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I. Statement of Purpose

The goal of this document is to provide a framework of the various areas of study applicable to the implementation of an EDI project within an organisation. It is intended to provide a potential user an overview on EDI, guiding the user through from the initial planning and analysis phases to implementation. This document also seeks to provide a simple and cohesive picture of the synergies between EDI, and more specifically EANCOM®, and the other EAN data standard and communication tools, ranging from product numbering and location numbering to bar coding.

This document is of an informative nature only. It has been published with the aim of providing users with additional information which might guide them in the implementation of the EANCOM® EDI standards manual.

II. Acknowledgements

EAN International would like to express their gratitude to all parties who assisted in the production of this publication. Special thanks is offered to the members of the EAN Communications System Committee (CSC) and the ECR Europe EDI project team whose input proved most valuable.

III. Executive Summary

The rise in world-wide competition has concentrated businesses' minds to develop better ways of managing the flow of raw materials, stocks and finished goods through the supply chain. Electronic Data Interchange or EDI addresses the information flow processes within these complex systems. EDI is a vital tool available to every business allowing them to conduct their transactions electronically for increased efficiency and productivity. The ability to gain accurate timely data about the movement of goods and to communicate it unambiguously has transformed management information systems. However, it is important to understand that EDI cannot be viewed as a strictly technical MIS project.

EDI is not a technology but a tool which can effectively be used to redesign information driven business processes. EDI should not be an end in itself, the effort of implementation should be directed at enabling suppliers to meet their customers' requirements consistently and reliably via a mutually cost-effective supply chain. This, with the understanding that each company is both a supplier and a customer as it faces both up and down a particular supply chain.

For every organisation, the successful implementation of EDI will be a multi-disciplinary project requiring a high level commitment not only from upper management but from a broad spectrum of functional managers responsible for different areas of activity. Corporate policies and procedures will need to be examined, current functional procedures may require revision and new business relationships will be established and managed. At the centre of the system lies the better use and sharing of information internally and between trading partners so that dependency can be more informed and reliable.

Companies are not part of a single supply chain but rather form networks of chains with common points of interconnection, often transcending sectoral boundaries. The individuality of particular supply chains has to be acknowledged with the understanding that a common approach is of benefit to all when analysing the means of improving operations. The use of EAN standards are a vital part of the overall improved business process. Working together, effectively building trading partnerships is essential. The benefits and risks are mutual, reductions in costs and gains in efficiency, however these are measured, have to benefit both supplier and customer if long term development and improvement are to take place.

This guide is intended to provide an overview of the different issues, both at a technical and organisational level that a company should consider when implementing EDI. It is organised in simple and easy-to-read chapters which look at EDI through a simplified cost-benefit analysis, the components of an EDI system from a technical perspective and the implementation of an EDI project from an organisational viewpoint. In addition, the guide presents the EAN tools, ranging from product and location identification and bar coding standards to EDI message standards, focusing on the synergies between them and how they can be used to support different parts of the whole process and contribute towards a more effective management of supply chains.

We hope you find the guide to be interesting and useful.

1. What Is EDI

1.1 An Introduction to EDI

Every day, businesses generate and process a staggering volume of paper documents. The paper documents, ranging from purchase orders and invoices to product catalogues and sales reports provide the vital information flow which must precede, accompany or follow the physical goods in a commercial transaction. Any interruption in the physical or information flows halts the smooth operation of the supply chain, leading to significant cost overruns.

In recent years, companies have channelled vast amounts of resources into streamlining the physical production and distribution processes. Considerably less attention has been devoted to the benefits of improving the information flow within and between organisations. Management, faced with increasingly competitive markets, cannot afford to ignore any tool for improving their company's ability to manage information effectively enabling them to make the right decisions at the right place and at the right time. EDI is much more than another technology, it is a new way of managing information. In the decade of the 90's and beyond, the accurate and prompt acquisition, manipulation and use of information needed to manage any organisation, will distinguish the highly competitive and profitable company from the rest.

1.2 Basic Definition of EDI

Today, a majority of the data in commercial paper documents is generated from existing computer applications. These paper documents are printed and copied before the information they contain is finally communicated by mail or fax. The business partner in turn, re-keys all this information into another computer application for further processing. An increasing number of companies have found the above process extremely slow, costly and unreliable. The need for a faster, cheaper and more accurate solution for exchanging commercial data has become a significant priority for many companies and organisations.

EDI or Electronic Data Interchange can be conceptualised as paperless trading. A common and useful definition for EDI is:

"the transfer of structured data, by agreed message standards, from one computer application to another by electronic means and with a minimum of human intervention."

The structuring of data by agreed message standards implies that the data or information to be exchanged is recognisable, both in content, meaning, and format, allowing it to be processed automatically and unambiguously by computers. Two companies deciding to implement EDI are by definition agreeing on the type of data they will exchange, and how the data will be presented. The implementation of EDI demands a much greater degree of co-operation, collaboration and a sharing of information between business partners, effectively building trading partner relationships.

EDI provides trading partners with an efficient business tool for the automatic transmission of commercial data from one computer application directly to another. Companies do not need to worry about different incompatible computer systems. Through the use of EDI message standards like EANCOM®, data may be communicated quickly, efficiently and accurately irrespective of users' internal hardware and software types.

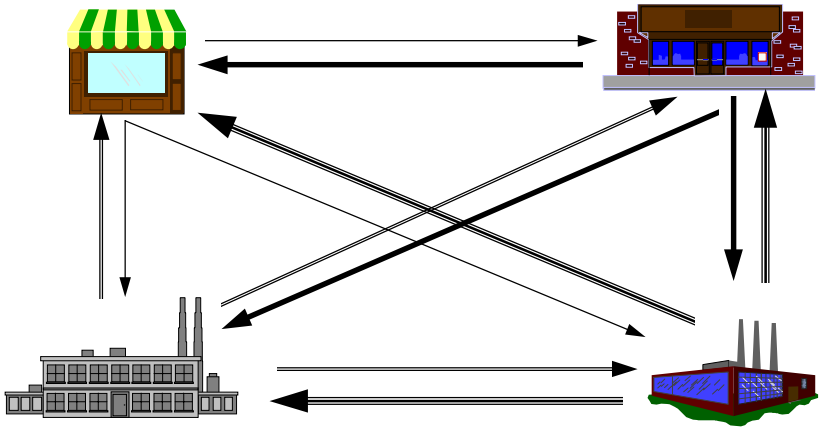
1.3 The Components of an EDI System

The three components or building blocks of an EDI system are standard messages, EDI enabling software and (tele)communications. At this stage only a brief explanation about the principal functionalities or purpose of each component will be provided. Each of these components are studied more in detail in chapters 2, 6 and 7 of this guide.

1.3.1 Standard Messages

EDI and message standards have become inter-dependent as EDI has progressed from proprietary, closed systems to open systems. A simple analogy illustrating the need for message standards can be constructed by considering human communication and languages. We can imagine in the best case scenario a situation where an interpreter can facilitate communication between two people speaking two different languages, but what would happen if the number of people suddenly increases to 10 or 100? Without a common language the situation would rapidly become chaotic.

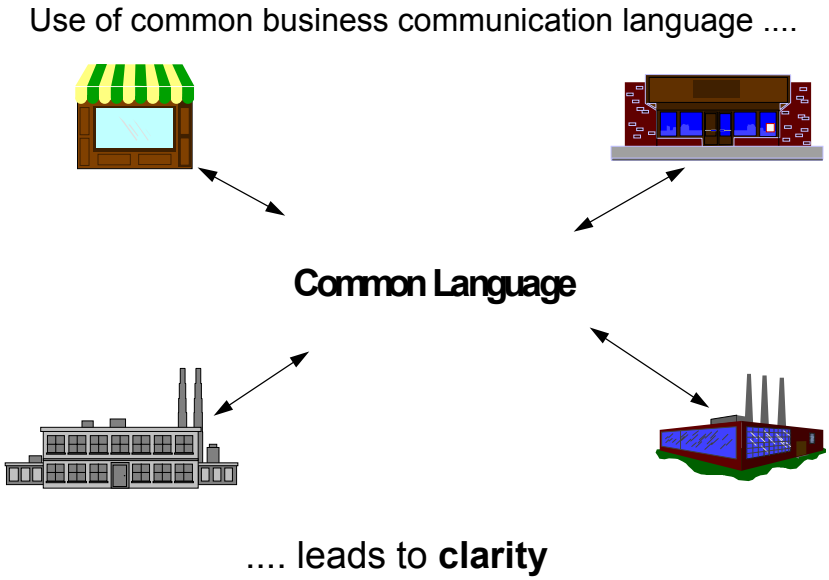
Business communication without a common language ....



.... leads to confusion

Returning to the analogy of human communication, the figure above illustrates that although interpretation or data conversion might be possible between two or more trading partners, the situation rapidly becomes unmanageable as the number of trading partners increases.

Computer communications and applications also need a common language in order to understand each other, and this common language is to be found in EDI message standards and most notably in UN/EDIFACT (United Nations Electronic Data Interchange For Administration, Commerce and Transport), the international EDI message standards and in UN/EDIFACT implementation guides such as EANCOM®.



1.3.2 EDI Enabling Software

The basic functionality of EDI enabling software, usually known as the EDI converter, is that of translation of incoming messages from a message standard such as EDIFACT/EANCOM® to a company's internal in-house file format and vice-versa for out-going messages.

