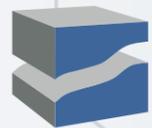


e-commerce, freight distribution and the truck industry

Prepared by

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Foreword

The ACEA Scientific Advisory Group

To overcome the shortfall of scientific understanding of freight-related transport policy issues, during 1998, the commercial vehicle manufacturer members of ACEA established a scientific advisory group to examine important issues relating to freight transport and commercial vehicles.

This report is the result of the fourth such meeting.

The first three meetings dealt with transport infrastructure, freight transport policies and freight distribution of the future. An impressive list of international scientific transport experts came together under the chairmanship of Professor Bryan Bayliss from the University of Bath.

This fourth examination follows in that tradition in producing this report on “e-Commerce, freight distribution and the truck industry”. The participants in the group were as follows.

| | |
|--------------------------|--|
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| Mr Michael Hollingsworth | <i>ACEA</i> |
| Mr Marcel Huschebeck | <i>PTV</i> |

This report does not necessarily reflect the views of ACEA or the other participants, but is intended to provide a contribution to the discussion on the topics concerned.

Preface

This discussion paper has been produced as an output of the 4th ACEA SAG Meeting on “e-commerce, freight distribution and the truck industry” held in Brussels on 10th October 2000. The objectives of the meeting were:

- To evaluate the changes in manufacturing and marketing processes in the new economy.
- To evaluate the changes in commercial vehicle (CV) users’ requirements as a consequence of the growth of business-to-business (B2B) and business-to-consumer (B2C) e-commerce.
- To identify legal and administrative constraints that could unnecessarily limit the opportunities arising from e-commerce.
- To define broad recommendations to be proposed to the European Commission.

1 Introduction

The information society is changing the lifestyle of European citizens and in some cases changing the fundamental mechanisms of the European economy. The information society does not necessarily mean that goods movement will decrease. Goods movement will however change as a result of developments in e-commerce practices. The automotive industry is interested in these changes for two basic reasons: (i) because its business is directly involved in these changes (e.g. business to business transactions via the internet); and (ii) because the requirements of its customers will change as they adapt to new ways of collecting and delivering goods.

A definition of e-commerce used in a recent report noted the link between tangible goods and services:

“The purchase of goods, services or other financial transactions in which the interactive process is mediated by information or digital technology at both, locationally separate ends of the interchange.” [REF. 1]

Electronic commerce is a part of the broader category of electronic business. E-business incorporates services such as on-line customer support, account maintenance, provision of information resources and so on that are elements of on-line business but do not directly involve commercial transactions.

This discussion paper reviews the distribution activities of e-commerce involving the physical movement of goods within supply chains and including delivery to the consumer. In addition, the paper explores changing demands for transport resulting from initiatives such as freight exchanges.

2 e-commerce: background, developments and trends

Background

Although the internet and technology in a wider sense are important, e-commerce is not just a set of technologies or business methods, it is a view of business and of value creation which leads to revolutionary change. It is also sometimes argued that e-commerce can be perceived as a threat to established enterprises for two main reasons: (i) value may migrate from the old to the new (ii) companies which are existing business leaders can find it difficult to retain leadership when business models change. Following on from this it has been suggested that:

“competition today is not between products, it’s between business models. The hottest and most dangerous new business models are out there on the web.” [REF. 2]

The fundamental importance of the developments was noted in a recent report:

“... by 2010 all but the most traditional of businesses will have redesigned their supply and distribution chains to take account of electronic commerce. Those which have not will long since have been out of business.” [REF. 3]

Rapid growth and forecasts

The rapid development of e-commerce and the resulting uncertainty about the emerging patterns is evident when forecasts of growth are considered. Estimates of growth vary considerably from one report to another. In many cases this is due to

methodological issues about sampling, extrapolation techniques and so on. However, in other cases it is a question of definition – for example should EDI transactions be included in the scope of forecasts about B2B growth? As Table 1 shows, the range of forecasts available is rather wide.

TABLE 1: FORECASTS OF WORLDWIDE E-COMMERCE REVENUES FOR 2003

| SOURCE | FORECAST (\$ BILLION) |
|--------------------------------|-----------------------|
| OECD | 1000 |
| Intel | 1000 |
| Deloitte & Touche | 1100 |
| Emarketer | 1244 |
| IDC | 1317 |
| Active Media | 1324 |
| Forrester-low-(excluding EDI) | 1800 |
| Forrester-high-(including EDI) | 3200 |

Source: Reports (various) / As a point of reference, total world GDP was estimated at US\$ 40 trillion in 1999 so the high forecasts for e-commerce would represent about 8% of that total.

If one of the forecasts from the middle of the range is considered then it is possible to look at expectations of growth on a regional basis and also comparing B2B and B2C (see Figures 1 and 2). The pattern that is implied is clear – rapid increases in worldwide revenues and the importance of B2B e-commerce in terms of total revenue. B2B e-commerce is currently estimated to have a significantly greater value than B2C e-commerce, and many commentators expect this difference to increase over time.

