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Traditional EDI and Supply Chain Management

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Traditional EDI and supply chain management

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Introduction

Electronic Data Interchange (EDI) – or the application-to-application exchange of structured business documents such as invoices and purchase orders – has been in use for many decades. During the late 1980s and 1990s in particular the push by industry and academics for widespread EDI use led to what could arguably be called the origins of supply chain management, including Just-in-Time manufacturing, Quick Response retailing and Efficient Consumer Response in the grocery industry.

In this paper we will explore these supply chain management approaches, beginning with an overview of the enabling technologies: traditional EDI and various complementary technologies such as barcoding and eCommerce gateway systems.

EDI standards

EDI document translation standards define the rules for expressing business documents (or messages or transaction sets) electronically in an unambiguous way so that the recipient may interpret the documents correctly (Sadhwani and Sarhan 1987; Notto 1989; Swatman et al. 1991; see also Emmelhainz 1992; Shaw 1995). At the most primitive level, the document translation standards define data elements, which are the smallest pieces of information within a document (for example, colour, date, name) described precisely to avoid ambiguity (for instance, allowable contents, length, etc.) (ANSI 1987; Sadhwani and Sarhan 1987; Jenkins 1988; Notto 1989; Berge 1990; Dawkins 1990; Janssens and Cuyvers 1991). Sequences of related data elements form segments (for example, an invoice data line), and sequences of logically related data segments form transaction sets or messages (ANSI 1987; Jenkins 1988; Notto 1989; Berge 1990).

ANSI X12 and UN/EDIFACT (ISO 04937) are two such EDI document translation standards. The American National Standards Institute (ANSI) initiated the X12 standard to support cross-industry communication by defining generic formats for general business documents including purchase orders and invoices (Schatz 1988; Notto 1989; Sortland 1989). EDIFACT (EDI for Administration, Commerce and Transport) was devised by the United Nations Joint EDI working party (UN-JEDI) to provide universal standards for EDI transactions (Dreyer 1989; Berge 1990; Finch 1990; Janssens and Cuyvers 1991; Swatman and Swatman 1992).

Document translation standards were necessarily generic to cater for the needs of different industries and other trade communities (McGuffog 1988; Sortland 1989; Hollands 1991). More specifically, EDI standards were designed in such a manner that a

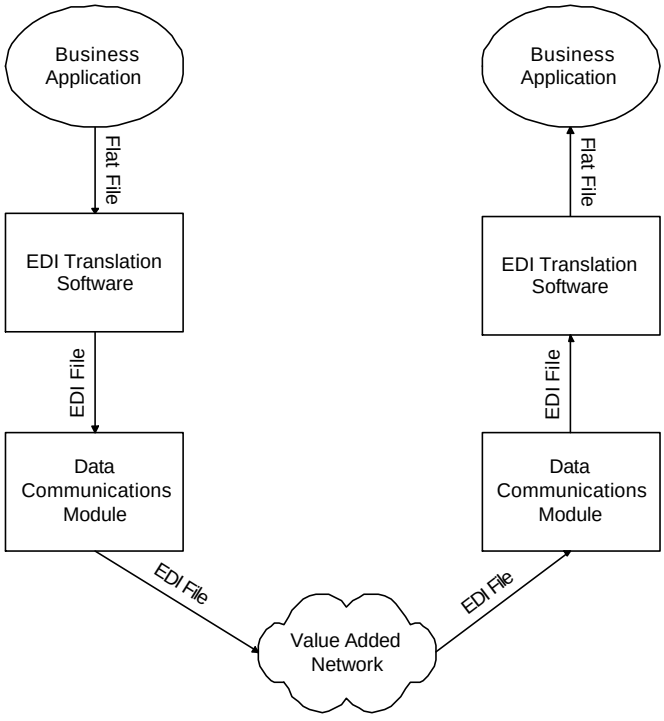
company from any industry could map data from its business transactions (for example, a purchase order, invoice, etc.) to an equivalent EDI format which could then be sent to its trading partners. This objective of the standards organisations was difficult because different industries sometimes have very different information requirements. For example, some industries require detailed information concerning hazardous goods to be included in the business documents. Satisfying all these disparate information requirements of many industries means, however, that the document translation standards became quite large (Hollands 1991; Swatman et al. 1991) and contain information which will be relevant to one industry, but perhaps not to another.

