Internet transactions and physical logistics: conflict or complementarity?

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Abstract

Every business can be described in terms of flows – both of materials and of information. Materials flow into the company, between activities within it, and in the form of finished goods and services from the company to its customers. Simultaneously, there are flows of information in the reverse direction that provide valuable data for the system: feedback from the marketplace in the form of customers' orders, customer reaction, and information on needs and wants; flows of information within the company that provide data in the form of inventory schedules, production schedules, etc., and orders from the company to outside suppliers. In one sense the whole company and the market in which it operates can be regarded as a series of linkages and relationships, and the company's operating efficiency can be seen to depend on how well these connections work. If the system can be made to flow smoothly, at minimum cost, then the chances are that the overall company performance, measured by any criteria, will be high. In practice, however, it is very common to find bottlenecks and poor integration between different parts of this system, with consequent unsatisfactory performance.

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Introduction

Over the last few years, the science of marketing has gradually extended its frontiers. The emphasis on marketing as a means of creating customers, identifying and anticipating market needs, whilst valid in itself, has proved to be too narrow. This is because the definition of marketing goals and the implementation of marketing strategies inevitably have some implications for other areas within the corporate system. If the interfaces between marketing and other functional areas in the company are not given enough attention, decisions in one area may produce disturbances elsewhere in the system that can impair total company performance. This tendency is very noticeable in the interface between marketing and distribution. A recognition of the key role that distribution can play in the company's marketing effort can be the first step to a new, integrative approach to the management and supply of markets, based on the development of logistics, or total "systems" approach to the company's activities.

The main emphasis of the logistic concept is on systems. It suggests that the materials-flow activity in the company has such an extensive and pervasive impact on different departments that it should be considered as a system. Thus the activities of marketing, production, communication and distribution departments should be harmonised in order to increase the efficiency of the overall company.

To move from the realms of general theory to the more specific activities of the firm involves a consideration of five key decision areas:

(1) facilities (plant, warehouse and depot location, size and design);
(2) inventories (raw material, component, work-in-process and finished goods stocks);
(3) communications (order-processing and related data-transmission and data-processing);
(4) unitisation (packaging in the broadest sense, including merchandising, storage, handling, inventory and transport implications);
(5) transport (the physical movement of material into, within and out of, the company).

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Logistics can help to integrate a company's activities in three major ways (McKinnon, 1989), namely by:
(1) bringing sub-systems together;
(2) mirroring the marketing "mission" of the firm;
(3) improving the efficiency of materials and information flows.

The importance of physical distribution

The principal task of physical distribution is to ensure that products are available at the right places at the right time in the right quantities to satisfy customer demand. Christopher *et al.* (1979, p. 180) contend that: "Availability should be viewed as the output of the physical distribution system".

Customers generally define "availability" in terms of the speed with which they can physically obtain supplies. This is principally determined by the adequacy of stocks held at the supply point and the order lead time, defined as the period between a customer ordering goods and their delivery to his premises. When adequate stocks of the requested products are available at the supply point, the time taken to supply the order depends on the speed of four operations:
(1) transmission of the order to the supplier;
(2) order processing;
(3) physically assembling the goods;
(4) transporting the goods to the customer.

Although availability is mainly discussed with respect to lead times, it also has an important spatial dimension. Order lead times can vary geographically, with deliveries to more remote customers taking significantly longer than average. Manufacturers can confine the distribution of their products to particular market areas and to certain types of outlets. Thus defined, availability is only one of a series of factors determining the overall quality of a physical distribution service. Several authors (Perreault and Russ, 1976; La Londe and Zinszer, 1976) have defined physical distribution service more broadly to include other factors such as the following:
- Convenience of the ordering process.
- Provision of information about the status of an order (progress information).
- Adherence to a delivery timetable at the customer's premises.
- Compatibility of handling equipment and packaging.
- Condition of the goods on arrival.
- Order accuracy (the extent to which the items received correspond to the order specification).
- Policy on returned goods.
- Complaints and claims procedure.

All these factors have been improved lately by the introduction of computer technology. At present, the logistical operations are heavily dependent on IT, particularly the large integrated stock replenishment systems that control the movement and storage of an enormous number of separate products.

