Network and Process Re-design As Success Factors Of EDI

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Trading has always been a main source of economic development for Singapore. Because of this dependence on trading, it was natural for Singapore to identify opportunities for efficient and effective techniques, particularly through the applications of computer and communication technologies to increase business efficiencies and reduce operational costs. TradeNet, Singapore's first nation-wide EDI system, launched in 1989 links the private trading community to government agencies to process trade documents for cargo clearance. This paper illustrates the factors that impact the success of EDI, in particular of TradeNet from two perspectives. From the government perspective, a collaborative networking relationship amongst government trade control agencies is essential, and from the private sector perspective, the integration of the system with internal business operations is necessary.

1 Introduction

Singapore saddles the inter-continental trade route linking the UA, Europe, and the Middle East, with India, China and Japan, and trading has always been a key source of economic growth for this island nation. Singapore is also the gateway to the emerging economies of South East Asia such as Thailand, Malaysia, Indonesia and the Philippines. Hence, it is important that the island nation provides an efficient trading hub as its economy is dependent on entrepot trade. In other words, it services in the re-exporting of agricultural products, minerals and industrial goods from neighboring countries to the rest of the world, while importing high technology items from industrialized nations for distribution in the region.

Today, Singapore is among one of the top trading nations in the world and her external trade is three-times her GDP. She has one of the largest and most efficient maritime port as well as airport around the region. In the recent times, she is also well known as a manufacturing, logistics and business hub. However, this achievement has not been taken for granted because the rapid development of her neighboring countries and their port facilities have steadily reduced the volume of goods imported and exported through the island’s ports. It is therefore obvious that Singapore’s competitive position in trade must be firmly established. To bolster the fragile trade economy so as to strengthen and sustain foreign investment, TDB decided to develop Singapore into an efficient and sophisticated trading as well as manufacturing, logistics, and business hub.

In 1986 a recession hit Singapore. Therefore, it was natural for her to identify opportunities for cost reductions and productivity improvements to boost international trade. Cutting operational costs and improving productivity in the trade sector became a priority as the trading process involves many unwieldy procedures whereby traders have to submit voluminous paperwork to many trading parties or agencies. Indeed, a key focus is to leverage information technology (IT) to enhance efficiency in the seaport as well as the airport as the high costs of paperwork (about four to seven per cent of the value of goods traded) has made it unattractive for companies to compete in the global market. Consequently, trade efficiency and expediting cargo movements are of utmost importance to Singapore. Thus, the objective to simplify and integrate trade documentation procedures amongst the many government agencies and the trading community became the key mobilizing factor for the development of TradeNet.

As information technology has been a key focus of Singapore’s strategy to enhance productivity and business efficiency since the early 1980s, it was therefore, appropriate to apply electronic data interchange (EDI), a combination of computer and telecommunication tech-
organizations a cost-effective approach to process trade messages and transactions. It enables the direct transfer of business data between computer systems in different organizations (without human intervention) using widely agreed standard to structure the transaction or message data. With the structured format based on an agreed standard, the data are directly transferred from its source to destination which makes EDI an efficient and attractive system to use. As it is a direct inter-organization system, and the exchange is between machine to machine, EDI eliminates paper handling and delay which is a problem of the paper based handling system. Further, there is no need to generate the transactions in different formats for different organizations.

With the introduction of EDI into the trading process, there is now a one-stop connection to the full range of services offered on the network. The advantages of EDI are many, and include typically the saving of time and effort in processing the laborious and voluminous trade transactions. In a manual system, the transfer of trade documents is often slow as they go through labor intensive activities of filling in forms, checking, matching, and posting the transactions and documents. Further, errors are reduced, thus reducing costs from the handling such as in data entry, transcriptions, sorting, and reconciling the transactions. Through EDI, the transactions are instantaneously transferred, thus, allowing organizations to produce and deliver their goods more timely. Consequently, with a more efficient approach to processing trade transactions, organizations can provide better and faster services to their customers, hence increasing further business opportunities.

While EDI can be employed to support business automation, the full benefits of this technology could only be realized through electronic integration of the various trade business facets between and within the organizations. In other words, the integration of business processes within the firms is just as important as the electronic integration between the firms through inter-organizational systems. For example, the integration must facilitate the many processes and activities ranging from ordering to purchasing, to inventory, payments and general ledger systems to be streamlined. Thus, an effective EDI must not only result in integration on the external and macro-economic level between business partners, it must also facilitate the integration of the internal and micro-economic levels of the different organizational functions and units. Thus, the diffusion of EDI will only be pervasive if it is well infused or integrated into the individual business processes, and not function as a mere interface of separate inter-organizational systems.