Individual industries addressed this problem by producing implementation guidelines which define subsets of document translation standards to ensure a significant degree of commonality between companies adopting the EDI standards within that industry (Sokol 1989; Hollands 1991; Swatman et al. 1991). Subsets are formed by excluding segments and data elements from the document standard which are not required, as long as they follow the mandatory and conditional restrictions placed on the document (ANSI 1987; Swatman et al. 1991).

Components of a traditional EDI system

A traditional EDI system required three technological components which are discussed in the following subsections. Figure 1 also illustrates the interrelationship of these components:

Figure 1: A traditional EDI system



Source: Parker (1997) page A-5.

EDI translation software

The EDI translation software component of an EDI system converts business documents (ideally originating from a company's application system) to and from an EDI format (Emmelhainz 1992; Shaw 1995). More specifically, this component performs such activities as (Bert 1988; Reich 1988; Boucher 1989; Payne 1989; Dawkins 1990; Palmer 1990; Janssens and Cuyvers 1991; McCusker 1992):

- data conversion (mapping) of inhouse formats to the standard format agreed to by the intended recipient (and vice versa) in a generic manner (application independent);
- standards maintenance to support the various standards and versions which may be needed to interface to all trading partners;
- storing of incoming and outgoing documents ready for processing;
- document status determination (e.g., translation errors detected, sent, received, etc.) and report generation facilities;
- error reporting and modification of system configuration (e.g., trading partner profiles);
- message preparation for transmission to the intended recipient; and
- auditing, backup and recovery facilities.

Data communications

The data communications component of an EDI system allows a company's computer(s) to exchange EDI messages with a trading partner and includes, for example, a modem, communications software and a telecommunications link (discussed in more detail in the next section) with that trading partner (Shaw 1995). More specifically, this component of an EDI system is responsible for (Dawkins 1990; Palmer 1990):

- providing the appropriate communications protocols and session establishments so documents can be transmitted to the recipient;
- handling access to mailboxes on the appropriate computer network(s);
- accessing the services of a network, such as acknowledgements and delivery notifications;
- allowing modifications to communications configuration (e.g., network profiles);
- selecting the correct network (using trading partner profiles) for communicating with each trading partner; and
- security and encryption of data transmission.

Value-added networks (VANs)

The network requirements associated with an EDI system can be satisfied in numerous ways, from direct point-to-point links with a trading partner, to subscriptions to third party networks (Sadhwani and Sarhan 1987; Janssens and Cuyvers 1991; Swatman and Swatman 1991; Colberg *et al*. 1995). Third party networks (or Value Added Networks) are often used because they offer security, reliability, audit trails and cost effectiveness (McGuffog

1988; Brawn 1989; Payne 1989; Rochester 1989; Janssens and Cuyvers 1991), translation to standards, connections to companies located in other countries and connections to other VANs (Emmelhainz 1990).

Interworking between third party networks is gaining momentum because EDI users are unwilling to subscribe to more than one VAN (Bidgood 1988; Swatman *et al*. 1991; Colberg *et al*. 1995). The term “interworking” is used instead of “interconnection” because interconnection implies a physical connection between third party networks while interworking implies a higher level of cooperation between VANs to provide levels of service which are requested by clients (Bidgood 1988). Interworking enables EDI messages to be exchanged between trading partners who subscribe to different third party networks, thus requiring on organisation to subscribe to a single network only (Bidgood 1988; Swatman *et al*. 1991). An ideal interworking solution between third party networks therefore provides users with both a physical connection and end-to-end quality in the form of security, reliability and audit trails (Bidgood 1988).

Of course, today the Internet also plays an important role as a telecommunications network over which EDI documents can be exchanged.

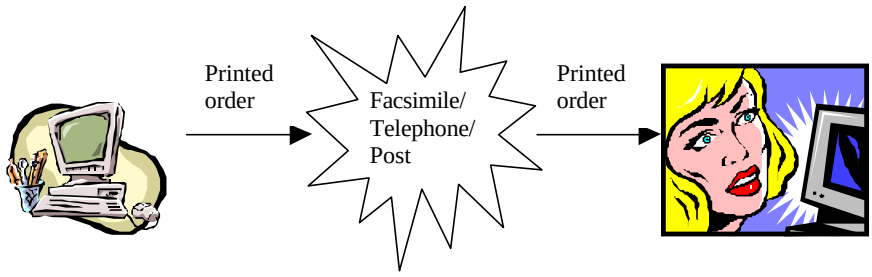
Complementary technologies and approaches

The following sections will describe a range of complementary technologies and approaches which have been used in conjunction with or have been enabled by EDI over the last two decades.

