Tracking a Transformation

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BRIE-IGCC E-conomy Project

Tracking a Transformation

E-commerce and the Terms of Competition in Industries

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Lean Information and the Role of the Internet in Food Retailing in the United Kingdom

The progress of information and communication technologies (ICT) is known to have an impact on productivity, jobs, and economic growth. It is less clear what constitutes the precise nature of the mechanisms transmitting this impact. In this chapter, we identify the dynamics of this transmission process in a key sector in an advanced economy: the food retailing sector in the United Kingdom. However, we found that rather than a linear transmission of impact, from technology to business structure, there was an interaction between the two sets of factors, so that the system as a whole can be viewed as enacted by participating agents. Here changes in the interorganizational structure and dynamics of an industry can be related to such factors as information processing, costs of production and interaction with supply chain, and returns to scale. These in turn influenced both the efficiency and productivity of the food retail sector and the autonomy of consumer relations. There was a rapid consolidation of food retailers and manufacturers in the United Kingdom with the advent of electronic point of sale data. This occurred a decade earlier in the United Kingdom than in the United States (as described by Kinsey in chapter 11 of this volume); consolidation is facilitated in the United Kingdom by centralization and lesser regional differentiation. We begin by examining the earlier impact of ICT on this sector. We go on to use this analysis as a basis for examining the specific impact that the Internet and

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the advent of e-commerce have had in recent years on the food retailing system.

In addressing the question of the effects of the availability of the Internet on food retailing in the United Kingdom, we examine the role of earlier proprietary IT systems and accounting information in replacing arm's-length market relationships and the coordinating role taken by supermarkets in relation to their suppliers. The second part turns to the impact of the ubiquitous Internet. We argue that despite its benefits, the Internet could overwhelm the grocery sector with information. Information flows operate in certain respects analogously to just-in-time (JIT) production and distribution flows.[1] What the supermarket requires is "lean information": just the right amount of information, of the right quality, in the right place, and at the right time.

The Supermarket Story before the Internet

In the 1990s U.K. supermarkets emerged as the major success story of British business. They had captured 80 percent of the grocery market and achieved an average net margin of between 5 and 7 percent.[2] This was up to treble the level achieved by their European and North American counterparts.[3] One important reason for this is that in the early 1990s supermarkets radically reorganized business processes on the basis of quick response partnershipping (QRP).[4] QRP made extensive use of new information systems, eliminated waste,[5] and improved synchronization of activities throughout

1. For a discussion of the origins and implementation of JIT, see Womack and Jones (1996, p. 58).

2. Thompson (1992, p. 51).

3. Wrigley (1993). The U.K. grocery sector, which includes nonfood sales, is exceptionally concentrated. The top four supermarket chains—Tesco, Sainsbury's, ASDA, and Safeway—capture around 65 percent of grocery sector sales. Tesco is the leader with 22 percent market share in the year 2000. The top twelve grocers in the United Kingdom account for 85 percent of sector sales. In 1996 the U.K. food market alone (which includes soft drinks and confectionery but not alcohol and tobacco) was worth £48.5 billion. Consumers purchase most of their food from grocery stores. In 1996 a total of £37.6 billion was spent on food in grocery stores; this represents 77.6 percent of the total spent on food. A further 18 percent was purchased through alternative multiple retail outlets such as co-ops, butchery chains, and bakers. It is estimated that small independent food retailers are left with a market share of 5 percent. Corporate Intelligence on Retailing (1998).

4. Whiteoak (1993, p. 3).

5. We use the term *waste* in the Japanese sense of *muda* to mean "specifically any human activity which absorbs resources but creates no *value*" (Womack and Jones [1996, p. 15]).

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the supply chain. The concept of waste applies as much to information flows as it does to material flows with cost implications.

When we examined the literature on the processes and factors that had led to the high concentration of U.K. supermarkets and their subsequent domination of the U.K. food retailing market, we found no coherent account of these developments. The literature was functionally based and fragmented in analysis. On the basis of evidence drawn from information systems, logistics distribution, retail, marketing, management, environmental issues, and planning, we argue that this success has above all been the result of the creation by the supermarkets of close interdependence with their suppliers. We suggest that to understand the new organizational configurations, it is necessary to examine relationships with suppliers from a systemic perspective.[6] This reveals how the capacity to improve accountability in the network was achieved. The dominant buyer in a business network pressing in all directions for reduction in waste could harness the new information technologies and accounting techniques to tighten interlinkages, reduce costs throughout the system, and gain increased influence through positive feedback effects.

Large retail food corporations used accounting techniques as control mechanisms beyond their own boundaries and ensured coordination in the organization of production and distribution; in doing so they have created barriers to entry into food retailing. One effect has been considerable influence by food retailers on consumption patterns. Consumer choice is not entirely autonomous but is influenced by interactive processes of this kind. This suggests the need for systems thinking in which relations between players in the system are seen to extend beyond a logistical perspective.

The pre-Internet system of that time had been enacted not only by the supermarkets but also by suppliers and consumers motivated by a variety of incentives and constraints. We begin by showing how changes leading to quick response partnershipping were introduced into U.K. grocery retailing. We go on to look at the system of relations between supermarket suppliers (specifically growers and packers)[7] and consumers from the stand-

6. Garnsey (1993, p. 229).

7. Growers provide supermarkets with fresh fruit and vegetables with value added in the field or packing house. In 1993 supermarkets retailed 48 percent of fresh produce sales. Their predicted share for 2000 is 70 percent. Fruit and vegetables are the supermarkets' most profitable lines; accounts show a retail margin of between 35 and 45 percent (*Grower,* March 11, 1993).

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point of the supermarkets and from the perspective of other actors in the quick response partnership. We review evidence that shows how U.K. supermarkets achieved advantages in the 1990s by using information and communication technologies as the critical enabler in processes of organizational change.

Food Retailing in the United Kingdom

The 1980s were an era of widespread restructuring for grocery retailers. Between 1977 and 1987 outlets fell by 37 percent from 75,000 to 47,000, and the grocery market became dominated by the supermarket chains. A decade later, in 1997, there were an estimated 32,000 grocery shops trading in the United Kingdom with the top twelve supermarkets operating from 4,900 outlets.

By 1997, almost 70 percent of the U.K. grocery sector was concentrated in five companies: Tesco (22.7 percent), Sainsbury's (18.7), ASDA (12.0), Safeway (11.1), and Somerfield (5.2).[8] Competition between supermarkets became increasingly concerned with space; the struggle for superstore sites ("store wars") intensified. In 1995 an average edge-of-town superstore covered 30,000 square feet and offered the consumer over 20,000 lines from which to choose.

