The Life-cycle of Electronic Data Interchange: Emergence from the Dust till a doubtful Survival in the Future

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Abstract

The introduction of internet applications in e-commerce made many adopters think that EDI would soon disappear. But the trend in logistics towards closer collaboration in supply chains made on the other hand the impact of EDI larger. A resultant of those forces will probably lead to a new type of EDI, which integrates with other technologies. Early studies on EDI were promoting its use because of savings in administrative work. But due to intra-corporation management model changes, today's savings should be looked for rather in lower inventory holding, fewer obsolete materials, and lower premium freight. The traditional potential of EDI reduces cost and error, but cannot cover its comparatively huge investment and maintenance cost at all, especially for small players. Players in the supply chain should look for indirect potential of EDI. EDI is to be treated as a tool of providing a communication channel or a platform for integrating other technologies that can completely redesign the supply chain. Players in the chain should be aware that the most relevant infrastructure of such a collaboration model consists of a smooth working collaborative information system, including EDI, but intertwined with other applications and technologies to emerge its potential benefit.

1 Introduction

The spectacular growth of information technology (IT) has a large potential for improving the performance of organisations. But the huge investment made in IT puts increasing pressure on management to justify the outlay by quantifying the business value of IT. Also the impact upon transport services has been profound.

The use of IT has permitted the development of faster, more reliable, more precisely timed logistics strategies, within which information-intensive transportation services are central. The internationalization of production networks combined with the heightened attention to time as a factor in competition (Schoenberger, 1994) has made the operation of those chains a far greater concern for firms in a wide range of industries.

The structure of supply chains has changed apparently. Transportation is being placed in the first place among supply chain to satisfy the demand of customers who reduce inventories and place smaller orders more frequently while requiring higher service levels and lower costs. Transportation is not only the largest component of total logistics cost, but also the fastest growing component. Rondinelli and Berry (2000) argue that four major trends push the supply chains towards inter-modal transportation: (1) economic globalisation, (2) speed-to-market product delivery, (3) agile manufacturing and business practices, and (4) integrated supply chain management.

Due to lack of synchronisation, goods may be immobilised at various links in the supply chain. Goods have to stored, guarded, they are open to risk and, most of all, they do incur an

investment cost. From this, an urgent needs arises to line up the documents stream with the goods flow in international trade and to speed up the whole process by automation and electronic data interchange (EDI), as well as by standardisation and simplification of trade procedures and documents (Janssens and Cuyvers, 1991).

It has been claimed that inter-organisational systems using EDI, e-mail etc. lead to 'vertical information integration' between trading partners along the value chain. By improving the accuracy and timeliness of information exchanged over manual methods, EDI is believed to significantly change how organisations conduct business with their suppliers and customers. By now, it is generally accepted that the effect of EDI on business is undeniable.

With the development of global business and inter-modal transportation, maritime transportation no doubt has become more important, using a port as a connection hub. The competition among ports is fiercer. Information technology plays important role to strengthen the ports, and EDI as a tool to exchange of information among concerned parties in a community is preferable weapon for ports among all the information technology. This is mainly because of its three main capabilities: high speed, reliability, and ease of data capture (Hoogeweegen, Streng and Wagenaar, 1998).

Management and control of harbour processes is based on the intensive use of information technology (IT). IT can be used in many ways to increase the efficiency of harbour operations. They include: (1) using electronic data interchange (EDI) to improved data exchange between harbour services and customers; (2) unifying all information flows and processes into one information system; (3) using computer-based simulation to make efficient decisions (e.g. related to the use of harbour resources, redesigning a lay-out, or controlling transport flows) (Blümel and Novitsky, 2000).

2 Emergence from the Dust: Historical steps towards EDI

Electronic transmission of data between trading partners is the only way to get rid of a bad synchronisation between a fast goods flow and a slower document and data flow. What is now called EDI, must have emerged from the dust residing between piles of paper in offices of some commissions or committees. Starting in 1960, the Economic Commission for Europe of the United Nations (the UN/ECE Working Party 4) spent a great deal of effort on designing and harmonising standards for uniform trade documents. In a long period of time, three standards were developed towards electronic messaging: (1) the UN Layout Key which is a standard paper form for trade documents (later accepted as the ISO standard 3535; (2) the ECE/UNCTAD Trade Data Elements Directory (TDED) which assigns fixed positions for data on a standard form including a standardised vocabulary; and (3) the ECE/UNCTAD Trade Data Interchange Directory (TDID) containing a terminology, syntax rules and standards for the exchange of messages composed by these rules.