Systems integration

We can see in Figure 2 that traditional methods of computer application-to-application exchanges of documents has occurred by printing out the information and sending it (via post, facsimile or a telephone conversation) to the recipient. The recipient then requires data entry staff to key in the documents into the recipient’s application system.

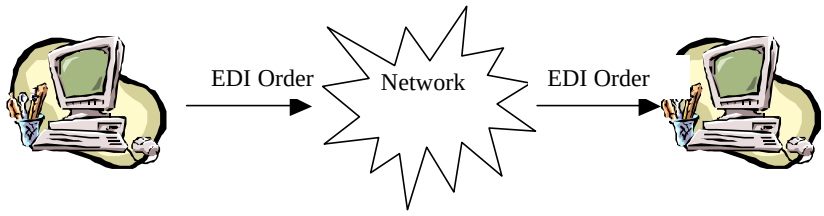
Figure 2: Non-integrated computer systems



Since the 1980s, however, organisations have gained significant benefits from the complete integration of all their internally and externally located application systems, where these systems are interconnected using EDI's standardised document formats (McCusker 1992; Swatman 1994). The integration of computer applications is illustrated in Figure 3, which shows an EDI formatted purchase order being sent directly to the

recipient's application system via a telecommunications network. Figure 3 is a simplified version of Figure 1.

Figure 3: Computer application-to-application integration



The benefits which have been attributed to the full integration of application systems within and between companies – compared with the approach in Figure 2 – include the (Allen 1990; Colberg 1990; Ellram *et al*. 1990; Emmelhainz 1990; Fitzgerald 1990; Hill 1991; Janssens and Cuyvers 1991; Parfett 1992; Swatman and Swatman 1992):

- elimination of document errors, duplications and loss because data re-entry into internal systems is no longer necessary, resulting in improved information quality and accuracy;

- minimalisation of human intervention in terms of document shuffling, matching and verifying and correcting of data entry errors, resulting in reduced costs and time delays;

- elimination of postage, overnight delivery costs and other administrative costs due to the increased speed of document exchanges;

- ability to have many business functions interconnected so that the output document of one application system (for example, a purchasing system) can automatically initiate processes in another application system (for example, the accounts payable system) without human intervention; and

- improvement of customer satisfaction and service due to error and time delay reductions.

Product numbering standards

EAN•UCC is the international standard for the unique numbers which can be assigned to all products such as retail products, locations, non-retail products, cartons, etc (EAN 2002a). You will have noticed these unique numbers of retail products in the supermarket, for instance. Unique numbering is important in a supply chain, so that all items, groups of items and locations can be uniquely identified in a supply chain by all its members (see EAN 2002a). Each EAN•UCC number includes a unique identifier for the company, plus a unique identifier for the product/location/carton which is to be numbered (EAN 1998).

Barcode scanning

The unique EAN•UCC numbers are represented in a form which can be scanned by a reader so that the numbers do not need to be entered manually by a person and can be entered much faster (EAN 1998). This scannable form is known as a barcode, with unique vertical lines which represent each digit of the EAN•UCC number.

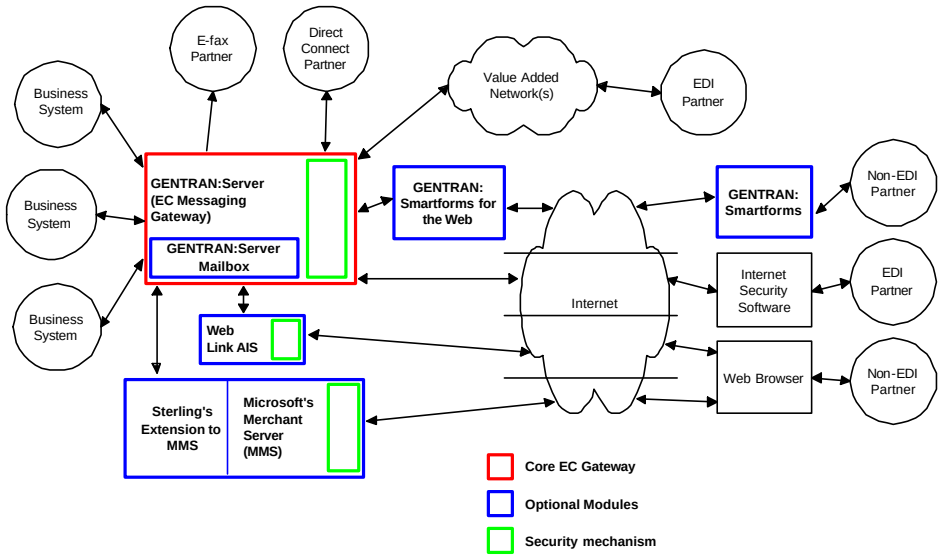
When standardised product numbering, barcode scanning and EDI are combined there is considerable opportunities for efficiencies to be gained in the supply chain (EAN 2002b). For example, the scanning of a carton can trigger the retrieval of the EDI transaction which contains details of the shipment and the contents of the cartons (see EAN 2002b), so that the carton does not need to be opened to determine what is inside.