In this regard, two critical success factors are necessary for harnessing the full benefits of EDI systems. The first success factor looks at the effective electronic business network co-ordinations, and the second success factor looks at the intricate integration of business processes. Business network redesign involves the interfacing and cementing of "relationships" among business partners so that each organization’s work processes can be streamlined and reconciled for integration. Business process redesign involves leveraging information technology to “re-engineer” or re-design the work processes across various business units within a firm so that the functional activities are organized around customer serving outcomes rather than just functional tasks. In the case of TradeNet, there is evidence of business network redesign and business process redesign in both the public and private sectors.

EDI may well become the universal way to exchange trade documents in the 21st century. Indeed, there is an increasing use of EDI in the Asia Pacific region to facilitate the growth of the global trade and to enhance trade efficiency in international trade. For example, Taiwan’s TradeVan, Hong Kong’s TradeLink, the Republic of Korea’s KTNet, and Malaysia’s DagangNet are examples of how these countries expedite the process of trade declaration, issuing permits and approvals. There is also an increasing interest among these countries to interconnect to each other and to process electronically the trade documentation between trading partners in these countries. Through EDI, there is no doubt that globalization, liberalization, and harmonization of trade procedures and policies amongst the developing and the developed nations will be a reality sooner than anticipated by the World Trade Organization.

This paper aims to provide an overview of the development of the EDI network in Singapore. It highlights the success factors of Singapore's first EDI flagship, TradeNet from two perspectives. From the public sector perspective, it demonstrates the formation of collaboration among various trade control agencies to redesign and co-ordinate their network processes for trade documentation and declarations. From the private sector, it illustrates the importance of redesigning its internal business functional processes to integrate with the external trade documentation procedures. Since
TradeNet’s implementation in 1989, it has been cited as one of the most successful inter-organizational system that links the private trading community with the government agencies to process trade documents and clearance. A series of case studies have been written describing how TradeNet was developed and implemented (King and Konsynski, 1993; Neo, King and Applegate, 1993). These studies provide a rich source of anecdotal accounts of the benefits of TradeNet.

2 Paper-based Trade Procedure

The trade documentation procedure consisted of the collating of information on trade facts such as cargo load or tonnage, vessel size, and ports of origin and destination from various parties of interest such as freight forwarders, shipping companies, banks, insurance companies, and customs office. This information was then used for the exchange of trade transactions such as cargo manifests, transfers, and custom payments. Examples of the trade documents that link these crucial bits of information include trade manifests, bills of lading, letters of credit, and custom declarations.

Using the conventional manual procedure, the trade documentation process involved the trader to submit up to twenty copies of the trade documents containing similar items to various government agencies in geographically dispersed locations for import and export clearance and approvals. Shipping agents and freight forwarders had to personally deliver documents and wait for approvals and clearance with the customs and government agencies. Often, two to three days turnaround time was common. Before TradeNet was launched, it was often considered easier to move a tonnage of cargo than a piece of document. Also, it was rather costly to process the trade documents, e.g., it was estimated to be as high as 4 to 7 per cent of the value of goods traded.

Not only was the procedure cumbersome, it was also error-prone as similar information regarding the same consignment of goods was transcribed onto different forms and captured again or repeated for processing by different government departments for the approval of licenses for the shipment. Thus, some of the procedures were repetitive and became quite redundant. These inefficiencies led to exasperation if documents were misplaced, or lost, or incorrectly transcribed, thus resulting in further delay in clearing the trade documents. Further, cargo clearance could become highly complex, tedious and cumbersome when the volume of trade kept rising steadily. In 1987, TDB was handling about 10,000 declarations a day, and this number was steadily rising. It was also very costly during a tight labor market. Thus, voluminous paperwork and red tape were beginning to undermine Singapore’s competitiveness as a global trading hub. Therefore, solution had to be found to eliminate these inefficiencies so that the trade approval process could be expedited (King and Konsynski, 1990).

It is important to note here that tackling the cumbersome trade documentation problem is not an isolated course of action to develop an EDI system. In fact, streamlining the overall trade documentation process was an important part of a larger plan to develop the state-of-the-art transportation, telecommunication, materials handling, and IT infrastructure for Singapore. At the time, it was envisioned that these investments would also position Singapore as a hub in the global networking web, where increasingly business is being done through linkages which open new opportunities irrespective of geographical distribution and time zone barriers.