As a first step, paper documents were standardised. A layout form has been developed, which became recognised as an ISO-norm (ISO 3535). On these documents information elements have their fixed position. At that time, the use of the layout form allowed, through the use of special masks, to produce new documents by a simple photocopy operation (for example an invoice on basis of an airway bill). In this way time is saved but, more important, errors are avoided while copying data elements from one document to another.

As a second step, the data elements have been standardised. As a side effect of locating data on the layout form, an inventory was made up of the widely appearing data elements. In

such a way the *Trade Data Elements Directory* has been created. A list has been created which provides a standardised vocabulary for commercial messages.

In a third step, a move was made towards messaging in an electronic way. The first important step towards electronic messaging has been realised through the development of the *Trade Data Interchange Directory (TDID).* The TDID contains a terminology, syntax rules and standards for the exchange of messages composed according to the rules. It was agreed upon that within the messages an hierarchy would be put: a message consists of segments, each segment consists of data elements, and each data element consists of a sequence of characters from an agreed character set. This electronic message traffic later received the name: Electronic Data Interchange. Formally EDI could be defined as: the electronic transmission of structured data from computer to computer according to agreed standards.

For the practical execution of this message traffic a detailed agreement is required on data elements, codes, syntax rules and message formats. Such an agreement has been reached through a set of national EDI-committees. The interchange itself takes place across telecommunication networks provided by public or private telecommunication or value added network services. The field of application of EDI extends to all trade and trade-related activities, i.e.: commerce (trade and industry, manufacturing, finance, banking, insurance, construction industry, tourism and travel), transport (road, rail, air, sea, forwarding, dispatching, handling, warehousing), governmental (customs and excise in both national and international trade, statistics).

The European Community recognised the strategic importance of EDI through its TEDIS program, launched in 1988 (Commission of the European Community, 1989). The program has four goals: (1) to avoid an uncontrolled expansion of data communication networks resulting in incompatibilities; (2) to encourage the development and implementation of data communication systems in small- and medium-sized companies; (3) to stimulate the European industry for telematics hardware and services; and (4) to support the use of common standards (as EDIFACT). Since 1985 both the UN/ECE's working party (from the European side) and JEDI (from the US side) worked towards a common standard to be called EDIFACT (EDI Standard For Administration, Commerce and Trade). The EDIFACT syntax has been accepted by the ISO in 1987, and published under the norm ISO 9735. In 1988 the UN agreed to maintain the standards.

So it took nearly 30 years of background work from the UN/ECE working before the EC put up a program to stimulate the industry towards a global acceptance of Electronic Data Interchange (EDI). Also the academic community only slowly got interested in various aspects of EDI or inter-organisational information systems in general. Such information systems were recognised as a real company resource by Suomi (1986) and, more specifically, Janssens and Cuyvers (1991) stressed that EDI could be a strategic competitive weapon in international trade.

For decades, Electronic Data Interchange (EDI) has been adopted by organisations around the world for the purpose of replacing mail or fax. Many of them use EDI not because of their own decision, but are being forced by external pressures (business partner or competitive pressure). EDI itself as a technology goes through Value Added Networks (VAN)-based communication networks to an Internet-based communication network, which makes its costs drop substantially, but its adoption cost, especially the integration cost, still is comparatively huge, especially for small companies. Although its adoption cost may be limited to several hundred dollars, but its integration cost (intra-organisational and inter-organisational) maybe hundred times of its adoption cost. Very important to understand is that the benefit of EDI just comes from the integration cost. Many companies wonder whether the big investment can be covered by EDI benefit, some researchers even sigh that EDI will completely vanish in the near future.

The need for a solution as EDI has been recognised in international trade centres like international ports. Goods did arrive faster at their destination than their associated documentation. Creating documents, mailing them to the freight forwarder and handling them in the port of departure could take up from five to days to two weeks, while the goods could be transported in a shorter time. Mailing the required documents to the exporter, from the exporter to is bank, from the exporter's bank to the importer's bank abroad and acknowledging the matter could require ten days to three weeks, while the transport from the port of departure to the port of destination took only three up to 20 days. Practical evidence has been reported by Cuyvers and Janssens (1993).

