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UNCTAD MONOGRAPHS ON PORT MANAGEMENT

A series of monographs prepared for UNCTAD in collaboration with the International Association of Ports and Harbors (IAPH)

11

Electronic Data Interchanges Concerning Ports

by

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NOTE

The views expressed in this monograph are those of the authors and do not necessarily reflect those of the United Nations. The designations employed and the presentation of the material in this publication do not imply the expression of any opinion whatsoever on the part of the Secretariat of the United Nations concerning the legal status of any country, territory, city or area, or of its authorities, or concerning the delimitation of its frontiers or boundaries.

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INTRODUCTION TO THE SERIES

UNCTAD has been cooperating with the International Association of Ports and Harbours (IAPH) for many years, in various fields and in particular in the production, translation and distribution throughout the world of technical papers in the form of **Monographs** which help contribute to the development of the management skills needed for the efficient operation of ports in developing countries.

As a result of UNCTAD VIII, new developments have taken place in UNCTAD which have resulted in the adoption of a new work programme in the ports field. It is worth emphasizing that the previous objective of improving the efficiency of ports, on which the UNCTAD/IAPH monograph scheme was based, was reaffirmed.

The UNCTAD secretariat is therefore pleased to continue cooperating with IAPH in producing monographs where the practical experience gained by a specific port or individuals is presented for the benefit of the internal port community. Such a scheme supplements the other research, training and technical cooperation activities carried out by the UNCTAD secretariat with the objective of fostering competitive maritime and international transport services, strengthening capacities for trade and promoting international cooperation and exchange of expertise. We would like to thank the authors for their contribution to these monographs, all of which have been made on a voluntary basis.

Y. Berthelot
Deputy Secretary General
UNCTAD

FOREWORD

When UNCTAD first decided to seek the cooperation of the International Association of Ports and Harbours in producing monographs on port management, the idea was enthusiastically welcomed as a further step forward in the provision of information to managements of ports in developing countries. The preparation of monographs through the IAPH Committee on International Port Development has drawn on the resources of IAPH member ports to record for the benefit of others the experience and lessons learnt in reaching current levels of port technology and management. In addition, valuable assistance has been given by senior management in ports of developing countries in assessing the value of the monographs at the drafting stage.

I am confident that the UNCTAD monograph series will be of value to managements of ports in developing countries in providing indicators towards decision-making for improvements, technological advance and optimum use of existing resources.

The International Association of Ports and Harbours looks forward to continued cooperation with UNCTAD in the preparation of many more papers in the monograph series and expresses the hope that the series will fill a gap in the information currently available to port managements.

Goon Kok Loon
Chairman
Committee on International
Port Development IAPH

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Chapter I

INTRODUCTION

1. The intended purpose of this monograph is to provide a synthesize of the functions ensured by the main data-processing systems of ports, more specifically in the field of the automation of data interchanges connected with transport operations. In that context, it should be taken in conjunction with and complementary to the reports "Guidelines for port managers on the use of computers" (TD/B/C.4/AC.7/11 and TD/B/C.4/AC.7/11/Supp.1).

2. Exchanges of information are of key importance for any organization. This aspect is all the more sensitive in the field of international transport because it is one of the nerve centres for the operation of the enterprise. Given that this area of activity handles considerable flows of goods and the transport facilities involved, it calls for perfect mastery of the handling of information and of information exchanges. We shall begin this document with an account of the basic principles of electronic data interchange (EDI), the advantages from its use, and the need for standardization. Thereafter we shall turn to a presentation of the main information flows between enterprises that could be computerized to considerable competitive advantage: the term "enterprise" is used here in the sense of an entity involved in the transport chain and therefore applies to the port community. A detailed account will then be given of the various approaches to the transfer of information. An account of the various considerations for the implementation of externally open computerized systems for port operations will be followed by a presentation of the essential stages for the realization of EDI. The last part of the document will set out the steps that led the port of Le Havre to implement EDI.

3. Given that a port is a cargo transhipment point, a frontier between carriage by land and carriage by sea, it is naturally a point of convergence for numerous information flows. Nowadays port communities are heavily involved in the implementation of computerized systems to control these information flows.

Chapter II

EDI FOR PORTS

The challenges of EDI

4. There is a general awareness in shipping and port circles that the productivity of the port and the quality of its services are directly connected with the speed at which both physical and administrative operations are carried out and the consequent reduction in the time for which ships are immobilized and goods remain on the quays. As the use of containers has become general, there have been very great improvements in productivity over the last 20 years; the main gains still to be sought are in the areas of the processing of flows of information and documentation. Consequently, what has to be done for port areas is to improve conditions for the handling of goods and the reception of the various modes of transport, not only in terms of infrastructure and equipment, but now also in terms of data processing. The advances to be expected are accelerated port transit time and greater organizational reliability of the transport chain from end to end.

5. Over and above the need to automate port procedures, it has turned out that exchanges of information between all parties involved in the transport chain should rapidly benefit from computer and telecommunications facilities. Computerization of the information networks that accompany the passage of goods, of the container and the ship's stay permits increases in the productivity of data gathering, processing and transmission, a reduction in the time for which goods remain in the port and in the length of the vessel's stay, more efficient use of storage areas and equipment, and faster and more rigorous administrative procedures.

6. It is equally important to point out that, over and above the rationalization of data processing, the computerization of flows makes it possible to forecast port operations in a global logistic approach to the transport chain. In that context, port operators have seen clearly that the computerization of administrative and commercial procedures and the development of EDI (Electronic Data Interchange) tools are an essential element in their competitiveness. Indeed, whatever the level of computerization of each enterprise concerned and whatever the degree of automation of procedures in the port, the fact that separate enterprises are involved raises the problem of exchanges of documentation between them.

7. The traditional handling of the various transport documents by each operator in his own information system generally involves multiple entries of data that give rise to lost time, mistakes and corruption of the data, and hence to costs. Direct exchanges of information between the computerized systems of the enterprises concerned therefore emerge as an impressive stake in competitiveness.

Need for a standardizing approach

8. There is no longer any need to demonstrate the advantages of an open, communicating port computer system, which is nowadays a strategic necessity. Ports are not merely transport terminals where handling operations take place; they are one link in the transport chain, closely connected with shipping agents, shipping companies and land transport operators. Port computer systems cannot be planned as local systems cut off from communication with clients and partners outside the port. Having become aware of the advantages to be had from opening up their own information systems to electronic data interchanges, port operators recognized the need to go beyond the urgency of the immediate profitability of specific bilateral links and to assess all the problems that would ultimately arise in the juxtapositioning of piecemeal interfacing developments. The approach of developing simple bilateral links with indebted partners or contractors may satisfy short-term financial and trading criteria for an enterprise (a container terminal operator, for example), but there is no future in it. There is no guarantee that such links will be durable,

and the definition of the interfaces is called into question as each of them evolves, and their multiplicity makes for difficult management.

9. Such developments, disregarding the international standardization of EDI, do not show the way ahead for an enterprise open to exchanges of information with an increasing number of trading partners. The use of international standards for data interchanges in transport operations, with the UN/EDIFACT standardization, appears to be the only solution that will eventually enable generalizable interfaces to be developed independently of the equipment and telecommunication networks in use. These international standards (EDIFACT syntax, trade data elements directory - TDED, and IFTMFR message framework) have been expressly drafted so as to have the minimum impact on existing computer systems. Furthermore, the use of standards recognized at the international level is an essential basis for plans for the dematerialization of documents. Many exchanges of information between operators are indeed not only of an informative nature, but also contractual and legal. The contractual consequences emerge from the simple document exchange: orders for carriage, declaration of dangerous goods, organization of the port call. What is reciprocally at stake from exchanges is accompanied by the need for agreement on facilitated interchanges through the standardization of data and messages. Furthermore, the port authorities or the administration will often be involved in the dematerialization process. If transmission of data from system to system is based on standards recognized both by the international standardization bodies and by the major administrations, it will more readily obtain official recognition. On the other hand, transmission relying on ordinary agreements between the parties clearly has little chance of being agreed and legally recognized and of being acceptable as proof in case of litigation. Over and above a preliminary agreement between the parties laying down the commercial implications of the document exchange implemented, it must be noted that the administrative implications of the exchange (relations with the customs, the tax authorities etc.) require appropriate legislation. These legislative developments, especially as regards the dematerialization of documents, are possible only in the context of collaboration between the major administrations, the standardizing bodies and the trading partners to the exchange.

Chapter III

INFORMATION FLOWS IN THE TRANSPORT CHAIN

10. The information circuits between port operators when goods pass through a port are complex. They involve the exchange of many documents and pieces of information between many partners. These exchanges may be grouped by kind to form sizeable flows. Many professional bodies, associations and groups are currently examining the main information flows of the transport chain with a view to the construction of EDIFACT messages and the implementation of computerized interchanges. While not claiming to make an exhaustive listing of the EDIFACT messages so far produced, we shall indicate the messages and current developments for each of the information flows.