Table 2 illustrates the categories of goods that are currently purchased most frequently on-line. Although this can be expected to change in the long term, it provides a useful snapshot of the physical distribution demands that will be placed on those providing B2C services. The importance of

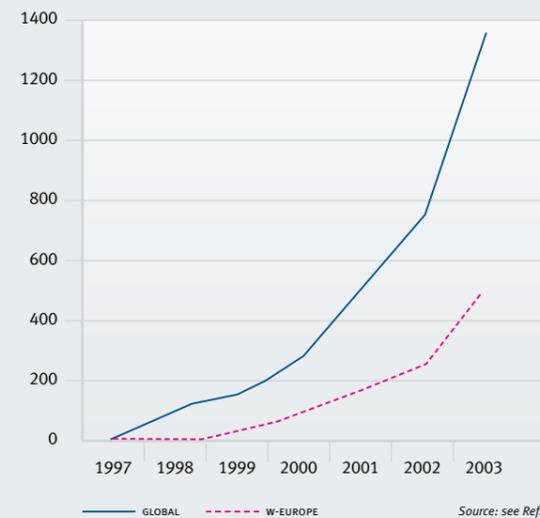
delivery and collection can be seen by reference to any recent presentations on e-commerce – for example: *“23% of on-line shoppers say easier delivery/collection options would encourage them to spend more on-line”*. [REF. 6]

TABLE 2: CATEGORIES OF GOODS PURCHASED BY ON-LINE SHOPPERS

| PRODUCT CATEGORIES | BOUGHT BY % OF ON-LINE SHOPPERS |
|--------------------------------------|---------------------------------|
| Books | 66% |
| CDs, recorded music | 58% |
| Computers and related products | 38% |
| Air travel reservations | 26% |
| Videos, filmed entertainment | 19% |
| Flowers | 18% |
| Event tickets (sport, entertainment) | 17% |
| Food, drink | 13% |
| Men’s clothing | 12% |
| Women’s clothing | 12% |

Source: [Ref. 5]

FIGURE 1: GROWTH IN GLOBAL AND W-EUROPEAN E-COMMERCE REVENUES (\$ BILLION)



Source: see Ref. 4

Four scenarios relating to growth in B2C e-commerce have been presented in a recent UK report (see Table 3). These scenarios relate to the year 2005 and provide an interesting starting point for the discussion in the following section on the impacts of e-commerce on logistics and the supply chain.

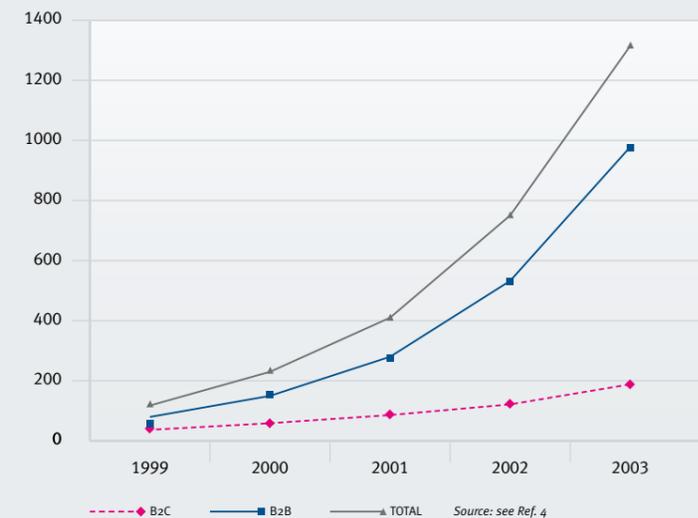
TABLE 3: POTENTIAL COMMERCIAL IMPACT OF E-COMMERCE IN THE UK

| GROWTH SCENARIOS | % OF TOTAL RETAIL SPEND | TOTAL VALUE CONSUMER E-COMMERCE (£ BILLION) |
|------------------|-------------------------|---|
| Explosive | 15 | 30 |
| Dynamic | 12.5 | 25 |
| Active | 5 | 10 |
| Sluggish | 2.5 | 5 |

Note: More details of the scenarios can be found in the Appendix

Source: Ref. 1

FIGURE 2: B2B AND B2C E-COMMERCE REVENUES (\$ BILLION)



Source: see Ref. 4

3 Impacts of e-commerce on logistics and the supply chain

The B2C e-commerce market is usually discussed as if it is separate from the B2B market. In some ways this can hide the important links between B2B and B2C e-commerce. Many of the changes that will result from growing use of e-commerce in the B2B market will feed along into changes in the way products move through supply chains to final consumers. To some extent, electronic channels blur the boundaries of the B2C and B2B markets and enable the emergence of new consumer-to-business relationships.

However, for the purpose of clarity, this section of the discussion paper is divided into two parts - first the implications of growth in B2B e-commerce are reviewed and this is followed by the impact of B2C e-commerce. The section on B2C e-commerce is longer and more detailed because more has been established about likely patterns of physical distribution and the extent of change that may be expected.

3.1 B2B e-commerce

[A] DEVELOPMENTS IN B2B E-COMMERCE

Much of the discussion of B2B e-commerce concentrates on the creation of new trading and supply chain communities resulting from the emergence of on-line marketplaces. These marketplaces (or communities) are often referred to as vertical or horizontal depending on whether they involve trading partners from different industries or whether they involve trading partners from the same business sector. One key implication of the trading communities is that there will be a move away from

contractually-based business relationships towards relationships based on transactions. It should be stressed that we are at the beginning of these developments – a recent report argued that even by the third quarter of 2000 no B2B marketplace was fully up and running [REF. 7].

One of the major differences that may emerge with the new marketplaces will be the relationship between sellers and buyers. At present many relationships in business are formalised through time-specific contracts and this often applies to physical distribution activities. In freight transport it is frequently the case that the decision to use a specific transport operator is the subject of complex contract negotiations. Following the contractual decision however there are a series of shipments that could continue over many years – although strictly each of these shipments may be a transaction, they are the result of the contractual relationship. Recent initiatives, such as the creation of internet-based freight exchange systems, hold out the prospect for more short-term relationships between manufacturers and transport operators. If there are indeed moves away from a contractual to a transaction pattern of operations then this could have important implications for patterns of movement.