Containerisation has increased due to its ease of handling the same unit by various modes of transport. As capacity of vessel has been extended from 400 TEU at the introduction of containers in the mid-fifties till 4000 TEU and more today, small container terminals have changed into large container terminals. To ensure a fast transhipment process at large terminals information technology and automated control is required, but this leads to large investments in various technologies and an ongoing database management (Vis and Harika, 2004). Wan et al. (1992) did show that the application of information technology in the port of Singapore resulted in more efficiency and higher performance.

Finally it can be stated that Electronic data interchange, EDI, is a powerful tool for communicating between trading partners. It is considered to be an advanced tool for modern logistics, as it offers economic and strategic advances in terms of competitiveness and allows for the provision of new and improved services. Multiple reports have supported the claim that the expected tangible advantages prove to be valid: EDI indeed speeds up communications, allows for better control over information flows and quality, decreases the volume of paper, and reduces costs, thus obtaining a higher service level, followed by gains in efficiency (lower costs) and improved external aspects (held/gained clients, better relations with partners). In spite of these perceived advantages, EDI in the maritime transport sector is still in the stage of introduction, compared to the airline and airport industries.

The most well-known industry-specific organizations related to EDI (at the European level) are the following (Giannopoulos, 1996):

(1) Odette: Organisation for data exchange by tele-transmission in Europe. Odette was formed early in 1984 and is made up of national delegates, representing both the manufacturers and suppliers of the automotive industry in a particular country. The countries involved at present are: United Kingdom, France, Belgium, Germany, Italy, Sweden, Spain, and the Netherlands.

(2) CEFIC-EDI: Council for the European Federation of the Chemical Industry. CEFIC represents the fifteen national chemical federations of Western Europe. It has, as corporate members, most of the major chemical companies with headquarters in Europe.

(3) Edifice: European Electronic Industry EDI Association. The Edifice Group was formed in 1986, with participation from electronic industries from the United Kingdom, France, Germany, Sweden, the Netherlands, Switzerland, and Italy. Several of the participating companies are subsidiaries of major US electronic companies. The group provides a forum for discussion and agreement of EDI practices within the electronic and electronic components industries.

(4) EAN/COM: International Article Numbering Association EDI project. The International Article Numbering Association, perhaps best known for the 'barcode' product numbering system, has been entrusted by its member companies with the development of a standard communication system including telecommunication facilities for trade messages.

(5) Rinet: Re-insurance and insurance network. Rinet was set up in 1987 in Brussels by eight insurance and re-insurance companies to provide EDI and network services to both the insurance and re-insurance companies in Europe. The services will be extended eventually to cover insurance and re-insurance companies from all over the world.

(6) EDIS: EDI associations for transport and harbours. The group was formed in 1987 with participation from several national and harbour EDI projects, namely UK (DISH-Data interchange shipping). Dedist (Sweden), Intis (Rotterdam harbour) and Seagha (Antwerp harbour).
(7) COST 306: EDI trial projects in the transport sector. COST 306 is a European Commission and EFTA initiative to promote EDI trials in the transport sector. An extention of the COST 306 initiative was the Tedis transport group which was formed within the framework of the Tedis programme, to co-ordinate the various EDI transport and transport-related services in the Member States and EFTA covering rail, road, air, sea and deep-sea transport.
(8) Advanced Transport Telematics (ATT) programme. This EU/DGXIII sponsored research on transport telematics included several freight transport projects which tested EDI (and MDC) applications. A regular meeting of all freight related projects, known as Area 6, produced a special recommendation for EDI messages for use by small and medium sized companies.

3 Benefits of EDI in a port community

The exchange of information is as important to freight movement as the movement of the cargo itself or the equipment that is moving it. In freight transportation, if information does not move, cargo does not move. The more seamless the information flow is, the quicker cargo can get from its origin to its destination. Electronic Data Interchange (EDI) communications facilitate the smooth handling of cargo from mode to mode, as well as automating billing, data entry, tracking functions, and other information exchanges such as cargo manifests, vessel arrival times, inbound movements, and status notifications. Within context EDI can reduce cycle times, forward documents, improve inventory management, plan schedules, and make purchases, in an electronic and automatic way.