3 Planning for TradeNet

Initiated in 1986, Trade Net received maximum government support, including an endorsement from the then Minister of Trade and Industry, BG Lee Hsien Loong. The Minister publicly announced that the new system would be operational within two years. Consequently, the team entrusted to develop TradeNet was given full authority and support to garner the necessary resources to proceed (King and Konsynski, 1990). Indeed, TradeNet became operational in January 1989. The national driving force behind TradeNet made it possible for the trading community comprising traders, cargo agents, shipping agents and freight forwarders to work with approximately 20 government agencies to design and put in place an integrated multi-agency system to expedite the clearance of goods in and out of Singapore.

The planning of TradeNet began at the Trade Development Board (TDB), a statutory board responsible for managing all external trade activities. A steering committee chaired by TDB including representatives from relevant agencies such as Customs and Excise, the Port of Singapore Authority (PSA), the Civil Aviation Authority of Singapore (CAAS), trade representatives from associations, and the major user firms was set up. There were regular meetings commissioned by the TradeNet steering committee to investigate on how best to streamline the trade procedures and to develop a pro-
file of essential trade documentation activities that must be incorporated in the new set of procedures. A key objective of the planning effort was to work collaboratively to simplify the trade documentation procedure and to develop an integrated system that could directly tie into the computer systems of the government agencies and the private trading community. It was agreed that significant savings would accrue from reducing the burdens of trade documentation handling.

Following a six-month study of trade procedures in the air, sea, and government sectors, a multi-agency design specification for TradeNet was finalized. It was decided that the many forms involved could be reduced to a single form—actually a formatted computer screen comprising single electronic declaration form—for the submission and approval of licenses. This procedure was carried out using a totally automated process across the systems of all the participating agencies. By streamlining the procedures across the government agencies, standardizing the code classifications of all items, and developing the interfaces between the government systems and TradeNet, the electronic trade documents prepared by the trader using standard applications were routed automatically through the network without any manual intervention. Thus, the whole process makes it possible for the entire approval to be reduced to minutes rather than days.

Indeed, it may be noted that TradeNet’s overwhelming success is a result of the government’s stewardship in systematically preparing computerization programs for the public and private sectors in Singapore since the early 1980s. The National Computer Board (NCB), formed under the Ministry of Finance in 1980, was given the mission to develop Singapore into an IT society. In the 1980s, NCB embarked on two major computerization programs before the launch of TradeNet. The first program was the Civil Service Computerization Project (CSCP) where there was concerted effort to computerize all the government departments and agencies. The second program called the Small Enterprises Computerization Program (SECP) was to promote the use of computers in small and medium enterprises. These programs helped prepare the groundwork or laid the foundation on which the IT infrastructure was built for the implementation of TradeNet in both the public and private sectors. Indeed, without these systems, it would be impossible to link TradeNet.

4 Developing TradeNet

As the largest single EDI project undertaken by the government, TradeNet involved building an (IT) networking capability and infrastructure spanning different trade control agencies and numerous private firms in the trading community. Since the sheer magnitude of the project called for full-time, dedicated involvement, a separate organization called Singapore Network Services (SNS) was set up in March 1988 to own and operate the system. SNS is jointly owned by TDB with 55 per cent shares, and Port of Singapore Authority (PSA), Civil Aviation Authority of Singapore (CAAS), and Singapore Telecos, each having 15 per cent each.

The scale and complexity of TradeNet required the development phase to be carefully planned and executed. To ensure successful implementation of TradeNet, Price Waterhouse was appointed to study its likely market and evaluate the potential applications in the trading community. This feasibility study provided examples of applications that were needed to enhance TradeNet’s value throughout the trading community.

IBM was appointed as the integration contractor with responsibilities for all aspects of the system, except for the development of the software. IBM subcontracted Computer Systems Advisors (CSA) for developing the information exchange interface, the application host, the session manager, and the modules associated with system monitoring and billing. The core system was based on IBM’s proprietary EDI system called the Tampa Engine, modified to serve the needs of TradeNet.

To facilitate the design of the TradeNet system, TDB developed an on-line prototype, Trade-Dial-Up system. Traders were encouraged to try the prototype on a voluntary basis. The prototype was significant to the development of TradeNet as it gave the traders a chance to test out the innovative concept of on-line trade documentation. Indeed, it contributed to the more successful implementation of TradeNet for those traders who had tried out the Trade-Dial-Up system as they found out early the requirements of TradeNet to integrate them into their own computer systems.

To meet the tight implementation deadline of January 1989, SNS and IBM decided to concentrate on the basic information exchange and transaction processing components of the system. They delayed implementation of some database capabilities as well as the user billing modules until after the system went live. TradeNet was successfully operationalized as scheduled.
and the remaining modules were completed, tested, and installed in the following six months. By mid 1989, all the components of TradeNet were in place.