It is unclear whether power in these marketplaces will be spread equally between all the participants or whether, as in conventional supply chains, one party will have more power and control than the others. Such marketplaces are likely to commence with inequalities in power that are similar to the current pattern, but over time the relationships may become more equal. Both horizontal and vertical communities may be formed. In horizontal communities (i.e. involving parties that carry out similar or the same activities, for example,

several logistics companies working together) it is likely that one or a few of the larger parties involved will have greater power than other participants. In vertical communities (i.e. involving parties that carry out different activities in the supply chain) there may be greater likelihood of equal power-sharing between all participants.

Although B2B marketplaces have so far focused on bringing together trading partners, carriers and third-party logistics companies are also expected to participate. Indeed, on-line communities could alter the way shippers do business with carriers. For instance, transport companies could find themselves working for a given marketplace rather than for a specific shipper, or trading communities might begin designating one or more carriers as preferred suppliers.

The automotive sector has seen several developments pointing at the creation of on-line marketplaces that will merge the separate purchasing systems of individual manufacturers. Among the benefits of such a hub are:

- a larger, more transparent market is created which gives greater power in dealing with suppliers;
- procurement becomes integrated with demand forecasting;
- inventory and stocks can be reduced.

It is also evident that including distributors in the network will also provide better quality and more timely information about purchases being made by final consumers which in turn can be used to adjust the manufacturing schedules (and therefore procurement and so on). Where this will lead remains uncertain, however it could be argued that some of the large manufacturers will not them-

selves produce cars – rather they will simply design, specify and manage the brand. This is a model that is familiar in the fashion industries (e.g. Bennetton and Nike). The impact on physical distribution is also uncertain - for example will the location of production facilities and sub-assembly change dramatically under this model?

[B] B2B: LOGISTICS AND PHYSICAL DISTRIBUTION ISSUES

At present the pattern of the business relationships between industrial companies is typically tightly structured and there has been a growing emphasis on long-term business relationships and working with supply chain partners. The physical transport links within a supply network are often well established and although complex may have changed relatively slowly. The creation of more open and information rich markets holds out the prospect of more rapid change and also the possibility that physical transport links will need to be much more responsive to change. In this more flexible environment it is possible to foresee a pattern of demand for and supply of transport capacity that changes rapidly and where the origins and destinations of products may also change at short notice. Although the nature of these new markets is not yet clear it seems likely that in some cases there will be a dominant player, while in others the market will be based around a broader equality between the members. The key point for physical distribution patterns is the potential development of a network in which the origins and destinations of product flows could change rapidly and where the consignment size, frequency of collection and delivery and the velocity in the supply chain are different from the existing pattern.

The emergence of supply chain communities will have a major impact on the logistics functions of inventory management and transport. The typical pattern of manufacturing and retailing leads to waves of products moving along the supply chain – for example – a manufacturer of electrical goods places orders for components on suppliers who then ship them to the assembly plant. On-line communities could act like a hub – thus a retailer could place continuous orders with manufacturers to accommodate changes in consumer demand, and manufacturers, in turn, would place a steady flow of orders with suppliers. This in turn will lead companies to review their distribution systems. Among the implications are:

- real-time demand rather than forecasts will drive these new supply chain models;
- a reduction in aggregate inventory held by all trading partners – in many current supply chains stock is held at each link;
- shared information about demand and inventory should also smooth out the peaks and troughs in replenishment flows;
- supply chain communities should achieve more inventory turns and higher shipment velocity.

These trends will encourage further developments such as cross-docking initiatives – with an impact on distribution centre design as well as transport requirements.

The impact of B2B e-commerce on vehicle trips and vehicle fleet requirements is somewhat uncertain. On the one hand, it can be argued that attempts to meet real-time demand could result, at least initially, in more frequent, smaller shipments. On the other hand there is strong argument that the emergence of supply chain communities using computer intelligence to share information will

lead to greater visibility and transparency, and that this will lead to opportunities to consolidate orders, and thereby improve commercial vehicle utilisation and reduce freight costs.

It is also apparent that the development of freight exchanges could spur more competition for freight among carriers by facilitating on-the-spot bidding for shipments. Furthermore, if supply chain communities decide to manage their distribution activities as a group, it might benefit the third-party logistics industry as they will have the opportunity to consolidate products from multiple vendors.

The switch in emphasis from the individual company to a group approach may have a major impact on distribution. The development of supply chain communities may result in new group distribution strategies as companies apply their collective computer intelligence to develop an integrated response strategy that would juggle production capacity and inventory availability to meet fluctuating demand. [REF. 8].

3.2 B2C e-commerce

By contrast with the B2B e-commerce sector, B2C has received rather more attention and more of that has been paid to issues relating to the order fulfilment process (especially the delivery to the final consumer). The focus on business sector varies somewhat from one country to another - for example in the UK and USA there has been much interest in grocery retailing developments.

Already current consumer e-commerce is weighted towards certain goods and services. The reduction in the price of books, music CDs, com-

puter hardware and software in the high street is a reflection of the cost-cutting ‘bargains’ to be found on the internet. New areas of consumer interest are unpredictable, but examples could include entertainment (e.g. multi-player games, and event participation), gambling, buying and selling shares, and grocery shopping. The type of product involved will have an important bearing on the requirements for distributing that product to the customer.