Within this electronic context an electronic sea waybill and an electronic Bill of Lading is required. Greiner (1997) summarises the shortcomings of a paper Bill of Lading as: (1) different types of cargo and methods of shipment entail distinct Bill of Lading practices, the master or captain of cargo and container vessels must sign hundreds of bills of lading; and (2) the paper trail that is generated using a paper bill of lading is extremely costly and results in a slow rather than an efficient means of transfer, as banks would require. The cost of producing all these documents in a paper format is estimated to be approximately 10% of the invoice value of the goods.

All parties concerned in the maritime industry are forced to use EDI to facilitate electronic documents. The port is a mail player and should use the system. Further it may be chosen by a shipping line, a carrier as an offshore terminal, and continues to exist in parallel with the current port system.

EDI can allow a user to select any container and gain instant data on the container's location, weight, and identification number through electronic communications. EDI systems can link customs, shipping lines, inland carriers, importers, and exporters. This helps shipping lines transact business more efficient within the port and to trans-ship the containers fast, since automation results in quicker release times.

Early adopters have proven the contributions of EDI in different departments of port community players. Customer service departments, distribution centres and transportation departments have conflicting objectives. Customer service wants products to be picked and shipped for next-day delivery to order change. A distribution centre wants orders immediately

loaded and shipped to avoid dock congestion and unnecessary handling. Transportation managers aim at building an effective loading plan before releasing the order to minimize transportation expenditure reduction, taking into consideration on-time delivery and maximisation capacity utilization. The use of EDI may solve this conflict of objective by sharing key information between functions. The benefit of this cooperation can be realised through reduced costs, enhanced productivity and higher customer satisfaction marks.

Lee et al. (2000) point out some of the problems and successful factors in the process of EDI development and implementation for container cargo logistics, taking the cases of TRADENET in Singapore, KL-Net in Korea, and SHIPNET in Japan as examples.

TRADENET, which was developed in the early 1990s, has been one of the most recently successful cases in the maritime community. This mainly because: (1) Singapore was the first nation to develop the EDI systems nationally; (2) the Singapore government and the Customs organization have played a crucial role in the implementation of EDI, (3) TRADENET has been initiated and designed by the maritime community to meet its own needs, being developed from processes used by the nine major members representing the majority of users in the port community (see also Lee-Partridge, Teoa and Limb (2000)).

SHIPNET was established in 1986, and is a document exchange system which connects freight forwarders, shipping lines/agents, sworn measures and tally firms. It aims to provide facilities to allow the optimum transfer of shipping documentation. It seems that the system is regarded as a failure, owing to the following reasons: no government involvement, no support from port authorities, no customs involvement, high user costs due to high cost of transmission lines, no communication standard message adopted, lack of technical support and standard software packages for shipping lines. An accelerating rate of attaining a critical mass of users is important for realizing the economic benefits associated with using EDI. However, in SHIPNET, there has been a considerable delay in reaching anything like the critical mass.

In Korea, the network is called KL-Net (KLstanding for Korean Logistics). Since 1992, the government has invested a lot in order to introduce EDI for container cargo logistics through KL-Net. In spite of this major effort, the evolution of EDI in Korea has been slow. The major problems which have arisen in the process of the introduction of logistics EDI into Korea are: KL -NET has been developed for inland transport and port operations for the total EDI system without involving any pilot projects; customs have not been included in the scope; there is no sharing system of cargo data; weak support from users, owing to big discrepancies between users' needs and the services provided by the KL -NET.

A survey by Macharis (2004) on both collaboration and competition in the inter-modal transport sector also spends some attention to the role of information technology. She states that the use of IT in an inter-modal environment is more difficult than in a conventional transport mode environment for various reasons: (1) in inter-modal transport a lot of collaboration takes place between small and large companies. The size of the company determines many times the level of computerisation; (2) as it uses different transport modes, any efforts to standardise information communication within a specific transport mode leads to incompatibility for inter-modal transport partners; (3) inter-modal transport is used for a larger part in an international environment. This enlarges the possibility of incompatible information systems.

Based on the survey, it was found that inter-modal transport partners use two types of communications-based information systems: EDI and Automated Equipment Identification (AEI). In the port of Antwerp the Seagha-system is used. However, not each company within the port makes use of this system. Some large companies have developed their own system. But, even due to the non-participation of some partners, the message traffic is increasing

significantly. The port of Zeebrugge uses its own system called Zedis, but makes use of the Seagha system for communication with the customs office. As a great part of the goods is shipped from the ports by train, it is worth to look how the EDI component may propagate in to the Belgian railway system. Customers can make use of the Rail-EDI system to send a waybill to the Belgian Railways.