5 TradeNet - Electronic Trade Documentation

TradeNet service was offered as scheduled on 01 January 1989. It was opened to a pilot group in January 1989 before it became fully operational in April 1989. Before the end of the pilot, additional users were clamoring to sign on as subscribers of the network. This is because the ease of the system and the 15min approval of permits for the first 50 users gave them a tremendous competitive edge over those who did not have the service open to them. Since then the subscriber base has grown steadily. The electronic system of approvals has now become the new way of conducting business.

The advent of TradeNet has changed the trading community’s mode of operations significantly. The electronic system of approvals has now become a new way of conducting business. In a typical EDI transaction, a trader completes a prescribed declaration form (in a format conforming to the established international standard called EDIFACT) on a computer linked to TradeNet. The message or the electronic form is transmitted via telephone lines to SNS main computer which, in turn, transmits the message to various trade controlling agencies such as TDB, Customs and Excise, and Board of Film Censors. Once the submission is approved, the permit is routed through SNS’s mainframe to the trader’s computer so that it can be printed on the firm’s local printers. Finally, depending on whether the shipment is by air or sea, bookings can also be made with either the airport or the port for the shipment of cargo. Furthermore, it also facilitates and integrates the import, export and transshipment documentation procedures for both air and sea cargo. Figure 1 provides an illustration of this sequence.

In terms of the trading community, TradeNet’s encapsulation of more than twenty plus declaration forms into one electronic form that could be automatically sent across all relevant government agents has truly revolutionized the trade documentation process. The direct computer to computer link eliminates the preparation of multiple forms. As the forms are cleared electronically, courier services too are eliminated as “despatch” clerks are no longer required to handle the paper forms physically from one government department to another to process the trade declarations or collect approval permits.
On the contrary, they can finalize clearance of their cargoes from the comfort of their cool offices, in approximately 15min after the electronic submission of trade documents. This is a marked improvement from the 2-3d average that was needed under the previous manual paper-based system. Further, storage of goods in warehouses is also no longer required as goods are despatched to the consignee immediately on arrival. All these features have improved customers services significantly as the flow of goods is expedited because it is no longer being held up by paperwork.

With the introduction of interactive clearance, the time will be further reduced to a mere 2 to 3 min (Toth 1990). While the initial TradeNet processed the declarations in batches in a store-and-retrieve mode, the Interactive TradeNet system allows a trade declaration to be processed, transmitted to TDB and returned to the sender in a single connect session. The Interactive TradeNet system, which is presently applicable to non-controlled and non-duty outward declarations for goods such as vegetables, dried goods and stationery, will be extended to the other types of TDB declarations and implemented in phases.

Amendments to the declarations can also be made immediately. Consequently, the speedier flow of trade documents allows traders to load and unload their containers, thus saving the storage space and cost which, in turn, provides a higher throughput for the port. With electronic filling of documents, TradeNet offers higher accuracy of information as checking and the approval processes are performed automatically. It also provides subscribers with the facility to engage in the exchange of business documents such as invoices, purchase orders, delivery orders, debit/credit orders, etc. There is also the plan to incorporate TradeNet on the Internet.

The participants of Trade Net include government agencies, trade intermediaries, trade firms, financial institutions, and port authorities, as illustrated in Figure 2. TDB and the Customs and Excise agency are the principal government agencies with which traders are interacting via TradeNet. By mid-1991, 1800 of the approximately 2400 trade related organizations in Singapore were utilizing TradeNet for 95 per cent of their documentation requirements (Neo, King and Applegate, 1993). Trade Net was handling 60 per cent of all trade documentation by the end of the first year and 90 per cent by the end of the second year. TradeNet was so well embraced by the trading community that TDB revised its mandatory deadline for traders to adopt TradeNet by 1991, instead of the original deadline of 1993. Today, there are over 20,000 subscribers on the network.

From the standpoint of the public sector, the Trade Development Board has achieved significant gains in productivity since implementing TradeNet. Under the previous paper based system officers had to check trade declarations individually. Now, they can leave this te-
Table 1 — Trade processing before and after TradeNet