eCommerce gateway systems

One of the major problems for large organisations using traditional EDI was getting their small trading partners to adopt this technology (see Parker 1997). eCommerce gateway systems were (and still are) a common way in which to address this problem. eCommerce gateways allow these small firms to receive and send business transactions via the Web, which involves entering data into a Web-based form and does not require any EDI capability or software.

Figure 4 illustrates one of the original gateway solutions used by Sterling Commerce which supported a wide range of interconnections between trading partners.

Figure 4: eCommerce document exchange gateway



The advantage of these types of gateways is that they can support trading partners with varying types of capabilities, from fax through to traditional VAN and Internet based EDI. The Figure also shows that non-EDI partners can use a web browser to send and receive business documents with the large organisation. The host company, however, can continue to use EDI or other forms of systems integration with its internal business systems regardless of what its trading partners might be capable of using.

Origins of supply chain management

In the late 1980s and early 1990s, the increasing interest in EDI led to growth in the use of inventory management approaches such as Just-in-Time (JIT) in the manufacturing sector, Quick Response (QR) in the retail sector and Efficient Consumer Response (ECR) in the grocery industry.

Just-in-Time (JIT) is an approach to managing inventory in which materials are delivered to the manufacturer by suppliers mere hours before they are needed for processing, significantly reducing the cost of maintaining large stock levels (Hollands 1991; Parfett 1992; see also Ramsdale and Harvey 1990). Achieving this goal requires that materials be delivered at the right time, at the best price and at 100% quality (Sokol 1989).

Similarly, Quick Response (QR) relies on retail shelves being replenished rapidly once sales have been made, so that inventory can be reduced, significantly decreasing the guess work involved in determining customer demand (Dobbie 1991). As a result, retailers can be more responsive to customer needs without holding excess inventory (Rousselot 1989; Knill 1990).

Cooperation between trading partners is also essential when employing a strategy called Efficient Consumer Response (ECR). ECR refers to the "*... combination of technologies and business procedures and practices that eliminates waste and inefficiencies throughout the supply chain in the grocery industry*" (Sokol 1995:274; see also deRoulet 1993). Through ECR, organisations work together to develop a demand-driven supply chain (or a more efficient "pull", rather than a "push" system) by streamlining their business processes (Harris and Swatman 1997; see also Dutton 1993).

The full integration of internal and external systems enabled by EDI is fundamental to reducing the order-delivery delays on which JIT/QR/ECR inventory and production systems depend for successful implementation (Ellram *et al*. 1990). EDI provides the fast, accurate exchange of order information within and between organisations so that order-delivery cycles can be significantly shortened (down to, for example, a day or even an hour) and carried out more frequently (Knill 1990; Parfett 1992). Consequently, inventory levels can be kept to a minimum while still ensuring stock replenishment is sufficiently rapid to meet variable customer demand, since suppliers can now receive expedited sales information (Allen 1990; Ellram *et al*. 1990; Knill 1990; Dobbie 1991). Such timely results are not possible without EDI, as the users of other means of communication, including mail, facsimile and telephone readily testify (Colberg 1990; Ellram *et al*. 1990; Emmelhainz 1990).