4 The EDI partners and their relationships

4.1 The EDI champions

Jelassi and Figon (1994) illustrate that Brun Passot, a French family business with a small market share in the distribution of office supplies in the early 1980s, by using EDI technology based tele-purchasing applications, they got significant direct (basic EDI benefit: manpower saving, higher business efficiency, fewer mistakes) and indirect benefit (winning more customers, lower inventory level, eliminating the costs of banking transactions, etc.). EDI technology-based applications helped them to retain current customers, win new customers, and seize new business opportunities. Today office supplies distribution in France is concentrated only into five distributors, amongst them is Brun Passot.

This example is only one of the many, which can be shown: manufacturers and distributors using information technology and EDI in order to grow their market share. Keen (1991) stated twenty years ago that the economics of EDI are so compelling that EDI should become one of the "must do" applications. A buying firm can manage its relationships with suppliers by asking each vendor to adopt EDI to create a close relationship between buyer and supplier. Managing forward in the value chain, a supplier may connect its operations with those of buyers to create disincentive for customers to seek other suppliers.

The benefit of EDI however falls mostly in hands of the EDI champions. EDI adopters are mostly smaller in size and have the EDI champion as a most important customer. With this strength in negotiation, the EDI champion may force the smaller company to make a big investment in EDI. While the EDI champion benefits through these capabilities, it is doubtful for the smaller sized company. It can be observed however that the pioneers of the EDI usage, e.g. the distributors, are amongst the bigger international companies.

4.2 The EDI adopter: the customer or the retailer

Two questions need an answer: can the EDI adopter get any benefit from EDI? Under which condition can the adopter get apparent benefit? A study by Mukhopadhyay et al. (1995) confirms financial benefits of EDI adoption to the customer side. The assembly centres of Chrysler Corporation adopted EDI since 1984.The study made a longitudinal research from 1981 to 1990 on its financial benefits.

The study emphasises two types of benefits. One type concerns basic EDI benefits. It replaced telephone or fax transmissions, and manual work was replaced by machine. This results in more manpower is freed, less errors made, comparatively significant cost saved. 25% of total benefit earning came from this regard. Another type of benefit, also the main part of the benefit, came from intra-corporation and inter-company management model changes:
Intra-corporation management model changes. Because of fast and accurate information sharing with suppliers, smaller inventory buffer was needed compared to earlier and at the end of the year, less obsolete material was left in the warehouse. According to the result of a 10 consecutive years time-series data analysis, at Chrysler corporation, inventory holding cost

was saved by 21 % compared to total cost saving. The obsolete inventory cost was saved by more than 4 %; and

Inter-company management model changes. Chrysler changed the mode of logistics operations. In the old mode, the inbound material flow was inefficient and resulted in less than truck (LTL) loads. Under the new system, Chrysler makes use of the "Scheduled Delivery Program". The new operating premise is a scheduled pick-up loop, with the carrier picking from several suppliers and returning the reusable containers. Savings in this side was 10 % compared to total cost saving.

Indirect EDI benefit accounts for a big part (67%) in total EDI benefits. If a company adopts EDI and only acknowledges and harnesses its direct benefits, the company can only get 33% of total EDI benefits. The result is that the company may strongly feel that EDI cannot produce benefits. This might be the foundation of some pessimism in early scientific reports. A better exploration of EDI indirect benefits is imperative and becomes a research topic.

Recently the concept of collaborative commerce (C-commerce) has come up. EDI has facilitated buyer-supplier transactions but, beyond the execution of transactions, business partners can develop collaborative relationships. The relationships entail knowledge sharing, knowledge creation, and knowledge usage as the partners jointly work toward performing various activities including research, design, production, marketing and logistics (Holsapple and Singh, 2000). There are different levels of integration in C-Commerce: at the lowest level companies are exchanging data via traditional means such as fax, phone, and mail; and one level higher they make use of EDI or email for point-to-point data interchange (Chen et al., 2007).