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Before using TradeNet</th>
<th>After using TradeNet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Submission of documents</td>
<td>By dispatch clerks</td>
<td>By electronic transmission</td>
</tr>
<tr>
<td>Trips per document</td>
<td>At least two trips</td>
<td>No trips needed</td>
</tr>
<tr>
<td>Interpersonal interactions</td>
<td>Dispatch clerk and TDB counter clerk; TDB supervisor and data processing clerks</td>
<td>No interpersonal interactions needed</td>
</tr>
<tr>
<td>Knowledge of trade codes</td>
<td>Resident in TDB processing clerks</td>
<td>Resident in TradeNet system</td>
</tr>
<tr>
<td>Checking and approval process</td>
<td>Manual</td>
<td>Automatic</td>
</tr>
<tr>
<td>Turnaround time for document processing</td>
<td>4 h (average) to 2 d (normal)</td>
<td>15 min</td>
</tr>
<tr>
<td>Fees charged per declaration</td>
<td>$56 - $510</td>
<td>$56</td>
</tr>
<tr>
<td>Accuracy of data on declaration vis-a-vis documents</td>
<td>100 per cent manually checked prior to approval</td>
<td>Automatic system edit checks; no manual checks; sample audit sources checks of supporting documents</td>
</tr>
<tr>
<td>Durable goods handling</td>
<td>Separate document for customs processing</td>
<td>Same electronic document automatically routed to customs based on Harmonised System code</td>
</tr>
<tr>
<td>Controlled goods handling</td>
<td>Separate documents in different controlling agencies for processing</td>
<td>Same electronic document to controlling agencies automatically</td>
</tr>
<tr>
<td>Number of staff in TDB document department</td>
<td>134</td>
<td>88 (as of July 1992)</td>
</tr>
<tr>
<td>Floor space used by TDB documentation department</td>
<td>1,390 square meters</td>
<td>985 square meters</td>
</tr>
</tbody>
</table>


The work to TradeNet’s automated system as check­
ing and the approval process is performed automatically. With TradeNet, the same electronic document is used consistently across all trade controlling agencies instead of separate manual documents. Table 1 provides a detailed list of administrative efficiencies resulting from TradeNet.

According to SNS, TradeNet has increased productivity in the trade sector by about 20 to 30 per cent, and costs have been reduced by as much as 50 per cent. Total annual savings for both government agencies as well as the trading community have been estimated to be about $1 billion (Singapore Network Services, 1993). Has TradeNet benefited Singapore beyond the trade documentation process? The answer is an emphatic “yes.” First, TradeNet has increased the throughput, that is the transshipment of goods through its ports because of faster cargo clearance procedures. According to Mr Yeo Seng Teck, CEO of the Trade Development Board (King and Konsynski, 1990):

“The local benefits of TradeNet are very good but the big payoffs for us are international. TDB is not a trade control agency; it is a trade facilitator. TradeNet facilitates trade. It makes it easier...
Links with other trade related networks have extended the benefits of TradeNet to dimensions not envisioned before. The link to PortNet, a maritime community system operated by the Port of Singapore Authority (PSA), allows TradeNet subscribers to make electronic booking of port facilities, track cargo and container movements within the port, and gain electronic access to information on vessel movements. By linking TradeNet to PortNet, TradeNet subscribers are now able to make electronic booking of port facilities including the application for berths and marine services. In addition, the subscribers are also able to track cargo and container movements within the port and gain direct access to vessel arrival and departure information electronically. This facility provides the business operations of the shipping community a single connection through which services on both networks are made available.

TradeNet is also linked to the air cargo community system that allows direct cargo space booking as well as cargo tracking facilities world-wide. Spectrum, a Cargo Community System (CCS), modeled very much after the concept introduced by the International Air Transport Association (IATA) enables a paperless cargo-related information exchange among the members of the cargo community. This information includes the cargo agents, ground handling agents, airlines, shippers, and consignees. With a single system link, users are able to place booking for cargo space and to track the movement of their shipment form the point of uplift to the final destination. A gateway connection with TradeNet allows users from both systems to communicate with each other through the existing link into the network. For example, the link with StarNet enables air cargo agents to communicate with the ground handling agents, government agencies, and each other. This system also supports certain financial transactions such as inter-bank funds transfers.

Finally, TradeNet's connections to overseas networks have boosted Singapore's share of international trade. So far, overseas connections to TradeNet included the INTTIS system operated by Rotterdam, and the US Customs Automated Commercial System. Through such international linkages, Singapore has also established a connection between TradeNet and the Customs Automated Commercial System (ACS) in the US so as to facilitate the pre-clearance of cargo at their ports of destination. This makes it possible for a Singapore trader to make a single export declaration, obtain an export permit to ship the goods form Singapore, and have a copy of the certification of origin for the export routed directly to the Customs Authority in the US. In the long run all these trade related systems will be interconnected to form an Integrated Cargo Community System using a single interface offering users easy access to all the services offered on each network, both locally and internationally.