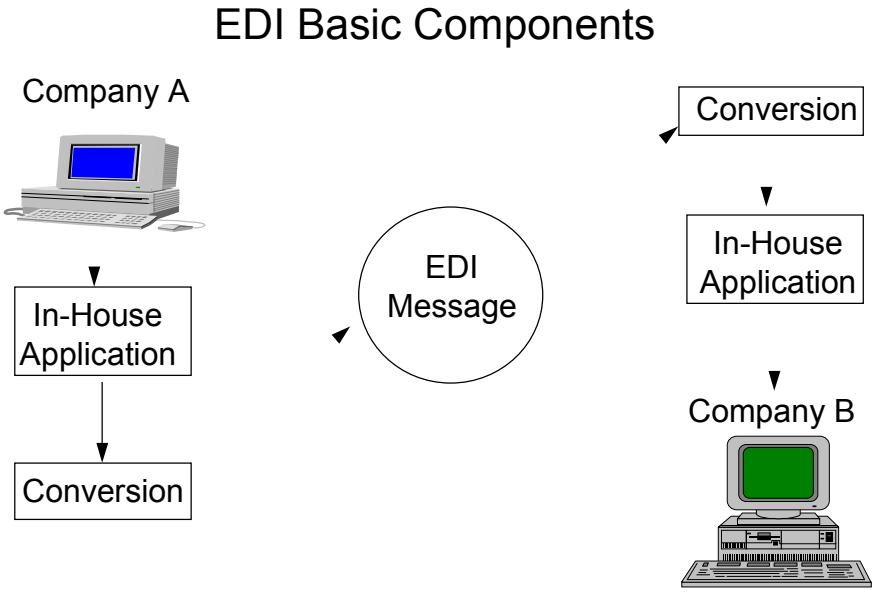
However, in addition to the converter functionality, off-the-shelf EDI software packages will also contain additional functionalities which usually include conversion of multiple message standards and message versions, maintenance of trading partner profiles, application interfaces, a communications module to communicate directly or via one or more third party value added networks, management information on incoming and outgoing messages including audit trails, manual menu driven data-entry modules and security or access control by way of passwords.

1.3.3 Communications and Networks

Once the data from an application has been converted from an in-house file format to a standard message format by means of the EDI software, the data must be communicated or physically transferred to the intended message recipient. Although it is possible to transfer the data on magnetic media such as tapes or diskettes, telecommunications is part of the EDI concept.

Returning to the analogy of human communication and languages, even if everybody in a group speaks the same language, if everybody would try to speak at once, the result would once again most probably be chaos. Data communications also require some form of discipline in order to achieve an orderly transfer of information and this is accomplished through communication protocols.

In addition, there will be several possible telecommunication/network options which will carry the function of transfer medium for the data communications. Some of these options include point-to-point private leased line communications, use of the public telephone network or a public data or packet switched network or a third party value-added network service.



1.4 The Cost and Benefits of EDI

EDI in not a technology but a new way of doing business. Though identifying the costs related to EDI is relatively easy, identifying the benefits of EDI, especially when a company is not using EDI is hard since most of the real benefits are strategic and intangible in nature. As such, EDI will require a different approach to cost-benefit analysis and it is essential for the success of a corporate EDI program, that management have appropriate expectations on the return on investment. Still a cost-benefit analysis is essential not so much to justify the investment in EDI but in order to prioritise applications and the allocation of information-technology resources.

The costs associated with an EDI program can be broken down into the following categories:

1.4.1 EDI Program Costs

- **Strategy** - The time spent in planning everything that goes into an EDI system.
- **Development** - Acquisition of EDI enabling software, programming of EDI application interfaces, enhancing application software to obtain full advantage of EDI.
- **Education** - This includes both the training of internal staff to re-adjust and take on new responsibilities in the EDI environment and more importantly education of trading partners. For the latter, there should be an estimate of the number of weeks it will take to establish a connection with one new trading partner.
- **Implementation** - The cost of MIS staff ensuring systems and application compatibilities internally and with new trading partners. Maintenance of the EDI interfaces.
- **Interchanges** - The costs associated with sending and receiving data interchanges through private or public third party networks.

Numerous EDI success stories have demonstrated that the greatest benefits from implementing EDI are qualitative and intangible at the start of the EDI program rather than quantitative. Nevertheless, the following areas may be analysed to obtain the clearest possible picture on the benefits to be gained from EDI:

1.4.2 Savings in Administrative and Processing Costs

These are probably the most tangible benefits gained from implementing an EDI system. Estimates should be made on the number of document/line items processed per year for the document in question. Costs related to the processing of that document will include pre-printed stationary, envelopes, stamps, telex, telephone/telefax and photocopying charges.

Estimates should be made for the time spent on gathering and collecting the data, data-entry, typing, photocopying, filing and archiving, mailing and faxing and most importantly on control and error corrections per line item. The exchange of data directly from application to application will eliminate the frequent and costly errors which are inevitably produced when data is keyed in manually. The time spent should be multiplied by the average salary (including fringe benefits and overheads) of an administrative/clerical employee.

The value of re-deploying staff currently involved in data-entry functions towards more value-added activities such as resolving discrepancies, preventing loss of discounts, obtaining the best invoice price, etc. should also be considered.

1.4.3 Faster Trading Cycle Benefits

A successful EDI system can dramatically shorten the order to delivery and invoicing to payment cycles leading eventually to reductions in inventory and account receivable, better cash flow management and a release of working capital.

Estimates should be made on the possible reduction of lead time days when trading via EDI and the percentage of inventory reduction per lead time day gained. This will enable companies to estimate the savings associated to reductions in raw material and finished goods inventory.

EDI will not only lead to a faster trading cycle but also to more secure supply chains as a result of the increased quantity and better quality of information shared between trading partners. Secure and more reliable supply chains enable the elimination of buffer or safety stock previously held in different parts of the supply chain to deal with uncertainty.

1.4.4 Strategic Benefits

Although EDI has some clear costs and benefits, EDI is primarily a way of doing business, the most important benefits being strategic. Strategic benefits include such things as greater customer satisfaction and improved supplier relations as EDI strengthens business relationships. Other strategic benefits might include sustainable increases in market share and competitive advantage as it becomes more difficult for the competition to take over business, increased staff productivity and morale, etc.

Strategic benefits are difficult to quantify but represent a response to the needs of the marketplace. Though it might be easy to demonstrate that EDI will lead to an increase in market share, and it is possible to quantify the value of an increase in market share, it will be difficult to predict by how much market share may increase through an EDI system. Although the benefits of EDI might start with sending and receiving documents electronically, the greatest benefits will come from an analysis of the whole operation and the efficiencies EDI requires companies to make in their business flows.
Justifying an EDI investment will be easier if the changes and benefits to be gained by EDI are applied to the whole organisation as opposed to only the departments directly concerned by the

EDI application. An electronic invoicing and payment system might provide the greatest benefits to the accounting department but it could also provide tangible benefits to the sales department, account managers or the treasury department.

2.

EDI and Message Standardisation

The need for message standards in EDI has already been examined when looking at the basic components of an EDI system. The question might then be, if standards are one of the key components of EDI, why do so many standards exist? The answer to this question is largely historical and can be best understood by looking at the evolution of EDI and message Standardization. This will not only provide an answer to the above question but will also illustrate the importance of standard messages in EDI and provide a clear picture of the future on the basis of which implementation decisions can be made today. It will also help the reader understand the history of EANCOM® and its status today within the global EAN community.

2.1 The Evolution of EDI Standards

EDI is in fact not new, some companies have been practising the equivalent of EDI between in-house systems on the basis of proprietary formats since the late 1960's and early 1970's, before the term EDI was even coined. However the cost of translations between proprietary formats, which grew exponentially with the number of external trading partners, led major companies to launch sectoral initiatives to develop message standards.

Before looking at the development of message standards it will be helpful to understand the building blocks of a standard EDI message. At the lowest levels a message will be composed of data elements identifying an individual item of data such as a product code, unit price or delivery date, and which may relate to one or more fields in a company's database file. Data elements will have associated code lists which enable representation of data such as country, unit of measure, type of package, etc.

Functionally related data elements are grouped together to form composite data elements and/or segments which provide information on a given topic such as name and address, payments, goods description, etc and are similar to records within a system's data base. Segments in turn are grouped together to form an EDI message with clearly defined functionalities such as a purchase order or invoice. One EDI transmission or interchange may contain several messages and these may be grouped into functional groups, such as a functional group of purchase orders.

CODES
DATA ELEMENTS
COMPOSITE DATA ELEMENTS
SEGMENTS
MESSAGES
FUNCTIONAL GROUPS
INTERCHANGES

2.1.1 Developments in the United States

Sectoral initiatives to develop message standards flourished in the United States around the mid 1970's. The work consisted in arriving at common data element directories and segment and

message definitions on a sectoral basis. Pioneering work was conducted in 1975 with the development of EDI transport standards (TDCC - Transport Data Co-ordination Committee) and from 1977 - 1982 in the grocery industry with pilots of UCS (Uniform Communication Standard). Several other standards were being developed in the banking, insurance and automotive sectors, to list a few. At the same time there were appeals to start development of broadly based standards as it was believed that the maintenance of multiple proprietary formats, even if these were now at a sectoral level, would cause operational problems in the future.