4.3 EDI integration with other technologies

EDI implies the connection of business applications across company borders. The main issues are legal issues and integration issues. The legal issues concern the fact that an EDI message may trigger certain actions like shipment of products, which involve a change of ownership. If an inventory management system recognises a re-order point for a type of material, this event may trigger a purchase request to be sent to create an (semi)-automatically created purchase order. A similar message will be sent to a supplier's distribution system where it triggers in a (semi)-automatic way the delivery of the requested materials. A purchasing contract may be concluded and settled without human involvement.

Lee, Clark and Tam (1999) through a study from the EDI adopter side, strongly assert that EDI can benefit the adopters, even they are forced by their champion partners to set up an EDI communication channel. But there is one prerequisite: you have to explore EDI's indirect potential. Mostly the traditional direct benefits from EDI cannot cover its comparatively large investment and maintenance cost at all, especially for small companies, in which the amount of data transmission through EDI is very small. As a result, a question may be raised like: what is the indirect potential of EDI? What indirect benefit can we get from EDI? The answer is: EDI should be treated as a tool of providing a communication channel or a platform for other technologies that can completely redesign the supply chain. Redesigning the supply chain corresponds to giving up the traditional trading model between commercial partners, making the relationship between trading partners more interdependent.

Raghunathan and Yeh (2001) show that a CRP (Continuous Replenishment Program) is a technology that can make use of the EDI communication channel to redesign the supply chain. In such a way it offers significant benefits both to EDI champions and to EDI adopters. EDI adopters (product retailers) transmit detailed information about their products on a daily basis to EDI champions (products manufacturers). The information concerns products

inventory available at retailer side. The manufacturers decide on the retailer needs based on those data. The retailer thus transfers the order responsibility to the manufacturer side. As a result, the manufacturer can better plan its workshop production, and transfer the required products to the retailer more frequently. Thus the warehouse cost on the manufacturer side reduces, and also the capital returns more fast. This means that the capital turnover is higher than before, and the manufactures has sufficient capital to produce continuously. On the retailer side, the warehouse level and stock-out situation both reduce. The result is that both manufacturer and retailer win under the combination of EDI-CRP.

Lee, Clark and Tam (1999) also practically demonstrate that EDI combined with CRP provides great benefit both to manufacturers and to retailers. They collect data from historical records at Campbell Soup Company (EDI champion). The source data contained pre-and post-CRP information on manufacture and 31 retailer sides. Through analysis of the data they conclude: (1) retailers investing in EDI capabilities for CRP innovations with manufacturers reduce the inventory level at their warehouses; and (2) retailers investing in EDI capabilities for CRP innovations with manufacturers reduce the stock-outs level at their warehouse.

A similar assertion is found by Lee, Pak and Lee (2003). They split EDI applications into basic EDI and collaborative EDI. Basic EDI is just traditional EDI, adopters use its direct benefits to transmit documents in an automatic way. Collaborative EDI is EDI combined with other technologies, such as CRP, to create new inter-company co-operation and enhance inter-company dependency. The authors use empirical data to answer the question: why organisations fail to achieve significant results from EDI despite its rapid adoption? They strongly demonstrate that companies are unlikely to achieve significant benefits from basic EDI. EDI itself cannot significantly improve the channel performance, but enables new processes to be adopted, for example collaborative EDI, which can improve a company's performance in a significant way.

5 The future of EDI towards outsourcing, e-commerce and the B2B-marketplace

Companies noticed the necessity of outsourcing of low strategic importance resources (goods, labour) to specialised companies. The benefits of the outsourcing action appear in terms of cost, time and quality. Specialised companies can offer cost savings due to the scale effect. Specialized companies have specialized labour resources and material, machines and more suitable information to save time on some activities. Specialised companies have more abilities to offer high quality goods or services, because of their specialization position. The company can concentrate on its strategic goods, which offer competitive advantages, and thus improves its competition ability. As product life cycles are shrinking, this also leads to the necessity of companies to outsource more goods or technologies to equip itself. This means that general inter-company activities emerge (not only traditional supply chain relationships).

A great part of inter-company coordination in the future will consist of information (Holzmuller and Schluchter, 2002). The uncertainties among the participants are lower and the transactions have lower specificity, compared to such rich media which could be used to transmit complex information as a face-to-face meeting, a phone call, which are costly and time-consuming, such poor media as fax or EDI is more suitable and cheap. The new technology EDI is more efficient and more suitable digital information transmission. With the continuous emergence of new technologies, the indirect value of EDI can be more explored, and it will definitely be used more widely.