11. At the level of the productivity and competitiveness of a port area, the main flows described below are, *a priori*, the ones that will be the first to benefit from the development of EDI:

- the operational management of containers with computerization of the links between container terminal operators, consignees and the "tonnage centres" of shipping companies;
- the development of links for the transmission of booking data;
- the development of links for the transmission of bills of lading;
- the automation of exchanges of information concerning pre-forwarding and post-forwarding operations;
- exchanges of information with the customs;
- transmission of information concerning dangerous goods.

12. The flows concerned involve:

- the port area and shipping companies;
- operators of the port area;
- the port area and the hinterland (carriers, shipping agents);
- port authorities between themselves.

The following diagrams summarize the various exchanges involved in importing and exporting as the goods pass through the port.

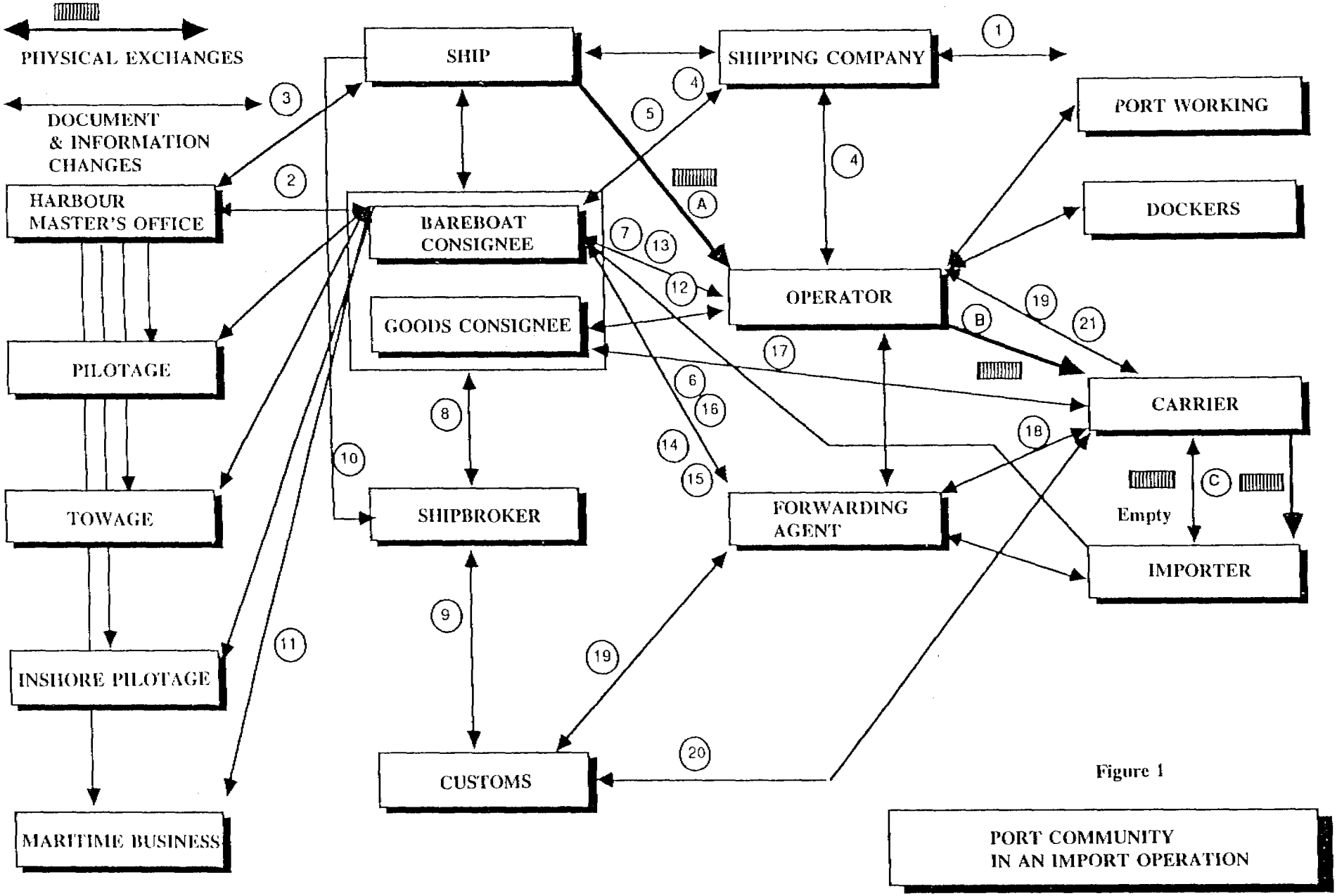

Figure 1

PORT COMMUNITY
IN AN IMPORT OPERATION

PORT COMMUNITY IN AN IMPORT OPERATION

(main physical exchanges and exchanges of documents)

A Discharging and placing in store
B Handing over to carrier
C Carriage and delivery to importer
Stripping and return of empty

1 Timetables of regular services
2 ETA
3 Confirmation of ETA
4 Bay plan
5 Copies of BL (Bill of Lading), cargo manifest and freight manifest
6 Advice of arrival
7 Provisional discharge list, preparation
8 Cargo manifest
9 DESMAD [summary customs declaration], D1
10 Ship certificate
11 Declaration of dangerous goods
12 Seen on quay notes
13 Definitive discharge list
14 Claiming of goods
15 Presentation of bill of lading and freight payment
16 Commercial delivery note
17 Transport order (Carrier haulage)
18 Transport order (Merchant haulage)
19 Customs collection note, inspections, controls
20 Seals, controls
21 Terminal exit note

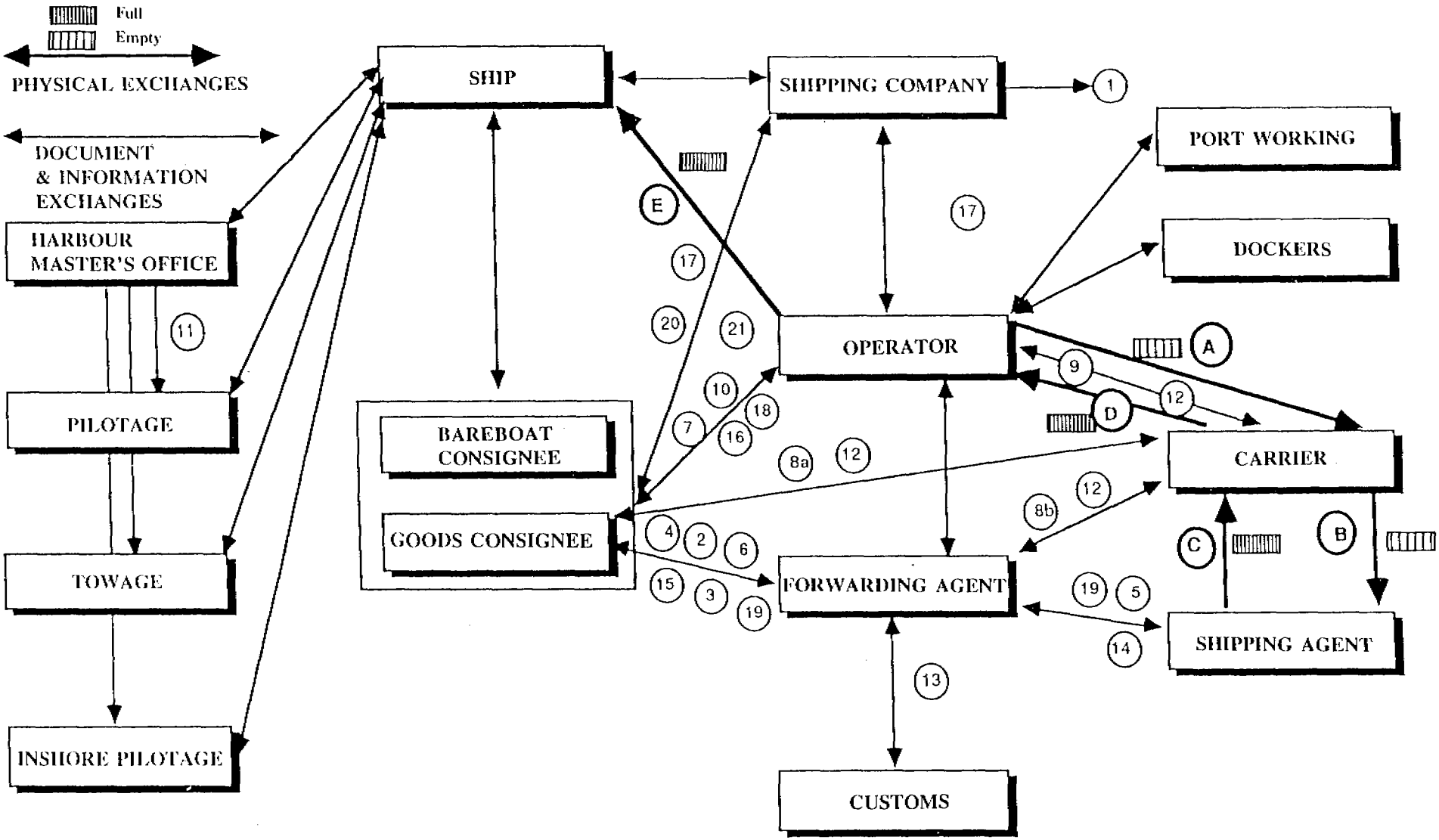

Figure 2

PORT COMMUNITY
IN AN EXPORT OPERATION

PORT COMMUNITY IN AN EXPORT OPERATION

(main physical exchanges and exchanges of documents)