We will look at each of these supply chain management approaches in more detail in the following sections:

Just-in-time inventory management

Just-in-Time (JIT) inventory management originated from a Japanese innovation called Kanban. The objective of JIT is to move inventory carrying costs to suppliers using a "pull" approach whereby input materials delivered "as required" for use in the organisation. The results of JIT therefore include:

- inventory being in transit more so than being warehoused by the organisation, thus resulting in reduced buffer stocks and capital costs;

- retooling by the supplier to support the inventory carrying role which it will now play in the supply chain;

- increased demands for adaptability by suppliers in particular;

- tighter bonds between the customer and its suppliers.

JIT also necessitates:

- reliable and more frequent deliveries of small volumes of goods, since purchases are now being made on the basis of more immediate need rather than on long-term forecasts. This might require short distances between the two organisations to help facilitate such deliveries;

- consistent quality, because JIT is dependent on unaffected performance and throughput;

- stable, predictable production schedules, along with the ability to respond quickly to small fluctuations in demand.

The types of benefits which can be achieved using JIT inventory management approaches include:

- reduced inventory holding, warehouse and freight costs/overheads, because the supplier will undertake most inventory management;

- reduced cycle time (that is, the time between an order being received by an organisation and the order being filled);

- reduced product obsolescence, because quantities of products which more accurately reflect customer demand will be built;

- reduced product damage due to reductions in unnecessary handling;

- increased inventory turns (that is, an item of inventory will remain in stock for shorter periods of time).

JIT elements

The main eCommerce elements of JIT include (Back Office Systems 1999a):

- EDI for the exchange of standard business transactions between organisations;

- Electronic Funds Transfer (EFT), which allows payments to be made directly between company bank accounts;

- barcode technology (and its associated standards) for automating the handling (such as tracking) of items, boxes, pallets, etc. Barcode numbers are typically contained within EDI documents so that details about shipments can be exchanged between organisations;

- Value Added Networks (VANs), which tend to be proprietary, secure networks over which EDI transactions are exchanged between company mailboxes situated on these networks (see Back Office Systems 1999b). The Internet is now an alternative EDI transaction exchange platform; and

- Open Buying on the Internet (OBI), which is a framework for the use of such Internet protocols and technologies as HTML, EDI, HTTP and Secure Sockets Layer to enable ordering between organisations over the Internet (see Back Office Systems 1999c for more information).

JIT and internal processes

While the concept of JIT inventory management is relatively simple, achieving these benefits and implementing this form of SCM is not. JIT necessitates large-scale changes to the internal operations (business process reengineering or BPR) of the customer and supplier, such as:

- more efficient information exchanges and handling;
- changes to the structure of production, materials handling, manufacturing processes and distribution facilities.

Back Office Systems (1999a) emphasise this point when describing the types of computer-based management systems which need to be integrated when implementing SCM:

- Enterprise Resource Planning (ERP) systems, which are extensions of more traditional Manufacturing Requirements Planning (MRP) systems, integrates the management of many manufacturing factories;
- order management (OM) systems, which process customer orders and can be linked with warehousing and transportation systems to provide customers with real-time stock availability and delivery status (respectively);
- transportation management (TM) systems, which receive orders from OM systems, manage delivery and logistics providers, tracks deliveries, authorises payments to logistics providers, etc; and
- warehouse management (WM) systems, which allocates inventory to shipments using information provided by TM systems, coordinates scan packing (where packers will scan products as they are placed in boxes as specified in a 'packing list') and handles other fulfilment activities.

Similarly, an organisation and its suppliers must also reconsider these aspects from an interorganisational perspective as well. For example, information and product flows between these organisations must be highly efficient. eCommerce applications such as EDI will have a significant role to play in expediting these information flows and integrating systems internally and externally with trading partners. These trading partners will include suppliers, logistics companies, financial institutions, etc.

JIT and the supply chain

The real benefits which can be derived from SCM, and JIT inventory management in particular, depend on efficiency improvements being achieved right along the supply chain. Suppliers must be able to:

- respond quickly, flexibly and efficiently;
- delivery small quantities directly and frequently to the point of use.

For a supplier to be able to achieve these objectives without maintaining large quantities of inventory, the supplier too must adopt JIT! It is therefore critical that SCM not just be viewed between an organisation and its suppliers, but rather viewed as an integrated supply chain from raw materials suppliers through to retailers.

Associated JIT strategies

One approach which can be used in conjunction with JIT is Evaluated Receipts Settlement (ERS), which is a financial management program initially developed in the automotive

industry, where invoices are eliminated. The basic premise behind ERS is that all the information in the invoice is already transmitted in the Shipment and Billing Notice EDI transactions, so that payment can be made using these transactions rather than requiring an invoice.