6 TradeNet Plus on Internet Platform

With the advancement of Internet technologies that are based on open architecture, TradeNet originally built on a more specific architecture may not remain so attractive, especially to the small enterprises. Thus to ensure its continued success, TDB has decided to modify TradeNet to be implemented on the Internet, and is thus, called TradeNet Plus. TradeNet Plus is thus an enhancement of TradeNet, and is currently being developed and implemented over several phases. It strives to provide a much easier electronic access to trade declarations procedures in addition to providing economic and trade data. When fully completed by year 2001, it will cover all aspects of the international trading cycle – from trade documentation and clearance, transportation, finance, insurance, cargo movements to billing and payments online. The entire project consists of 18 modules that include Trade Register System (TRS); Air Cargo EDI System (ACES), Manifest Reconciliation Statements (MRS) for Sea, Trade Finance and Trade Insurance Systems to name just a few modules. Some of the enhancements for TradeNet Plus include, e.g., the logistics sector that would integrate the current cargo community systems to allow end-to-end capabilities. For instance, EDITRANS, a transport system that enables shippers and freight forwarders to send and receive pre-shipment documents such as transport instructions, packing lists, bills of lading and manifests will be further enhanced to include integrated payment and logistic using a set of standard messages. This will further facilitate communication between shippers and freight forwarders.

For TradeNet Plus to provide a seamless and transparent interface with varied users, a inter-networking Committee was set up to oversee the inter-connectivity among the various systems. The members of this committee include the major value-added network operator, which is Singapore Network Services (SNS), the Port of Singapore Authority (PSA), the Cargo Community
Network (CCN) and the Network for Electronic Transfers (NETS). TDB is also streamlining and enhancing the international trading process through TradeNet Plus, and thus is also working with various government agencies and the private sector in a concerted manner to effect the plan. The goal is to develop a total community system.

In view of the overall enhanced performance of the new trading systems and even with fee reductions, savings to the trading community is estimated to reach US$2 to US$3 million per annum. When TradeNet Plus programme is fully implemented in year 2001, it is estimated to bring about some US$2.8 billion savings to the entire trading community. The development of TradeNet Plus again demonstrates Singapore's commitment to harness and deploy information technology to its fullest capability so as to establish Singapore as a trading and distribution hub. Further, TradeNet Plus will help Singapore achieve its vision as an intelligent logistics hub.

### 7 Collaborative Network Redesign

Electronic integration of business processes amongst different organizations requires close collaboration and co-ordinations between the business partners. Because no single entity could create a workable electronic system for the overall process, it is important that strategic partnership must take precedence in negotiating for streamlining the trade documentation process. Close collaboration, a collective commitment, strong leadership, and above all shared vision among the various interest groups were essential.

For TradeNet, the business network co-ordinations required the workflow and protocols of all parties to be streamlined and reconciled into a set of coherent and simplified procedures, which could then be automated. This challenge was often more political than technical. Thus, sound working relationships were required to grease the complex negotiations to integrate the trade procedures and processes. Co-operative relationships and visionary leadership were especially important because the players that had to come together comprised a mix of hierarchical government bureaucracies, private companies of all sizes, and voluntary organizations (King and Konsynski, 1990).

The TradeNet experience demonstrated the necessity to co-opt influential representatives from different organizations to ensure collaboration. As Yeo Seng Teck, Chairman of the Trade Development Board (TDB) speaks of his association with Philip Yeo, Chairman of the Economic Development Board (EDB) and National Computer Board (King and Konsynski, 1990),

"Philip and I knew each other well. The small size of our country makes it possible for key people to get to know one another. In fact, people often hold a number of key positions in different agencies through their career. Philip was chairman of EDB, and I had been CEO of EDB before moving over to TDB. We both understood the problems. We also knew nothing would happen unless we agreed to push it."

It is interesting to note that prior to TradeNet, a few government agencies had actually recognized the need to streamline the inefficient trade documentation process. However, when attempting to tackle the issue each agency perceived the solution in a very narrow sense - each saw the problem and its solution as a procedural - one limited to the purview of its own charter and objectives. Consequently, each agency worked on its own separate ways to overcome the problem. For instance, the Port Authority of Singapore (PSA) understood trade documentation as a shipping problem, and hence developed the PortNet system. Similarly the Civil Aviation Authority (CAAS) looked into the feasibility of a common computer system for air freight companies. The Ministry of Trade and Industry developed the Trade-Dial-Up system so that statistical reporting may be enhanced when traders link up with the Ministry's mainframe to submit documents to the Trade Development Board (TDB). Finally, Singapore Telecoms saw the documentation problem as a market opportunity for value-added-networks, (Neo, Leong and Tan, 1992).