In 1978, ANSI (American National Standards Institute) became involved in the initial developments of a generic EDI standard which would eventually be designated as X12. However, by the time ANSI X12 developed and acquired a critical mass of users (1986), several communities had a head start of several years and an important user base which would not easily migrate to the generic X12 standard.

2.1.2 Developments in Europe

In several European countries, EDI message Standardization activities began in the early 1970's in the retail and distribution sector under the auspices of EAN Numbering Organisations. EAN Numbering Organisations were approached and entrusted by their member companies to develop a standard communication system, including telecommunication facilities allowing for the exchange of commercial documents with their trading partners. As early as 1972, Sweden had developed the Dakom standard. Similar activities took place in France in 1974 when GENCOD developed the GENCOD language, in Germany in 1977 when CCG developed the SEDAS Invoice and in 1979 when the ANA in the United Kingdom began working on the TRADACOMS standard. Other sectoral activities included the ODETTE Automotive industry project and international projects such as IATA (airlines) and SWIFT (banking).

In 1983, around the same time that the ANSI X12 generic standards were becoming a reality, the UK international trade facilitation body (SITPRO) and the British Standards Institute, in an effort to move towards a common European and even international standard, presented the Trade Data Interchange standard or TDI to the European Commission and shortly after to the United Nations Economic Commission for Europe (UN/ECE), were it gained general approval.

2.2 The Birth of UN/EDIFACT

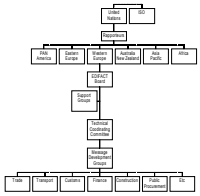
With the wish to develop a fully international standard, the UN/ECE delayed submission of the proposed TDI standard to the International Organisation for Standardization (ISO) to investigate the feasibility of combining the developing European and American standards. The intercontinental co-ordination began in 1986 and led to the creation of the UN/EDIFACT (United Nation Electronic Data Interchange for Administration, Commerce and Transport) syntax implementation and message design guidelines which were endorsed by ISO in a record 18 months in 1987 as ISO 9735. A United Nations Trade Data Element Directory also was approved as ISO 7372.

2.2.1 The UN/EDIFACT Organisation Today

Today, the EDIFACT standard is still developed under the auspices of the United Nations by the Centre for the Facilitation of Procedures and Practices for Administration, Commerce, and Transport (CEFACT). Over 60 different countries and many international organisations such as the European Commission, IATA, International Chamber of Commerce, the International Chamber of Shipping and EAN International are represented in the CEFACT.

UN/EDIFACT work is divided into six global regions or EDIFACT Boards. The work in each region is directed by a Rapporteur who is responsible for the organisation of EDIFACT development and support activities in the respective region. The organigram below provides a simplified illustration of the process and committees involved in the development of EDIFACT standard messages in the Western European region.

2.2.2 UN/EDIFACT Organigram



Twice a year, all the regions of the world come together in global Joint Rapporteur's (JRT) meetings to reach consensus and resolve differences which have arisen throughout the regional development processes, with the end-goal of submitting a set of United Nations Standard Messages (UNSM's) and supporting directories to be approved by CEFACT. There are currently over 200 UN/EDIFACT messages developed or under development, covering a wide range of commercial, service and administrative activities. Today there is an increasing number of EDIFACT EDI projects in several sectors including automotive, books and publishing, chemicals, construction, electronics, health, insurance, retail and open distribution, textiles and many others. EAN International is an active participant in the UN/EDIFACT development process, participating in the various committees in the Western European region and at the global Joint Rapporteurs meetings.

2.3 EAN and EDIFACT

In view of the Numbering Organisation's early activities in communications, EAN International formed a working party to give an international dimension to the message Standardization work being carried out in various countries. With the advent of UN/EDIFACT in 1987, the EAN General Assembly decided on the same year that an international EDI standard should be developed on the basis of EDIFACT, with the name of the communications project to be known under the acronym of EANCOM®.

EAN International's objective regarding EANCOM is to provide EAN users with a standard for national and international EDI communications. Numbering organisations should make EANCOM available to their members and are encouraged to promote the concept of EANCOM for national and international use.

EAN International's strategy regarding EANCOM is to provide, as an integral part of the EAN system, an EDI standard which is fully compliant with UN/EDIFACT and to co-operate with EDI service providers with the objective of supporting inter-operability.

2.4 The Status of EANCOM®

In Western Europe, sustained growth in the implementation of mature national standards was accompanied by an increasing use and interest for EANCOM® both as an EDI standard for international and national communications. In a number of countries such as Denmark, Iceland,

Italy, Ireland, The Netherlands, Portugal, Sweden, and Switzerland, the EANCOM® standard has been adopted as the national standard by the EAN Numbering Organisation. In other countries, like Germany and Norway, a full or partial migration from the national standard to EANCOM® has begun. As they do so their member companies benefit from the implementation of one standard applicable for national and international communications based on the internationally recognised EDI standard, UN/EDIFACT.

Several new Numbering Organisation EDI projects were launched in Asia and Latin America during the early 1990's including Argentina, Brazil, Chile, China, Columbia, Hong Kong, Korea and Singapore. The majority of these projects have been launched on the basis of EANCOM® as the implementation guideline for the international UN/EDIFACT standard messages. Many of these Numbering Organisations have begun a process of study and pilots on EANCOM® with the objective of obtaining a consensus for its establishment as an operating national standard.

In 1993, EAN's sister organisation, the Uniform Code Council (UCC) covering the United States and Canada, announced that for international EDI communications outside North America, EDIFACT on the basis of EANCOM®, would be supported.

2.5 Managing Multiple Standards

This brief historical overview of EDI message Standardization will hopefully have shed some light into the question of the multiple EDI standards in existence today. Beyond the actual timing of the events there have also been numerous technical and administrative problems to resolve between the different standards, certainly not simple problems and a time-consuming task.

In the meantime, users will have to live with the existence of multiple standards, until user communities find it economically justifiable to migrate to the EDIFACT international standard. Although translation between standards would seem to deliver utopia to the average user burdened and confused with message Standardization issues, in reality it is not really feasible. As standards have developed separately through time, they have also developed different functionalities, and it is simply impossible to translate the functionality present in one message standard to another message standard where this functionality has not been included in the message design.

In the short term, EDI enabling software provides solutions for users who need to switch between standards as they communicate with different user communities. This solution nevertheless has maintenance cost implications especially since, as the number of trading partners grow, not only is the likelihood of different message standards being used likely to grow, but also the number of message versions within a single standard. In the long-term it will make sense for everybody world-wide to migrate to the international UN/EDIFACT standard.

3.

EANCOM®

This chapter will look at the relationships between EDIFACT and EANCOM®, focusing on the benefits EANCOM® offers the potential user. The chapter also looks at some of the other EAN tools which when combined with EANCOM®, provide a powerful tool for efficient, integrated data capture and communication systems across the supply chain.

3.1 EDIFACT and EANCOM®

Chapter 2 provided a historical overview of EDI message Standardization, culminating with the development of the international EDI standard, UN/EDIFACT. The primary objective of the UN/EDIFACT process is the development of EDIFACT standard messages (United Nations Standard Messages or UNSM's) along with the supporting directories containing the building blocks of messages (segments, composite data elements, data elements and codes) needed to implement the standards. However, as a result of the generic and dynamic nature of the standards, their wide scope of application and the numerous interested parties (each with their own specific business requirements) involved in the development, the EDIFACT standard messages are often complex, overburdened with functionalities and difficult to understand and implement. Practically, UN/EDIFACT messages must be supplemented by user implementation guides such as EANCOM®.

3.1.1 Developing EDIFACT Subsets

One of the initial tasks in the development of an EANCOM® message implementation guideline is defining the simplest possible subset of the EDIFACT message which will be able to support the EDI business transaction. The subsetting of EDIFACT messages involves dropping all those optional (conditional) elements which have been designed into the EDIFACT messages to cover very specific or particular business requirements. Only the required (mandatory) elements within the standard plus the optional one's which are considered to be needed for the particular business application are retained in the subset. Once the subset has been defined, detailed notes and explanations are developed on the usage of the message as a whole and at the level of individual segments, data elements and associated code values.

The end result is a detailed implementation guideline of a simpler EDIFACT message which two users can easily understand and use when meeting together to decide what data is to be exchanged and how this data is to be presented. In addition, EANCOM® acts as a guide for the business and systems analysts whose responsibility it will be to map the business application data to the EANCOM®/EDIFACT messages. Users within a trading community referring to the EANCOM® implementation guideline will also minimise the number of different EDIFACT message interpretations (and implementations) possible, reducing the number of single message versions an end-user has to maintain as separate trading partner profiles in the EDI enabling software.

3.1.2 EANCOM® - Benefiting from Standardization

The process of Standardization is dynamic and standards must continually evolve in order to meet changing or new business requirements. The EDIFACT standard is no different, with the number of supporting directories and message versions produced within a few years as well as the volume of change requests processed every year as evidence of the interest (and changes this leads to) in EDIFACT. EDIFACT can be correctly perceived as a moving target.

On the other hand, if users are to benefit from the results of Standardization, they will require periods of stability during which profits from the investments in standards can be reaped. Once the investments have been paid-off and have generated appropriate income streams, users are then able to consider migration to the next version of a standard offering enhanced functionalities. Users can be understood as following a stepped migration process. In this respect, EANCOM® is also designed to act as an interface or buffer between the EDIFACT Standardization process and end-user implementations. EANCOM® is controlled by a set of EDIFACT independent version release procedures designed to provide end-user stability.

