons: first, despite the interest for e-commerce, data is not gathered on a structural basis. Second, the material that is available is many times grounded on case studies, gives indirect evidence and often conflicts with comparable material from other sources.

The four questions set out in the objective have been broken down to several concise research questions. This section discusses these research questions and the results we found in successive order.

How many people and European business are online?
The latest estimate on Internet use is for August 2001. NUA estimates the world-wide use of Internet at 513.41 million users, for Europe the estimate is 154.63 million.

Surveys on Internet access of European business vary from 16% (Dataquest, 1999) to 37% (NOP Research Group, 1999). Especially large companies have a high penetration rate. NOP Research shows that companies with more than 200 employees have an average Internet user incidence of 75%. For small companies (<10 employees) this is 32%.

What is the size of total e-commerce sales?
E-commerce is not easy to measure and difficult to predict. The estimates for e-commerce revenues show a considerable variation as a result. The major reason is the difference in interpretation of the definition of e-commerce. All forecasts project however that the e-commerce sales shall double or more than double each year.

Forrester Research forecasts Western European e-commerce will account for 6% of total sales by 2004 (Forrester Research). Expectations for the Netherlands are very high, namely 10% of total sales. With respect to total European e-commerce revenues, especially Germany and the UK have a relative high share: around 30 and 25% respectively (IDC, 2000)

What is the E-commerce part within trade?
E-commerce has a negligible share in total trade. This applies to Europe, but also for the whole world. In 1999, the B2B and B2C related e-commerce revenues of EU-15 have no more than a 0.3% share in the total European trade (intra EU trade and trade with the rest of the world).

The B2B e-commerce trade still grows considerably. On top, the (Western Europe) private trading networks increase their trade from € 50 billion in 2001 to € 1476 billion in 2005. In general, the Western Europe B2B e-commerce trade is projected to increase from € 205 billion to € 2916 billion.

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12 As listed in “Annex I: technical specifications for the study” of the contract.
For Europe, the B2C e-commerce sales are estimated as 0.24% of total retail sales in 1999. The average growth is projected on 170% for Europe in 2000. With respect to this growth, Belgium, Switzerland and Italy set the range of variations per country. Whereas the B2C e-commerce sales are estimated as 0.16% of total retail sales in Belgium, the growth is projected on 420% in 2000. In Italy however, the B2C e-commerce sales are calculated as just 0.09% of total retail sales, and the growth is projected on just 145%. Finally, albeit the B2C e-commerce sales in Switzerland are estimated as 0.29% of total retail sales, the growth is projected on just 110%.

Several sources expect that B2C e-commerce will amount to 5% of retail spending by the year 2005 (see a.o. Coppel, 2000).

What is the quantified impact of e-commerce on freight transport as regards the mode of transport and transport routes?

Actual scenario studies do not identify e-commerce as a significant factor that influences transport routes, transport modes, goods flows in tonnes, nor in distances (TRT & TNO Inro, 2001). Therefore, there is not any quantified data on this relation available.

In general, the modal share of international freight transport in the EU is expected to be as follows in 2020 (ECMT, 2020): road is growing from 43% to 45%, maritime shipping keeps a stable share of 24%, inland waterways a stable share of 15%, and rail stagnates at 7%.

How will the behaviour of those ordering goods affect the frequency of transport movements?

Statistical data for Europe is unavailable and on the basis of the material available, no clear answer can be given. In the UK, NERA (2000) have estimated that home shopping will reduce car based shopping travel by 5% by 2005 and 10% by 2010. This outweighs a forecast increase in delivery traffic of 0.25% by 2005 and 0.5% by 2010. In contrast, the Dutch Road Haulage Association TLN (TLN 2000), has estimated that 11.5% of total retail sales - approximately 3.5 million tonnes of goods - will be purchased on-line and home delivered by 2005. The net effect is forecast to be a 17% increase in road vehicle movements over the next 5 years.

Will a measurable substitution effect lead to an overall reduction in shopping trips?

In addition to the previous section, trip optimisation can lead to a reduction of the number of trips, regarding both B2B and B2C delivery. However, it is very difficult to make a prediction of the influence of e-commerce on the number of shopping trips by consumers, because of the fact that many other factors must be taken into account for such a prediction. On the one hand, people do not shop only to buy specific goods, but consumers often go shopping just for fun and social interaction. On the other hand, the retail sector has a strong interest in consumers that shop in the traditional way, because of the fact that those people can be persuaded to buy more goods than they intended.