None of the above solutions were really able to address the trade documentation problem properly because each focused on only one aspect of trade inefficiency - the aspect directly related to the individual organization concerned. In fact, the trade documentation problem involved inefficiencies across many government agencies. Only a collaborative and cooperative effort on the part of all agencies could effectively address this multi-faceted problem. Before TradeNet, there were no strategic relationships between the relevant government agencies to formulate a comprehensive solution. It was only after the Ministry of Trade and Industry convened a special committee to co-ordinate the efforts of PSA,
CAAS, TDB, and Singapore Telecom, did all these agencies pool their ideas, problem solving skills and expertise on trade data administration, documentation and procedures. The synthesis of their efforts was the beginning of TradeNet.

Even after TradeNet was conceived, it required the pooling of TDB’s expertise in trade policy and procedures, and National Computer Board’s (NCB) expertise in information technology to develop and implement the TradeNet system. Key to this strategic alliance was the willingness of both institutions to join hands and develop a system which each organization could not have been able to develop on its own. It must be mentioned here that strong leadership and the intervention of powerful leaders at appropriate times were also essential to overcome constrained resources and organizational perspectives. A single, but influential minister, BG Lee Hsien Loong, at the helm of both TDB and NCB sealed the strategic alliance between these two organizations (Neo, Leong and Tan, 1992). Incidentally, the importance of the TDB-NCB partnership in the success of TradeNet was recognized by the global IT community when the US based Society for Information Management felicitated the two organizations with the Partner-in-Leadership Award in 1989 (Neo, Leong and Tan, 1992).

8 Integrated Process Redesign

The full benefits of TradeNet can only be achieved if EDI technology is integrated and streamlined into the work flows within the many functional units and facets of the organizations. Firms that view the EDI system only as a stand alone communication apparatus or an external interface, not only miss out on the benefits of electronic integration, but also end up with a set of automated, yet ineffective business processes. For instance, if a firm does not properly streamline and align its internal work processes with TradeNet, information would flow on automatically from TradeNet into the company’s core business systems. The ensuing pools of stagnant data and information would have to be re-entered again into the company’s computer systems in order to be processed for further decision making. Unfortunately, this process is inefficient, error prone, and expensive.

However, it is never easy for a private firm to be able to readily incorporate EDI and streamline it into its internal business systems. Indeed, it requires pro-active IT plans to develop and implement EDI systems to integrate into the firms’ internal systems. A proactive planning approach gives the firm an opportunity to replace outdated ways of doing business with streamlined, re-engineered processes more suited to today’s rapidly changing business environment where innovation, speed, service and quality are keys to success. Michael Hammer, guru of business process re-engineering, advocates employing modern information technology to radically redesign business processes and achieve dramatic improvements in performance (Hammer and Champy, 1993). While there are several re-engineering principles, the following principles are relevant to the implementation of EDI. First, organize work around outcomes and not tasks. Secondly, decentralize information processing to persons closest to the tasks so that they can take advantage of the information to manage the process. Thirdly, capture information only once – at the source. Finally, link EDI networks with databases and processing systems to benefit from the structure of centralization such as scale and co-ordination and to gain from the structure of decentralization such as flexibility and service.

In the case of TradeNet, the combined applications of the last two principles mentioned above have been a source of great value to the trading community in Singapore. First, encapsulating the trade documentation process into one electronic form enables trading firms to satisfy all regulatory requirements with a single form, even though the approval process involves a multitude of government agencies. Next, linking TradeNet’s central system to the computer systems of trading firms allows automatic transmission of trade documentation from information that is being generated during the day to day operations of firms. Merchant Air Cargo (MAC), the first private firm to be linked to TradeNet, reported numerous productivity gains from the system. Mr Joseph Low, Managing Director of MAC explains:

"...we also save money and time by automatically completing most of the TradeNet documentation using information already entered in our own systems. Between 60 to 70 per cent of the information required for each TradeNet submission is automatically transferred from our own system each time we prepare documentation forms."

Mr Low realized from the beginning that TradeNet must not be used as a stand-alone system. He felt that if data from TradeNet were not integrated into the firm’s computer system, data for TradeNet would have to be..."
entered again, and vice versa data from TradeNet would have to be re-keyed into the firm’s system. This would result in repetitive work and a high possibility of making errors in subsequent input. He, therefore, decided on an integrated system and involved the company’s vendor in the planning stage to ensure that data to and from TradeNet was well integrated with MAC’s internal system. MAS gained immensely from integrating its business processes with the information flows of TradeNet. It is a good example of how TradeNet allows it to integrate its cargo clearance and logistics functions to enhance customer service. Mr Joseph Low has this to say about merits of integration for MAS:

“We can integrate operations now. For example, we can get information on incoming shipment before the arrival of the aircraft it is on, submit the documents, get the shipment cleared, and meet the plane with all the finished documents in hand. We can get shipments to customers very quickly this way, and we can clear whole collections of shipments on our trucks.”