[A] HOME DELIVERY OF PRODUCTS

Two factors are of special importance when considering delivery of products to consumers:

- Whether the physical distribution channel will need to change;
- Whether the product requires that the customer is present at time of delivery.

Physical distribution channels

In B2C e-commerce the type of product can result in a need for change in the physical distribution channel (i.e. the way and place in which the product is stored, picked and transported to the customer’s home):

- for certain products there is no physical delivery (such as in the case of downloading software or music, or on-line gambling);
- for many products there are existing physical distribution channels along which the products can flow (e.g. books purchased over the internet are handled by existing physical distribution channels of express companies and postal networks);
- for some products there is no existing physical distribution channel and it is necessary to establish an entirely new means of supplying

goods to customers (e.g. grocery home shopping which requires investment in and the operation of entirely new vehicle fleets).

Products distributed via existing physical distribution channels (operated by express companies or postal networks) can flow both ways through the system, without large differences in handling and costs. The number of hubs and depots operated depends on several factors such as size of demand, geographical spread of population, size of country, and domestic or international operation. This system accounts for most non-food products purchased via e-commerce.

In the case of grocery e-commerce provided by existing grocery retailers, in which there are no existing physical distribution channels for the home delivery operation, the company has to decide where to locate storage, order processing, picking and delivery activities. Broadly speaking, two logistics models are in current use (see page 12 Figures 3 and 4 [REF. 9]):

- locating e-commerce operations at existing retail stores;
- locating e-commerce operations in order fulfilment centres, which are specially designed for, and dedicated to, e-commerce orders.

Order fulfilment centres are more expensive to establish than simply using existing retail facilities. However, store-based operations tend to prove less operationally efficient, and can negatively affect the shopping experience of those customers who continue to visit the store. Order fulfilment centres tend to cover a much wider catchment area than existing retail stores. As a consequence, this results in either: (i) relatively long trip lengths for delivery vehicles, or (ii) the need to introduce an

FIGURE 3: LOGISTICS MODEL FOR STORE-BASED PICKING [REF. 9]

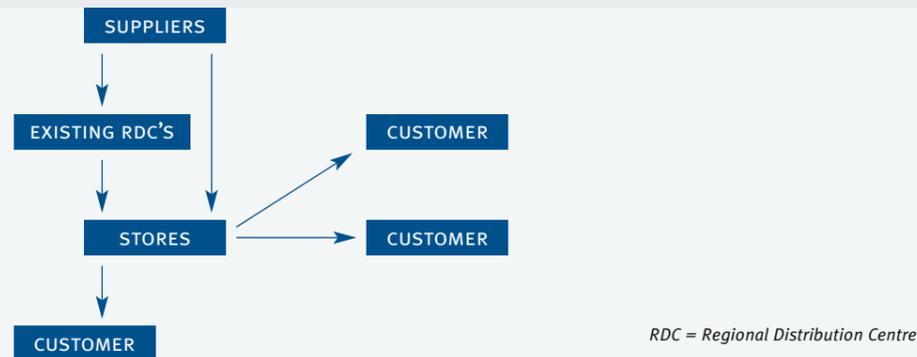
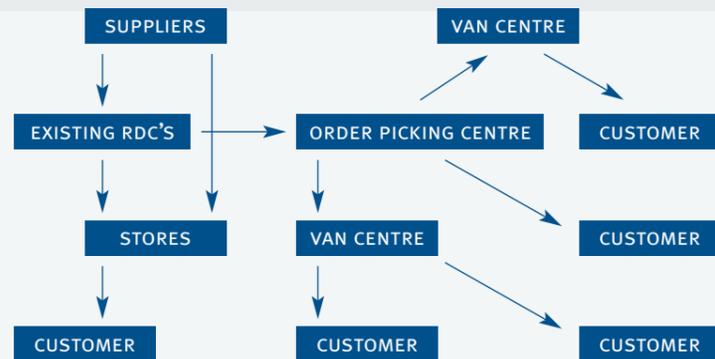


FIGURE 4: LOGISTICS WITH E-FULFILMENT CENTRE [REF. 9]



additional tier of small depots at which goods are transferred from larger vehicles to local delivery vans.

The new physical distribution channels being operated by grocery e-commerce companies are likely to become blurred as retailers continue to experiment in order to find the best methods for their operations and markets. It may lead to the emergence of hybrid models. A key issue concerns

whether, in the future, these new physical distribution channels will continue to be operated on a dedicated basis (i.e. only for the supply of one e-commerce grocery company's products) or whether these facilities including e-fulfilment centres and delivery vehicles will be shared between companies.

Whether the customer has to be present at time of delivery

In the case of e-commerce deliveries made to customers' homes a key issue in planning the delivery is whether or not the customer has to be at home to receive the delivery. If it is necessary for the customer to be present this requires greater planning in order to ensure that a satisfactory proportion of deliveries are successful. Unsuccessful deliveries lead to higher operating costs and/or poor customer image of the company. Deliveries attempted when the customer is not at home result in the need to call again, while failure to deliver at a time agreed with the customer could threaten a customer's repeated use of the e-commerce company.