The need and benefits for implementation guidelines such as EANCOM® as a supplement to EDIFACT can be summarised as follows:

- EANCOM® simplifies EDIFACT messages and their implementation by subsetting EDIFACT messages down to the core components needed to support an EDI business transaction.
- EANCOM® provides rules, descriptions, clarifications and examples on the detailed use of EDIFACT messages, reducing the number of potential EDIFACT message interpretations and versions.
- EANCOM® provides a common reference point on the evolving EDIFACT standard within a user community.
- EANCOM® offers stability and co-ordinated message version migrations through a set of independent version control procedures.
- EANCOM® and the EAN Numbering Organisations act as an interface between the end-users and the EDIFACT Standardization process.

3.2 Development of EANCOM®

The maintenance of any standard is a critical issue for users if they are to benefit from the implementation of a standard and for users to express desired changes or new business requirements. EAN International and its member Numbering Organisations are strategically committed to maintaining, further developing and promoting the use of EANCOM®.

EAN International has established a committee of individual EDI experts, the Communications Systems Committee (EAN CSC), whose main objective is to monitor the development and maintenance of EANCOM® in accordance with user needs and requirements. Several project teams with representatives from various industries have been established with the objective of analysing specific issues and developing business oriented solutions.

3.3 Good Business Practice and EANCOM®

The main strength and identity of EANCOM® is that it is only one of the components from a comprehensive EAN toolbox which includes EAN product numbering, location numbering and bar coding standards. These standards or technologies, when combined together with EDI, provide the means for designing powerful systems for the unambiguous and efficient exchange, capture and communication of data. The EANCOM® messages have been designed to take full advantage of these associated standards to provide maximum efficiency and benefits to the user.

3.3.1 EDI and Product Numbers

Codes are the most efficient means of identifying a product. Products can be assigned a unique tag which unambiguously identifies a specified product in a specified packaging configuration.

EDI does not only rely on the use of agreed message standards but also on the use of international codes rather than codes based upon bilateral agreements between two trading partners. Use of internationally recognised codes will naturally simplify implementations with future trading partners. EAN provides the infrastructure for a total coding solution.

The use of international, unique product codes is particularly important in open distribution environments, where other entities further up the supply chain may not have a pre-defined agreement with the parties involved in the transaction, but will still require a unique and unambiguous product identification. The EAN international article numbering system, is the only one which, on an international scale, allows for every item and its variants, regardless of its place of origin or destination to be identified by a unique code or EAN number. EAN numbers can also be if necessary, physically marked on the item to which it relates, both in human and machine readable form through the use of bar codes, allowing rapid and automatic data recognition.

3.3.2 EDI and Location Numbers

As with products, codes are a more efficient means of communicating location or company identification than full text descriptions. Names and addresses, information about particular locations and special trading requirements do not need to be communicated for every transaction. The necessary information is communicated once, entered onto computer files and subsequently retrieved by reference to a location number. Location numbers can not only be used efficiently between trading partners but also by networks to route EDI messages to the designated mailbox, workstation or application. The EAN coding system also makes provision for location numbering. No other location numbering system, at an international scale, offers the same comprehensive facility and flexibility for assigning unique codes to every company, site or even individual.

3.3.3 The Advantages of Using EAN Numbers

EAN numbers, whether they be used for product numbering or location numbering are characterised by their simplicity, international uniqueness and non-significant structures. International uniqueness implies that there is no risk of duplicate codes clashing between trading partners systems, irrespective of their location in the world. Non-significance implies that the information relevant to a product, service or location is maintained in a computer database and not embedded in the number itself. Updating information held in databases is easier and less costly than changing code structures to incorporate new meanings.

The EAN system is an international system, the allocation of numbers carried out through a network of local Numbering Organisations throughout the world providing a quick and efficient service in the local language. Users benefit from implementing a numbering system developed by an international and widely recognised coding authority with over 15 years experience in the field.

3.3.4 EAN Numbers and EANCOM®

The EANCOM® messages have been designed with the view that each product defined in its widest sense is identified by a unique standard EAN number and each party and location is identified by a unique EAN location number. Use of the EAN coding standards provides the following significant benefits:

- EAN Standard Numbers. EAN identification numbers are unique and recognised world-wide.

Use of EAN standard numbers means that trading partners do not have to maintain complex cross-references per trading partner's internal codes. Unique and non-significant EAN numbers may effectively be used as a bridge between a supplier's and the customer's internal numbers.

- EANCOM® Standard Messages are simple and accurate. The unambiguous coding of products and locations greatly simplifies EDI messages, reducing transmission costs and facilitating processing.
- EANCOM® as a multi-industry standard. The non-significant characteristic of EAN numbers allows any item to be identified and consequently any business regardless of its activities to use EANCOM®.

3.3.5 EDI and Bar Coding

Just as EDI is an efficient means of communicating data from one computer application to another over a transmission medium (e.g. a telephone wire), bar coding is an equally efficient technology for transferring data encoded on a physical product or a shipment of products to a computer application. The data which is to be read on a product, such as its product number, is encoded using a bar code symbology. The data contained in the bar code symbol can subsequently be automatically read and the data transferred to a computer application by means of an optical reading device or scanner.

In addition to the EAN numbering standards, EAN has also developed standards for bar code symbologies, application identifiers used to identifying the type of data encoded in a bar code, bar code labels and the serialised coding of shipping containers. The EAN standards have been designed for use in an open environment, meaning that any EAN user anywhere in the world will be able to scan and understand the information contained within a bar code even when the party who initially applied the bar codes is unknown to the user.

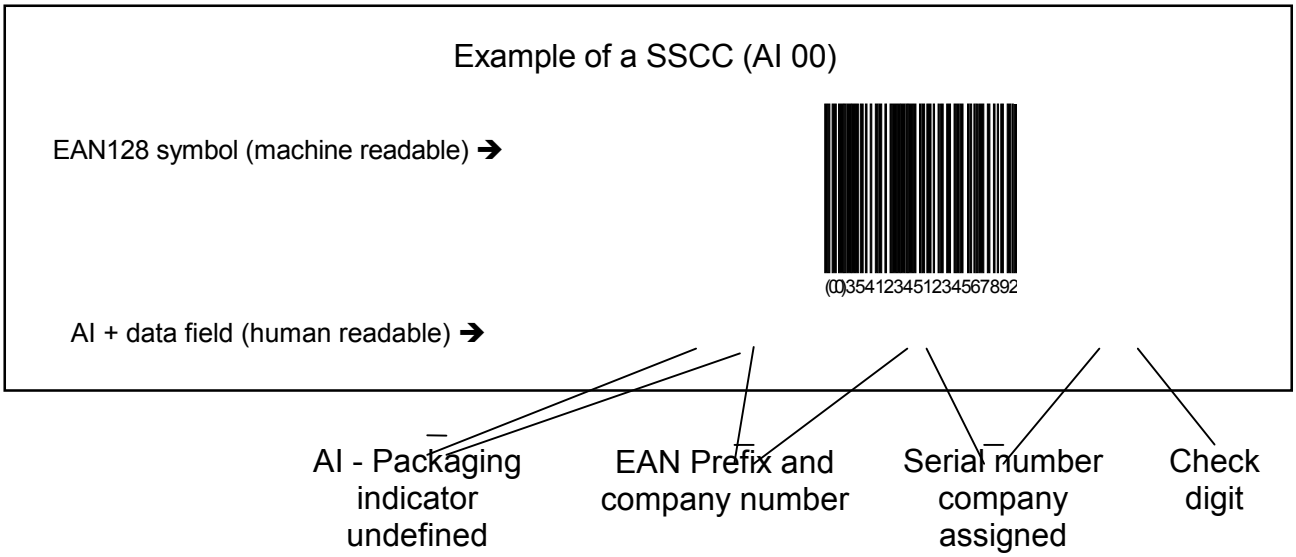
The benefits of integrating bar coding applications involving the physical movement of goods and EDI applications involving the information flows supporting the business transactions for these goods would appear to be obvious;

- At the despatch point, scanning of article numbers and ship to/deliver to locations of products picked to satisfy individual orders can improve supplier order fulfilment, increase the accuracy and speed of deliveries and be used to generate accurate electronic despatch advices.
- At the receiving point, scanning of article numbers and purchase order numbers help the customer in the receipt and control of deliveries and in matching deliveries to outstanding orders. Electronic Despatch Advices enable the customer to reconcile deliveries with invoices.
- Scanning the article numbers of products despatched, received or returned enables all partners to update stock counts. Within an automatic replenishment systems, point-of-sale scanning data can be aggregated at the end of the business day and sent as an EDI Sales Data Report triggering the order and delivery of goods the next day.
- The impact of quality control standards will place an increasing demand upon companies to provide full product traceability. The implementation of systems to meet these standards, such as ISO 9000 is already taking place. Scanning and EDI enables companies to track components and finished products on the basis of their associated batch/lot numbers, serial numbers, minimum or maximum durability dates (i.e. production date, best before date, sell by date, expiry date), etc.

3.3.5.1 The EAN Serial Shipping Container Code

The EAN Serial Shipping Container Code or SSCC is a standard designed for the unique identification of individual transport packages. It enables merchandise that is packed differently from one transport package to another, for example where products are picked and packed to meet individual orders, to be identified. Use of the SSCC with EDI can support operations such as despatch, shipment tracking and on-ward distribution, and receiving of non-standardised packages.