The ERS process involves:

- the supplier's advance shipping notice (ASN) being used by the customer to determine the quantity of goods supplied;
- the quantity data (verified by the purchaser) being extended based on the purchase contract price and the terms in effect at the time of shipment;
- the amount owed and the payment due date being calculated based on this extension, whereupon the payment can be made using financial EDI or other electronic payment approaches agreed to by the parties.

Other strategies in addition to ERS might include:

- plant maintenance improvements being made to reduce down-time and improve machine reliability;
- quality management systems being introduced which emphasise "right first time" for products and processes;
- ISO 9000 systems to define quality standards, processes and control systems;
- a customer-orientation being adopted to encourage product and service design improvements.

Quick response inventory management

QR involves rapid replenishment of retail products once consumers purchase them. As with JIT, this requires the delivery of the right retail goods, just at the right time. In many implementations of QR, the retailer's internal systems keep track of product consumption (eg, through barcoding point-of-sale systems at the checkout) and orders are triggered when product levels reach certain limits.

The first reported use of QR occurred in 1985 by the "Crafted with Pride in the USA" Council, in addition to a further 4 pilot projects between leading retailers and major manufacturers of retail goods. The pilots demonstrated such results as 25% increase in sales, 30% increase in stock turnover and 37% increase in gross margins.

Like JIT, the effectiveness of QR is dependent on the efficient exchange of information within and between organisations. The types of requirements for QR include:

- barcoding and automatic data capture equipment for scanning product numbers and packing box labels which contain retail products;
- EDI for exchanging standardised business documents such as Advance Ship Notices, Orders, etc and the associated integration of internal and external systems of the organisations;
- distribution release planning and forecasting systems, which also includes joint planning (eg, assortments, replenishment, promotions);

- fixed-cycle replenishment (for instance, orders received on Monday and shipped by Friday).

In 1992 the Australian TCF industry conducted a QR pilot project as a joint Commonwealth/State initiative with Coles Myer, TCF manufacturers and 1st and 2nd tier suppliers. The pilot project primarily involved education through information dissemination, periodic supply chain workshops and the provision of consultancy to participants. 70 Victorian manufacturers and 30 retail buying chains then took up QR practices.

With the advent of the Internet and the Web in particularly, QR still has an important role to play in retail organisations. For example, Anonymous (2001) uses Dell as an example of an organisation which using eCommerce up and down its supply chain to ensure that orders for computer parts (or entire computers) are filled quickly. For instance, once an order is received via the Web from a customer, Dell requires its suppliers to let it know if they can provide the part or not and then notify customers accordingly. According to the article, Procter & Gamble are also planning a similar quick response system which will interconnect raw materials suppliers to manufacturers, distributors, retailers and warehouses. The company believes that this system will enable them to manufacture products and distribute them as the items are needed by consumers.

Efficient consumer response

In 1991 the US Food Manufacturing Institute (FMI) asked McKinseys to research the impact of alternative store "formats" on supermarkets and to determine what action should be taken. Alternative store formats include the "category killers" such as Toys R Us, which focus on a particular categories of products often to the detriment of supermarket chains which provide a wide range of product categories.

The McKinsey's report concluded that alternative store formats were a threat and that a range of objectives need to be achieved:

- a reduction of supply and operating costs;
- increased sales through targeted pricing, merchandising and marketing initiatives;
- adoption of best practices from the competing store formats.

Kurt Salmon Associates (KSA) were commissioned to study the grocery industry supply chain in response to McKinsey's report. In 1993 the produced the report "Efficient Consumer Response: Enhancing Consumer Value in the Grocery Industry". For this reason Efficient Consumer Response (ECR) is commonly associated with the grocery industry.

The five strategies for implementing ECR are:

- efficient store assortment;
- efficient replenishment;
- efficient promotions;
- efficient production introductions;
- efficient unit load.

We will look at each of these in turn.

Efficient store assortment

Efficient store assortment is concerned with optimising the productivity of inventories and store space at the consumer interface. Included with efficient store assortment is the management of categories, or groups of products with common consumer end-use. Categories include health and beauty care products, fresh fruit and vegetables, household cleaners, etc. Each category is managed as a business unit to identify optimal product mixes and is customised on a store-by-store basis.