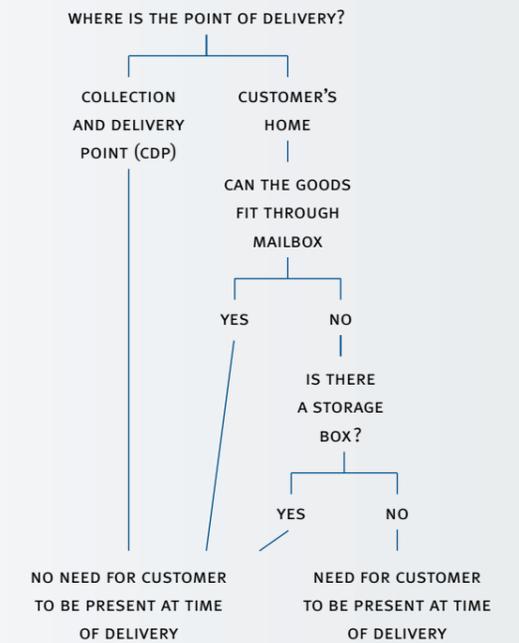
Some e-commerce products are small enough to fit through letterboxes or into mailboxes at customer's homes and can be delivered whether or not the customer is at home at the time of delivery. These products tend to be distributed to customers via existing national postal networks. To provide an example of size and weight limits, the Deutsche Post postal system domestically operates with 353mm x 250mm x 50mm as maximum measurements and 1,000g as maximum weight for items that have to be able to fit through the letterbox. For international destinations it operates with maximum weight of 2,000g and length, width and height can maximally sum up to 900mm, without length exceeding 600mm [REF. 10].

The delivery of groceries to customers' homes tends to take place on a pre-arranged day and within a given time-window. By putting in place these arrangements with customers it is possible to significantly increase the number of successful deliveries. This is important in the case of grocery and other products that physically deteriorate over time.

Deliveries of non-food products tend to be less tightly scheduled with the customer. In the case of some deliveries (such as furniture and white goods) a day for delivery is agreed in advance, and in some cases a day and time-window (e.g. morning or afternoon) is agreed. This tends to be more common for the delivery of large, heavy items, as it is very inefficient to have to load and unload these types of goods from vehicles more than necessary. However, in many cases of non-food delivery (especially those made by postal or express companies) no arrangement about day or time of delivery is made with the customer.

Figure 5 shows the product and delivery factors that determine whether or not the customer has to be present to receive the delivery.

FIGURE 5: FACTORS AFFECTING WHETHER CUSTOMER HAS TO BE PRESENT DURING DELIVERY



Using secure storage boxes to receive deliveries when the occupier is absent would allow delivery companies to optimise transport routes and schedules and thereby achieve better vehicle and driver productivity as well as reducing the total transport requirement for each unit delivered. This option has been tested in the United States and property developers in Europe are reported to be installing these devices in some new houses.

For grocery deliveries, such a storage device would need to be temperature controlled, unless the goods were delivered in an insulated box. Food safety and legal liability issues would need to be addressed before such systems become commonplace. Research in Finland has illustrated the potential improvements in transport efficiency that may result from this type of approach [REF. 11].

If a suitable storage device can be designed, its use could be encouraged by policy makers through the planning process. It could, for instance, be made a compulsory component of any new housing developments.

[B] COLLECTION AND DELIVERY POINTS

Increased use of collection and delivery points (CDPs) would enable delivery efficiencies to be achieved. As with storage boxes, such a facility would allow the option of optimising routes and schedules for deliveries. Goods could be stored until it was convenient for the customer to collect them, or the operator of the CDP could deliver as part of a local delivery round. There is also scope for the CDP to act as a central facility for the management of any returned goods. The exact facilities required would depend on local circumstances (see REF. 9).

Examples of possible CDP locations include:

- Workplaces
- Local stores or petrol/filling stations
- Park & Ride sites
- Out of town shopping centres
- Local urban delivery centres
- Leisure facilities (swimming pools, sports clubs)
- Schools
- Rail Stations

One of the important points about the use of CDPs is that it would have an impact on the optimum size of commercial vehicle for the particular type of operation. Overall it would also change the mix of vehicles required to service any given distribution system or network.

[C] THE POTENTIAL IMPORTANCE OF LEGISLATION

Two categories of legislation are important with respect to e-commerce deliveries:

- Product-related legislation
- Vehicle operating legislation

Examples of product-related legislation 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. Legislation also governs how any dangerous goods can be transported. Although not immediately obvious, several products commonly stocked by grocers, such as aerosols, might be affected by this type of legislation and could require special attention.

Vehicle operating legislation 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 CDPs to collect their goods,
- the size and/or weight of vehicles that can be used to make these deliveries.

[D] B2C LOGISTICS COSTS AND EFFICIENCY

In thinking about the logistics costs of B2C e-commerce, it is important to remember that the costs associated with order picking and delivery to the customer's home are not new costs. These activities and costs existed prior to the introduction of e-commerce. The difference in an e-commerce environment is that rather than these activities and costs being borne by the customer they are now borne by the e-commerce company. Therefore, e-commerce involves a redistribution of costs rather than the creation of new costs. In fact, it may be the case that order picking and transport costs are lower when performed by or on behalf of an e-commerce company than when carried out by the consumer (especially when taking into account the customer's value of time). The concern for e-commerce companies is whether these costs are recoverable (i.e. whether the customer is prepared to pay a price that fully covers the cost of these activities).

For B2C e-commerce to prove profitable and appealing it will require very efficient, reliable and low-cost freight transport services. While freight transport services tend to be relatively low-cost, it remains to be seen whether these services can achieve the level of efficiency and reliability that

will be required by customers with ever-increasing service level expectations. It is possible that e-commerce deliveries that are able to make use of existing physical distribution channels will prove more successful, at least in the short-term, than those that require new physical distribution channels to be established. This is due to the fact that these existing distribution channels already receive high product throughput (helping to reduce unit costs) and achieve a relatively high level of efficiency.