The main aim of many commercial firms has been to cut the inventory levels and to speed the flow of merchandise between plants and final customer. This has been possible by the development of electronic data interchange (EDI) and electronic point of sale (EPoS), the latter driving the "sales based ordering" (SBO) systems that most of the larger retailers have installed (Marchant, 1996; Sparks, 1998). However, in relation to the final customer, the overall efficiency of commercial distribution can be further improved by using Internet technology.

Transaction processes on the Internet

The use of the Internet has become increasingly popular in the last five years, particularly in industrialised countries in which the cost of accessing and building an Internet site is relatively low (Cronin, 1995, 1996a; Watson and Zinkhan, 1997; Clemente, 1998). The Internet has many potential uses, depending on the objectives and capabilities of the user (*The Economist*, 1998). It can be:
- a source of information;
- a communication tool; and
- a distribution channel for products and services.

The new developments in the field of multimedia software have increased the range of information than can be transmitted, which can now be expressed in the form of printed text, image, sound, or a combination of all these (Watson *et al.*, 1998).

Taking into consideration the advantages of speed, interaction and flexibility, it is easy to understand why the Internet is considered as

a revolutionary tool for the development of commercial transactions. Many innovative companies have made attempts to transfer a part of their marketing activities on to the Internet, in order to benefit from the advantages offered by this unique system of communication (Ghosh, 1998; Watson *et al.*, 1998).

Many authors have analysed the impact of the Internet on the marketing strategies implemented by companies. Table I presents four opinions expressed in the specialised literature regarding the main strategic advantages derived from an effective Internet marketing strategy.

The efficiency of the Internet is higher for the companies whose value-added contribution is concentrated primarily in the informatic side of their products (Benjamin and Wigand, 1995; Cameron, 1997; Watson and Zinkhan, 1997). There is a general trend in all areas of human activity to create more value through information, but this is especially true for the high-tech companies (informatics, biotechnology, electronics). Figure 1, which is adapted from Quelch and Klein (1996), outlines how some companies are balancing themselves on the information/transaction axis.

Despite existing problems (Hoffman *et al.*, 1997; Clemente, 1998) related to the ease of access and overall security of electronic transactions, predictions are extremely optimistic (see Table II). The range and the volume of products sold online will constantly increase in the future, expanding the size and value of the electronic market (Cameron, 1997; De Kare-Silver, 1998) (see Table III).

Figure 1 Categories of WWW sites

Audience Focus	Web Site Content: Information Support/Service Only	Web Site Content: Transactions
Domestic	1 Apple Computer Saturn Reebok Catalog site	2 Software Net Wordsworth books Mr Upgrade CD Now Godiva Chocolates GAP Clothes
Global	3 Building Industry Exchange Federal Express Sun Microsystems British Airways Most Biotech Companies	4 TRADE'ex Underground Music Archive American Venture Capital Exchange Amazon Books CapEx Some Biotech Companies

Source: Adapted from Quelch and Klein, (1996)

Table II Projected size of e-commerce market by 2000

Market size, characteristics	Estimate
Total value of all Internet-based purchases	\$4.5-\$6 billion
Total value of all purchases per average buyer	\$600-\$800
Value of average Internet purchase transaction	\$25-\$35
Total Internet-based purchase transactions	\$130-\$200 million
Percentage of purchases for online products	60%-70%
Percentage of purchases for delivered goods	30%-40%

Source: Cameron (1997, p. 15)

Table I Strategic advantages of effective Internet marketing

Ellsworth and Ellsworth (1995, 1996)	Sterne (1995)	Quelch and Klein (1996)	Cronin (1994, 1996a, b)
Communications	Improved corporate image	More rapid small firm internationalisation	Cost/efficiency savings
Corporate logistics	Improved customer and investor relations	Reduced importance of global advertising costs as a barrier to entry	Performance improvements
Competitive advantage	Increased visibility	Adoption of global market niche strategies	Market penetration
Cost savings	Cost reduction	Price standardisation	Product transformation
Collaboration	Finding new prospects (customers)	Reduced importance of traditional international marketing intermediaries	
Information search and retrieval	Market expansion	Electronic support for inter-firm networks	
Marketing and sales promotion	Improved internal communications	New world-wide marketing research medium	
Data transmission			

Source: Hamill and Gregory (1997)

Table III Online shopping revenue by market segment ($ millions)

	1996	1997	1998	1999	2000
Computer products	140	323	701	1,228	2,105
Travel	126	276	572	961	1,579
Entertainment	85	194	420	733	1,250
Apparel	46	89	163	234	322
Gifts and flowers	45	103	222	386	658
Food and drink	39	78	149	227	336
Other	37	75	144	221	329
Total	518	1,138	2,371	3,990	6,579

Source: Cameron (1997, p. 42)

The impact of the Internet on the physical logistics system

It is considered that the Internet represents a revolutionary tool which can totally transform the business transaction procedures. Considered as a highly efficient communication channel, the Internet can replace some of the operations included in a classical marketing and distribution channel, and improve some of the others.