All the information pertaining to the goods within the transport package or container is communicated in advance via EDI by means of the EANCOM® Despatch Advice message. At the receiving point, all the information related to the goods in the container can be referenced by scanning the EAN SSCC (equivalent to a container licence plate) to access the information held on file.



The previous example is an EAN-128 bar code symbol encoding an SSCC. The application identifier (AI) 00 identifies that the data which follows is an SSCC.

3.3.5.2 The UCC/EAN Logistics Label

When integrating bar coding and EDI applications it is important to consider how much information should be communicated by means of bar codes physically marked on shipment of goods as opposed to the information being transmitted via EDI. EDI is the optimal way to transmit information along the supply chain. In practice, however, fully automated communication channels which make it possible to rely exclusively on electronic files for retrieving information on the movement of goods are not always available.

For this reason, there is clearly a need to indicate relevant information on the goods themselves, in addition to their identification. The various fields of information need to be organised in a standard way in order to facilitate their interpretation and processing by the trading partners involved. The EAN label standard is designed for this purpose, presenting the information on the unit to which it is fixed in a clear and concise manner.

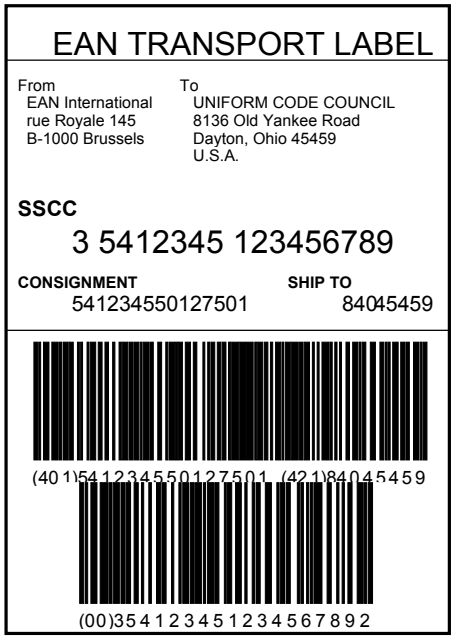
Structure of the UCC/EAN Logistic Label

UCC/EAN logistics labels are structured in three sections:

The top section of the label contains free format information:

The middle section contains text information and human readable interpretations of the bar codes:

The lowest section includes the bar codes and their associated interpretation.



4.

The EANCOM® Messages

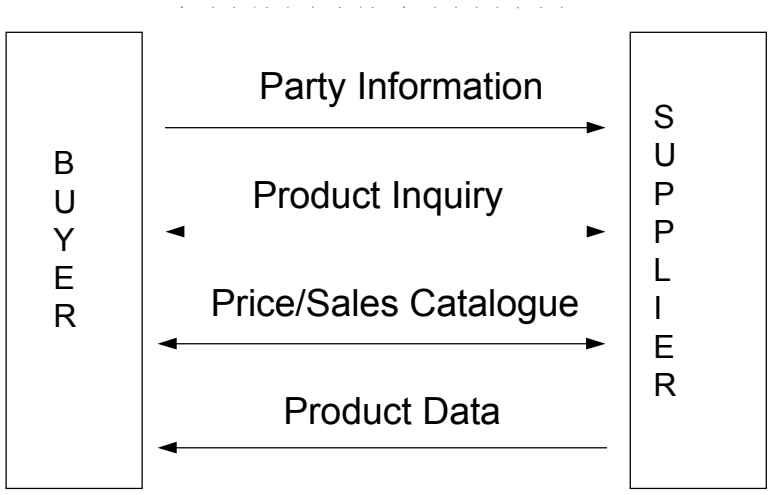
This chapter reviews the business functional areas covered by the EANCOM® messages today and some of the business and systems implications their implementation might have within an organisation and its trading partners.

4.1 The EANCOM® Information Flow

The messages available in the EANCOM® standard can be categorised in four different classes:

- **Master data** related to relevant parties and products are exchanged between trading partners and stored in their computer systems for reference in subsequent transactions or interchanges. Parties and products are identified according to EAN rules.
- **Transactions** starts with the ordering of goods or services, includes the message required to transport the ordered goods, and ends with the payment order for the goods or services supplied.
- **Report and planning** messages are used for informing the trading partner on the trading activity or to plan ahead for future requirements, thus allowing a streamlining of the supply chain.
- **A General message** is used to send general application support information to one or multiple addresses.

4.1.1 Master Data



4.1.1.1 Party Information

The Party Information message is the first message exchanged between trading partners in the beginning of a commercial relationship. It is used to provide location information and the related operational, administrative, commercial and financial data to the trading partner such as name and address, contact persons, financial accounts, etc. Physical and functional locations are identified by EAN location numbers which are referred to in subsequent commercial transactions. The message will be exchanged again if there are any changes or updates to such information at a later stage of the trading relationship, so that the partner's master data files are maintained current. The Party Information message can also be used by the trading partners to

feed a central catalogue of addresses, making the information available to all interested parties.

4.1.1.2 Product Inquiry.

The Product Inquiry message enables a buyer to inquire on a product or group of products from a master product catalogue according to criteria defined in the message. The buyer may specify in the message the attributes of a product or group of products for which is interested in receiving additional information. This will allow a manufacturer and/or supplier to send the buyer only information for those products the buyer is specifically interested in rather than the entire product catalogue.

The Product Inquiry message may request information in order to select a specific group or family of products from a suppliers entire product catalogue, e.g. a buyer requesting from a supplier of medical equipment all product information related to sterilised products; select a product or group of products according to attributes or product characteristics as defined by the sender in the message, e.g. a retailer requesting a clothing manufacturer to send product information for all blue, white or stripped men's shirts, sizes medium to extra-large; or determine the availability, lead-time and/or general commercial/sales conditions for a specific product.

The Product Inquiry message may be responded to by a Price/Sales Catalogue and/or Product Data message depending on the business requirements expressed in the message.

4.1.1.3 Price/Sales Catalogue

The Price/Sales Catalogue message is sent by the supplier to his customers. The message is used as a catalogue or list of all of the supplier's products or as an advanced warning to particular changes in the product line. The message is intended to serve as an update to a standing database of supplier product information. The catalogue would include descriptive, logistical, and financial information about each product. The message might indicate only general information about the products, valid for all customers or provide a single customer with specific product information such as special pricing conditions. Additionally, the message can be sent from a buyer to a seller to specify special requirements such as buyer labelling or packaging requirements.

Similar to the Party Information message, each product in the catalogue is assigned a standard EAN number which will be referred to by the supplier's customers in future transactions. The message would be resent when there are any changes, deletions or additions to the supplier's products. The Price/Sales Catalogue message can also be used by suppliers to feed a central catalogue of products, making the information available to all interested parties.

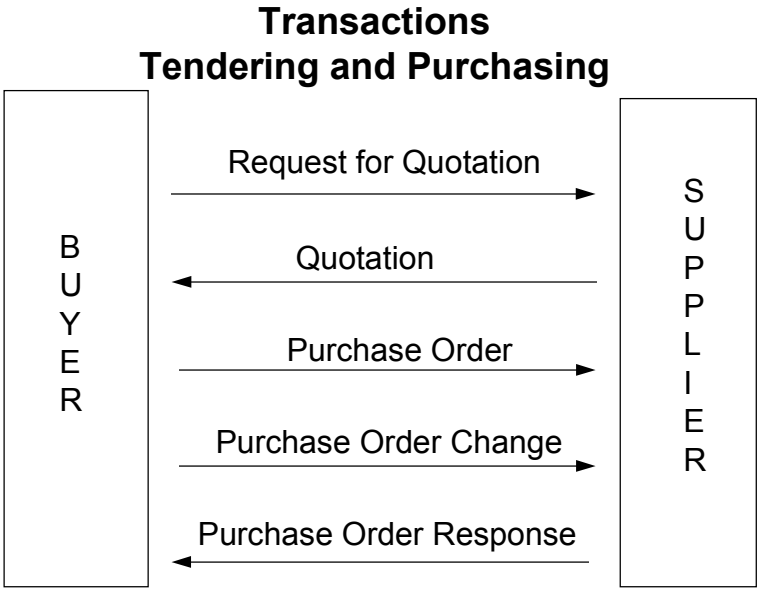
Most of the effort expended in exchanging the Party Information and Price/Sales Catalogue messages will be in establishing the correct EAN codes for locations and products and in creating procedures to maintain the databases up-to-date. By maintaining a current, accurate database the subsequent ordering process will be more efficient and error-free. Advanced notification of supplier pricing information allows the customer to match supplier prices against corporate prices, with any discrepancies solved before an order is raised as opposed to after the receipt of the invoice.

4.1.1.4 Product Data.

The Product Data message is similar message to the Price/Sales Catalogue message in that it is

used to exchange product related information between trading partners. The fundamental difference between the messages is that the Product Data message is used to provide technical and functional data related to products, e.g. the technical specifications of an electrical product, the ingredients of a cake, etc, and does not include any commercial terms and conditions. Data exchanged in the Product Data message normally does not change very frequently.