A Allocation of an empty container
B Conveyance, handing over to shipping agent, stuffing
C Conveyance
D Unloading and placing in store
E Loading

1 Timetables of regular services
2 Transport instructions
3 Quotation
4 Booking
5 Information of shipping agent
6 Request for empty container
7 Instruction for allocation of container
8 Transport order
(a) Carrier haulage
(b) Merchant haulage
9 EIR (Equipment Interchange Receipt)
10 Container allocation, booking
11 Delivery slip
12 AMP (Port movement notice)
13 Export clearance through customs (customs collection note)
14 BL (Bill of Lading) instruction
15 Bill of lading
16 Provisional loading list
17 Bay plan
18 Loading list (seen on board)
19 Confirmation of loading

Container tracking

13. The study of information exchange circuits demonstrates the importance of exchanges concerning the operational management of empty and full containers between container terminals and consignees, shipping agents and shipping companies. These exchanges are essentially concerned with the following information:

- the bay plan, or the plan for the loading of containers on board the ship, which gives the position of each container on board and the information describing it, is a document transmitted to the handler by a consignee or directly by the tonnage centre of a shipowner. The bay plan, accompanied by handling instructions, enables preparation to be made for the port call and provides a provisional list of goods expected at sea;

- instructions from the consignee to the handler: loading lists, discharge lists, instructions for the allocation of containers (empty or full) for a carrier, special container instructions (regarding refrigerator containers and dangerous goods);

- reports on operations transmitted by the handler to the consignee: lists of outgoing and incoming containers (gate in, gate out), loading and discharge lists, replies to instructions. These reports may be made through the bay plan updated following the call at the port and retransmitted to the consignee or to the shipping company's tonnage centre by the handler.

14. The tonnage centres of large shipping companies (operational centres for the tracking of containers and vessels) have installed computerized management of their container fleet and tracking of their vessels that requires frequent exchanges of information with the handlers concerning vessel loading plans. It is, however, apparent that the information circuits differ from one shipping company to another. Some shipping companies transmit the full bay plan to the handlers (through their consignee or directly), leaving it to them to update it and return the complete information. Other shipping companies perform centralized management of the bay plan, and the information transmitted to the handlers consists of provisional loading and discharge lists; in this case the handler sends back handling reports and the shipowner updates the bay plan.

15. Much is to be gained from the automation of these multiple exchanges: the information is available more rapidly and the avoidance of repeated entries makes it more reliable. The diversity of circuits in the organization of information chains will have to be taken into account in the implementation of these exchanges. The representative of the shipowner, agent or consignee may, in fact, act on behalf of the shipping company or as a focal point agent in the case of consortia. Ship-planning operations, i.e. the preparation of the stowage plan for the vessel, may be entrusted to the handler or may remain the responsibility of the shipping company. It should also be noted that these exchanges are of a repetitive nature, and that the information is frequently amended by the consignee or the ship owner.

16. EDIFACT messages corresponding to these information flows already exist and are being standardized. A bay-plan message has been drafted jointly by shipping companies, handlers and shipping agents. This BAPLIE message is now recognized by the standardizing bodies as a first stage and numerous transmission trials are in progress. It will probably be modified in the light of the pilot trials in progress and will consequently evolve so as to correspond more "truly" to the practice of operators and to be integrated into information chains. In the context of the operational management of containers, many messages have been developed to meet needs for the exchange of information concerning containers, transport facilities and handling unit irrespective of the goods possibly being transported. This set of message is grouped under the name INTRACON (Intermodal Transport of Containers). The messages created cover all import and export flows, including the pre-forwarding and post-forwarding routing of containers, handling orders, handling reports, transport orders, provisional information on container movements etc. The set of messages has recently been submitted to the EDIFACT standardization authorities and should rapidly receive official recognition.

17. In this context, it is obvious that all automation of information exchanges between port operators concerning operational container management must rely on the messages that have already been developed and on the analyses that led to their creation. Within the framework of the opening up of a port system to information exchanges, it is all the more important to have regard to the existing messages because there are large shipping companies working along these lines and currently conducting pilot trials with some of their partners.

Exchanges concerning pre-forwarding and post-forwarding operations

18. These exchanges concern various operators - consignee, forwarding agent, carrier and handler - depending on how the transportation is organized. The automation of such links would permit the optimization of the information circuits between the principals and the carriers; it would also anticipate information on container collection and receipt and make such information more reliable. The simultaneous sending of a transport order to the carrier and the handler gives the latter greater scope for the organization of handling operations, especially where exports are concerned.

19. It should, nevertheless, be noted that the automation of exchanges with carriers by land is one sector that, although strategically important for the port, is very difficult to implement. The main obstacles have to do with the fact that the number of carriers is far greater than the number of port operators, and that forwarding operations before and after carriage by sea are not always the principal activity of the carrier (some of the information to be handled is specific to port circles); there is also the fact that many haulage contractors are not large enough to justify an EDI operation. EDI messages concerning pre-forwarding and post-forwarding operations have been developed within the framework of the previously mentioned INTRACON messages.

Exchanges concerning booking

20. The analysis of information circuits shows that the delocalization of booking operations is a reality. Booking information received by telex, telephone or on lists from customers or agencies inland is re-entered into the data processing systems of the consignees. Moreover, all computerization that enables booking entries to be computerized does offer important benefits to consigning companies in terms of the reduction of re-entry tasks, but also in terms of the quality of the information received and the associated processing operations. In view of the benefits, some port consignees would like to develop booking data interchange with their main port partners and with their sales agencies inland.

21. The great danger, in the absence of any standardization, is that there will be costly and inconsistent proliferation of exclusive interfaces between systems. Given that standardized booking messages have been defined at the EDIFACT international standardization level, it seems essential for port operators to adopt a clear position on these developments. The messages concerned have been derived from the IFTMFR (International Forwarding and Transport Message Framework), which is a "super-set" of the information exchanged by transport operators. There are three messages concerned with booking:

- IFTMBP : Booking provisional, which corresponds to a provisional booking;
- IFTMBF : Booking firm, which is a firm booking and sets out the transport conditions requested;
- IFTMBC : Booking confirmation, which is a reply indicating whether the requested booking has been accepted, along with any conditions.

Exchanges concerning the transmission of bill of lading data

22. Consignees are in general computerized to handle bills of lading in their own exclusive system. The information from the bill of lading, most often edited by the forwarding agent, is re-entered by the consignee

into his data processing system. It should be noted that, in addition to the savings in productivity generated by automated transmission, the electronic mailing of bills of lading should make it possible to reduce the time required for the creation of documentation, speed up flows of funds and reduce the transit time of goods through the port. It frequently happens that the final bill of lading, and the invoice for freight and costs are not available until two or three days after the departure of the vessel. The principal cause of this delay stems from the tasks of re-entering data into the computer systems of the consignee, who must verify the bills of lading prepared by the clients, look up the applicable freight rates, code them and enter the information into his system.

23. Where the bill of lading is concerned, the aspects of information transmission may conveniently be dissociated from the aspects of editing the various existing formats; some consignees have already developed applications in their systems to edit the various formats specific to each shipowner. The development of automated transmission of bill of lading data would make possible:

- capture or extraction of the data of an exclusive system to enable a consignee or a forwarding agent to compose a standard message (necessarily with consideration of the developments in the framework of the international standardization of EDI);
- the editing or extraction of data to an exclusive system for the reception of a standard message by an NVOCC (Non Vessel Operator Common Carrier) consignee or forwarding agent;
- treatment of bill of lading data for correction or alteration by an NVOCC consignee or forwarding agent.

Although there is not at present any standardized EDIFACT message concerning the bill of lading, some professional groups are working on the definition of one. This message, like the previous ones, will certainly be derived from the IFTMFR message frame. It should, however, be noted that automated transmission of the bill of lading does raise problems of the security of information systems. This document, which is the title deed to the goods, is of such great commercial value that its dematerialization may be envisaged only in systems and networks of proven high reliability.

Transmission of the manifest

24. The manifest, which is the document that itemizes all the goods transported, is theoretically on board, signed by the ship's captain. In fact, given that containerization speeds up handling operations and shortens the call at the port, the ship's document is often no more than the loading plan of the vessel. The various documents that make up the manifests (commercial manifest, custom's manifest, dangerous goods manifest) are often still with the consignee being prepared on the basis of elements of the bill of lading and the loading list on the departure of the vessel. They are then routed in various ways to the next port of call.

25. The deposition of the manifest at the port of discharge serves several functions. For the customs its deposition serves as a declaration of the goods unloaded; updated by the list of containers actually seen on the quay side, it will subsequently be compared with the actual declarations. Mention should be made at this juncture of the part played in France by shipbrokers, who have the right to conduct the customing of foreign vessels. Furthermore, the manifest will have a special role in the Europe of 1993 as a Community transit receipt.