The Internet as a communication channel

The major impact of the Internet is on the communication system of the company. The use of the Internet in business transactions can increase the speed, the flexibility and the specificity of the information exchange.

In the last ten years, marketing techniques have placed a bigger emphasis on the interactive side of the commercial transaction, emphasizing the importance of communication techniques (relationship marketing, one-to-one marketing, etc.). Information became an important commodity in marketing, conveying competitive advantage to companies that transmit, store and process information effectively (Porter and Millar, 1985).

The Internet as a distribution channel

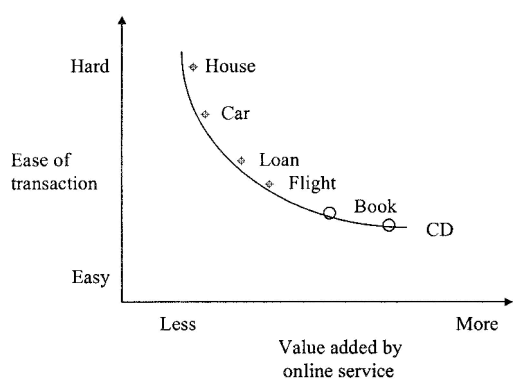
Firms can have multiple benefits using the WWW as a distribution channel (Hoffman *et al.*, 1997). First, the WWW potentially offers certain classes of providers participation in a market in which distribution costs or costs of sales shrink to zero. This is most likely for firms in publishing, information services or digital product categories (Jones, 1994). For example, digital products can be delivered immediately; hence, such businesses may encounter massive disintermediation or even the eventual elimination of the middleman (Hoffman *et al.*, 1997). Moreover, buyers and sellers can access and contact each other directly, potentially eliminating some of the marketing costs and constraints imposed by such interactions in the terrestrial world. This may also have the effect of shrinking the channel and making distribution much more efficient (mainly due to reduced overhead costs through such outcomes as uniformity, automation, and large-scale integration of management processes). The time in which to complete business transactions may be reduced as well, translating into traditional efficiencies for the firm. However, such potential efficiencies must be tempered with market realities (Kline, 1995).

Second, business on the WWW transfers more of the selling function to the customer, through online ordering and the use of fill-out forms (Hoffman *et al.*, 1997), thus helping to bring transactions to a faster conclusion. This permits a third benefit in the form of capture-of-customer information. Obviously, the use of these techniques requires reliable electronic hardware support systems such as hi-fi systems, computers, video recorders, etc. (Anderson, 1997) (see Figure 2).

The Internet as an optimisation tool for physical logistics systems

When the product sold must be physically transmitted, the commercial use of the Internet has to be complemented by the implementation of a physical distribution operation. Even in this case, distribution can be coordinated and monitored on the Internet. The seller can provide a series of additional online services to the customers, for example the possibility of tracing the

Figure 2 Where online scores



Source: Anderson, (1997)

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progress of the product during its transportation and estimating the time of its arrival (De Kare-Silver, 1998). Consumers perform a large part of the distribution function when purchasing from stores. With interactive shopping and distribution, this cost has to be borne by the retailer (Alba *et al.*, 1997). However, the retailer will not have to bear the extra costs of transportation from the warehouse to the retail shop.

In the case of institutional clients (business-to-business transactions) it may be more important to supply a particular product at a precise moment (as in the case of materials and components for a just-in-time assembly line) (Maddox and Blankenhorn, 1998). In other cases, the criterion of delivery speed will be paramount for the success of the transaction (medicines, perishable goods, etc.). The Internet represents a common technological platform which permits better coordination, organisation and management of the business operations between partners (Poon and Jevons, 1997).

Despite its advantages, the Internet cannot eliminate the physical logistic system of a company. Even in the case of the virtual companies, the specific logistic operations are sub-contracted by the firm and then coordinated at the managerial level. The Internet is not replacing the classical system of distribution, but it can change its organisation and implementation and the firm level.