4.1.2 Transactions - Tendering and Purchasing



4.1.2.1 Request for Quotation

The Request for Quotation message is transmitted by a buyer to its (potential) supplier requesting a quotation for the supply of goods or services. The request for quotation may be used to solicit the supplier's payment terms and conditions, and also, to specify the required quantities, dates and locations of delivery. The message will refer to the location and product codes exchanged previously in the Party Information and Price/Sales Catalogue Messages.

4.1.2.2 Quotation

The Quotation message is transmitted by the supplier to it's (potential) buyer in response to a previously received request for quotation for the supply of goods or services. The quotation should provide details on all aspects previously requested by his customer. The information sent in a quotation may directly lead to a Purchase Order being placed by the customer.

4.1.2.3 Purchase Order

The Purchase Order message is transmitted by the customer to his supplier to order goods or services and to specify the relevant quantities, dates and locations of delivery. The message will refer to the location and product codes exchanged previously in the Party Information and Price/Sales Catalogue Messages. It is intended to be used for the day to day ordering transaction with a general rule to place one Purchase Order per delivery per location. However it is possible to request deliveries in several locations and at different dates.

Purchase Orders constitute the primary point of business interface between two organisations. They are usually the first point of EDI implementation and the document therefore assumes and importance beyond normal consideration. Many companies base their selection of EDI software, hardware and communications network on this document. It is important to recognise this fact and insure that decisions made surrounding this implementation are made with a much broader scope than normal implementation of the purchase order would imply.

Many organisations which have order processing decentralised in several locations will have to decide whether to keep processing order information at each location or whether to centralise this function in one location. An EDI agreement should be executed with each trading partner on the terms and conditions that govern EDI purchase orders. With this in place, redundant verbiage may be removed from the EDI purchase order, thus reducing transaction data volume and time.

In order to fully integrate EDI purchase orders with the order processing system, the buyer will have to fully automate all of the current manual functions performed by order entry staff such as credit checking, account type classification and buyer sortation. The supplier will also have to be able to cope with multiple variations of EDI purchase orders which will meet the different requirements of its buyers. Many suppliers will have used copies of paper orders to trigger other processes within the organisation, with EDI other methods will have to be devised to satisfy these requirements. Sufficient care should also be taken to archive purchase order data files as required by law and for audit purposes.

4.1.2.4 Purchase Order Response

The Purchase Order Response is sent by the supplier to his customer in relation to one or more goods items or services to acknowledge the receipt of the Purchase Order, to confirm its acceptance, to propose any amendments, or to notify non-acceptance of all or part of the Purchase Order. The Purchase Order Response may also be used to respond to a Purchase Order Change Request Message. A buyer's Purchase Order may be responded by one or more response messages according to business practice.

As part of the procedural considerations when planning implementation of this message, it will be necessary to decide how and when the supplier's Purchase Order Response is considered "accepted" by the buyer.

4.1.2.5 Purchase Order Change Request

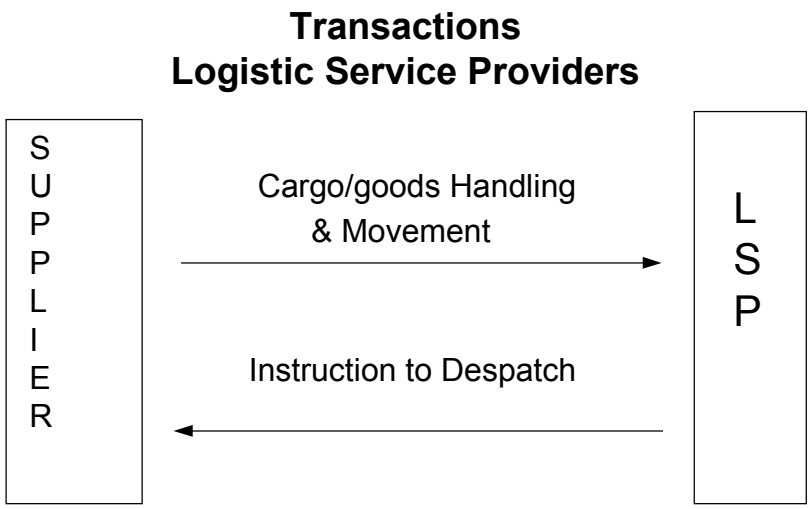
The Purchase Order Change Request is sent by the customer to the supplier to specify the details concerning modifications to a previously sent Purchase Order. The customer may request to change or cancel one or more goods items or services.

Timing is a critical issue for purchase order changes, especially in just-in-time or quick response environments or generally for products with very short lead times. A security mechanism should be in place to prohibit changes past a certain cut-off time. Applications will also have to be tailored as to the type of change desired. While line item changes are generally accepted, certain changes such as, buying location, ship to location and other related information might require the original order to be cancelled and a new one generated.

The exact information flow with regard to the Purchase Order, the Purchase Order Response and the Purchase Order Change Request messages can vary. The procedures to be followed by

the trading partners should be specified in the Interchange Agreement.

4.1.3 Transactions - Logistic Service Provider



4.1.3.1 Cargo/Goods Handling and Movement

The Cargo/Goods Handling and Movement message is sent by a party (e.g. buyer or supplier) to a warehouse, distribution centre, or logistics service provider identifying handling services on products held but not owned by the message recipient and where required the movement of specified goods, limited to warehouses within the jurisdiction of the distribution centre or logistics service provider.

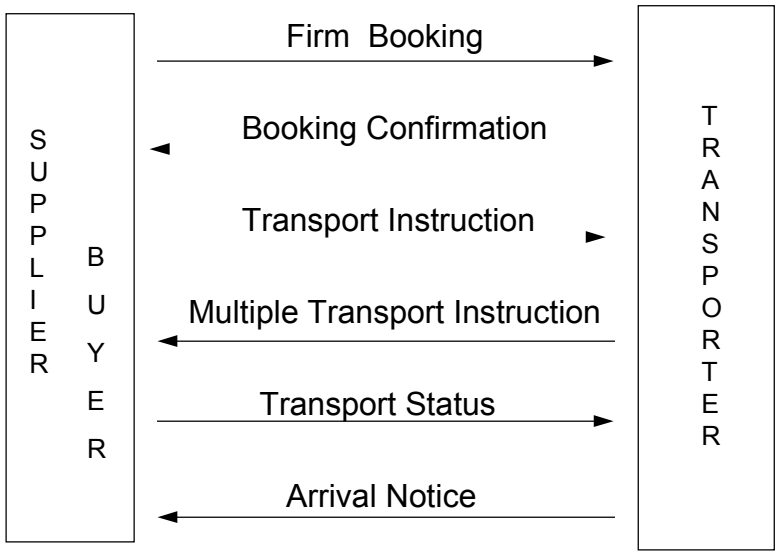
This message addresses the indirect flow of goods between supplier and buyer through a warehouse, distribution centre or logistics service provider and caters for the following functions; the preparation of goods for shipment, the picking of goods according to instructions, the packing or unpacking of goods, the marking and labelling on the packages of goods, and instructions regarding the movement of goods between warehouses.

4.1.3.2 Instruction to Despatch

The **Instruction to Despatch** message is a message from a party (e.g. buyer or supplier) to another party (e.g. Logistic Service Provider) who has control over ordered goods, providing instructions to despatch or collect a consignment according to conditions specified in the message. The message may be used to identify the delivery location(s), identify the date(s) on which delivery should take place, indicate that the despatch is subject to cash on delivery, etc.

Because the third party service provider is outside the normal buyer to supplier order process, the Instruction to Despatch message may be used by the supplier or buyer to inform the third party service provider of information stated in the purchase order which is required for the effective despatch of the goods, e.g. terms of delivery, transport equipment required for the delivery; to enable the logistic service provider to produce a despatch advice on behalf of the buyer or supplier.

4.1.4 Transactions - Transport



4.1.4.1 Firm Booking

The Firm Booking message is a message from a party booking forwarding and/or transport services for a consignment to the party providing those services containing conditions under which the sender of the messages requires the services to take place. A firm booking message is a commitment from the consignor to the carrier or forwarder to avail of certain services and is used for planning or operational purposes by the carrier or forwarder.

4.1.4.2 Booking Confirmation

The Booking Confirmation message is sent from a carrier or forwarder, to the consignor booking services, providing confirmation of a booking for a specified consignment. A confirmation may indicate that the booking of a consignment is accepted, pending, conditionally accepted or rejected. The message can be used whenever a confirmation of the booking of a consignment is deemed necessary as an answer to a firm booking message for a specific consignment.

4.1.4.3 Transport Instruction

The Transport Instruction is sent by a customer to his supplier of transport services (who may or may not be the supplier of the goods) requesting the transportation of a single consignment of goods to a specified delivery point or points. The instruction may be for one or several goods items which may be specially packaged for transport purposes. Identification of transport packaging may be achieved through the use of EAN Serial Shipping Container Codes (SSCC).

4.1.4.4 Forwarding and Consolidation Summary

The Forwarding and Consolidation Summary message is a message from the party issuing either an instruction or a booking regarding forwarding/transport services for multiple consignments (the equivalent of multiple Transport Instruction messages) under conditions agreed, to the party arranging the forwarding and/or transport services.

The message results in a transport contract for multiple consignments and is primarily meant for administrative purposes. It will be the message from shipper to carrier or forwarder containing the final details of the consignments for which services are provided.