26. As regards the port authority, the manifest serves for the calculation of port charges on the goods (collection sometimes entrusted to the customs administration); it also has a statistical role. The manifesto of dangerous goods is used by the Harbour Master's Office to ensure that the safety regulations are observed during the call at the port. The goods manifest and the bills of lading are used by the shipowner's representative, agent or consignee to notify those responsible for the goods of their arrival and to organize the physical transfer.

27. It may thus be seen that means of automating the exchanges connected with the transmission of the manifest are being sought and that EDIFACT messages concerning the manifest are being developed. We may, however, question the real point of such automation. The first goal of the development of EDI is to further commercial operations between enterprises. In the area of sea transport it is therefore appropriate to pay close attention to the identification of considerable flows of information exchanges and to give preference to the automation of those that have a direct impact on the organization of port calls and on commercial operations. The objectives of the manifest are different: what is involved is a procedure imposed by international maritime regulations and a document required by customs and port authorities. The speeding up of port calls affects its reliability and it is a document of little commercial interest to the shipowner. The manifest is often no longer physically present aboard the vessel, but is completed following the call at the port and sent to the agent at the next port in various ways. Furthermore, it is continuously being corrected at the time of the operations of the port call, before being sent, in summarized form, to the port and customs authorities.

28. It would seem more judicious to automate the exchane flows of more reliable documents on the grounds that they satisfy commercial and logistic requirements:

- the list of containers (bay plans, handling instructions and loading and discharge lists);
- bills of lading accompanied by a reliable reference;
- the correspondence between containers and bills of lading.

There would appear to be greater hope of increased productivity from such an approach than from automating the transfer of manifests.

Information on dangerous goods

29. The carriage of dangerous goods is governed by restrictive regulations, the purpose of which is keep the risks under control and to make intervention easier in case of accident. The shipping agents and especially the chemical industry currently seek to have an attestation of "quality" all along the transport chain. Consequently, exchange of documents is a requirement of those concerned, whether it be information from the operators or completion of the formalities of compulsory declaration.

30. As a cargo transhipment point and a meeting ground between the regulations of carriage by sea and by land, the port is subject to specific regulations in the light of the special risks associated with the storage of dangerous goods, their possible concentration and the passage in transit of cargoes remaining on board. It is also the place where transfer of liability between operators takes place: shipping agents, importers and their forwarding agents, customs declarants, handlers, shipowners and representatives of consignees, and road hauliers.

31. Electronic data interchange and the dematerialization of compulsory declarations are both a means of speeding up document exchanges and of making the tracking of physical flows more reliable. They thus offer shippers high quality certification of the passage of goods through the port.

32. Confronted with the stakes involved in the automation of information concerning dangerous goods, a grouping of northern European ports working together within the framework of a PROTECT project has been examining the computerization of these exchanges for some years past. These studies have resulted in the formulation of EDIFACT messages: a message concerning the mailing of the dangerous goods manifest between shipping agents from port to port, and an IFTDGN (Dangerous Goods Notification) message concerning the compulsory declaration of dangerous goods made to the Harbour Master's Office in the port of call by the shipping agent. The IFTDGN message has been approved by the standardizing bodies and is the subject of pilot trials in the ports taking part in the PROTECT project.

Exchanges of information with the customs

33. The automation of information exchanges with the customs administration is one of the main areas in which considerable reductions of transit time can be made. On importation, the advance deposition of the customs manifest should enable inspection of the documents to be carried out in advance and allow the customs to issue a notice of customs status before the arrival of the goods (the status not being effectively confirmed until after the actual arrival of the goods). Such procedures, which may be carried out only through protected transmission and after approval of the information systems by the customs, would enable the whole of the transport chain to be organized in advance. A good deal is at stake in customs clearance procedures by anticipation in terms of the easy flow of goods in the port. Such procedures, which are already in operation in the United States with the AMS system, would, if generalized, constitute an important factor in the facilitation of international trade.

34. There are already existing EDIFACT messages concerning exchanges between operators (declarants) and the customs administration:

- CUSDEC : declaration of goods imported, exported or in transit made by a declarant to the customs;
- CUSRES : mailing of information from the customs to the declarant, a message which may be used for the mailing of a computerized customs clearance;
- CUSCAR : mailing of information from the carrier to the customs concerning the goods carried;
- CUSREP : mailing of information from the carrier to the customs concerning the means of transport.

Irrespective of the legal and regulatory problems that would have to be resolved before complete automation of the information chain with the customs could be envisaged, it is important, in order to prepare for future developments, to design port information systems that integrate these messages.

35. Were all the operators of a port community, whatever their data processing system, to be able directly to exchange and transmit the available information, they would make the optimum use of that information for the greatest common good. As regards customs transactions, the anticipated and/or electronic interchange of data ought to facilitate procedures and reduce delays in customs clearance while at the same time guaranteeing the effectiveness of controls, which remains a concern of customs administrations.

36. Within the framework of the programme for the facilitation of procedures and the effectiveness of trade, UNCTAD (United Nations Conference on Trade and Development) is proposing a complete management system for customs clearance - ASYCUDA (AUtomated SYstem for CUstoms DAta). The integration of such software, which covers all customs functions (administration and declarants), ought not to raise any major problem.

37. The opening onto the world of EDI is one of its basic characteristics; in addition, the standard messages relating to customs transactions (CUSCAR, CUSREP, CUSDEC, CUSRES) have already acquired operational status and are therefore known and applicable. The exchange of messages within the EDIFACT framework is going to permit the exchange of existing data; it thus avoids multiple entries, which are a source of mistakes and productive of delays.

Chapter IV

IMPLEMENTING EDI IN TRANSPORT OPERATIONS

38. The concept of EDI may appropriately be recalled at this point: electronic data interchanges concern information exchanges between enterprises, computer to computer, by information retrieval, in accordance with recognized standards. It is now recognized in the sphere of sea transport that the EDIFACT standardization forms the basis of EDI as regards data and messages. In order to meet the stated needs of their partners or their clients, and aware of what is at stake in standardization, the port operators especially involved are playing a part in the standardization bodies in the definition of EDIFACT messages covering the main exchange needs of their activity. The messages now being standardized are concerned with the major flows "open to automation" enumerated in the previous chapter.

39. It should, however, be pointed out that the point of EDI is the integration of data into the computerized applications of enterprises: there is no real improvement in productivity from the development of interactive EDI chains between microcomputer work stations. The fact is that many enterprises in port life are small and medium-sized enterprises and industries that are little computerized. It is to met their needs that, having regard to the fact that such small and medium-sized undertakings do process a not inconsiderable amount of port information, some large ports have established information systems that confer added value on the exchanges between these enterprises. This added value of the port community may be conceived as a set of communication facilities (network, E-mail) associated with standardized sectoral messages, or as a complex set of automated procedures implementing community data bases.

Port computerization: multiplicity of approach

40. It is important, in tackling the installation of EDI systems, to distinguish between two aspects - information transfer within a network or within interconnected networks, and the management of that information. Three main architectural systems may be distinguished in the port computerization systems thus far implemented: centralized systems, E-mail and value-added network systems, and systems that bring together procedural treatment of the information, on the one hand, and a value-added network, on the other hand, that makes possible global computerization of the port community.

Centralized systems

41. Such systems are essentially procedural. The various users are committed to a complex chain of procedures in which every actor contributes to the progressive enrichment of the data on the tracking and status of goods, a container or a ship in port call operations. EDI is not initially involved. All the information is effectively handled by a single shared system with which all the actors communicate. The limits of such a system are connected with the lack of openness and flexibility, the need for all the actors to be a part of the information chain and the redundancy of data entries already handled in the exclusive systems of the port enterprises. In addition, given that most of the information exchanged within a port community is of a confidential and commercial nature, a centralized system in principle assumes the existence of what is a very cumbersome system for the granting of access and ensuring confidentiality.

42. Another obstacle to the use of the system is the diversity of the communicating enterprises as regards the degree of computerization. A port system relies for its success on the fact that all transport operators are a part of it and are involved with it, whereas some enterprises that already have internal data processing systems feel disinclined to re-enter information destined for a centralized system. Furthermore, centralized systems are often felt to be a global expression of all the data processing systems, whereas few enterprises are prepared to entrust their data processing to third parties.

43. Nevertheless, passing beyond these disadvantages, it has to be noted that generalization becomes the rule once a critical threshold of membership of the system has been exceeded. The initial joining may arise from strong incitement (port authority, customs administration). When a significant proportion of the partners of the enterprise automate their procedures through the system, there is real point in terms of efficiency and cost. Encouraged by the economic logic of belonging to the system, membership strengthens the overall synergy and contributes to the rapid generalization of the system through the port area.

E-mail and value-added network systems

44. This option, the opposite of excessive centralization of information, goes to the extreme of dispersed data processing. With this scheme, each operator possesses his own information system and uses E-mail or a value-added network for communication (in standardized format or otherwise). This, by implication, rules out any aggregation of information at the community level. Nevertheless, EDI may be implemented with such systems. The principle is as follows: each actor in the transport chain has an information system (possibly no more than an ordinary microcomputer) which he uses to process his information on his premises. When information needs to be exchanged, the operator connects up with the value-added network and transfers the required information to his partner or receives the messages needed for his activity.