The benefits of managing groceries by category rather than by product include:

- better retailer/manufacturer alignment with the consumer;
- better alignment of retailers and manufacturers;
- new perspectives on retailing.

Efficient replenishment

Efficient replenishment (much like QR in the retail sector) involves providing the right product, to the right place, at the right time, in the right quantity, and in the most efficient manner possible. There are two phases associated with efficient replenishment implementation:

- paperless logistics systems between supplier and the warehouse, and the warehouse and the store(s);
- continuous, automatic product replenishment, which requires dynamic computer-aided ordering, point-of-sale forecast-based planning systems, integrated truck scheduling and flow-through distribution (cross docking).

Continuous replenishment is a program used to control and monitor the movement of goods from the manufacturer to the warehouse. It involves the manufacturer (rather than the retailer's warehouse) taking responsibility for replenishing warehouse inventory. To achieve this, the buyer must supply the manufacturer with inventory withdrawal and SKU (stock keeping unit) data so that the manufacturer can engage in inventory control for the retailer. For this reason, continuous replenishment reduces inventory costs but can result in increased transportation costs.

Vendor-managed inventory, therefore, is a major component of the continuous replenishment program and is enabled by Direct-Store Delivery, where the manufacturer and retailer deal with each other directly without the use of a wholesaler.

Flow-through distribution (or cross docking) requires an integrated logistics management system where products are transferred directly from the factory to the retail stores. Cross docking involves a docking area at which trucks arrive and exchange products (usually in boxes which are in turn on pallets) and leave again to distribute the products. It is therefore similar in concept to airports, which are cross docking stations for passengers and airfreight.

Cross docking requires the integration of warehouse and transportation management systems, warehouse networks and proprietary communication architectures. Cross docking also requires accurate forecasting of consumer demand and radio-frequency data technology to sort and track individual items.

There are three types of cross docking:

- current active, in which products are pulled from one truck and pushed to another straight away;

- current same-day, in which products are pulled from one truck, kept for a few hours and reloaded;

- future cross docking, in which products received today are kept until the next shipment is required.

Computer-assisted ordering (CAO) aims to automatically generate store replenishment orders based on current/historical point-of-sale scan data, delivery data and sales forecasts. CAO replaces manual ordering in the store, allowing products to be shipped on time, in the right amount and to the right place. The ultimate goal is the integration of CAO with centralised purchasing systems which would incorporate EDI.

Efficient promotion

Efficient promotion aims to maximise the total efficiency of trade and consumer promotions. It eliminates inefficient/short-term promotion techniques such as forward/investment buying (buying more during the "deal" period) and diverting (selling products bought during forward buying to other regions).

Forward buying/diverting:

- erodes the value of consumer products, making customers more price sensitive and less brand loyal;

- introduces additional production/shipping costs for manufacturers during the promotion;

- increases variability and unpredictability of demand;

- increases administration costs for retailers in dealing with large quantities of invoices, correcting billing/pricing errors and providing market development funds.

More efficient and targeted consumer advertising, consumer promotion and trade promotion underpin this aspect of ECR (Bhulai 1997). For instance, technologies such as the Internet provide a more efficient way in which to provide consumer specific advertisements based on their browsing behaviour.

Efficient product introduction

One third of today's grocery sales are for products which did not exist 10 years ago. In addition, new product introductions increase warehousing costs for retailers (who must hold additional inventory) and increase supply costs for manufacturers (who must pay retailers a premium for shelf space). For this reason, manufacturers and retailers must work together to produce products wanted or needed by consumers, and to ensure that production introductions are carried out more efficiently and cost effectively.

According to Bhulai (1997), production introductions will depend on the type of product (eg, an existing product, an improvement of an existing product, an expansion of an existing assortment of products, or an entirely new product innovation) and the period in which the product would normally be used. These criteria result in a matrix in which to develop product introduction strategies for each cell.

Efficient unit load

This involves determining, for the entire supply chain, what the most efficient unit loads are for goods in order to optimise transport, storage, handling and packaging throughout the supply chain (e.g., the use of pallets). Traditionally it has been the responsibility of individual members to determine their own optimisations, which might not be in the best interests of the entire supply chain.

Summary

In this paper we have looked at the origins of supply chain management, which took the form of Just-in-Time manufacturing, Quick Response and Efficient Consumer Response. We have also examined the eCommerce technologies which made these approaches possible – namely traditional EDI, and complementary technologies such as barcode scanning and eCommerce gateway systems.

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