Another issue is the distinction between transport and traffic. Home delivery is imputed to goods flows and thus to transport. When a customer must collect its order(s) at dedicated collection points however, the customer carries its goods probably by car, bicycle, or on foot. So transportation of goods from collection point to the home is imputed to traffic. Although this could be seen as more a methodological issue, it does has it effects on quantitative analysis and numbers.

Will a measurable substitution effect lead to an overall reduction in distances travelled?

The substitution of goods flows by dematerialisation will not significantly lead to an overall reduction in distances travelled. Dematerialised products may substitute some physical products. However, the moment that customers put the digital product on physical blank records, other goods flows emerge. Further, digital purchase of physical products creates
different kind of goods flows (in comparison with traditional supply chain structures). The average goods flows in tonnes may decrease, but the total distance travelled could increase as a result of a very fine distribution structure and dispersed daily deliveries.

Nevertheless, ICT tools can optimise transport flows. This optimisation can take place in the planning process, thus before the transport takes place, and during the transport by using sophisticated communication tools. And through a more efficient use of truck capacity for example, trips can be minimised, which may affect the total distance travelled. For the UK, NERA (2000) estimates that bringing in more IT into the freight sector (route planning and scheduling, freight exchanges etc) will lead to a 17% and 19% reduction in vehicle mileage by 2005 and 2010.

Does e-commerce-induced extra ordering lead to extra transport?
As shown in Figure 15, e-commerce has some influences on goods flows in tons. Dematerialisation, a major influencing factor, may initially lead to a reduction of transport. However various substitution effects occur, which results that the goods flows in tons hardly change. Further, one can argue that the influences identified have just a minor effect on the total goods flows with respect to other non e-commerce related aspects.
As depicted in Figure 16, e-commerce has several influences on goods flows in distances. Next to dematerialisation, the use of ICT tools and the strive for responsiveness trough (de-)urbanisation, (de-)concentration, and the usage of e-commerce dedicated distribution centres are important influencing factors. Taken the substitution effect into account, one could argue that the influences identified have just a small effect on the total goods flows.

What impact does the customer structure of e-commerce have on the demand for transport services from private households and companies (works transport)?
This question cannot be answered in isolation. Along with e-commerce, a vast bundle of new technologies is becoming available, making it possible for people to start tele-working and tele-learning, and for companies to work over greater distances and to reduce the number of business trips (e.g. by videoconference).
If the history of telecommunication is taken into account with for example the development of the telephone, the PC and IT-networks, the impression however is that new forms of communication do not hamper growth in the demand of transport. Rather, it appears to lead to an increase in mobility, hence an increase in demand for transport services.

Does the use of e-commerce mean that transport movements do not take place since only goods actually ordered are moved (fewer return goods)?
No, one could think that less transport movements might be necessary, since only actually ordered goods are moved. But the need for responsiveness makes it necessary to still have products in stock, preferably at a decentralised warehouse. And the ease of e-commerce makes that people order goods return more easily. The return percentage for most products is between 1 and 10%, and for apparel between 25 and 30%. This is not so much caused by the selling through the Internet, but is more a consequence of the principle of “selling at distance” (TNO Inro, 2001b).
Furthermore, the necessary home delivery causes one van to drive for 10 consumers instead of ten consumers driving, but it is not clear whether consumers go shopping anyway. Also vans need to drive more often because consumers are not always home at the time of delivery. If customers are to pick up their goods at collection points, they must drive in any case.
Is there any likelihood of an alteration in the volume of traffic, where possible with greater concentration at certain time of day/night or certain days of the week?
This will largely depend on the logistics structures companies develop in answer to the e-commerce developments. Current evidence is scarce and based on cases. The “Albert” example in chapter 3 shows that a group of companies decided to restructure their logistics leading to another form of the fundamental lay-out of the chains, which could alter volumes of traffic. However, this alternative has only started recently, with no hard data available yet.