45. E-mail is the ideal tool for EDI. It enables processing to be desynchronized and makes the systems independent of each other. E-mail is also the optimum solution for the development of multi-partner EDI: in place of the proliferation of bilateral links, it suffices for each member of the system to have an electronic mail box in which the partners place EDI messages coming from their own data processing systems. Furthermore, the use of E-mail makes it easier to take into account a number of security-related problems. The passing of transactions through an electronic mail box ensures the insertion of a third entity between the two communicating systems, one which may also perform a notarizing function, thus dispensing with direct links and all the concomitant problems of access granting. The value-added network may also offer translation services when one of the partners to the exchange does not have his own translator.

46. This approach makes the integration of data in hand possible without totally challenging the information systems of the partners. It ought, however, to be borne in mind that the enterprise will have to cope with the transformations brought about by this opening up to the outside world. It will have, at the very least, to implement procedures for the management of automatic functioning and for authentication. In contrast to centralized systems, the construction of a port system around a value-added network requires a minimum level of computerization among the users; the fabric of port enterprises is, however, not always in a position to meet this condition.

47. However attractive they may be, these systems are not without their drawbacks. Once again there is a critical number of members below which the system is of no interest and there is an initial obstacle in the fact that the data processing systems of port operators may not be geared to EDI or even that there may not be any computerization. There is another obstacle that militates against systems based uniquely on value-added networks. As we have already seen, the information chains that accompany the passage of goods through the port imply a large number of actors. An information flow may be initiated by one partner and added to and amended by others before reaching its final recipient. However, not all the information contained in the initial message will necessarily have been handled by the systems of the intermediate actors. One way round this difficulty would be to put out the information simultaneously to all the actors, including the final recipient, and make them responsible for sending any additions or changes to the final recipient. That would, however, imply that the latter would have to handle several entries in his system relating to the same information flows and having the same ultimate origin, with all the aspects of conflict of data to which that could give rise.

Combined systems: data base, procedures and value-added network

48. We have examined the advantages and drawbacks of handling the information of a port area either by a centralized system of procedural type or by the use of a value-added network and EDI. Each solution

requires broad participation in the system: an operator cannot be asked to make effective use of several types of procedures in his relations with his partners. Procedural systems have their limits: complexity, difficulty of development, lack of openness, interdependence of the actors. Systems based on the use of EDI, although effective in a scheme based on bilateral links, are difficult to implement in a multi-operator context. The difficulties involved are illustrated by the following diagram (Figure 3). Let us assume that information exchanges involve a chain of three enterprises. The implementation of EDI assumes, at the technical level, that the problems of interfacing for data output and integration into the management system of the enterprise (availability of information, standardization and codification) have been solved. Subsequently it will become apparent that some information of use to two enterprises is of no interest to the third and is not handled in his data-processing system, with the result that the links of the chain are broken.

49. For example, let us imagine a chain:

- "goods consignee" (commercial function)
- "handler" (physical function)
- "tonnage centre" (physical and commercial function.

Identification of the container by the consignee of goods for export rests partly on the booking reference that *a priori* has not been entered in the handler's system. The information of the tonnage centre will therefore be incomplete unless a Consignee-Tonnage Centre EDI link is created. Furthermore, there is no certainty that reconciliation of the partial messages will be possible unless the container number is known, and so on. The drawbacks of the scheme selected are obvious:

- reduction of the interchange links and agreements
- loss of information.

50. A mixed network appears to be one solution:

(1) a value-added network (E-mail, EDI)

(2) community services of data base type on the network.

The next diagram (Figure 4) illustrates the dynamics of the approach.

51. Each partner manages his own information system and effects exchanges through EDI, using the value-added network and acknowledging that the data bases at the heart of the network structure the information and ensure its permanent availability. Everybody is therefore able to amend the data of a message by consulting the common base and even to form a complete message by outputting from the base.

52. For example, a container data base may be initialized by preliminary information of "bay plan" type for goods expected at sea or of "booking" type for goods arrived on land. The correspondence with certain identification of the container will be made at the time of the "quayside inspection" or on the drawing up of the interchange document on entries to the container terminal. It will be possible to send movement reports, under the handler's control, to the shipowner by a process involving:

- outputting from the data base
- EDIFACT translation

- X400 formatting
- deposition in the electronic mail box or routing to another VAN (Value-Added Network).

53. A value-added network may be built up on this principal providing specific services such as:

- "goods" data base
- "ship" data base
- "containers" data base
- "dangerous goods" data base
- forwarding agent procedures
- consignee procedures
- carriage procedures.

Although each service (or data base) is independent, it is capable, thanks to the standardization of the data, not only of being at the heart of EDI, but also of adding to the specific applications present in the network.