Considering the relationship between Internet commerce and physical logistics systems, the following hypotheses can be formulated:

H1. Most of the Internet business transactions still depend on a physical logistics system.

H2. The online offers will be primarily directed to the national/regional markets which have a well developed logistics infrastructure.

H3. The development of online commerce has to be complemented by the implementation of a physical logistics system.

H4. The companies which already have a physical logistics system are in a good competitive position to successfully exploit the Internet business channel.

Research methodology

In order to identify the effects of the Internet on the physical logistics system, the WWW sites of 500 commercial companies were randomly selected, accessed and studied during November 1999. In order to be selected and studied, a company had to have an active business presence on the Internet – WWW site, and have a commercial activity – to offer and sell products online.

The nationality of the companies confirmed the predominance of US-based companies on the Internet. Of the firms, 399 were US-based (79.8 per cent), followed at a long distance by UK-based companies – 33 (6.6 per cent), Australia and Canada with 15 (3 per cent), Taiwan with ten (2 per cent), Japan, Italy and Singapore with five (1 per cent), and finally, France and Germany with four (0.8 per cent).

The place and the importance of the physical logistics system in relation to the Internet commerce was evaluated considering the distribution strategies implemented by the studied companies. The importance of the physical distribution system ranged low for the companies which have implemented an online distribution system, medium for the companies using direct shipping or a distribution network of agents and dealers, and high for the companies which distribute the products through their own system of subsidiaries.

In the case of online distribution, the importance of the physical logistics system is minimal. This strategy can be implemented only for digital products, which can be transmitted through electronic connections. However, even in this case the company should be concerned about the quality and reliability of the electronic system. Some countries have not yet implemented fiber optics phone lines, and the capacity to transmit large amount of information can be impaired. On the other hand, the final receiver/customer of the digital product must have the necessary software and hardware to download and store the product without errors. In some cases, the specialised software needed to access or process the digital product is provided free of charge by the selling company and can be downloaded from its Internet site.

The companies using a direct shipping distribution strategy, or a network of agents and dealers, are obliged to use the physical distribution system by the non-digital nature

of their products. However, they try to minimize the number of physical assets which they own and manage, subcontracting the distribution services from other specialised companies.

When direct shipping is offered, the customer can access the WWW site of the selling company to obtain all the necessary information about the desired product and order it online. In the second stage, the company ships the purchased (or the selected) product directly to the customer. If the client is another company or organization, the distribution will be considered a direct export, in which other intermediaries can be indirectly involved (exporting agencies, transportation and insurance companies).

For individual clients, the companies normally use the services of international delivery companies (UPS, USPS, Federal Express, TNT, etc.). Depending on the urgency of request, different options of speed delivery can be chosen, obviously, with a differentiated level of price.

When the direct shipping option is not possible (either because of the volume of the offered product or because of the additional services required for the installation of the product to the buyer), the company is using a network of agents and dealers who also provide the physical logistics system for the distribution of products. In some cases the logistics operations are sub-contracted by the selling company from other specialised firms, the agent/dealer acting only as a commercial representative of the selling company.

The distribution through subsidiaries offers the highest degree of control and of responsibility over the physical logistics operations. The company owns warehouses, commercial outlets, and sometimes even transportation facilities (ships, trucks, planes, etc.). However, some logistics operations can be subcontracted on a permanent or temporary basis (as, for example, when the company has to deal with a special order or an increase in demand).

The efficiency of the distribution operations can be improved significantly through an electronic data interchange (EDI) system, which can be implemented between the selling company and its partners/subsidiaries. The logistics operations can be correlated and managed in such a way as to provide a quick and problem-free transfer of the material product between the selling company and the final customer.

Considering that only 47 (9.4 per cent) of the surveyed companies have implemented an online distribution system, Table IV confirms the hypothesis that:

H1. Most of the Internet business transactions still depend on a physical logistics system.

Table V shows the characteristics of the target markets of the surveyed companies. Most of them are targeting their offer to the developed countries (91 per cent), at domestic (36 per cent), regional (28 per cent) or international (27 per cent) level. Only 45 (9 per cent) of the surveyed companies are offering their products on a global basis, targeting both developed and developing countries. The possible problems related with the physical logistics operations in a country which does not have a well developed logistics infrastructure represent an important factor in the selection of target markets for online offers.

This confirms the hypothesis that:

H2. The online offers will be primarily directed to the national/regional markets which have a well developed logistics infrastructure.