Electronic commerce may be narrowly described as a mechanism for internet-enabled EDI (Addison, 2003). The diffusion of e-commerce is in course of development. Ten years ago the Gartner group (2001,quoted after The Economist 2002) predicted that 70% of firms would have an incoherent e-business strategy very soon. By 2010, all businesses in Wales are supposed to have access to a choice of modern advanced telecommunication technologies at an affordable cost (Lewis and Cockrill, 2002). Involvement in e-business activities has become compulsory in most industry sectors (Jed et al., 1998). In the future, there will be no way to survive without getting into e-business (Addison, 2003). E-commerce has permeated into each business field of our global society, including e-entertainment, e-banking, e-library, etc. The move has been much slower than predicted ten years ago but the trend is steady.

E-commerce provides a big platform for the development and utilization of EDI. EDI is a key application powering e-business according to the Gartner Group. Although EDI exists for several decades but most EDI users are still in the early stage of EDI utilization: they only make the EDI basic benefit. The introduction of the Internet for commercial use in the mid 1990s has offered a solution to this cost associated problem. Using the Internet as the communications medium for EDI transactions these costs, which include the cost of purchasing the translator software, the establishment of the communications network or subscription to a value-added network can all be reduced.

But with the use of internet-based EDI, the EDI cost will drop. Chan and Swatman (2000) have indicated that this cost reduction drives the move from traditional EDI towards Internet-based EDI and enables smaller organisations to more readily afford the implementation.With more companies using EDI, EDI can demonstrate its indirect benefits. The relation between the number of EDI users and EDI indirect benefits is positive. This spiral increase makes us believe that the future of EDI is just like the future of e-commerce.

But, one should be aware that, internet-based EDI is seriously threatened by on-line security problems. This problem has in great extend increased the EDI business cost, blocking many potential users who are willing to use Internet-based EDI but are afraid that the confidential information will flow into wrong hands. They are forced to use private networks, thus keeping the EDI cost high. Ndubizu and Arinze (2002) demonstrate that, solving the on-line security problem, enforcement of legal rules, creditor rights, shareholder rights and market technology integration will guarantee the on-line business benefit and increase the on-line business amounts. So, in order to make internet-based EDI more prosper, EDI legal rules should be developed and enforced globally.

B2B marketplaces as a new technology have been discussed intensively recently. Of relevance to our topic is whether B2B marketplaces as more efficient media will replace old media such as mail, fax, or even EDI.

A survey by Holzmuller and Schluchter (2002) shows that EDI will be engaged for inter-company coordination in the future, especially in companies where respective solutions are already in place. Although we are sure that EDI has a bright future, this does not mean that EDI should be used for all types of inter-company coordination. It needs to be determined in which concrete areas and in which way this institution is of value. Sometimes, face-to-face talking or telephone maybe suitable, sometimes, mail maybe more efficient, sometimes, B2B marketplace is the best choice. In general, EDI seems to be more suitable for company collaboration (intra- and inter-organizational e-commerce), while B2B marketplaces are more beneficial in the case of exchange (B2B e-commerce). E-mail is more suitable for consumer-oriented e-commerce. According to the concrete feasibility for individual in order to choose one of both media, it can be stated that both EDI and B2B have a future.

6 Conclusion

In this paper we have looked at various aspects of EDI in the business world, and more specifically how EDI has changed from its original concept. We can conclude that the use of EDI is still increasing and that the concept of supply chains is a driver to give its use an additional boost. In a port, where by definition, lots of supply chains cross each other and have their links, the use of EDI seems to grow towards a common service. While in the past the use of Edi has been slowed down to high software investments, in the future, internet-based EDI will have a dominant position over dedicated software implementations. Efforts by port authorities or port community organisations allowing a relatively low-cost access to the use of EDI will certainly benefit its future positive evolution. Although EDI champions are often the big winner of EDI investment, small EDI adaptors can also gain benefit from EDI adoption, be it so much, if they can explore the EDI indirect benefits. Recent business trends like outsourcing, e-commerce and the business-to-business market place are all steps into collaborative commerce, where the integration of IT and effective electronic communication is a number one-priority. Incompatibility, security, different company size, internationals and cultural differences are expected to slow down the growth process, but the final conclusion is that there exist a positive future for EDI.

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