In the decade from the early 1980s to the early 1990s, U.K. food retailers found ways to use to advantage their direct contact with a mass of consumers provided through the new information technology generated at the checkout: electronic point of sales (EPOS) data. By the mid-1990s, U.K. supermarkets were recognized as the most aggressive grocery chains in the world in introducing EPOS computing systems in stores and electronic data interchange (EDI) ordering systems with suppliers. (And by this time U.K. supermarkets had achieved the highest rates of profit and levels of market share among food retailers in the world.[9]) This led to a total rethinking of their own warehouse and stock replenishment systems. The supermarkets, enabled by the new technologies, were able to extend their influence over other sectors in the supply chain and affect their performance by replacing open market relationships with a system of interfirm networks coordinated by IT—an efficient vehicle for managing large

8. Corporate Intelligence on Retailing (1998). ASDA was sold to Wal-Mart in 1999.
9. Corporate Intelligence on Retailing (1998).

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numbers of discrete transactions. This created new interdependencies between participants in previously separate networks.[10]

Before the introduction of the new technologies, suppliers unintentionally accelerated their loss of power in two key ways. First, through their willingness to produce own-label goods for supermarkets, they marginalized their own identity.[11] Second, in the era of rapid supermarket expansion, suppliers readily transferred accounting information on merchandising and stock control to supermarkets in expectation of increased sales. But "once the skills were transferred . . . suppliers had lost more degrees of freedom."[12] At the same time, suppliers continued to give supermarkets generous credit. As Loasby pointed out, supplier credit extended "often for a longer period than the goods remain unsold. They also sell for cash. Supermarket chains have negative current assets." U.K. food retailers operate in oligopolistic markets, burdened by the continual need to differentiate what are effectively the same products. At the same time, they have to avoid destabilizing the market and recognize their interdependence.[13]

In the early 1990s, quick response partnershipping was adopted with the aim of cutting inventory levels. The origins of the concept can be traced back to work carried out by Kurt Salmon Associates in the United States, originally for the apparel sector and later the grocery sector.[14] Quick response partnershipping includes the harmonization of order management, inventory replenishment, physical handling, transport, and the exchange of information with the customer through EPOS and with the supplier through EDI. In 1993 Terry Leahy, then marketing director of Tesco, gave a graphic description of the quick response partnershipping in practice:

10. Loasby (1991, p. 99).

11. Of the four top supermarkets, Sainsbury's has 67 percent of sales through own-label products; Tesco, 56 percent; Safeway, 46 percent; and ASDA, 43 percent. Own-label products account for 15 percent of sales in U.S. supermarkets (Fiddis, 1997).

12. Loasby (1991, p. 99).

13. It is acknowledged in the trade that U.K. supermarkets use the retailer Marks and Spencer (M&S) to ascertain an upper price the market will bear. M&S holds 4.9 percent of the U.K. food market and is atypical of major food retailers in style and location. M&S trades mainly from the high street, does not provide parking, and stocks 100 percent own label, but has a reputation for quality—along with "quality profits" and high prices. Davies and Brooks (1989); Fernie (1990). Since 1999, the fashion division of M&S has had poor returns, but the food division continues to do well and hold market share.

14. Fernie and Sparks (1998).

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> We have linked our ordering to our electronic point of sale system. And we've linked our ordering system to our suppliers with electronic data interchange. Now when we sell a sandwich for example, the sale is registered by the scanner which automatically speaks to the ordering system, which orders a replacement. This is transmitted to the supplier straight into the supplier's production planning system; automatically calculating the raw ingredients required, the amount to be produced on the next shift, the labor needed the line capacities, the dispatch and distribution details and so on. Out go the lorries into the distribution center depots, deliver straight to stores, back on the shelf, back in the trolley and across the scanner within forty eight hours.[15]

This is an example of the use of an Extranet, an EDI system that includes customers, suppliers, and other strategic partners and is identifiable as business-to-business e-commerce as early as 1993. By 1995 Tesco had sales of around £10 billion, making it one of the largest grocery chains in the world and number two in the rankings of the top four major grocery retailers in the United Kingdom.

Quick response partnershipping demanded the harmonization of EDI software systems to supermarket specification at the suppliers' expense. Moreover, suppliers usually supplied more than one supermarket and had to fund and run different software packages—with resultant strain on their own business process. Customized inventory management software can provide indirect control over the value chain. In the supermarket literature, the system was described as a customer-oriented, integrated process that harnessed information and communication technologies to intensify closeness to the customer. "A logical extension of this concept (quick response partnershipping) is that the whole activity becomes a single, common, shared process."[16] The dominant player controls the information flows in this process.

SUPERMARKETS AND SUPPLIERS. As a special case study, we chose to explore in detail supermarket relations with suppliers of fresh produce, the growers. The short shelf life of fresh produce does not tolerate the delays incurred by trading on an open market. The lessons learned by the supermarkets in fresh product supply—that is, the need for customer-driven

15. Leahy (1993).
16. Whiteoak (1993).

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systems in place of inventory-based systems in order to reduce waste—have permeated all parts of the supply chain.

Relationships between suppliers of ambient goods and the supermarkets resembled those between growers and supermarkets in certain central respects. Quick response partnershipping, enabled by EPOS and EDI, allowed the supermarket to treat all suppliers as if their product had the fragile shelf life of the mushroom—that is, a matter of hours. By the late 1980s, the top four U.K. supermarkets had radically altered their replenishment processes by moving toward daily orders for all fresh products and for many items with a long shelf life. This revolution came about through the supermarkets sharing their professional advice about customer choice and real-time purchasing activities of customers, leading to more accurate stock forecasting. In return, suppliers were expected to develop shorter replenishment cycles and gain efficiency by eliminating forecast and delivery errors. Furthermore, supermarkets tracked the business outcomes of their suppliers—through EPOS data—and ranked their profitability by sector. Good suppliers, those who provided delivery and orders with zero defects ("a quality product in just the right quantity at just the right time"), were rewarded with custom and advice. Supermarket patronage for a preferred supplier resulted in an increase in volume supplied, compensating for a decrease in payment made per unit.[17]

The network using quick response partnershipping for sourcing fresh produce for supermarkets is usually represented as in figure 12-1. This shows the information flows between supermarket customers, the stores, head office, the growers, and warehouse and distribution. Figure 12-1 shows the way EPOS and EDI are used to help control the range of operations between partners within the retail food sector network. The new technology has led to increased efficiency and profitability for the partners but not to parity among them.

The suppliers' dependence on the custom of a major supermarket was much greater than the supermarket's dependence on any one supplier. The supermarket controlled the crucial resource of access to large numbers of consumers, while the supplier provided products that were normally also available elsewhere. The potential substitutability of the supplier contrasted with the key access to mass custom controlled by the supermarkets,

17. Suppliers are prepared to incur costs of promotions and recover these through volume sales and steady demand throughout the year (confidential telephone interview with the marketing manager of a multinational food manufacturer, June 2000).