Influence of e-commerce on traffic concentration: increased congestion of industrial estates, approach roads and distribution centres? What effects are to be expected on the existing major distribution points, motorway/intersections, residential areas?
This study does not find any significant relations between e-commerce and traffic concentration. So far, e-commerce induced trade is too small and e-commerce related supply chain structures are integrated in traditional structures to a large extent. Nevertheless, e-commerce is growing very fast. This could mean that e-commerce induced traffic would lead to undesired situations. Exemplary actions to avoid such situations are:
1. Product related legislation. Not all products are suitable for electronic sale and home delivery. Especially when health and safety are at issue, restrictions are desirable. Exemplary restrictions are temperature regimes, required certifications for transport operators, and prohibition of sale (e.g. of guns).
2. Regulation of the time slots in which deliveries can be made. Shops already have time slots for their urban distribution of supplies. It can be argued that very frequent home delivery also should be regulated.
3. Regulation of the time slots in which customers can visit the collection points and delivery points to collect their goods. If a collection point is open for 24 hours, it may contribute to increased (local) congestion at peak times (e.g. 4:30-6:30 PM) and may come to local noise pollution in the night. But on the other hand, the collection points need to be accessible when consumers are able to drive along and that is especially at rush hours.
4. Regulation of the size and/or weight of the vehicles that can be used to make these deliveries. Home delivery by using heavy truck could have consolidation effects, but could also damage local roads in city centres or residential areas. When home delivery is used more often, it can be argued that vehicles are restricted to certain limits.

During 1999 and 2000, the growth of e-commerce led to an increased demand for warehouse space. In the USA, the market for rented warehousing has been growing by 10-15% per annum, much of it driven by e-commerce vendors (WERC, 2000). In the UK, e-commerce warehousing is mainly concentrated in the Southeast, where the surveyors FPP Savills have estimated that e-retailing accounted for 2 million square feet in 1999, or 10% of the available space. A study by Lambert Smith Hampton (2000) has also found that there is now a shortage of suitable sites in several areas of the country. Such demand and concentration effects will lead to new traffic patterns, potentially to a shift of congestion to new areas.

What happens to the use of conventional delivery services and the mode of delivery?
E-commerce has a minor influence on conventional delivery services and the mode of delivery. As far as B2B e-commerce is concerned, transport operators and logistics service providers bring the usual modes of transport (especially trucks) into action. With respect to B2C e-commerce, dedicated delivery networks and courier services are often used. These dedicated delivery networks are usually fitted to conventional systems, because of the high investments involved and to avoid business risks. As long as the products bought electronically are of a two-dimensional nature (i.e. they fit in the letterbox), the logistical
structure and the modes used will not likely change. When the products ordered become larger in future (more three-dimensional), changes in the distribution structure will be necessary.

In addition, because of the fact that many other factors influence the modal split (in an even stronger manner), the impact of e-commerce on conventional delivery services is minimal.

What scope is provided for shortening the transport routes specifically by the intelligent use of IT (GPS?) in transport management? Is there a resulting likelihood of a reduction in the number of empty runs or low capacity runs for vehicles?

It is highly unlikely that the use of IT will lead to shortening of transport routes, except for an optimisation in networks used by transport operators (which is a repeating planning activity). On the other hand, the application of intelligent IT makes it possible to reduce the number of empty runs by means of better communication between the different parties in a transport chain. Many companies are investing in communication equipment for their vehicles (like in on-board computers, mobile phones, tracking and tracing facilities, etc.), but also for information exchange in the chain.

What figure can be put on the avoidance of physical freight transport resulting from e-dematerialisation?

The little dematerialisation so far and the low volume of products and services suggest that the effects on transport are expected to be insignificant. Dematerialised volumes are too small to obtain a significant effect. Although the Internet has made possible that letters, reports, memos and other business correspondence can be formatted and sent in a digital way, the mail is collected anyway and the product replaced has a relative light weight. And even though software, music, movies, books can be downloaded instead of sent and received in a physical way, the moment that a customer puts the digital data on a physical record, blank CD-ROMs, paper etc. must be bought. These activities result in other good flows. Thus, dematerialisation therefore initiates several substitution effects.

3.2 Expectations for 2010

Assuming a guaranteed growth of the exploitation of e-commerce as a result of a persistent technical innovation, two trend scenarios may represent the development of e-commerce:

− a flourishing trajectory, in which e-commerce makes a large, and expanding contribution to the overall business. This scenario can be translated into ‘e-combustion’: transport is completely subordinate to customer service; one stop shopping changes into daily ‘just-for-you’ shipments of small packages by mail order and teleshops; producers require perfect responsiveness of their suppliers, who must deliver more than once a day instead of once a week. An underlying trend is mass-customisation; logistics will shift from production-to-stock to unique production of single items. Transport will significantly increase.