4.1.4.5 Transport Status

The Transport Status message allows for the exchange of information regarding the status of the physical movement of consignments or goods at any point (in time or place) within the full transport chain. The message may be sent as the result of a request or requests for information regarding a consignment or consignments, on a scheduled basis at predetermined times, on the occurrence of a selected event or events, or on the occurrence of an exceptional event as agreed by the partners involved.

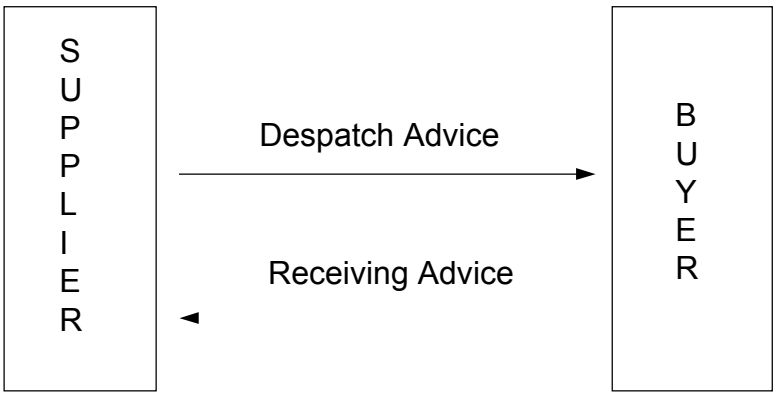
4.1.4.6 Arrival Notice

The Arrival Notice message is sent the party providing forwarding and/or transport services, to the party such as has been indicated in the contract (e.g. the consignor), giving notice and details of the arrival of a consignment. The message may also be used to provide proof of delivery information. One arrival notice message should always equal one consignment.

4.1.5

Transactions - Despatch And Receipt

Despatch And Receipt



4.1.5.1 Despatch Advice

The Despatch Advice is a message specifying details for the goods despatched under conditions agreed between the buyer and the seller with the function of advising the consignee of the detailed contents of a consignment. The message relates to a single despatch point and a single or multiple destination points and it may cover a number of different items, packages or orders. The message allows the consignee to know what materials were despatched and when, allowing the consignee to prepare the reception of the goods and to cross-check the delivery with the order. The Despatch Advice ensures accuracy of communication between product shipped and product received, reduces the off-loading time at the receiving dock and reduces check-in time from receipt to selling floor.

The Despatch Advice information is useful in merchandise tracking, delivery appointment scheduling and provides automatic container identification at point of receipt using bar codes. At point of receipt, merchandise can be checked in at multiple levels. At the shipment level, the total number of containers can be verified against the Despatch Advice. Detail carton verification can take place since carton contents are transmitted along with the container identification. When the supplier ships to a distribution centre, the buyer can utilise the carton identification for cross-docking. This implies that bar code scanning equipment is in place to accomplish this task. In addition, the data provided within the Despatch Advice is used as verification of the carton label. This enables an automatic update of receiving systems as well as appropriate merchandise tracking and financial applications. Furthermore, checking of carton contents is possible on a random basis. This procedure can detect discrepancies at the distribution centre rather than at final delivery location.

The Despatch Advice combines order and shipment information into one message. Once executed, updated information can then be communicated to inbound carriers, internal receiving departments, inventory control and outbound carriers. The key to success of the Despatch Advice is advanced notification. In some cases where the buyer is in close proximity to the shipping point, this can constitute a challenge. If merchandise arrives without advanced notification the buyer may chose to return merchandise to the supplier or hold merchandise until receipt of the Despatch Advice, depending on the demand for the products in question. Such

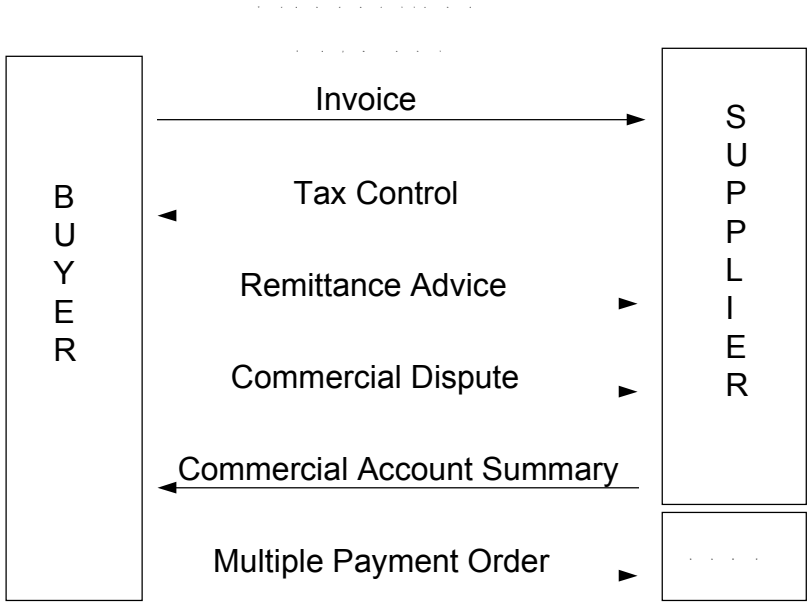
information as bill of lading, carton markings and contents, carrier identification, helps to speed the flow of goods through the pipeline. The Invoice completes the ordering cycle by matching the Purchase Order and shipment information and relating it to a request for payment.

4.1.5.2 Receiving Advice

The Receiving Advice message is sent by the customer or recipient of goods to the seller to communicate business needs related to the receipt of goods. The message relates to a single despatch point and a single receiving point and allows the customer to confirm receipt of goods, advise of any discrepancies between goods received and accepted and goods ordered or despatched when used in conjunction with the Despatch Advice. The Receiving Advice can provide information on lost, damaged or missing goods and provide instructions or suggested actions for the identified discrepancies. The supplier can use the Receiving Advice to correct internal invoices.

The buyer can use the Receiving Advice to inform the supplier of shipment discrepancies or anomalies such as damaged or stolen goods, and request correction of forthcoming invoices or the issue of a credit note. Inventory counts can also be corrected or updated if these functions are performed by the supplier or a third party on behalf of the buyer. The Receiving Advice may also be used for intra-organisational stock transfers between distribution centres or warehouses.

4.1.6 Transactions - Paymen



4.1.6.1 Invoice

The Invoice message is sent by the supplier to the customer claiming payment for goods or

services supplied under conditions agreed by the seller and the buyer. This same message with correct data qualification also covers the functions of pro-forma invoice, debit and credit note. The seller may invoice for one or more transactions referring to goods and services related to one or more order, delivery instruction, call off etcetera. The invoice may contain references to payment terms, transport details and additional information for customs or statistical purposes in the case of cross border transactions.

The invoice document allows a buyer to record payment information and automatically update applicable financial systems. The Invoice enables automated cross-referencing of purchase orders with receiving data. Once the Invoice has been verified, the information may be reformatted into a Remittance Advice informing the supplier of the payment to be made.

The Invoice can provide significant savings in the financial area. Each Invoice should be subject to rigorous control duplicating the checks and balances normally performed manually. The existence of a valid Purchase Order and receiving documents should be verified. The data contained within the invoice; terms, shipment date and other related information should be verified against existing trading partner profiles. Any discrepancies discovered in the shipments should be applied to the invoice as deductions, or should cause a "hold" to be placed on payment. The system should provide a discrepancy analysis detailing the results of the invoice control. Personnel can then utilise this analysis and assume the function of rectifying supplier errors so that timely payment can be remitted. Once an invoice is approved and paid, it should be archived for the time specified by law.

Electronic Invoicing is an extract process. The assumption is that the process for automatically generating Invoices on paper is in fact an automated procedure. This being the case, the implementation of an EDI invoice becomes a matter of comparing what your current system produces versus what is required by the buyer. Once the differences have been identified, this information becomes the basis for designing an invoice bridge system. The invoice bridge should be designed taking into the account the requirements of multiple buyers, in order not to have to design a series of buyer specific interfaces. EDI Invoices might require information that previously was not required and this may lead to the extraction of information from other files. Corrections of invoices as a result of shipping discrepancies detailed in a Receiving Advice or manually should be possible. However, trading partners should agree and specify in an interchange agreement what sort of changes are allowed and who is allowed to make such changes. It should be noted that the current invoicing system will have to be able to be aware of those buyers requiring an EDI invoice and those that require a paper invoice.

4.1.6.2 Tax Control.

The Tax Control message may be sent by the supplier to the customer summarising the tax related information for an invoice or batch of invoices. Generally it accompanies the actual invoice or batch of invoices. The message may also be sent by either party to third parties, auditors, tax authorities in summary form to detail the tax information over a period of time.

4.1.6.3 Remittance Advice

The Remittance Advice is a communication between buyer and seller which provides a detailed accounting information relative to a payment, or other form of financial settlement, on a specified date for the provision of goods and/or services as detailed in the advice. The message may be initiated by either the buyer or seller. The Remittance Advice is a notice of payment to be made, both national and international, covering one or more transactions. Each Remittance Advice is

calculated in only one currency and relates to only one settlement date. References to payment orders may be included.

In-house systems in many buyer organisations can readily access the information regarding the application of funds. This information is generally under the supervision of the Accounts Payable department and is referenced frequently as suppliers inquire about the allocation of funds remitted. Account adjusters perform the task of certifying invoices for payment and handling questions from their account base. If all this information is handled by a financial system it can be formatted into a Remittance Advice reducing the manpower required to perform day-to-day fact finding functions that are related to remittances. Implementation of the Remittance Advice will require the supplier to initiate necessary controls and reporting structures into the Accounts Receivable reconciliation process.