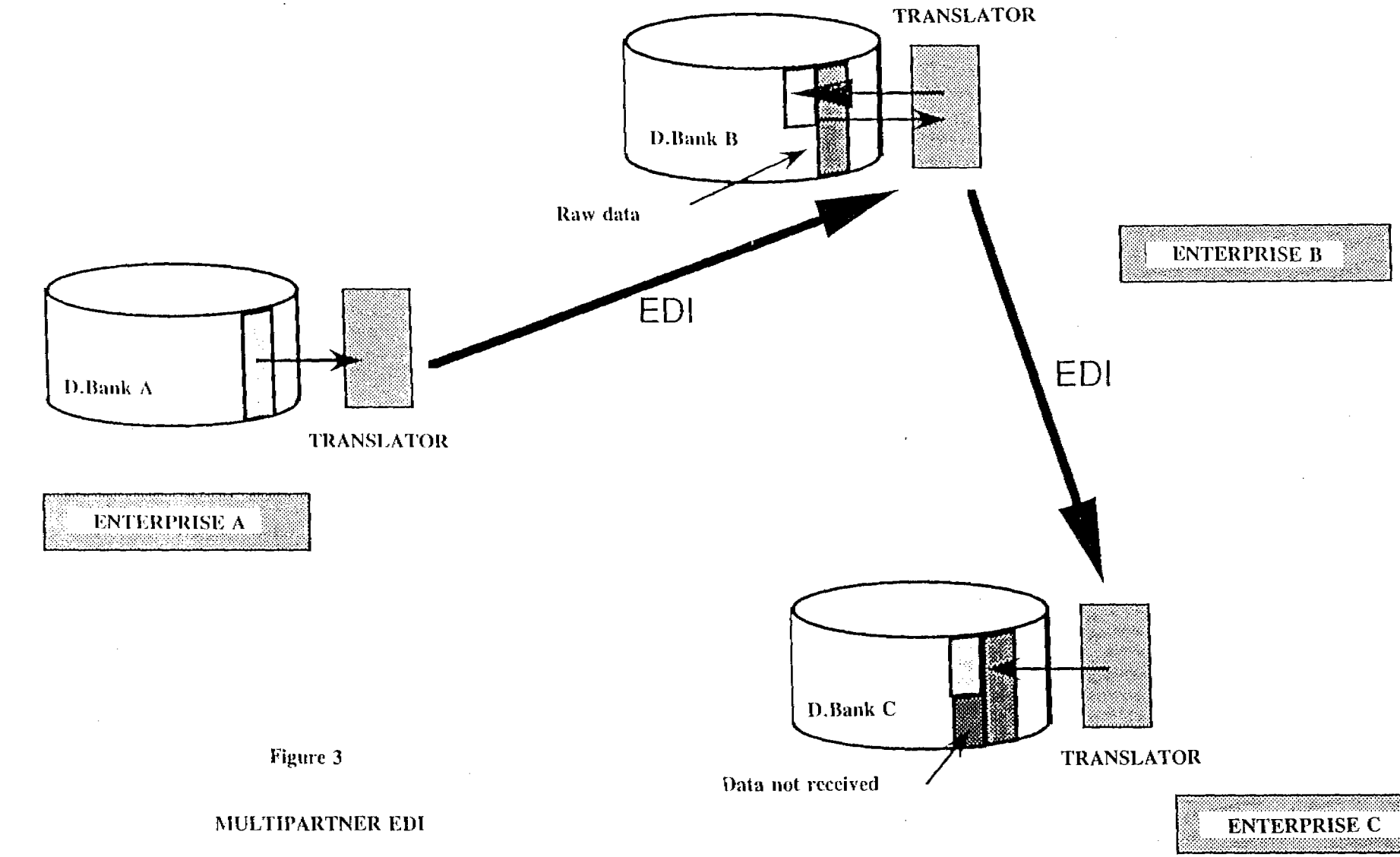

Figure 3

MULTIPARTNER EDI

INTEGRATION DIFFICULTIES

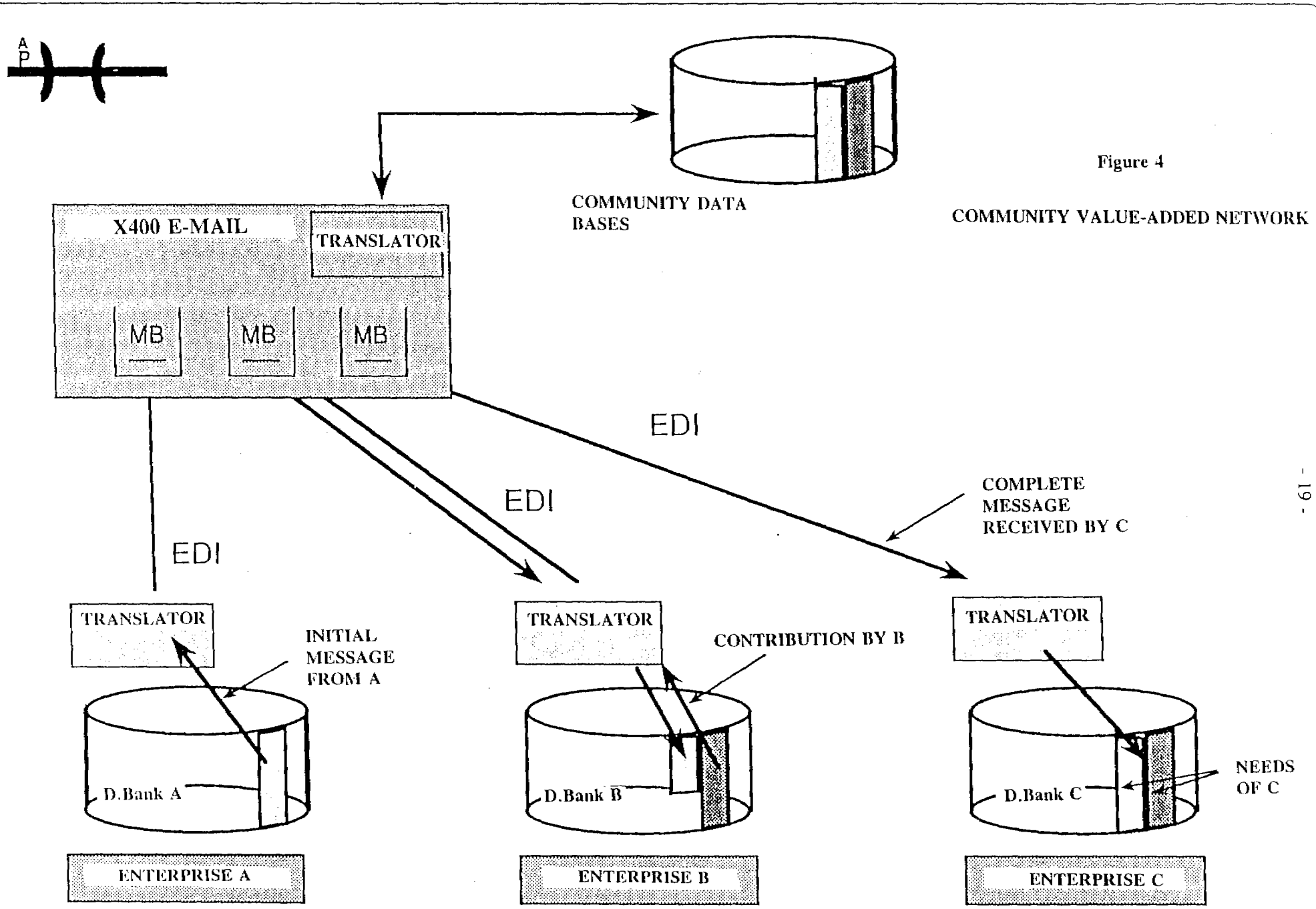

Figure 4

COMMUNITY VALUE-ADDED NETWORK

COMMUNITY EDI

Chapter V

STAGES OF IMPLEMENTATION

54. It is, in theory, an easy matter to open up an internal data processing system to data interchanges. It does, however, presuppose the availability of communication tools and the ability to interface internal data with standardized messages. Nevertheless, save for the various technical aspects that have to be resolved, the integration of external information flows has a very significant impact on the organization of labour and on the structures of the enterprise (at least as regards the departments that have relations with outside enterprises). The implementation of an EDI project for ports may summarized as comprising the following stages, each of which will be considered in more detail subsequently:

- strategic option,
- setting up a project team,
- choice of sphere of interchanges,
- choice of partners,
- technical options available,
- drafting of interchange contracts,
- setting up a pilot system and its modification,
- evaluation and extension of the pilot system.

Strategic option

55. The decision to carry out an EDI project may be variously motivated. One of the most usually motivations is to achieve "zero paper work, zero defects, zero delay". Other important motivations are the direct or indirect financial gain achieved through time saving and the gains in personnel assigned to data entry tasks (structural modification of the enterprise). We ought not, however, to overlook the fact that EDI is, in a great many port enterprises, a necessity imposed by the clients, in particular the large shipowners. In that case it is no longer a matter of strategic choice but of an obligation imposed by the market.

56. Nevertheless, whether the decision of the enterprise is freely taken or not, an economic study must be made to assess the implications of the change in modes of communication. That study must include an internal audit setting out not only the kind and number of the documents involved, but also the concomitant legal and commercial constraints, the roles of the participants etc.

Setting up a project team

57. All aspects implicit in data interchange and the impacts for the enterprise must be managed by a team formed inside the enterprise. Even if the team has external advisers and auditors, it must have personnel drawn from within who have a knowledge of the enterprise and its operation, and some degree of "continuity" within it. Having regard to the varied aspects implicit in the implementation of an EDI project, it seems necessary to set up a project team with multipurpose skills:

- telecommunication skills:
  The creation of data processing links between enterprises that do not necessarily have equivalent systems requires a good knowledge of networks. Additionally, what is needed is to promote telecommunications standards within the port area so as to avoid a multiplicity of different connections.

- abilities in the organization of information flows:
  The content of exchanges between operators must be analyzed in order to develop ones that not only correspond to the functions of the enterprise, but also fit into the more general logic of the information circuits of the transport chain.

- skills in standardization:
  A grasp of the tools of standardization and of what has been done at both the national and the international level makes coherent development of EDI possible and ensures some permanence for the existing automation measures.

The possible need for training programmes at some point will therefore have to be envisaged from the outset.

Choice of sphere

58. This question does not arise where EDI is a constraint imposed by one or more of the partners (the desire of shipping companies, for example, to send the bay plan to the handlers by EDI). On the other hand, if opting for EDI is a policy decision, there is point in studying the spheres in which EDI will offer the most to assess with parameters such as the time currently required to prepare and send the information on paper, the frequency of mailing, the volume, etc. The choice of sphere is also made in relation to the way in which information is handled in the internal system. The sector of activity selected ought to be one in which the information is well handled, in the sense that it is judged to be complete and reliable. It is, moreover, equally important when implementing the first computerized data exchanges to opt for a demarcated sphere of applications, i.e. one that is not fraught with consequences for the rest of the information chain of the enterprise. The ease with which the data to be sent to the partners can be extracted from the internal applications and, vice versa, the ease with which the data received are integrable will also be key considerations in the choice of sphere. Considerable attention should be paid in this analysis to the extent to which the data are standardized in internal applications.

Choice of partners

59. A port EDI trial cannot be launched with all the partners at once. It is therefore of importance to seek partners who have data processing capacity in their systems (or via community systems) and who have the skills, or the willingness to acquire them, in the areas already specified.

Technical options

60. Although one hears it said nowadays that EDI is 80% a matter of organization and 20% of technique, it is important to devote some resources to the choice of the tools and techniques to be used. The choice of translator is important, and there is a need to be satisfied that it can handle several user profiles and several versions of the same message. The partners with whom the exchanges will be established will not necessarily use the same message versions. Speaking more technically, there is a need to examine the aspects of the "interfacing" of the translator with the internal applications, the automation measures to be established and the procedures for dealing with semantic errors in the data. The "logging"[1] functions of the translator are also an element of choice, depending on the type of exchanges to be implemented; it may be important for an enterprise to have detailed summaries of exchanges with its partners.

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[1] Production of a daily report.

61. Transmission technique is also a matter for choice. As we have previously explained, E-mail is the most satisfactory tool for EDI in a multi-partner context. Standardized X400 E-mail is highly desirable, but there are still options to consider: whether to acquire an E-mail service of one's own or whether to call upon value-added networks.

Drafting of interchange contracts

62. Once decisions have been taken on the foregoing points, formal expression must be given to the terms of the interchange with the partners, both at the technical level and at the commercial and legal level. This leads ultimately to an interchange contract specifying the following points:

- the information flows exchanged, with precise definition of the messages, and the message sequencing when appropriate, the network protocols established, the codes and dictionaries used, etc.;
- possible relations with a value-added network used as an interchange tool;
- the handling of corrupted messages and procedures; the automation of interchanges ought not to lead the enterprise to neglect the manual or semi-manual procedures that could be used were there to be limited breakdown of the system;
- the contractual aspects of messages with levels of responsibility, the obligations of the partners both commercially and "technically", security aspects in particular, and problems of identification and confidentiality.