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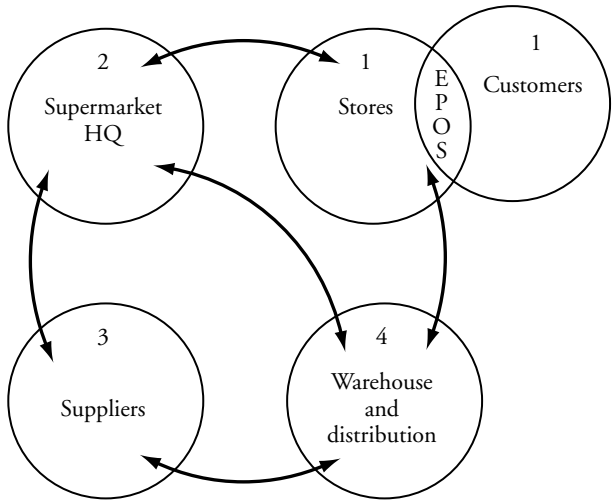
Figure 12-1. *Quick Response Partnershipping in the U.K. Grocery Sector*



which made them indispensable outlets. In 1994 Sainsbury's and Tesco had between them 18 million customers a week. In return for opening its market to a supplier, the supermarket demanded of them:

—customized product or priority access to available stock;

—supplier-funded EDI ordering systems;

—supplier accountability for value adding features: bar coding, supermarket packaging, and labeling;

—maintenance of prescribed "supermarket quality" as defined at any time by the supermarket.

This process bears all the hallmarks of a lean supply system that begins with "a 'market price minus' system rather than a 'supplier cost plus' system."[18]

The outcome of implementing lean processes using harmonized EDI systems between suppliers and supermarkets was that reviewing efficiency and effectiveness became a continual process. This reduced the need for and size of safety buffers for all parties with a subsequent saving all around, but the control remained firmly with the supermarket. The higher the performance target reached by the supplier, the higher the target it had to

18. Womack, Jones, and Roos (1990, p. 148).

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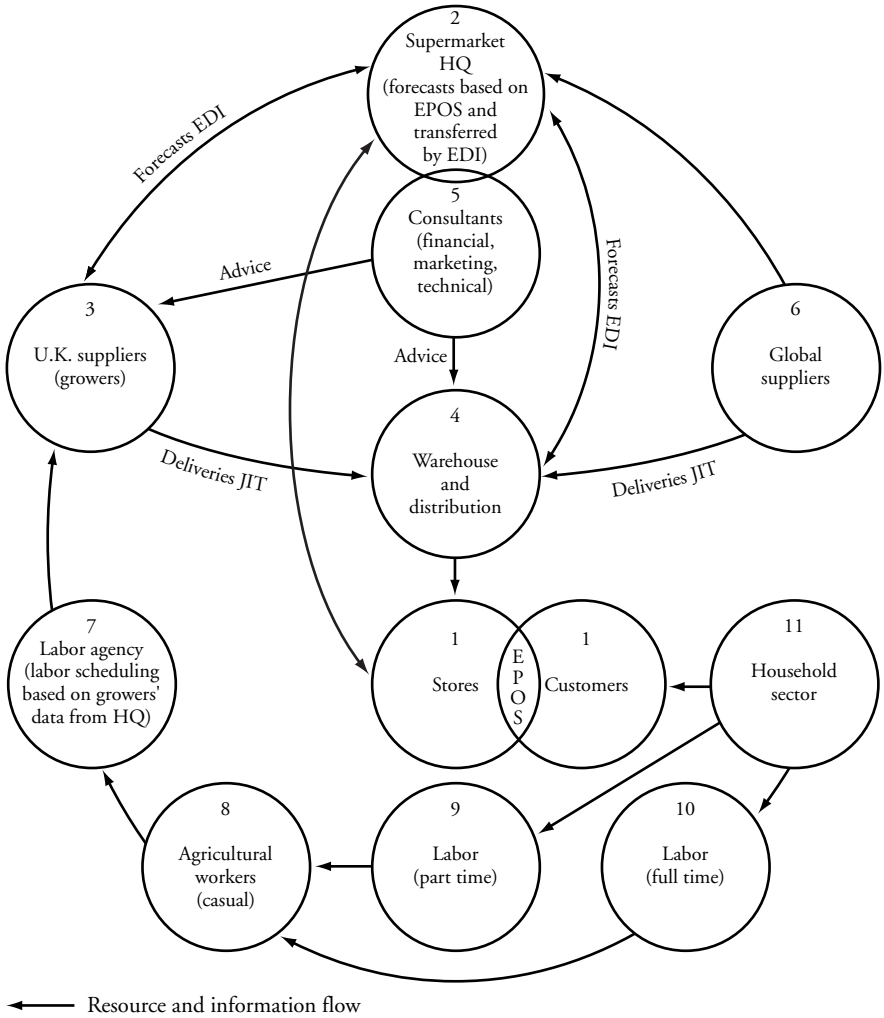
Figure 12-2. *Interaction between Participants in the Supermarket Retailing System*



reach. However, after a certain level, more intensive performance began to incur costs that suppliers and distributors sought to off-load.

Figure 12-2 provides a fuller representation of the agents in the supplier-retailer system of food retailers. In addition to the actors shown in fig-

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ure 12-1, there are global suppliers, labor agencies, casual workers (both part-time and full-time), and households.

CUSTOMERS AND STORES. EPOS generates moment-by-moment information regarding inventory replenishment need and the buying patterns of consumers. Indeed, when the customer makes the choice between the purchase of one or two bunches of spring onions, so sensitive is the stock replenishment information system that a job may be at stake. Not only does EPOS carry data about what is needed to go back on the shelf, but over time the data on customer demand creates a long-term and highly differentiated data stream on supply requirements. U.K. supermarkets are now aware of different consumer demands by geographical region, individual stores, days of the week, and hours of the day. Add to this the introduction of the smart card, and consumer activities are identifiable by customer name, age, sex, other members of the household, and social class (based on zip codes). The retailers use this knowledge not only for the management of goods from source to checkout but for product innovation. They alone are in the position to gather this data, which they sell to data companies that in turn feed back information to their clients, the manufacturers. By 1996 supermarkets had created a virtually cost-free, information-rich product emanating from their checkout counters.[19]

HEADQUARTERS, CONSULTANTS, AND SUPPLIERS. The management of the business process is the domain of the supermarket headquarters, and its role is to keep the supply chain transparent and to prevent the formation of barriers at any of the organizational boundaries. In order to control quality to suit their known customer base, the supermarkets became as technically knowledgeable and competent as their suppliers. With trusted "preferred suppliers," the supermarkets gave:

—technical advice, showing suppliers how to achieve quality products;

—financial advice on how to access financial backing;

—advice on how to update plant (particularly refrigerated storage and hygiene standards);

19. IRI Information Services claimed that U.K. fees for supermarket EPOS data peaked at six times those paid in France. The market research firm A.C. Neilson claimed it was ten times greater. Both companies have been trying to persuade the retailers that the fees they are charging are unsustainable. When the contract with Safeway ended, Neilson placed a "take it or leave it" offer on the table; Safeway walked away, leaving Neilson to estimate data through consumer panels. Neilson argued that "it should be a two-way street between retailers and manufacturers."