− a moderate trajectory, in which e-commerce makes a narrow contribution to the overall business that just grows in a very limited manner. This scenario can be translated into ‘e-elimination’: all opportunities to reduce transport demand are exploited; consumers and customers require sustainable solutions; service requirements are modest, leaving room to transport optimisation. An underlying trend is sustainability; logistics will focus on new forms of consolidation. There will be a modest grow in transport.\(^{13}\)

\(^{13}\) The relation between economic growth and the increase in mobility is positive. Hence, in the ‘e-elimination’ scenario there will also be an increase in transport.
In practice, the development of e-commerce and its consequences will be in between the e-combustion and e-elimination scenarios. After the hype of 1999 and 2000 on e-commerce and in the aftermath of September 11, the current expectations on economic growth and e-commerce are moderate. We expect that the current sentiment will turn positive in the coming years, leading to an upswing again. In effect, we expect that e-commerce developments will take on a growth rate which is around the growth rate of GDP, but with larger fluctuations.

Several sources expect that by the year 2005 B2C e-commerce as a % of retail spending will amount to 5%. We expect this figure to come true later than by 2005, given the current slower pace of economic growth in Europe. In addition, given the nature of the (physical!) products that can be sold, we expect the B2C e-commerce sales numbers to settle around this percentage. This will cause new distribution concepts to be developed, especially in urban areas. Traffic and transport patterns will alter and a pressure on the urban infrastructure and environment may occur. We do not expect that e-commerce will lead to significant global buying by consumers. Currently, consumers mainly buy from national websites, which may generate more local transport.

For B2B the picture is more difficult. In effect, the percentage of trade via B2Be-commerce may easily outnumber the B2C sales, in terms of value, volume and percentage of overall trade. However, these B2B e-commerce sales will for a very large part be a substitution of trade facilitated via other forms of communication. We expect that e-commerce will reinforce existing trends like global sourcing. On the other hand, we should bear in mind that the bulk of production in Europe is established by SME’s. These companies tend to source locally, or at a national level. The effects of e-commerce on traffic and transport will therefore probably still have a national scope.

### 3.3 Possible actions

On the basis of the results found in this study, the question is “what transport policy measures should be taken at Community level having regard to existing environmental standards in order to cope with any anticipated increase in demand for transport services?”

Given the current situation, the answer would be “nothing”. Effects, if at all present and measurable, are very small. More results may be possible in stimulating/mitigating other factors influencing transport. As the ECMT puts it: ‘The globalisation of trade, the reorganisation of distribution and the concentration of warehousing points, the specialisation of production units, the efficiency of transport, the performance of road, rail, air, sea, and waterways are probably the causes that should be factored into trends’.

This may be an unsatisfactory result, and the situation for 2010 may be such, that current intervention by policy makers is worthwhile. A first step is to recognise and acknowledge the e-commerce and Internet-related developments. In this respect it is striking to see that the new European white paper on transport (European transport policy for 2010: time to decide COM (2001) 370), e-commerce is not mentioned and Internet only twice!

While it is difficult to measure and predict the impact of e-commerce on transport, a first step should be to treat the topics not separately. Integration of policy, from different directorates within the European Union and from different policy levels (National, European, supranational) is therefore necessary.
Leaving all developments to the private market, without guiding the developments may lead to undesired negative effects. ‘Doing nothing’ is therefore not the most useful approach.

Suggested actions that the Parliament can undertake or support are:

- **Stimulate the development of an e-commerce or ICT-monitor** that measures in an unambiguous fashion the effects of e-commerce on traffic and transport in Europe. Choices should be made on the proper methodological approach and criteria which have to be used. The current set of criteria used for European statistics, such as ton-kilometres does not offer the right information on the e-commerce effects. Alternatively to the stimulation of a monitor is to join existing initiatives by other supra-national bodies like the OECD or the UNCTAD, who ‘struggle’ with the same measuring problems.

- The European SME’s generate the bulk of production in Europe. They are however lagging behind in the use of e-commerce. For them it can improve both efficiency and effectiveness. The Parliament can support initiatives to educate and help SME’s getting on the Internet. A stimulus in this respect can be the development of the ‘e-government’ concepts, in which the European Union can be in the lead.