4 Transport activity and vehicle requirements: the implications from growth in e-commerce

Despite the growing amount of market information available about e-commerce there is less data on physical distribution including vehicle fleets and operations. Much of the interest in this area has been restricted to B2C e-commerce and within that it has tended to focus on the extent to which shopping trips in cars made by individual consumers would be or could be replaced by home delivery trips (probably using small trucks or vans).

A recent presentation referred to an example of a 30% reduction in vehicle kilometres when individual shopping trips were replaced by teleshopping and home delivery [REF. 4]. This type of information, often produced by modelling, is now starting to be more widely discussed. However, the optimistic assertions of trip and distance reductions depend very much on the underlying assumptions (see REF. 12). In some instances it will be difficult to achieve high levels of vehicle utilisation, and a proportion of goods will need to be returned which will require additional trips. Also, the propensity of individuals to make additional non-shopping trips has yet to be fully explored. Nevertheless, e-commerce may well have a role to play in helping to reduce urban congestion levels.

It can also be seen from the previous section of this paper that the growth of e-commerce could have profound impacts on the physical distribution networks required to move goods from producers to consumers. The change in distribution networks will in turn influence the commercial vehicle users' requirements in terms of:

- Total fleet capacity
- Fleet activity (trips/kilometres)
- Fleet mix
- Technology/development

The extent to which vehicle fleet sizes, mix and activity change will depend on e-commerce growth rates. The rapid development of e-commerce has led to uncertainty about its future rate of growth, with estimates of growth varying considerably from one report to another. B2B e-commerce may well continue to grow in value over the next five years and beyond, however the rate of growth is difficult to predict. There is far less certainty about the future of B2C e-commerce. Its future will be closely tied to the issue of whether B2C e-commerce proves to be profitable in the next few years. Therefore, B2C e-commerce could either continue to grow (i.e. a continuation of the current trend) or, alternatively, it may reach a peak and then remain stable or even begin to diminish, continuing to flourish only in certain niche sectors in which satisfactory profitability is achieved.

The implications of growth in B2C e-commerce

Two factors are important in considering the implications of growth in B2C e-commerce: (i) that a number of channels already exist which are able to deliver goods direct from supplier to consumer and (ii) even predictions of explosive growth five years into the future generally assume a market of less than 20% of retail purchases through e-commerce. The implications of these two factors are:

- At very high levels of growth there would be extra demands for vehicles to deliver in residential areas; some of this growth could be accommodated by existing parcels delivery operations but some new services would develop.

- There are expectations that, in many cases, vehicles delivering in residential areas would be mainly small vehicles. The regulatory regimes in terms of operating licences are more relaxed for vehicles of this size and the requirements for specially trained drivers are less of a constraint; for example, car-derived vans and even some larger vehicles can be driven by those possessing an ordinary driving licence.
- At low levels of growth in B2C e-commerce (i.e. below 5% of total retail sales) there would be a correspondingly limited change in vehicle requirements. However, even at low levels of uptake there may be some increase in demand for smaller vehicles to make the local deliveries to homes and to drop-off and collection points.

The implications of growth in B2B e-commerce

In the case of B2B e-commerce it is much more difficult to be predictive about the likely scale and direction of the changes. It would be possible to construct an argument that suggests that if there is a trend to much greater uncertainty and a more transactional approach to business then vehicle utilisation within a given supply chain or supply network could fall. The fall would result from the more frequent changes in origins and destinations and in the uncertainty over the volumes to be moved along any particular link in the network. However, it could also be argued that the move towards greater transparency and the developments of better information flows would inevitably result in improved efficiency in the management of the transport resource within networks. If the latter were the case, then for any given level of industrial output there would be fewer vehicle kilometres required. Yet once again these changes need to be

clearly seen as separate from other changes that will also influence activities. For example:

- Congestion may increase in core industrial and commercial areas;
- Consolidation within industry - could lead to the scope to utilise transport networks in different and more efficient ways;
- Changes in vehicle design may lead to greater efficiencies (e.g. double decks);
- Modal shift may be achieved.

With high levels of growth in B2B e-commerce there may inevitably be some shift towards a decrease in the average size of consignment. If this were the case then it may lead to a general reduction in the average size of vehicle required within supply chains. In the case of low growth in B2B e-commerce, then it seems plausible to suggest that there would be little impact on the total requirement for vehicles.

It is necessary to recognise that the impacts of B2B e-commerce have received rather less attention and that the impacts on vehicle requirements are more complicated. If high levels of growth in B2B e-commerce lead to much greater transparency and efficiency in information flow then there may be an overall reduction in the requirement for vehicles within any given supply network. However, even in this case the reduction would probably be more pronounced in some sectors and for some types of operation than for others. For example, it is often suggested that there may be scope to improve utilisation of some long distance trucking movements.

Commercial Vehicle Users' Requirements

A range of changes in CV users' requirements can be expected to take place in the next 5 to 10 years. Table 6 contains a list of some of the features that CV users will need to take account of in determining their requirements. Some of these features may arise directly as a result of developments in e-commerce while others are simply part of broader trends in vehicle requirements and design. The list reflects that these CV developments will include not only vehicle manufacturers but will also involve trailer manufacturers, body-builders, and manufacturers of handling and in-vehicle equipment.