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—marketing advice to help stimulate product innovation and harmonize suppliers and supermarket promotions.[20]

For example, during the 1990s Marks and Spencer maintained a team of seventy science and food technologists. Within this team were technical groups that worked with growers and suppliers to produce world-class products with procurement detail specified by M&S; supermarkets adopted this approach with their suppliers.[21] The delisting of a supplier did not create a serious problem because supermarkets had the knowledge of products, finance, and marketing required to enlist new suppliers as needed.

Embedded within quick response partnershipping is the idea of "commitment both ways" as a means of encouraging bilateral accountability.[22] Supermarkets emphasized the mutual dependency between themselves and suppliers, playing down the hierarchical control of the network from head office. Each favored partner had a corporate strategy and in theory professional autonomy; however, supermarket programs prescribed their business practices.

EDI also helped to integrate the consumer-contact "front end" process of retailing with the "back end" process of distribution and in so doing created a role for third-party–dedicated composite warehousing and distribution agencies that handled all categories of goods, including ambient, chill, and frozen. Contracting out did not mean that the supermarkets diminished their control over logistics; the reverse was the case. Third-party operators were assessed on their ability to fit the supermarket system.[23]

GLOBAL MARKETS. The global market is used in two ways: as a resource for both supermarkets and growers and to put pressure on U.K. supermarket suppliers. Initially, global producers were used to provide substitutes for local producers that were not meeting the supermarket requirements. Moreover, purchasing on the global market meant that supermarkets could represent themselves as price takers, divesting themselves of the

20. A supermarket two-week promotion can typically involve the supplier in producing a whole year's supply in advance. It is in the field of supermarket promotions that the Internet is beginning to play a key role in real-time information sharing between supermarkets and suppliers, and we return to this point later.

21. McCracken (1995).

22. Helper and Sako (1994).

23. "Europe's Largest Composite Store" (1991, pp. 15–18). For example, in 1989 Tesco had forty-two depots, of which twenty-six were temperature-controlled. By the late 1990s, Tesco had nine composite regional distribution centers, each serving about sixty stores. Of the nine centers, four are run by Tesco, two by Wincanton, two by Excel Logistics, and one by Hayes. This mix has enabled Tesco to compare centers and the subcontractors and draw up a league table of performance.

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responsibility for price setting. However, dealing with unknown, unaccountable sources of supply required managerial effort and incurred transaction costs.

Growers, too, made use of global markets. They developed special relationships with compatible growers around the world to sustain the integrated system. For example, if the grower could not match the supermarket demand for green salad, a communication to California supplemented supply. The U.K. grower took responsibility for the product achieving supermarket quality. Supplementing supply in this way carried greater transaction costs, and supermarkets encouraged suppliers to develop methods to provide continuity of supply locally.

In 1995 Tesco planned not to import any carrots; indeed, it aimed for growers, in conjunction with U.K.-based supermarkets, to become food exporters to U.K. supermarket bases overseas. Sainsbury's had a base in the United States ("Shaws"), and Tesco in France ("Catteau"). Through the internationalization of grocery retailing, U.K. supermarkets have created new opportunities for preferred suppliers in the system. Thus the lessons from U.K. methods with their specialist accounting and IT techniques are diffused beyond the U.K. market.

LABOR AND HOUSEHOLDS. The influence of the supermarkets on the business processes of their suppliers extended beyond the formal logistics of scheduling, delivery, and their attendant bargaining dynamic into the organization of the labor process of their suppliers. Figure 12-2 shows the impact of quick response supply chain partnershipping on labor and how labor was used as buffer within the system. Labor is an area that has not received much attention within the retailer-grower relationship, yet the ways in which EPOS and EDI influenced labor scheduling in other areas of retailing is well known.

Despite deficiencies in agricultural data, it was clear that growers were integrated and integral to quick response partnershipping and that labor was essential to turn the supermarket programs into realities. Increasingly, small growers, although defined by the yearly agricultural census as "family owned farms," in practice often form networks of small growers. A major grower would organize the network (sometimes in the region of thirty small growers) to supply the volume and quality of product specified by the supermarket program. In order to match the flexibility in supply, growers had to use equally flexible labor.

Being part of a bufferless supply network brings particular problems for employers. The expense of maintaining a permanent "just-in-case" work

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force to meet EPOS-generated orders is untenable. Growers usually employed full-time supervisory staff to maintain quality of product and some permanent part-time workers, but frequently the majority of the employees were hired on a casual basis through the use of a labor agency. One of the key roles of the labor agencies was the provision of transport for workers, as fields and packing houses are usually sited in remote areas.

Another key function of the agency is to organize payment of labor. Casual labor was often hired out for only part of the day. Casuals were usually paid by the piece—in some cases the rate was determined individually, but frequently the rate was calculated for the "gang" as a whole.[24] If the supermarkets, on the grounds of not achieving the designated quality, rejected produce, then in some cases the gang responsible took a cut in pay. When crops were difficult to handle and weather conditions unfavorable for field gangs, total earnings by piece rates became depressed. The agency then renegotiated with the grower to fix an hourly rate.

ACHIEVING VERTICAL INTEGRATION WITHOUT OWNERSHIP. Supermarket production programs for growers specified the volume of crop required by the supermarket. The prices to be paid for the produce were not included at the planning stage between supplier and purchaser. The final agreement to purchase, based on quantity and price, was confirmed a few days or hours in advance of delivery. Thus although the quantity and quality of goods produced by the growers was specified directly by the supermarket, the supermarket was not bound by any contractual arrangement to purchase the goods. If the supermarket rejected the goods that had been dedicated to it, the grower's choice of alternative retail outlets was limited.

Supermarkets controlled almost 70 percent of the fresh produce market. They were able to distance themselves from any direct involvement in the growers' labor costs. At the same time, their formulas for managing their growers provided them with the overall control of vertical integration without the risks.

ENACTING THE SYSTEM. Labor is drawn from households, and the same households are among the supermarkets' customers. Field and packing-house workers meet arrangements justified in the interests of cus-

24. At the time of the study, the Agricultural Wages Board Order of June 1994 fixed the hourly rate for regular part-time and full-time agricultural workers in the United Kingdom at £3.72 an hour, £2.76 an hour for casuals. A good piece rate worker earned £5.00 an hour, but many earned less, and not all packing-house workers were covered by the Agricultural Wages Board Order.