The aspects that need to be taken into consideration in an interchange agreement are detailed in the document.

Setting up a pilot system and its modification

63. On completion of the foregoing stages, it is time to try out the automation of an information flow. The term pilot system is here used in the sense of the launch phase of the project, a phase restricted in time and possibly in the number of exchanges and partners. This phase of the project enables the various technical problems arising from the implementation of automation measures to be dealt with in advance. The solving of these problems must be monitored by the project teams of the partners and may possibly lead to modification of the interchange agreement (corrupted procedures, message specifications etc.).

Evaluation and extension of the pilot phase

64. The carrying out of a pilot phase should lead the enterprises in partnership to assess the results after a period that could be specified in the interchange agreement. The real effects at the organizational level from the introduction of EDI in the enterprise may be examined in detail in this assessment, which may also serve to bring out the aspects of increased loading, whether at the level of the increase in the flow of messages between the partners in the pilot project or regarding the integration of new partners. This evaluation should enable the enterprise to assess its position as regards the policy options and the general study that led to the implementation of the project.

Chapter VI

IMPLEMENTATION OF AN OPEN EDI COMPUTERIZED SYSTEM IN THE LE HAVRE PORT AUTHORITY

Data handling systems

65. The computerized system of the port of Le Havre may be presented as consisting of:

- one the one hand, a certain number of services of the port community devoted to ships, goods and containers;
- on the other hand, a network conforming to international standards, providing a large number of services concerned with communication of data and enabling the services of the port community and the exclusive systems of the port operators to be interconnected.

66. The customs administration is an unavoidable actor of the port area: all flows of goods involve one or more customs operations. Customs computerization played a critical role in the implementation of the first port community data processing developments of Le Havre.

67. Back in 1978 the French customs administration brought into service the SOFI system (acronym for Computer System for International Freight Handling), initially for air freight, but subsequently extended to other modes of transport. The SOFI system automates the handling of bills of entry for import and export operations.

68. When in 1982 the customs proposed to the forwarding agents that the SOFI system should be installed in the port of Le Havre, the latter negotiated with the customs for the extension of SOFI to transfer the customs status of goods to forwarding to the quay and to the hangars, thus doing away with the need to use brokers to transmit the information to the handlers. It was thus that, in 1983, the port of Le Havre installed an initial system, with the acronym ADEMAR (Automated Customs Clearance of Goods), interconnected with the SOFI system.

69. The SOFI system does not cover the field of all customs operations in the port such as transit, and the operations of trans-shipment, groupage, break bulk etc. While the system was initially created essentially for use by forwarding agents, its success and the need for extension of its functions rapidly led all operators and the Port Authority to enrich it through the ADEMAR+ system. It was with the ADEMAR+ system that the port of Le Havre was able to provide itself with tools capable of satisfying the requirements of the customs administration for regulation and control and those of the port operators.

70. The original functions of the ADEMAR system have been progressively extended to all spheres of the handling of goods in the port with the ADEMAR+ system, in the concern further to rationalize the circuits for exchange of information and documents between all actors of the port chain. ADEMAR+, which came into operation in 1985 and was previously exclusive to declarants and customs services, has assumed its port community dimension to the full by involving all the actors of the port:

- the customs and its various taking-over offices;
- the consignees, shipping agents and shipping companies present in the port area;
- the shipbrokers, legal officers responsible for the customs clearance of ships;

- forwarding agents, customs declarants, consolidators, break bulk agents;
- store managers;
- container terminal operators.

71. ADEMAR+ is now playing a determining role in the articulation of exchanges of information and documents between the operators of the Le Havre port area with an inter-operator network having around 250 members. The ADEMAR+ network has 260 terminals and 200 teleprinters. It is interfaced with the SOFI system, the VTM port call handling system, the Container data base and by EDI, which is non-standardized because EDIFACT standardization was in its early stages at the time of its introduction, with the data processing systems of the four container terminal operators and that of the CGM (Companie Générale Maritime). The running of the system has been entrusted to SOGET, a specialist company formed by the various professional associations of Le Havre specially for the purpose.

72. The main functions of the ADEMAR+ system are concerned with containers on import, for which the whole chain of commercial and customs handling is automated:

- creation of the voyage: On import, the consignee representing the shipping company initializes the ADEMAR+ system with the creation of an import and/or export voyage, designating the consignees who are partners, the handler(s) concerned and the quay posts, and the shipbroker responsible for the customs clearance of the ship;
- the entering of the import manifest: The consignee transmits the manifest to the shipbroker, who enters the data of the summary customs declaration (DESMAD) into ADEMAR+. The depositing of the DESMAD, which is performed by editing to the taking-over office, confers permission to discharge. Consequently, the ADEMAR+ system is informed of all the goods that will be discharged at Le Havre before the ship calls at the port;
- Quayside inspections: the data processing systems of the container terminals are informed of quayside inspections; being connected to the ADEMAR+ system, they transmit the information on discharging to the data base, which is thus in a position to reconcile the containers effectively discharged with those announced in the DESMAD. A discrepancy report may be produced and the automated procedures enable the consignee and the shipbroker to amend the manifest under customs control;
- the depositing of the definitive manifest: The shipbroker has 24 hours following the arrival of the ship to draw up a definitive customs manifest. The ADEMAR+ system enables that document to be edited by the shipbroker, but it is a document that cannot be dematerialized, because its signing is binding on the legal officer. When delivered to the customs administration, it serves for the calculation of the port charges levied by the customs and for the account of the Port Authority;
- The customs collection note (BAE): the forwarding agent, for his part, will have been advised by the consignee of the arrival of the goods. He will also have received by ordinary or express mail the various bills of lading and certificates needed to claim the goods from the company and to carry out the customs operations. For that purpose he will use the SOFI customs system in the case of a bill of entry effected at Le Havre, or the ADEMAR+ system for other declarations outside SOFI (transit, transfer in bond, stripping, break bulk etc.). The response of the SOFI system may be a customs collection note (BAE), a document check or a physical inspection. The SOFI system transmits its reply simultaneously to the declarant and to the ADEMAR+ system. The ADEMAR+ system automatically matches the declaration(s) and the container(s) concerned (partial and global declarations, groupage container, ship's convenience container, etc.);

- The commercial delivery note (BAD): The forwarding agent also acts as the claimant of the goods from the consignee. He supplies the documents that empower him to pick up the goods and, where appropriate, to pay the freight charge. Instead of sending him a document, the consignee sends him a commercial delivery note (BAD) in the ADEMAR+ system;

- The carrier's loading note (BACT): A transport order for road haulage or carriage by rail is given by the forwarding agent (merchant haulage), or by the consignee (carrier haulage). The transport contractor informs the ADEMAR+ system of the carrier authorized to pick up the container. This is, in the operator's jargon, the carrier's loading note (BACT);

- The terminal exit note (BAS): When ADEMAR+ is notified of the agreement of the customs, the forwarding agent/consignee and the identity of the carrier (BAE+BAD+BACT), it transmits a terminal exit note (BAS) by interface to the data processing system of the container terminal, which serves as an order to the terminal operator to make the container available to the specified carrier;

- Collection of the container: on the departure of the container, the movement recorded in the exclusive system of the container terminal is automatically transmitted to the ADEMAR+ system.

73. The ADEMAR+ system thus makes provision for a set of automated export procedures with:

- creation of the export voyage by the consignee;

- entry of the holding of the freight by a forwarding agent or a consignee;

- the allocation of a container for this freight held; the editing of the waybill and the port movement note by the forwarding agent or the principal consignee;

- its transmission by telex interface to the road haulier;

- the transmission by interface between the exclusive system of the terminal operators and the ADEMAR+ system of the entry of the full container and its EIR number, which becomes the customs reference of the dispatch;

- the editing of a container arrival note for arrival of the container at the consignee and the forwarding agent; the waybill, SOFI or outside SOFI (with the possibility of anticipation for goods subject to evidence of transit) and the transmission of the customs collection note to the taking-over office and the terminal operator;

- the application by the consignee for the editing of a provisional loading list in his premises or at the terminal operator;

- the transmission by interface between the operators and the ADEMAR+ system of "seen on board" notices and, through a completion of loading transaction, the editing at the consignee and at the taking-over office of the list of goods seen on board and left on the quayside.

74. In addition, the ADEMAR+ system may be used to track conventional goods subject to groupage or break bulk by a forwarding agent or to ship's convenience stuffing/stripping. In import operations, the ADEMAR+ system enables the break bulk agent to identify the item concerned on the manifest and to request an order for transfer in bond. The order for transfer is edited in the two taking-over offices concerned and, unless blocked by the customs within 15 minutes, transfer of the container is authorized. The exclusive system of the container terminal receives the terminal exit note concerned by interface. Receipt of the container in the store is communicated to ADEMAR+. On stripping the container, the store

enters or amends the descriptive data for each shipment arising from the break bulk operation. The ADEMAR+ system then automatically generates new unique references for each shipment which are picked up for the customs declarations. The break bulk agent , now acting as a consignee, is able to identify the claiming forwarding agent and may introduce a commercial delivery notefor this conventional shipment. Similarly, in export operations, the groupage agent receives the customs collection note in the store for each conventional shipment. He may then proceed with the stuffing and enter the groupage data in ADEMAR+. He then carries out a transaction in ADEMAR+ for completion of groupage and transfer of the container in bond. The ADEMAR+ system transmits the customs collection status of the container by interface to the container terminals.