An information-rich supply chain

The developments outlined in the previous paragraph refer primarily to technology related to vehicles. However, supply chain operations as a whole are very dependent upon developments in information systems and technology. The importance of visibility of products throughout the chain has been noted on many occasions by those concerned with logistics management. Within some supply chains it is now possible to track individual items from point of origin through to consumption (and even throughout the reverse logistics cycle of waste and recycling). The fall in the cost of equipment for tracking and tracing will lead to more widespread use in the near future. The greater visibility of components, semi-finished and final products opens up many possibilities of increased efficiency in supply chain operations. The added scope for more flexible and faster responses provided by this information-rich environment may also allow companies to identify considerable efficiencies in their use of supply chain resources such as transport.

TABLE 6: COMMERCIAL VEHICLE USERS' REQUIREMENTS AND FUTURE EXPECTATIONS

| VEHICLE DESIGN AND LOAD TECHNOLOGY |
|--|
| <ul style="list-style-type: none"> ➤ new vehicles for home delivery work ➤ dual purpose vehicles combing long-haul and local movements ➤ primary distribution – use of double deck vehicles ➤ aerodynamic profiling of vehicles ➤ small number of basic vehicles with modular add-ons ➤ possible increase in load carrying capacity of vehicles (reduction of tare weight) ➤ data tags widely used at product level – automatic checking and tracking |
| VEHICLE UTILISATION |
| <ul style="list-style-type: none"> ➤ load consolidation could be compulsory in cities ➤ specially designed unit loads (compatible between supply chain partners) ➤ greater sharing of vehicle assets |
| ENVIRONMENTAL |
| <ul style="list-style-type: none"> ➤ greater fuel efficiency expected ➤ reduced empty running ➤ taxation for empty running ➤ collaboration between authorities and logistics companies ➤ local delivery by silent zero-emission vehicles ➤ priority traffic concepts in cities |

Source: [Ref: 13]

5 Concluding remarks and recommendations

One factor that remains unclear is the scope for significant gains in efficiency in the utilisation of the vehicles within the network. This is one way in which B2B e-commerce and B2C e-commerce are linked. For example, the freight brokerage systems could produce better vehicle utilisation so it may be possible to achieve more deliveries without a significant increase in the total vehicle fleet or indeed the kilometres run.

It is also evident that there are a series of imponderables related to factors such as traffic congestion. For example, if urban road pricing becomes widespread by 2010 then the efficiency of goods deliveries within cities could be significantly improved (assuming the road user charging has the effect of significantly reducing car trips). However, if congestion worsens then a larger total fleet of vehicles will be required in order to achieve the same amount of work as that being performed today.

Several recommendations about e-commerce and the related road freight transport activity emerged from the discussion during the workshop. These are summarised below.

- It would seem quite likely that B2B e-commerce will continue to grow over the next five years and beyond, however the rate of growth is difficult to predict. There is far less certainty about the future of B2C e-commerce. Its future will be closely tied to the issue of whether B2C e-commerce proves to be profitable in the next few years. Therefore B2C e-commerce could either continue to grow (i.e. a continuation of the cur-

rent trend) or, alternatively, it may reach a peak and then begin to diminish, with it only continuing in certain niches in which it achieves satisfactory profitability. For B2C e-commerce to prove profitable and appealing it will require very efficient, reliable and low-cost freight transport services. While freight transport services tend to be relatively low-cost, it remains to be seen whether these services can achieve the required level of efficiency and reliability that will be required by customers with ever-increasing service level expectations.

- There should be consideration of whether any standardisation would be helpful in making e-commerce deliveries (especially B2C deliveries) more efficient. This could include standardisation of the size and shape of the consignments, which would facilitate standardisation in handling equipment, standardisation in tracking and tracing systems, standardisation in checking and signing procedures at the point of delivery (and any electronic equipment used during this activity).
- As discussed in the paper, growth forecasts for e-commerce vary widely. There is a need for research that will help to better understand how different e-commerce growth rates will alter commercial vehicle fleet size, mix and activity. The measures currently used to gauge the output and performance of the road freight transport industry in general, and the freight transport consumed in e-commerce operations in particular, are inappropriate and unhelpful. The two key measures used are tonnes moved (expressed in tonne-kilometres) and tonnes lifted. While these measures provide some idea of the total activity taking place in the road freight transport industry, they have two major defi-

ciencies. First, it is not possible to disaggregate data expressed in tonne-kilometres in order to understand the actual road vehicle activity taking place (either in terms of the type of goods being transported, the location of the activity or the type of vehicle being used). Secondly, the measure provides no indication of the monetary value of the work performed by the road freight transport industry (this is common practice in many other industries). By focusing on work-related measures, and failing to calculate the monetary value of this work, this diminishes the economic importance of the industry and the work that it performs. Therefore the issue of appropriate metrics for the industry needs to be considered, both to identify its monetary value, and also to provide a better understanding of the individual operations that go to make up the industrial activity as a whole (i.e. that provide the ability to disaggregate work-related data).

- ▶ The increasingly information-rich supply chain provides opportunities for better utilisation of resources throughout the chain. In order for these developments to continue to move ahead it is important that research is encouraged in this area. EU actions related to research and development programmes should ensure that projects concerned with enhancing transparency within the supply chain receive appropriate encouragement and support. The ability to track goods as well as vehicles along the supply chain and the need for compatible systems will become even more important in future.
- ▶ When examining the social and environmental impacts of B2C e-commerce transport activity it is important to make sure that a comparison is made with the impacts of the system it has

replaced, as this system will also have imposed environmental impacts. This is an extremely obvious point, but too often e-commerce is thought of as an entirely new activity that can be assessed in isolation. The transport activity in the entire supply chain for e-commerce needs to be compared with the transport in the traditional retailing system it has replaced. In some cases these supply chains will only differ between the retailer's shop and the customer's home (in terms of how the movement between shop and home takes place with, for example, a van trip replacing a car trip). However in other cases far greater divergence may occur upstream in the supply chain.