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tomers, who include themselves. Our research showed that casual workers identify strongly with the corporate image of the supermarket for which they are harvesting or packing produce, not the grower, whom they may never meet or know by name. Agricultural workers do not associate their low levels of pay with either the supermarket or the grower but with the labor agency.

Households are the source of both consumers and labor; they are the connectors enabling the system to function as it does, no less important to integrating the circuitry, the flows of information and resources, than are supermarket headquarters. However, members of households are reactive rather than proactive in taking up consumption opportunities in a system in which change is largely initiated by the strategies of the supermarkets.

THE OPERATION OF THE MARKET. Oligopolistic competition has centered on product differentiation aspects of retailing rather than pure price competition. In our case study, market control has been achieved by U.K. retailing organizations as a result of financial systems control over the supply chain, through the use of IT in stock control, the monitoring of suppliers' performance coupled with knowledge of suppliers' production processes, and massive buying power. Oligopoly has been essential to the current system, providing key players with the resources required for costly investment. Monopoly would reduce incentives to innovate, but the number of competitors with equivalent power must be small for the current system to operate, since a reduction in market share would reduce buying power, decrease control over the supply chain, and put in doubt the ensuing control over costs. In any one residential area in the United Kingdom, there are currently few—if any—competitors, because of planning restrictions (zoning) and because the superstores have been located to achieve access to maximum custom.[25]

COORDINATION OF SUPPLY CHAIN PERFORMANCE. The supermarkets' use of EDI programs and EPOS information illustrated how technological integration has promoted organizational integration across boundaries. The continuous flow and analysis of data on customer behavior has resulted in smaller orders and less wastage for stores. The benefit in production and distribution is the reduction in need for and size of reserves for all the parties and a subsequent saving all around. Table 12-1 summarizes the major points relating to IT, accounting and performance techniques, and control made in this chapter.

25. Raven, Lang, and Dumonteil (1995).

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Table 12-1. *Supermarket Coordination of Supply Chain Performance*

IT-generated data stream	*Accounting and performance*	*Control*
—Continuous information flow via EPOS, smaller and more frequent orders, allow for product differentiation	—Capacity to stipulate and assess performance of producers and distributors	—Consumption under the influence of the retailing system
—EDI programs focus on volume and quality	—Alignment of order process	—Synchronization of the business process throughout supply chain
—EDI influences labor scheduling for suppliers	—Elimination of forecasting and delivery errors	—Control over reserves reduced or eliminated from system
—Distributed information aids scheduling integration	—Forecasting, monitoring, and management of goods from source to checkout	—Asymmetrical access to information
—EPOS aids innovation	—Achieve shorter cycles	—Monitoring and assessment of suppliers' performance
	—Specialist accounting techniques diffused beyond the U.K.	—Price and market control

The supermarkets could not have achieved their performance improvements in the 1980s and 1990s had they not provided stores to which consumers actively responded. The U.K. shopping public helped to enact the system, enabling it to function as it did. Determined strategic priorities and centralized buying and distribution channeled the uncoordinated behavior of consumers. Alternative forms of food retailing have largely succumbed to competition from the new configurations. A major new development, however, has emerged in the form of the global Internet, to which we now turn.

U.K. Supermarket Information Systems and the Internet Age

It is widely predicted that the Internet will stimulate much higher EDI diffusion across all industry sectors. Internet EDI (I-EDI) provides an inexpensive infrastructure for data transmission compared with the original proprietary EDI software.[26] There are diverse views on the likely impact of

26. Unitt and Jones (1999).

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the Internet; one is that the Internet can limit the role of the large corporations in coordinating market relations: "The availability of the Internet is now taking the power away from arrogant hub companies who used to dictate the terms of an electronic relationship, usually skewing the power balance in their favor."[27]

A key function of the Internet is its ability to make available accurate real-time data, the weakest link in supply networks. The notion that information sharing and timely communications across systems enabled by the Internet will open up a whole new democratization in supplier-retailer relationships is based on the following arguments.[28] E-commerce via the Internet involves more symmetrical information flows that will bring the balance of power embedded within supplier-retailer relationships into equilibrium. EDI, the technology that kick-started the e-commerce revolution, facilitating computer-to-computer exchange of business documents in standard machine processible format (with "zero touch" between and among interorganizational trading partners), represents proprietary forms of information exchange. The high costs incurred in using EDI are sustained by suppliers and create barriers to entry to the grocery market. The Internet is seen to be inclusive because of the low costs of entry to Internet trading. Earlier we indicated that computer-to-computer technologies (including EDI) streamlined supplier-retailer business processes but that this was not a wholly technologically determined process. To establish trading partners, personal relationships also had to be formed; though technologically enabled, the system had to be enacted by active agents. We would suggest that this applies also to Internet trading systems.

The Internet and Information Flow

The Internet broadcasts simultaneously to all points in the supply chain, offering spontaneous coordination among trading partners. In examining these issues, it is critical to conceptualize the problems of coordinating information flows in an organization. From this analysis, some keys to supermarkets' ability and strategies to control grocery retailing information in the Internet age may emerge.

There are two solutions to information overload: either reduce the amount of information to be processed centrally or increase capacity to

27. Angeles (2000, p. 45).
28. Our discussion is indebted to Angeles (2000).

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process information.[29] The first solution involves accepting a reduction in the interdependence between parts of the organization—reduce information processing by reducing synchronization. This can be done through the creation of resource buffers or slack in the system, which prevents difficulties in one part of the system from affecting the rest. Supermarkets reject the idea of living with waste for themselves but acknowledge that their business processes mean that many of their suppliers work with buffers provided by massive finished goods inventories.[30]

As an alternative to increasing capacity in order to manage information, management may choose instead to rely on more elaborate storage, retrieval, and compression of information from point of origin to decision point.[31] Even within the efficient integrated supermarket network, information systems persist in being resource-hungry.

The 1990s have witnessed a plethora of data: loyalty card schemes, scanning data, data warehousing, and data mining that have facilitated understanding of the customer and improved category management initiatives. EDI allows the transmission of data back up through the supply chain, especially forecasting information. Item coding and database management systems need to be standardized to ensure that the information sent is comprehensible to other partners in the supply chain. Peter Jordan of Kraft Jacobs Suchard claims that "a lot of companies are throwing electronic data at each other and are not fully understanding the meaning of the data."[32]

Alongside the use of better-managed information, Galbraith called for the creation of lateral relations to keep decisionmaking close to the information source.[33] Since the mid-1990s, supermarkets have embraced this strategy through efficient consumer response (ECR) and category management, discussed in detail later.