75. The ADEMAR+ system was designed and implemented as a global system for the automatic data processing of a large number of operations concerning the passage of goods and containers through the port, in import, export and trans-shipment operations. However, some other functions initially envisaged by ADEMAR+ have not been used by the operators. The fact is that, since the conception of this system early in the 80s, changes in its environment have rendered some functions less relevant and other needs have become apparent.

76. The port area is not a rigidly set organization: its ability to take a full part in the developments of sea transport depends on its capacity for rapid development of the tools at its disposal. The Le Havre port community has therefore seen its interest as lying in the continued development of communal data processing in the knowledge of how to evolve from a centralized system to the conception of an open network embodying new modular and open-ended functions conditioned by the functions of communication between existing data-processing systems and those still to come.

77. This realization prompted new consideration of community data processing, with the idea of not remaining confined within the logic of a centralized data base system but of opening up the data processing system of the port to forward-looking computerization, with the establishment of a platform based on the ideas of communication, standardization and capacity for development. The overall approach adopted by the Le Havre Port Authority is one of an "open system", the feature of which is the use of standards in all areas in which their *de jure* or *de facto* existence is sufficiently established.

78. The new data processing network of the port has the dual aim of ensuring information exchanges (EDI) between the actors in the port and with partners outside the port and of ensuring the interconnection of users to the various systems of the port community: ADEMAR+ or VTM systems, but again using specialized data bases such as the container data base, by which container information required for the dissemination of the data to the various partners concerned may be consolidated.

79. As a supplement to EDI between operators, a container data base has been formed that offers the various operators a tool for the consolidation of information concerning the movements of containers in the port area. EDI procedures have been established for the exchange of information between partners by adopting an operational principle that enables information of interest to the transit community to be systematically gathered in the network.

80. The Container data base holds all known data on the technical specifications of a container and its successive states (its physical movements and changes in status) in the course of transit through the port of Le Havre. It may be initialized by the receipt of provisional information, for example by the receipt by EDI of Bay Plan data or by export booking data. In order to ensure the widest collection of known information, the data based may also be initialized by data extracted from the manifest or, later on, from the "seen on quayside" report on the container. It is then updated in real time by data interchanges with the exclusive systems of the container terminals and with the ADEMAR+ system (for changes in customs and commercial status). The unit data of the data base are in conformity with the Trade Data Elements Directory, and are thus readily convertible to the EDIFACT interchange formula.

81. The services rendered by the container data base go far beyond the replacement of documents by file transfers now that the port platform connects up the four exclusive systems of the terminal operators, the ADEMAR+ system, the systems of three large shipping companies, the system of the railway operator (CNC) and those of several consignees and forwarding agents. The container data base enables data on containers received, handled and handed over by the operators of Le Havre to be valorized at the least interfacing and communication costs.

82. The concept of an open, standardized and modular data processing system opens the way for future extensions of the computerization of the port community, with the provision to users, on demand, of new specialized data bases integrated into the existing information circuits.

83. There are developments under way regarding the reception and transmission of information on dangerous goods. The EDI to be implemented for the feeding of information into such a specialized service and its dissemination will concern all partners in the transport chain, i.e. not only the actors of the port (handlers, consignees, shipping businesses etc.) but also partners outside the port (port of destination or discharge, shipping company etc.).

A platform for communication and services to enterprises

84. The system of the port community of Le Havre is thus made up of a number of services of a communal nature. These services are interconnected through an information network having technical specifications and services going far beyond mere access to the systems set out above. The various operators of the port area and the main partners and users - shipowners, carriers, shipping agents and importers - maintain commercial relations that give rise to the need for ever increasing data interchanges between their respective information systems.

85. The implementation of connection services, but also of value-added services in the network is leading to the establishment of a real interconnections platform.

86. This network enables any professional subscriber to be put into contact with the services of the port community and private services by EDI link or by direct interfacing with the large systems, or even through a microcomputer work station of the PC type having as its principal functions:

- connection to the central site, in terminal mode and in file transfer mode;
- access to centralized E-mail with facility for the preparation of messages "off line";
- reception and sending of files, mainly by E-mail;
- execution of local functions (spreadsheet, specific applications etc.).

87. Furthermore, the network is the vector for an increasing number of functions over and above those provided by the community services, and it offers value-added services

- (Numéris, Transpac, Commuted Telephone Network, specialized links);
- access to major international networks;
- protocol conversion and standardization;
- X400 E-mail service;

- EDI message translation service;
- safeguarding of transactions.

88. E-mail is a turntable in the global architecture of the system. It is in itself a major function of the port system, one that enables EDI links to be established between the various actors of the port. The agencies of three large shipping companies, the four terminal operators and some consignees and forwarding agents make use of this function, thus avoiding the proliferation of interface developments. In each case, use of the EDIFACT syntax is recommended for the elaboration of messages. The translation service is initially restricted to messages using EDIFACT syntax, but it will ultimately be able to cope with other standards, the American ANSI X12 standard, for example, depending on the needs expressed by users.

89. In order to make savings on facilities (not having to provide every work station with an EDI translator) and to facilitate the maintenance of the system when confronted with developments in international standards, the Port Authority of Le Havre has decided to adopt a translation service centralized on the platform. Every exclusive system is therefore able to join the platform, not only for access to the systems of the port community, but also for its services and to use the E-mail, protocol transfer and EDI translation services.

90. The introduction of EDI requires the direct participation of the enterprises that make use of it. There is a need for permanent officials who are very precisely informed on the needs and constraints of the enterprises in terms of exclusive systems. With the change from an ADEMAR+ centralized data base system to a real interconnecting platform the users of the port data processing system have completed their apprenticeship on the transition to an "active" data processing system: thanks to the available range of tools, every enterprise, be it large or small, is able to be directly involved in the search for a solution that is fully in line with its needs and that uses the services of the port community.

91. The establishment of a company of port specialists to set up and run the port data processing system is enabling a single operator, recognized by everyone, to gather together and organize these shared services. This company, SOGET (Société de Gestion des Terminaux Informatiques) is the product of the main professional associations of the port of Le Havre, who are federated in UMEP (Union Maritime et Portuaire). Its purpose is to manage and operate the data processing installations used by the ADEMAR+ port system and the associated data bases, and to provide all services relating to the development of data processing in the port community of Le Havre.

92. Set up in 1983, when ADEMAR was installed, its mission has been progressively extended until it has become a company providing computerized services with skills dedicated to the port professions and able to play a part in various spheres, such as:

- the exploitation, monitoring and development of the network of the port community;
- the computerized tracking in real time of the passage of goods and containers in the port of Le Havre;
- auditing and technical assistance;
- training;
- data processing consultancy and analysis etc.

93. Consequently, it is thanks to an initiative of the port community that the operators of Le Havre are now in a position to master these techniques that are deemed to be indispensable in an environment that is computerized, but also increasingly competitive by virtue of the functions of communication. The introduction and development in the Le Havre port area of a port system based on open EDI concepts has promoted and accompanied the awareness of the stakes among the actors of the port.

94. Computerization of the Le Havre port community was launched in 1983. Working pragmatically, the port community has understood how the rapid and profound changes in its commercial, regulatory and technical environment may be progressively integrated at the level of its information system.

Chapter VII

CONCLUSIONS

95. As a complement to the new infrastructures and tools installed to increase the speed of physical operations, ports today are developing data processing systems to speed the flows of information exchanged in a port call by a ship and in the passage of goods. The circulation and handling of information, which are indispensable adjuncts to logistics, must now take on a new dimension. The sustained flow policy of the shipping agents, the increased power of EDI, and the logistic integration of shipowners are now requiring port operators to be better able rapidly to receive, add to and transmit information. Thus, the management of port calls, the tracking of goods and container logistics in the port used to be applications with which only the specialized terminals and enterprises of the port were connected.

96. The need to open up the network then became apparent: telex messages and faxes had to be sent to carriers, and provision had to be made for Minitel [French viewdata system] access to the network, and the direct reception of manifests. Given that technique is developing, that public operators are renewing network bids, and that the use of microcomputers in enterprises is on the increase, the opening up of the network is becoming a necessity.

97. One initial response to the wishes of many operators is often exchanges of files and interfaces using "in house" formats. Nevertheless, we are currently witnessing an increase in the power of EDI in the face of the multiplicity of demands and in response to the needs of communication outside port communities.

98. Port EDI, which is in its infancy, will make possible a real improvement in the supply of international transport. The opening up of the information systems of the major ports will permit the development of interchanges between shipowners, port operators and shipping agents. In addition, the sphere of application of EDI, which has already passed beyond the limits of the port and the country, is going to be further extended and will help to create a real international community of interchanges and international transport.

99. This development will also enable links to be woven together for the greater efficiency of ports in the face of requirements for the speed and reliability of transport and international trade.

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