Considering the qualitative nature of the third and fourth hypotheses, two mini case studies have been developed in order to investigate in-depth the relationship between online commerce and physical distribution systems at two successful companies: Tesco and Amazon.com.

Amazon.com

Amazon.com opened its virtual doors in July 1995 with a mission to use the Internet to transform book buying into the fastest, easiest, and most enjoyable shopping

Table IV Types of Internet-enabled distribution strategies

Internet-aided distribution strategy	Frequency	Percentage	Cumulative percentage
Online distribution	47	9.4	9.4
Direct shipping	247	49.4	58.8
Agents or dealers	72	14.4	73.2
Subsidiaries	134	26.8	100.0
Total	500	100.0	

Table V The target markets of the surveyed online companies

Target markets	Frequency	Percentage	Cumulative percentage
Domestic market	180	36	36
Regional market ± developed countries	140	28	64
International markets ± developed countries	135	27	91
Global markets ± developed and developing countries	45	9	100
Total	500	100	

experience possible. Today, Amazon.com is the place to find and discover anything you want to buy online. The company has more than 17 million customers in more than 160 countries that have made Amazon.com the leading online shopping site. The company offers earth's biggest selection of products, including free electronic greeting cards, online auctions, and millions of books, CDs, videos, DVDs, toys and games, and electronics. As part of its efforts to provide the best shopping experience for customers, Amazon.com provides secure credit-card payment, personalised recommendations, streamlined ordering through one-click technology, and hassle-free auction bidding with Bid-Click.

The Amazon.com family of Web sites also includes:

- Internet Movie Database (www.imdb.com), the Web's comprehensive and authoritative source of information on more than 150,000 movies and entertainment programs and 500,000 cast and crew members dating from 1892 to the present;
- LiveBid.com (amazon.livebid.com), the sole provider of live-event auctions on the Internet.
- PlanetAll.com (www.planetall.com), a Web-based address book, calendar, and reminder service.

Amazon.com operates two international Web sites: www.amazon.co.uk in the UK and www.amazon.de in Germany. Amazon.com entered the European market in October 1998 with the simultaneous launch of new Web sites in Germany and the UK.

These sites make available to Europeans a vast selection, guaranteed safety of transactions, unparalleled convenience, and electronic gift certificates for worry-free gift giving.

In addition, the two sites have significantly reduced the cost of and shipping time for thousands of US titles, thanks to a large supply of the most popular US titles ready for immediate shipment from the UK and Germany. In addition, thousands of other US titles will be delivered much sooner from Amazon.com facilities in the USA.

The Internet expansion of Amazon.com over the last five years has been correlated with the development of its physical logistics system. Amazon.com owns an international network of warehouses and customer services centres, located in its main target markets: USA, UK and Germany.

There are seven warehouses owned by Amazon.com in the USA, located in Seattle (Washington), New Castle (Delaware), Fernley (Nevada), Coffeyville (Kansas), Campbellsville and Lexington (Kentucky) and McDonough (Georgia). The last five warehouses were established in 1999, a fact which demonstrate the rapid expansion of the company's business operations. An integral part of the firm's effort to enhance customers' experience, these state-of-the-art facilities maintain quality control over the packaging and shipping of products. Using the company's data system, not only can orders from multiple publishers be shipped at one time, but books can be packaged with CDs and/or videos also ordered. In the process, Amazon.com employees can check for defective goods, like, for example, cracked CD packaging.

The warehouses are located with purpose (Saunders, 1999). Delaware, where the firm has set up its second warehouse, does not have a sales tax. Nevada was chosen to speed delivery on the West coast. Nevada is also a fee-tax state, and Fernley is located near Reno, Nevada, close enough to the huge California population, but just outside the state's tax-collection borders. The Kansas and Kentucky establishments were open to access quicker the key markets from the Midwest and Southeast USA, while Amazon.com's Georgia distribution center will play an integral role in the company's

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overall global logistics strategy and is part of the company's effort to develop a significant distribution infrastructure to meet long-term growth and provide Amazon.com customers nationwide and around the world with fast, reliable shipping that comes directly from the company.

In Europe, Amazon.com owns warehouses in the UK (Slough and Marston Gate) and in Regensburg, Germany.

These warehouses/distribution centres are complemented by seven customer service centres, located in Seattle and Tacoma (Washington), Grand Forks (North Dakota), Huntington (West Virginia), Slough (UK), Regensburg (Germany) and The Hague, The Netherlands.