29. Galbraith (1974).

30. Frances and Garnsey (1996). Tesco's daily replenishment system has reduced the average stocks on hand (in stores and regional distribution centers) from 21 to 12.8 days and for faster moving items to between 3 and 5 days. "However as Tesco did this they learned the limits of what can be accomplished in one firm alone. Specifically . . . suppliers . . . have been fulfilling Tesco orders nightly, just-in-time, but from massive finished goods inventories" (Womack and Jones [1996, pp. 46–47]).

31. For example, in one promotion Tesco used information gathered and analyzed from customer loyalty cards to communicate with their customer base of 9 million using 87,000 different offerings tailored to individual customer requirements. The benefits of managing information at this micro level remain unclear, given that Safeway has decided to abandon collecting customer information through the use of individual loyalty cards and will rely on amalgamated EPOS data.

32. Mitchell (1997, p. 34).

33. Galbraith (1974).

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STANDARDIZATION AND THE COORDINATION OF VARIETY. The reduction in information processing requirements through the introduction of uniformity is very important for supermarket management. When increased variety is introduced in the system, the problems of coordination increase. Here problems of information and implementation arise—how are managers to ensure that they have the information for coordination? How are they to enforce implementation? With expansion, the demands of direct supervision become too time-consuming, and rules and procedures are instituted based on what has worked in earlier experience. This should allow decisionmakers to concentrate on sorting out exceptions that do not fit the rules and procedures. But it requires considerable planning to specify all input and throughput requirements, including detailed analysis of input requirements, work tasks, and work flow specification. Though this may be possible in simple stable conditions, under conditions of rapid change—such as the flux in the system caused by promotions and new product introductions—the information processing requirements for the management hierarchy can become overwhelming. Dealing with exceptions can absorb much of managers' time. Implementation can become too complicated. How do the supermarkets get over these problems?

At the end of the 1990s, supermarkets had successfully begun to reduce the volume of information flow required for efficiency by reducing the supplier base. This enabled them to increase their capacity to process information by remaining close to the sources of information: customers, suppliers, and distributors investing in new technologies and relational contracting. At the same time, supermarkets gained further standardization of business processes with all partners in the network (see figure 12-2). Below we look at issues raised by information processing and standardization to the supermarket retailing system in the millennium.

First, the concept of standardization within grocery retailing is complex: supermarkets deal with up to 30,000 different product lines, with sales dependent on time of year, time of day, geographical location, and marketing promotions by the manufacturer. Variety of product offering coupled with accurate and effective physical distribution is the supermarkets' competitive advantage along with product promotions and new product introductions. To enhance the retail offer by service provision, supermarkets standardize their procedures throughout the entire supply chain. Standardized integration within and between companies (food producers and distribution) has led to the replacement of product flows by

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information flows enabled by EDI and the new technologies—with subsequent improved financial and risk flows.[34]

Second, supermarkets do not seek mutual accommodation with suppliers based on symmetrical information. This could challenge their ability to implement a market price minus system with suppliers. Nor do they want the unpredictability of market exchange relations. Instead, they have over the past thirty years developed relational contracting.[35] Relational contracting is characterized by

—long-term patterns of trading between suppliers and retailers;

—continuing discussions and negotiations between retailers and suppliers over product characteristics;

—continuing discussions and negotiations over the development of new products;

—sales-based ordering and the absence of written contracts.

The close relationship developed through relational contracting contains professional negotiation and organizational management between retailers and suppliers, but it does not change the asymmetrical information flow and power relationship, which remains firmly weighted in favor of the retailer. The supermarkets have instigated "along side the use of technology [the] creation of lateral relations to keep decision making close to the information source."[36]

Third, supermarkets have sought to coordinate information flow by policing their suppliers through imposing rules and regulations to promote customer interests. The late 1980s and early 1990s saw supermarkets devote considerable resources to specifying all inputs and throughput requirements (see table 12-2), including detailed analysis of supplier performance with the onus on the supplier to deliver to specification, on time, every time.

However, by the mid-1990s, the supermarkets were aware that it was costly to maintain a large number of close relationships with suppliers at the level of intensity outlined in table 12-2. From the early 1980s to the beginning of the 1990s, there had been a rationalization of suppliers based on the lowest total cost of order. Suppliers were evaluated on quality, delivery, flexibility, service, and price and allocated points for each. These points convert to a cost value for every order processed. By the mid-1990s, clear

34. Fernie and Sparks (1998).
35. Bowlby and Foord (1995).
36. Galbraith (1974).

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Table 12-2. *Supermarket Specifications for Fresh Produce Suppliers*

Input requirements	*Work tasks*	*Work flow*	*Sanctions*
Supermarket specification of —animal feed —type of seed —farming methods	Supermarket ethical audit of —materials sourcing —labor policies —hygiene of facilities	Supermarket implementation of —EDI —quick response partnershipping —just in time production and delivery	May impose financial sanctions on or withdraw orders from suppliers falling short of any specification

pictures emerged as to which suppliers could deliver best value, and the retailer sought to single source many items from the best suppliers. Preferred suppliers are allocated the responsibility for providing the capacity required. To structure this form of allocation enables the supermarkets to sustain their control and influence over their suppliers. Single sourcing in grocery retailing does not make the supermarket vulnerable for three key reasons:

—the supermarket has the technical knowledge and expertise to create new suppliers should the relationship break down;

—the global market can always be called upon if there is a crisis in supply;

—consumer loyalty is not undermined if the store fails to provide one item among those required. The customer will not go elsewhere for a shopping expedition simply because there was stock-out in the mushroom section.

The Impacts of the Internet: Diffused and Distributed Information

The Internet offers the possibility for information to be deliberately routed on a self-organizing basis, setting off further developments.[37] This suggests ways of avoiding resource costs of hierarchically managed information.

37. The reorganization of information of increasing complexity can be achieved without requiring a central hierarchy, on a distributed network basis. Holland (1995); Kauffman (1993).

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Can the Internet, with its capacity to allow information to route itself through diffused intelligence and distributed networks, help supermarkets to solve some critical problems of information management? Among other benefits, the Internet offers the possibility of spontaneous synchronization of the constituent processes of the major production process, so that there is entrainment within the network. That is, the various rhythms of the subproduction process may synchronize themselves, stimulating the self-organization of a quasi-organic system in which information processing can bypass hierarchical control. This resolves the dilemma presented by Galbraith, whereby there is *either* reduced synchronization as a result of reduced information processing *or* increased need to process information.[38]

To look at ways in which practical versions of these possibilities (if not conceptualized as such) are being considered by supermarkets and suppliers, we need to understand the grocery retailing system as it currently operates. How was a new level of synchronization to be achieved by the grocery sector in the United Kingdom? Table 12-3 summarizes the evolution of information synchronization of grocery retailing from 1970 to 2000.