- ▶ Wherever possible policy makers should refrain from devising policies that place unnecessary restrictions on the operation of commercial vehicles. However it is acknowledged that intervention by policymakers can be necessary where market failures lead to commercial vehicles imposing externalities. When considering appropriate regulations to deal with externalities imposed by commercial vehicle operations, policy makers should devise policy measures that bring about specific outcomes rather than measures that insist on the use of specific vehicle technology. The latter approach leads to reduction in vehicle manufacturers' freedom to innovate and devise creative solutions.
- ▶ When considering how best to reduce the environmental and social impacts caused by road freight vehicles as a result of a market failure, it is important that policy makers take the following approach. First, they should determine which impact(s) need to be reduced and second, they should decide on the means by which the activity causing those impacts can be

altered taking account of wider supply chain issues for industry. We are currently in a position in which policy makers are failing to express precisely which impacts need to be reduced (e.g. energy use, pollutant emissions, noise). Even when policy makers have made it clear which impacts should be reduced, they have generally not yet determined suitable policy measures for achieving this in conjunction with industry.

- ▶ When reviewing potential policies concerned with road freight transport operations, and in particular e-commerce operations, policy makers need to discuss their thoughts and ideas with a wider range of equipment suppliers than just commercial vehicle manufacturers. They should also consult with, and seek advice from, trailer manufacturers, body-builders, and manufacturers of handling and in-vehicle equipment.

REFERENCES

- [1] 'Clicks and mortar: The new store fronts.' Report produced by the Retail e-commerce task Force (DTI/Foresight) February 2000.
- [2] Hamel G and Sampler J 'The eCorporation' Fortune vol 1(38) no (11). 7.12.98
- [3] 'Smoke on the water. A fire in the sky.' report produced by the Electronic Commerce task Force (DTI/Foresight) June 2000.
- [4] Presentation by F.Karamitsos referring to data from IDC. 'e-commerce, logistics and Urban distribution'. September 2000.
- [5] Ernst & Young, Global Online Retailing, Jan 2000. referred to in presentation by PA Consulting at Home Delivery Conference, London, March 2000.
- [6] PA Consulting Group survey, February 2000
- [7] The real business of B2B. G. Ramsdell McKinsey Quarterly 2000 No 3 p174-184.
- [8] 'The dawn of supply chain communities'. Logistics Management & Distribution. February 2000.
- [9] '@ your service: Future models of Retail Logistics'. Report prepared for the Retail Logistics task Force. (DTI/Foresight). June 2000.
- [10] DEUTSCHE POST AG (2000) Service Information, Stand 01.04.2000.
- [11] Punakivi M and Saranen J. Identifying The Success Factors In E-Grocery Home Delivery. Department of Industrial Engineering and Management, Helsinki University of Technology, 2000.
- [12] Browne M & Allen J 'Environmental implications of home delivery systems'. Paper presented at 'Home Delivery Conference'. Cranfield, May 2000.
- [13] Based on points raised at a UK DTI workshop about the commercial vehicle of the future (held in London, mid 2000).

A P P E N D I X

Scenario definition

Summary of change with physical distribution implications

EXPLOSIVE

Rapid growth in wide range of information society activities, including consumer e-commerce. Policy measures promote considerable social experimentation with information and communications technologies, facilitating uptake of related services with low levels of social exclusion.

DYNAMIC

High growth in the value of consumer e-commerce transactions.
Low levels of social exclusions from e-commerce. Many existing differences eroded, though some groups may defy the general trend.

ACTIVE

Relatively high growth in the value of consumer e-commerce transactions.
High levels of social exclusions from e-commerce, current differences persist or amplified, though some groups may defy the trend.

SLUGGISH

Relatively low growth in the value of consumer e-commerce transactions.
Obstacles to development predominate.

EXPLOSIVE

Physical world retailing transforms rapidly away from selling and display towards service and interaction. Retail centres become highly leisure oriented with many outlets changing into post-sales service points. There is a significant shift downmarket in some retail centres to cater to consumers with lower incomes, or for the relatively few groups who are still excluded from e-commerce.

DYNAMIC

The fortune of high street retailers are mixed. The most successful transform their outlets into a combination of transactional, experiential and service delivery points. Consumers can shop in the conventional way, use in-store kiosks and organise home delivery, browse new product lines, or return items purchased on-line.
Retailers with no e-commerce presence struggle to maintain market share. Many find themselves in locations where there is a steady withdrawal from physical world retailing.

ACTIVE

Retailing becomes relatively polarised. On the one hand there is a significant growth in niche outlets catering to affluent consumers who require personal service, or want the social display opportunities of buying in the physical world. At the other end, less well-off consumers are strongly retail-focused. With a relatively increased income level for all consumers leading to increased consumption of holidays and consumer goods, this group prefers the personal interaction of retail and the social opportunities it brings.

SLUGGISH

Small businesses are unable to afford to adopt e-commerce, or lack the technology and skills to do so. There is insufficient market penetration to support the overhead of providing delivery and after-sales service for most. One of the major obstacles to growth is reliable and affordable logistics for delivery to the home, especially outside office hours.

Retailing is relatively unaffected by the growth of e-commerce, with current trends continuing towards segmented retail offers from different consumer groups and the enhancement of the physical experience of shopping. Overseas retailers may make a concerted entry into the UK marketplace, attracted by positive economic conditions and a better-off population.

Source: Adapted from [Ref. 1]

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