Integration meant that trade application to, and clearance from customs could be drawn to automatically update MAC’s systems so that the firm’s sub-systems could then access information from the database. For instance, trade clearance could automatically update the customer service systems, and MAC’s staff would then take necessary action to inform customers on the delivery date. Of course, TradeNet system had to be compatible with MAC’s NEC ASTRA minicomputer system to facilitate full internal integration. The integration of TradeNet into MAC’s system was a very complex process as it involved the marry of two different systems. However, MAC was fortunate to be on the trial run of TDB’s trade dial-up pilot project. With some prior knowledge and experience of the trade system, MAC engaged NEC to develop the software to interface and translate the trade documents into TradeNet’s format to facilitate the transmission of trade declarations.

Preparing trade transactions such as freight delivery, exports and data processing involved substantial paperwork. Usually as many as ten employees were involved in a single transaction, and most often the same information was required by the external parties concerned. This was a serious drain on the company’s resources and prompted the firm to explore various avenues to improve transactional efficiency. The workflow in all departments was reviewed and improved to keep up with technological changes necessitated by TradeNet. Now, when a customer wishes to freight cargo, the staff enters the necessary details such as name, code, quantity and value into the in-house computer system. Consequently, at the point of trade declaration, the firm’s operations department does not have to re-enter the same data, as it would have been already captured in the database. Moreover, once trade clearance is granted by TDB, the service systems would be automatically updated so that the customers could be readily informed about the day of delivery. Finally, the invoicing module of the accounting systems is also automatically updated with customs duties levied on the cleared cargo.

9 Conclusions

The building of a nation-wide EDI network is a task of substantial complexity and challenge. The key to the TradeNet’s success came from the shared vision and commitment of many parties in both public and private sectors. The paper illustrates that both the collaborative and co-operative efforts of the public and private sectors are crucial and critical to build the national information infrastructure designed to provide the nation’s competitive advantage.

Since the launch of TradeNet, Singapore has acquired the experience and capacity to build other value-added networks and to develop a national EDI infrastructure to move a step closer to becoming a fully networked society. As Yeo Seng Teck, a former Chairman of Singapore Network Services (SNS) explains (Neo, King and Applegate, 1993):

“SNS’s primary contribution to the Singapore economy was not the improvement of trade per se, but a larger vision. What SNS is really doing is building information infrastructure. We leveraged the trade documentation application to give us a beachhead, but we knew from the start that we were investing in an information infrastructure to achieve higher efficiency and productivity.”

With massive investments in information infrastructure, the rapid development of information technology capabilities, and the visionary leadership of the public authorities in Singapore, the island nation is well on its way towards achieving the vision of the intelligent island. The use of TradeNet is now being extended to facilitate communications and information exchange with trading partners overseas. Through these
gateway connections, companies in Singapore can communicate freely with their counterparts abroad. The different time zones and geographical dispersion no longer pose as obstacles or concerns to any businesses. It is now up to the private sectors in Singapore to exploit the national electronic integration to bolster their global competitiveness.

One of the trends that has clearly emerged among the Asia Pacific countries is the use of EDI for the promotion of international trade. Many of them have taken the step to set up national networks that are targeted to expedite the flow of goods by automating the process of permit approvals and payments. As EDI gained more popularity, the need for a more generic globally acceptable EDI standard becomes more apparent. UN/EDIFACT (United Nations/EDI for Administration, Commerce and Transport) is fast gaining recognition and acceptance as the global EDI standard. With more nations in the Asia Pacific using EDI for trade documentation, the Asia EDIFACT board is formed and it comprises China, India, Japan, Korea, Malaysia, Singapore, Taiwan, and Thailand. The Asia EDIFACT board has been active and currently has message development groups working on standard messages for financial, transportation, customs, and purchasing applications.

EDI today is a one-stop solution to total business needs. When TradeNet Plus is fully implemented for the various process flows using Internet technology, trade information and management become borderless. For example, as electronic trading centres provide information repositories; national networks provide local business the reach to global companies; and global networks provide the connections to the international community, trading becomes virtual. Companies will be able to communicate freely with their counterparts anywhere in the world such that differences in time zones and geographical dispersion are no longer obstacles or concerns.

Bibliography


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