A pioneering efficient consumer response (ECR) project was developed in the United States between Wal-Mart and Proctor and Gamble. It was described as a distress call by the grocery industry to replace inefficient and misdirected practices, particularly the failure of retailer-supplier relationships and the mismanagement of data. ECR took root in Europe in the mid-1990s with the establishment of a European executive board defined as "a global movement in the grocery industry focusing on the total supply chain—suppliers, manufacturers, wholesalers and retailer working closer together to fulfil the changing demands of the grocery consumer better, faster, and at less cost."[39] In essence, ECR was an attempt to deal with asymmetrical information that limited suppliers' knowledge of outcomes to the stores. It did this by adopting category management and providing a standardized management framework within which retailers and suppliers could more equally and effectively coordinate timely information and activities.

Evidence from the early 1990s showed that partnerships were not working because of the adversarial nature of existing relationships (see

38. Galbraith (1974).
39. Fiddis (1997).

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table 12-2).[40] In particular, problems with suppliers arose concerning product promotions, the distancing of suppliers from data required to understand their customer base, and the supermarkets' unwillingness to share EPOS data. New methods emerged to overcome these problems—one was category management.[41]

Category management can be defined as a retailer-supplier process for managing categories as strategic business units through enhanced customer value. A category is represented by its proponents as a manageable group of products and services that customers perceive to be interrelated and suitable in meeting a consumer need.[42] Category management has been described as bringing about a transformation of the interface between retailer and supplier and the coordination of supply and demand information flow. The basis for forming a category is to maximize market share for bundles of goods and services based on consumers' lifestyles and associated product requirements, as shown by Kinsey in this volume (chapter 11). For example, data mining has led retailers to understand that for consumers, ice cream can come into the same category as cookies, fruit, and yogurt—a dessert choice. In contrast, retail logic would divide these products across departments: frozen foods, cakes and pastry, fresh produce, and dairy. Management functions that disregard consumer lifestyle create tensions between consumer logic and retail logic, leaving consumer demands unfulfilled and stock unsold.[43] The Internet is a technology that enables business partners in a network to operate across organizational boundaries in real time. This is evidently a means of facilitating category management. Category management is achieved through placing responsibility for a given category in the hands of a single supplier. This changes the fundamental role of selling. Instead of seeking to gain market share at the

40. O'Sullivan (1992); Hogarth-Scott and Parkinson (1993).

41. "The failure rate of new product introduction is increasing. In 1995, 16,000 new items were introduced in the grocery industry in the U.K., an eightfold increase in 20 years. The life expectancy of the products has declined from 5 years to 9 months in this time and 80 percent of the 16,000 items lasted less than a year" (Mitchell, 1997, p. 109).

42. *ECR Europe Category Management Best Practices Report* (1997).

43. Evidence from a category management project between a global manufacturer and a retailer showed that to establish categories and new forms of work organization took six months, equal to 9,000 hours of work (McGrath [1997]). The qualitative evidence based on a semistructured interview with a global manufacturer supported this evidence. The start of the category management process had been time-consuming, but the learning curve had been rapid and the process was now viewed as efficient. Organizing around categories had involved a shift in organizational culture.

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Table 12-3. *Evolution of Information Synchronization in Food Retailing in the United Kingdom, 1970–2000*

1970s	*Early 1980s*	*Late 1980s: supermarkets implement enabling technologies in stores*	*Early 1990s: supermarkets require suppliers to harmonize enabling technologies and business processes*	*Late 1990s–2000*
—High street supermarkets —Era of price wars —Direct delivery from manufacturer to store —Weekly delivery —Lead time 7 days —Inventory controlled by store manager, stock control erratic —5 weeks stock held in store	—Larger stores —Transfer of stock and stock control to regional distribution centers (RDCs) —Delivery by manufacturer to RDC —Weekly orders —Several deliveries each week —Introduction of computerized store replenishment systems —Stock levels reduced	—Edge-of-town superstores —Quick response partnershipping —Control of replenishment transferred from RDC to head office —Central visibility of RDC stocks —Bar codes introduced —Ordering based on EPOS data introduced —EDI reduction in lead times introduced —Daily deliveries —Stock levels fell to 1–3 weeks	—Composite, multitemperature storage and distribution —JIT for perishable foods enabled by EPOS —EDI throughout the supply chain —Data mining/warehousing with analysis sold back to suppliers	—JIT for all foods, including packaged groceries —RDC stock reduced to minimum —Pick by line —Cross-docking —Composite networks —Daily deliveries —Very short lead times (< 24 hours) —Efficient consumer response (ECR) —Category management (CM) —Internet-enabled EDI (I-EDI)

Sources: Frances and Garnsey (1996); Whiteoak (1998).

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expense of competitors' brands, the category controller hopes to benefit by increasing the size and performance of the category, so that all brands (including the controller's) will benefit.

Information on customer behavior is critical to the operation of category management. Through the Internet, this information can be shared among channel members. The focus is on the total system in order to reduce costs and inventories for all parties in the network. For the system to be efficient, it needs a transparent pipeline across organizational boundaries that operates in real time, with real-time data, enabled by real-time technologies such as the Internet provides.

Supermarkets as Facilitators of Information Flow

The Internet is used to post real-time data for suppliers to draw on, to enhance joint forecasting, and to monitor stock levels. Tesco developed Information Link and ASDA uses Retail Link, developed by Wal-Mart and based on extensive computing power, which allows suppliers to view competitor data and ascertain where in the system goods are currently located. The view is taken that the sharing of data does not constitute a danger to suppliers so long as information on profit margins and future promotions does not reach competitors. The data itself are not facilitative except to those with the necessary competence.

Quick response partnershipping in the late 1980s and early 1990s was the means to bring about a shakeout of suppliers and control information flow through rationalization. Category management is the means to rationalize and control information flow as regards product lines. The proliferation of product range to 30,000 items in a single store is confusing to the customer and resource-intensive for the supermarket; the trend is to a reduction in excess variation of product. Information technology makes it easier to identify slow-selling items within a category, and in taking down the range and shelf space, a supermarket can use that space for faster-selling goods. Moreover, the supermarkets do not want consumers to limit themselves to habitual purchases, which could limit customer spending.