In organising and managing its logistics system, Amazon.com collaborates with ProLogis (www.amazon.com), which is the largest US-based global provider of integrated distribution services, with more than 1,500 distribution facilities owned throughout North America and Europe. Considering that the main distribution strategy implemented by Amazon.com is direct mail shipping, the company is using primarily the services offered by DHL. Order information is downloaded into two DHL Easyship systems – comprehensive kits installed at Amazon sites to produce airway bills, pro forma invoices, and management reports – so that shipments can be despatched and collected by DHL.

The main philosophy of Amazon.com has been to align distribution and logistics with strategic plans (Saunders, 1999). In the vision of the company's management the distribution and logistics has to achieve the following:

- to reflect an understanding of customers' delivery needs;
- to offer both current titles and hard-to-find editions and copies through the use of wholesale suppliers and independent producers;
- to provide a two-day delivery time limit on most orders through the Amazon warehousing setup;
- to enable the customers – through EDI – to query the status of their purchases and track their own shipments;
- to align supply and delivery to the other firm's functions such as marketing sales and customer service.

The complementary expansion of Amazon.com's Internet business and its physical logistics system represents a good example of an integrated commercial strategy. The company has understood that to obtain long-term success it is necessary to control not only the flow of information, but also the quality and the speed of physical delivery. This case study confirms the hypothesis:

H3: The development of online commerce has to be complemented by the implementation of a physical logistics system.

Tesco

Tesco is the UK's largest food retailer and has been leading the trial and experimentation of electronic shopping in its sector. Its Web site is one of the most frequently visited by the UK consumer base and it has been steadily building sales.

In 1998 Tesco extended its online shopping service, called Tesco Direct, throughout London. Its Internet superstores offer customers the ability to purchase any of the 20,000 product lines typically available in its stores (De Kare-Silver, 1998).

At present there are two ways you can shop with Tesco Direct, online or offline (www.tesco.co.uk).

Offline shopping involves the use of Tesco's Homeshopping software. The prospective buyer can order a free Homeshopping CD when he/she registers with Tesco Direct. This allows customers to connect to the Internet to get the latest product and price details, then disconnect to shop offline and then to connect again only to send an order.

Online shopping means selecting the goods "live" through the Tesco Direct site.

Every purchase made through Tesco Direct is automatically stored in the customer's favourites list to make future shopping faster and easier. The connection is secured by using encryption.

Next day delivery is the usual arrangement but shoppers can also order goods up to 28 days in advance. When ordering the goods, the customers can also select a two-hour delivery window that suits them best. The goods are chosen on the day of delivery by a specially trained team of personal shoppers and delivered by temperature controlled vans.

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The secret behind the success of Tesco Internet Shopping Service is an extremely well organised logistics system. Its purpose is to ensure that Tesco stores have the right products delivered against agreed delivery schedules and in good condition, enabling the stores to provide a consistently high level of customer service.

Tesco products are sent to stores from distribution centres around the country. Tesco runs 13 centres and a further six centres are run for Tesco by contractors. A typical centre covers 300,000 square feet and handles some 50 million units a year. The centres work around the clock, seven days a week, providing 2,500 deliveries daily, amounting to 19 million cases per week. Tesco employs 6,800 people in distribution (excluding the staff at the contractor-run centres), and has about 1,000 tractor units and 2,000 trailers in its national vehicle fleet.

The key to the distribution system's ability to supply each store's needs is the advanced use of IT at all stages of the distribution system. Information from stores about their sales and requirements is sent to Tesco head office and from there to the distribution centres. The centres run a computer system that has been specially designed to fit in with Tesco working practices and to maximise efficiency (see IT in Distribution fact sheet).

Computerised information arrives via printers in the warehouse offices. The system feeds this information directly to the staff on the warehouse floor via radio links mounted on the fork-lift trucks. The system helps to control the movement of stock and the activity of staff. Thus when a person has finished a particular job, the computer decides which would be the most efficient job to allocate next to that person, based on his or her current position in the warehouse.

In the past, distribution operations have been slowed down at peak times by the need for product identification and purchase-order matching. Now each goods-in checker is equipped with a scan gun which can scan the outer case code of each product and radio the information back to the head office computer, which matches a delivery with its purchase order in an instant. As well as easing bottlenecks, this system enforces accurate outer case coding, which Tesco believes to be essential to future developments in its distribution system.