- The use of ICT within the supply chains has large potential in improving transport efficiency (route optimisation, reduction of empty returns, etc.). This potential is clearly not use to its full extent, in particular not by smaller transport companies. The Parliament can support initiatives to educate and help transport companies using ICT-tools to their benefit.

- E-commerce is passing its hype-stage. It is therefore important to take the ‘e’ out e-commerce. By this we mean that e-commerce effects should be seen in the context of other developments and treated in an equal fashion as the other developments. As stated above, e-commerce will reinforce ongoing trends and accommodating those trends may sort more effect than a focus on e-commerce as a single entity.

- For many people and companies, the view on e-commerce developments is blurred by the many different possibilities and approaches that exist in the use of e-commerce. The use of e-commerce may be stimulated through supporting the standardisation of concepts, technologies, the body of knowledge, etc.

- In addition to the previous item, the Parliament can focus on preventing the ‘digital divide’ between those who use the technology, and those who cannot or do not want to use it. This divide may occur along the lines of generations, income groups and/or geographical areas.

- The parliament can accommodate the use of e-commerce by changing or developing new legislation.
  - With respect to e-commerce transactions the following issues are relevant (UNCTAD, 2001):
    - Finding global solutions for global transactions
    - Settling global laws for digital disputes
    - Setting a clear framework to protect the e-commerce consumer
    - Taking care of data protection and privacy
    - Finding solutions for digital signatures
  - “Cybertaxation”: a clear position and directive on the way taxes on international e-commerce goods- and services flows are levied, will support the development of e-commerce.

The Parliament can join the developments by supra-national organisations like the UNCTAD and the OECD, but should also develop its own vision and policy in this respect.

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14 Or, alternatively, the ‘m’ out of m-commerce.
With respect to e-commerce deliveries, two categories of legislation are important:\(^\text{15}\):

- **Product related legislation.** Examples include health and safety regulations that set temperature regimes required for many food products and the monitoring regimes required to ensure that these temperatures are maintained.

- **Vehicle operation legislation.** Regulation that includes any controls that affect:
  - the time at which deliveries can be made (both in terms of vehicle access to the street concerned and unloading regulations in force on the street);
  - the times at which customers are permitted to visit the collection and delivery points to collect their goods;
  - the size and/or weight of vehicles that can be used to make these deliveries.

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\(^{15}\) ACEA, E-commerce, freight distribution and the truck industry, 2000.
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http://www.lsh-ni.co.uk/
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### ANNEX A: EXPECTED ONLINE BUSINESS TRADE

Expected Online Business trade for a typical, European company in several sectors with Sales of € 30 Billion, in million Euro.

<table>
<thead>
<tr>
<th>Product/industry</th>
<th>Channel</th>
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<th>2002</th>
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<th>2004</th>
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<tr>
<td>Western European average</td>
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<td>282</td>
<td>571</td>
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<td></td>
<td>Storefronts</td>
<td>239</td>
<td>491</td>
<td>796</td>
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<td>271</td>
<td>660</td>
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<td>2,026</td>
<td>3,369</td>
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</tr>
<tr>
<td>Aerospace and defense</td>
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<td>63</td>
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<td>274</td>
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<tr>
<td></td>
<td>Storefronts</td>
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Note: € 1 = $0.88 (March 31, 2001)
Source: Adapted from Jupiter MMXI: Online trade, quantifying the benefits
ANNEX B: EVALUATION OF COLLECTION POINTS – DESCRIPTION OF CRITERIA

− Access refers to the accessibility of the prospective facility, is it within walking distance or within a short car-journey?
− Geographic coverage is the concentration of facilities throughout the UK.
− Management expertise reflects the extent to which operators have the necessary experience to manage this element in the supply chain.
− Capacity indicates if existing uses have the necessary capacity to provide additional services.
− The market structure reflects the pattern and concentration of ownership in the sector. Nation-wide facilities owned and operated by a small number of companies (grocery market) is likely to be more attractive than a nation-wide market dominated by small independents.
− The criteria of Value Added show the likelihood of the use of the facility as a collection point to add value to the original activity.
− Planning/Traffic refers to a particular constraint on either traffic or planning grounds, such as a lack of parking spaces.
− Returns indicate the easiness to make a return using the delivery system.
− Mindset refers to the fact that frequently visited destinations are more likely to be attractive as a collection point.
− Finally, branding indicates the opportunity to brand the collection point as an entity in its own right.

Source: Adapted from: DTZ Research, 2001