The lessons learned from EDI on the automation of the entire supply chain can now be amplified through I-EDI. U.K. food retailers achieved their success by entrainment within the supply chain network:[44]

44. Entrainment occurs as the parts of the self-organizing system move into dynamic synchrony.

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> In the case of the large multiple retailers in the U.K. their aim is very much to run continuous replenishment programs, a process in which they retain control of the replenishment (in order to have to deal with a single unified process) and move towards daily call off on very short lead times. . . . Cross docking is a technique in which goods arriving at a regional distribution center are unloaded from the inbound vehicle and moved from the goods receiving area "across the dock" for marshalling with other goods for onward dispatch without being put away into stock. This technique has long been a necessity for very short-life, perishable products. . . . [L]anes are set out containing roll-cages to be delivered to each store served by the regional distribution center. As the goods arrive they are broken down and the appropriate quantity of each product line is loaded into the roll-cages for each store. Full pallets of single products are no longer necessary.[45]

The United Kingdom is still ahead of the United States in these respects, and single-item tracing is well advanced and facilitated by new technologies. The competence of U.K. giant food retailers to configure small, discrete, product-mixed orders on a large scale to serve online grocery shoppers is in place.[46]

Shopping Online

The development of business-to-consumer (B2C) e-retailing in the U.K. food sector is expected to follow a different trajectory from that in the United States because of geography, demographics, regulatory systems, and familiarity with arm's-length shopping modes such as mail order.[47] The U.K. government aims to "switch off" analogue television between 2006 and 2010, by which time 95 percent of households will have transferred to digital TV. "The television will bring the Internet to the mass market and digital television is the key. Services offered through the television have a greater potential for attracting the types of advertising revenues needed to make the new Web-based services commercially viable."[48]

45. Whiteoak (1998).

46. We may even see redundant superstores converted to online distribution centers.

47. Retail E-Commerce Task Force of the Retail + Consumer Services Foresight Panel (www.dti.gov.uk/foresight).

48. Iain Stevenson, head of New Media, Ovum, quoted in the Retail E-Commerce Task Force.

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It is conceivable that brand leaders with a reduced product range and own-brand labels may come to dominate the B2C offerings with Internet home grocery shopping. Tesco and Sainsbury's have online grocery shops offering only 2,500 product lines.[49] At present, the online groceries have a unique feature; in the words of one manager, "managing the web based offering is like choosing goods for a small shop."[50] E-retailer advantage in reduced product handling and reduced information flow is rewarded by an average online home delivery purchase of £90–£100, double the average spend from a normal store visit.[51]

Moreover, the assumption that online purchases would be for bulk goods and packaged low-margin groceries has not been substantiated; high-margin fresh foods have also been accepted. It is anticipated that a critical mass of online home delivery grocery consumers will emerge in the next five years. In fact, some believe that the use of Internet TV could even lead to superstore closures in the next ten years.

The Mushroom Industry, an Exemplar

What takes place at the leanest end of grocery retailing, in perishable produce, is a good indicator of what is to follow in the industry as a whole. Our evidence to date is based on

—relational contracting;
—quick response partnershipping;
—cross docking;
—shorter replenishment lead times;
—the absence of brand identity;
—the identity of product being solely associated with the supermarket.

All arose within the fresh produce sector and subsequently were applied to the chilled and ambient temperature goods. It is for this reason that studying the impacts of the Internet on the edible mushroom industry is revealing.

49. www.tesco.com; www.sainsbury.com.

50. Telephone interview with the category controller of a multinational food manufacturer, June 2000.

51. The 1985 company report for Sainsbury's showed that the larger stores achieved on average a spend per visit three times higher than that of their smaller stores, a financial result that helped guarantee the growth of the superstore. The financial result from the value of online shopping (which shows similar behavior across all community sections) may be one of the key determinants to currently reducing superstore expansion as opposed to tightening planning regulations.

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Category management in the fresh produce market has intensified lead times. For example, in 1995 orders to mushroom growers were confirmed at 14:00 hours for next-day delivery. In 2000 orders were confirmed at 22:00 hours for next-day delivery. Forecasting using efficient consumer response and category management is more accurate, and sales-based ordering will soon be on a real-time basis using EDI intranets. Any supplier of mushrooms to U.K. supermarkets needs to operate within these time scales and therefore needs a U.K. base.

In the past, mushroom growers at times had difficulty fulfilling orders to match the supermarket forecast and used networks of suppliers to supplement orders, taking responsibility for supermarket quality. The role of the Internet in these networks is now becoming central. The problem of rolling out EDI to second- and third-tier suppliers was inhibited by cost.

In 2000, 200 small independent growers based in very rural areas of Ireland could turn on their networked PCs and look over requests for supply from one of the four major mushroom suppliers to the U.K. supermarkets. This is an example of the way individuals and smaller firms may in the future be able to develop a wider choice of trading partners. Whether they are able to negotiate trading terms more advantageous to them than those that prevailed before the use of the Internet is not yet known. Nor is it known whether there is a propensity for the formation of e-commerce communities when groups of sellers unite to form online trading communities. The mushroom industry can be interpreted as an example of open access with easy entry and exit to trading, as envisaged by those who see the Internet as a means of democratizing the marketplace.

Summary

In the United Kingdom, centralization has led to a higher level of consolidation in food retailing than in the United States. Since the 1980s, U.K. food producers and manufacturers accepted retailer-imposed proprietary EDI systems in their businesses and took on the financial responsibility for implementation and maintenance of the software. These were concessions they had to make in order to take part in a system of food retailing that conferred certain advantages on preferred suppliers. Indirectly, the use of EDI incurred costs for suppliers through the need to run multiple information systems. The migration to the Internet as the means of coordina-

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tion of the supply network offers the possibility of further reduction of waste. If suppliers can implement such savings, this may keep down their costs, though they may have to cede margins to the supermarkets that coordinate the system as a whole. However, new possibilities for niche activity are opened up by the Internet together with new channels of access to customers in the sector. Thus though business-to-business interactions over the Internet have so far represented continuity through path dependence, openings for business-to-customer relations over the Internet offer future possibilities that have not yet been fully explored. Our concluding exemplar, drawn from a pilot study of the mushroom industry, reveals further possibilities for business-to-business relations through the Internet.

We have shown that while the Internet greatly extends the possibilities for information management, new developments can threaten to overwhelm companies in costly information overload. It was formerly considered axiomatic that in order to deal with the challenge of information processing, companies must either improve their processing power or reduce the amount of information they have to manage, most commonly through various methods of standardization. However, a further strategy is to allow information to route itself through a distributed network, operating on principles of information flow on a distributed rather than a hierarchical basis. This is made possible through the simultaneous broadcast of information to all points in the supply chain through the Internet, allowing more transparency and inter-unit interaction. The key function of the Internet has been to make available to all parties in the system accurate, real-time data, the weakest link in the proprietary EDI-enabled supplier networks in this sector.

Moreover, the history of food retailing in the United Kingdom exemplifies the way in which open systems are subject to shifts with knock-on effects. As the relative strength of the major players shift within the food retailing system, the dynamics of competition may alter in the system as a whole in ways that will be affected by new business-to-consumer channels. Such developments open up new possibilities for structure and performance, spurred on by supermarkets, which have been proactive in synchronizing the system as a whole.

In the introduction, we outlined our aim to identify the impact of information and communication technologies, and in particular the Internet, on the food retailing sector in the United Kingdom. However, we have found that rather than a linear transmission of impact from technology to

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business structure, there was an interaction between the two sets of factors, so that the system as a whole can be viewed as enacted by participating agents and open to change at multiple points.

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