Tesco uses specialised delivery vehicles which have three separate compartments, each with an independent temperature control in the range –25°C to +12°C. This allows a wide variety of goods to be transported to the same store on the same lorry. In order to gain the most efficient use of a lorry, the insulating bulkheads that divide the compartments are movable so that the sizes of the compartments can be varied according to the load. The bulkheads can also be removed entirely, to provide one or two compartments only. This capability is important, as there are five different temperature bands for the transportation of different groups of foods.

Integrating computer technology with its existing physical logistics system, Tesco is actively putting itself in a prime position to benefit from increasing electronic shopping interest. The company is establishing itself in the customers' eyes as being the leading edge exponent and will thus be best able of all competitors to effectively respond and see through the inevitable evolution of its existing retail estate.

Operationally there is no doubt that retailers could achieve great success as pioneers and major distributors in an electronic environment (De Kare-Silver, 1998). They have years of retail experience. They are well placed in the present value chain. They can enhance their market position and capabilities in the Internet era by "value networking". They can bring a select range of partners and experts to help them realise their goals. Their biggest obstacle is in their own heads. They are struggling to deal with the apparent channel conflicts.

The implementation and organisation of Tesco Direct is a good example of a successful attempt to integrate online shopping into an existing distribution system, and supports the hypothesis:

H4. The companies which already have a physical logistics system are in a good competitive position to successfully exploit the Internet business channel.

Concluding remarks

Internet commerce does not eliminate the need of the physical logistics systems; in fact, it even increases their importance. The Internet can be used as a distribution channel

only for a limited range of goods, which can be stored, processed and transmitted in a digital format. However, the Internet can be used to manage the informational side of any transactions, e.g. exchange of information, inventories, tracking deliveries and providing in-line customer service.

The Internet cannot eliminate or replace the classical functions performed within a marketing channel, but can restructure them. The flow of information between the company and its suppliers, partners and customers can be efficiently managed over the Internet, reducing the costs and increasing the speed and the quality of data transfer. On the other hand, the virtual company should organise a complementary physical logistics system in order to distribute material products to its clients.

The functions of the physical logistics system can be subcontracted by the virtual company from other specialised firms. It can be said that the implementation of the Internet is changing the structure of the classical distribution channel, encouraging an increased specialisation of the physical delivery functions. The concept of "value networking" is emerging, in which the virtual company is organising and managing a complex portfolio of partnerships with physical logistics service providers. On the other hand, in many cases, the virtual company will decide to create its own physical assets in order to provide a consistent quality of product delivery.

In any of these alternative scenarios, the virtual company should take into consideration the logistics aspect of its business, and integrate it fully into the general business strategy. The present paper has demonstrated that most of the Internet transactions are still dependent on a physical logistics system. The issue of the physical delivery can represent an important factor in selecting certain target markets, especially at international and global level. The development of the Internet business must be matched by a similar expansion of the company's logistics system. As a consequence, the companies which already have a well organised distribution are in a good competitive position to implement an Internet business line.

Many specialists (Birch *et al.*, 2000; De Kare-Silver, 1998; Markham, 1998) suggest that the future will be dominated by Internet commerce. However, this over-optimistic vision must not eliminate the practical consideration regarding the physical delivery of the products. The physical logistics system was, is, and will remain, an essential element of the general business strategy, providing both challenges and opportunities to the Internet operating companies.

References

Alba, J., Lynch, J., Weitz, B., Janiszewski, C., Lutz, R., Sawyer, A. and Wood, S. (1997), "Interactive home shopping: consumer, retailer, and manufacturer incentives to participate in electronic marketplaces", *Journal of Marketing*, Vol. 61 No. 3, pp. 38-51.

Anderson, C. (1997), "Electronic commerce", *The Economist Survey, The Economist*, Vol. 343 No. 8016, 10 May, pp. 72ff.

Benjamin, R. and Wigand, R. (1995), "Electronic markets and virtual value chains on the information superhighway", *Sloan Management Review*, Vol. 36 No. 2, pp. 62-72.

Birch, A., Gerbert, P., Schneider, D., OC&C and The Mckenna Group (2000), *The Age of E-Tail*, Capstone Publishing, Oxford.

Cameron, D. (1997), *Electronic Commerce. The New Business Platform for the Internet*, Computer Technology Research Corp., Charleston, WVA.

Christopher, M.C., Schary, P.B. and Skjøtt-Larsen, T. (1979), *Customer Service and Distribution Strategy*, Associated Business Press, London.

Clemente, P. (1998), *The State of the Net. The New Frontier*, McGraw-Hill, New York, NY.

Cronin, M.J. (1994), *Doing Business on the Internet*, Van Nostrand Reinhold, New York, NY.

Cronin, M.J. (1995), *Doing More Business on the Internet*, Van Nostrand Reinhold, New York, NY.

Cronin, M.J. (1996a), *Global Advantage on the Internet*, Van Nostrand Reinhold, New York, NY.

Cronin, M.J. (1996b), *The Internet Strategy Handbook: Lessons from the New Frontier of Business*, Harvard Business School Press, Boston, MA.

De Kare-Silver, M. (1998), *E-Shock*, Macmillan Business, London.

Ellsworth, J.H. and Ellsworth, M.V. (1995), *The Internet Business Book*, John Wiley, New York, NY.

Ellsworth, J.H. and Ellsworth, M.V. (1996), *Marketing on the Internet – Multimedia Strategies for the WWW*, John Wiley, New York, NY.

Ghosh, S. (1998), "Making business sense on the Internet", *Harvard Business Review*, Vol. 76 No. 2, pp. 127-35.

Hamill, J. and Gregory, K. (1997), "Internet marketing and the internationalisation of UK SMEs", *Journal of Marketing Management*, Vol. 13 No. 1-3, pp. 9-28.

Hoffman, D.L., Novak, T.P. and Chatterjee, P. (1997), "Commercial scenarios for the Web: opportunities and challenges", in Kalakota, R. and Whinston, A.B. (Eds), *Readings in Electronic Commerce*, Addison-Wesley, Reading, MA, pp. 29-53.

Jones, R. (1994), "Digital's World Wide Web server: a case study", *Computer Networks and ISDN Systems*, Vol. 27 No. 2, November, pp. 297-306.

Kline, D. (1995), "'Friction-free' foolishness". URL: http://www.hotwired.com /market/95/37/ index1a.html

Kotler, P. (1997), *Marketing Management*, 9th ed., Prentice-Hall, Englewood Cliffs, NJ.

La Londe, B.J. and Zinszer, P.A. (1976), *Customer Service: Meaning and Measurement*, National Council of Physical Distribution Management.

McKinnon, A.C. (1989), *Physical Distribution Systems*, Routledge, London.

Maddox, K. with Blankenhorn, D. (1998), *Web Commerce. Building a Digital Business*, John Wiley & Sons, New York, NY.

Marchant, B. (1996), *Distribution: A Practical Guide to Planning and Operation*, Kogan Page, London.

Markham, J.E. (1998), *The Future of Shopping*, Macmillan Business, Basingstoke.

Perreault, W.D. and Russ, F.A. (1976), "Physical distribution service in industrial purchase decisions", *Journal of Marketing*, Vol. 40, pp. 3-10.

Poon, S. and Jevons, C. (1997), "Internet-enabled international marketing: a small business network perspective", *Journal of Marketing Management*, Vol. 13 No. 1-3, pp. 29-41.

Porter, M. and Millar, V. (1985), "How information gives you competitive advantage", *Harvard Business Review*, Vol. 63 No. 4, pp. 149-60 .

Quelch, J.A. and Klein, L.R. (1996), "The Internet and international marketing", *Sloan Management Review*, Vol. 37 No. 3, pp. 60-75.

Saunders, R. (1999), *Business the Amazon.com Way*, Capstone Publishing, Oxford.

Sparks, L. (1998), "The retail logistics transformation", in Fernie, J. and Sparks, L. (Eds), *Logistics and Retail Management*, Kogan Page, London.

Sterne, J. (1995), *World Wide Web: Integrating the Internet into Your Marketing Strategy*, John Wiley, New York, NY.

The Economist (1998), *Going Digital*, 2nd ed., Profile Books, London.

Watson, R.T. and Zinkham, G.M. (1997), "Electronic commerce strategy: addressing the key questions", *Journal of Strategic Marketing*, Vol. 5 No. 4, pp. 189-209.

Watson, R.T., Akselsen, S. and Pitt, L.F. (1998), "Building mountains in the flat landscape of the World Wide Web", *California Management Review*, Vol. 40 No. 2, pp. 36-56.