4.1.6.4 Commercial Account Summary

The Commercial Account Summary message enables the transmission of commercial data concerning payments made and outstanding items on an account over a period of time. The message may be exchanged by trading partners or may be sent by parties to their authorised agents (e.g. accountants).

4.1.6.5 Commercial Dispute

The Commercial Dispute message is a notice of commercial dispute against one or more INVOIC messages (e.g. commercial invoice, credit note, etc.) which is usually raised by the buyer to notify the supplier that something was found to be wrong with an invoice which detailed goods delivered or the services rendered (incorrect price, incorrect product identification, no proof of delivery, etc.).

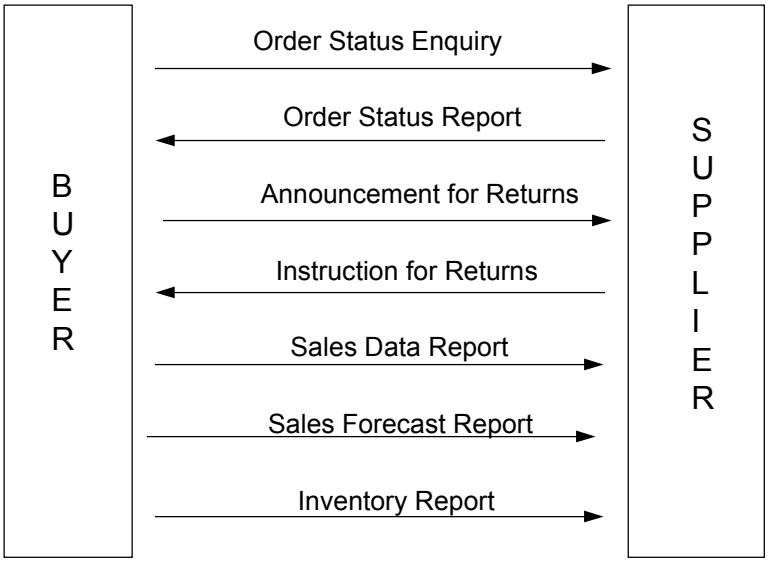
The buyer may use the message to supply the following information; non-acceptance of an Invoice message containing errors, with a mandatory indication of error(s) providing the reason for non-acceptance and an indication of the corrections to be made, or, acceptance of an Invoice message containing errors and, if necessary, an indication of error(s) and an indication of the corrections to be made.

4.1.6.6 Multiple Payment Order

A Multiple Payment Order is sent by the Ordering Customer (normally the Buyer in EANCOM®) to its bank, to instruct the bank to debit one or more accounts it services for the Ordering Customer, and to arrange for the payment of specified amounts to several Beneficiaries (normally the Supplier in EANCOM®) in settlement of the referenced business transaction(s). The Multiple Payment Order may cover the financial settlement of one or more commercial trade transactions such as invoices, credit notes, debit notes etc.

4.1.7 Report and Planning

Report and Planning



4.1.7.1 Order Status Enquiry

The Order Status Enquiry message may be sent from a buyer to a supplier to request information on the current status of a previously sent order(s). The message may be used to request status information for a previously transmitted Purchase Order message, Cargo/Goods Handling and Movement message, or Instruction to Despatch message.

4.1.7.2 Order Status Report

The Order Status Report message may be used by a supplier to report the status of an order. This message may be sent as a reply to an Order Status Enquiry sent by a buyer or buyer's agent or a report sent at regular intervals as agreed by the parties. The message may be used to report status information for a previously transmitted Purchase Order message, Cargo/Goods Handling and Movement message, or Instruction to Despatch message.

4.1.7.3 Announcement for Returns

The Announcement for Returns message is used by a party to announce to another party details of goods for return due to specified reasons (e.g. returns for repair, returns because of damage, etc.). The message may be used by the message sender to request credit for goods, or the replacement of goods from the message recipient due to a problem being discovered (e.g. goods received in bad condition, goods received but not ordered, goods which have exceeded their expiry date without being sold, etc) with the goods after the delivery process has been completed (i.e. the goods have been received and checked at case level and a Receipt Advice has been issued)

4.1.7.4 Instructions for Returns

The Instructions for Returns message is the means by which a party informs another party whether and how goods shall be returned. The sender of an instruction for returns message will

normally have previously been informed by the recipient of the intention to return goods by means of the Announcement for Returns message.

The Instruction for Returns message may be used to inform a party if the sender refuses, or does not require, return of the goods. Where the message sender does not require the return of goods the message may indicate what action the message recipient should carry out (e.g. disposal, destroy). Where the message sender refuses the return of goods the reason for the refusal may be provided.

4.1.7.5 Inventory Report

The Inventory Report message enables customer and supplier to exchange information related to held and planned or targeted inventories. The Inventory Report can cover one or multiple locations and allows to differentiate classes of inventory and to provide financial valuation. Information on held products can be provided including: opening stock, actual stock, damaged or quality control held stock, in-transit stock and goods movement (receipts and withdrawals) of held inventories over a period of time. Information on planned or targeted inventories can also be provided including: model or target stock, minimum and maximum stock levels and reordering points.

Organisations may realise significant benefits from enhanced inventory management systems. The message provides the opportunity for a buyer to minimise its inventory carrying costs and to pass information along to the supplier which enables the supplier to plan for future production and manufacturing levels. The inventory management system should be sophisticated in order to monitor not only specific inventory levels in specific locations, but also product movement between these locations and suppliers. A mechanism will be required to relay all inventory information to a central location or directly to the supplier.

The Inventory Report can be used in combination with the Sales Data Report to support supplier driven replenishment systems (see below). The message may also provide the capability for the supplier to notify the buyer of certain inventory positions that may prove advantageous to both parties such as overstocks and close-outs.

4.1.7.6 Sales Data Report

The Sales Data Report message sent from a seller to its supplier, headquarters, distribution centre or third party such as a marketing institute enables the transmission of sales data in a way that the recipient can process automatically. The message transmitting sales data by location in terms of product(s) identification, quantity sold, price, and promotions applicable can be used for production planning or statistical purposes. It should not be used to replace business transactions such as orders or delivery schedules.

The message can be used in conjunction with the Inventory Report to support supplier driven replenishment systems. In supplier driven replenishment, sales and inventory position are used by the supplier to calculate a replenishment quantity and products are shipped back to the buyer based on this replenishment. Buyers can report end sales to be replenished or can report movement from distribution centres to their final sales locations, expecting the supplier to replenish their distribution centres. The supplier can use a proposal order to inform the buyer of proposed replenishment levels which the buyer can confirm with a Purchase Order or change via a Purchase Order Change Request.

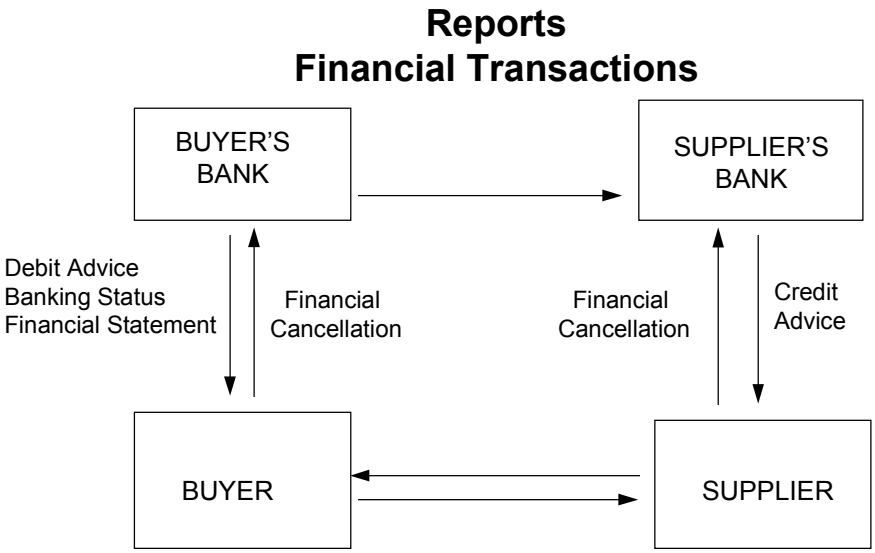
4.1.7.7 Sales Forecast Report

The Sales Forecast Report message sent from a seller to its supplier, headquarters, distribution centre or third party enables the transmission of sales forecast data in a way that enables the recipient to process it automatically. The message transmitting sales forecast data by location in terms of product identification, forecasted quantities and promotions applicable can be used for production planning purposes. It should not be used to replace business transactions such as orders or delivery schedules.

The Sales Forecast can be used by the buyer to provide forecasts of expected demand to the supplier either for informational purposes or as an actual request for products. The buyer can thus be safeguarded against possible supplier out-of-stock positions provided the information is made available in a timely fashion. This message can be extremely advantageous when the buyer is maintaining its own product model stock inventories. If the forecast is perceived as a future commitment to purchase, the supplier can be reasonably confident that a purchase order will be executed to reflect quantities in line with the forecast. This will enable the supplier to communicate its manufacturing needs and allow its suppliers to maintain a constant flow of goods. The "firmness" of the forecast can range from being a simple forecast, through authorization to commit resources, to an order release mechanism specified by the buyer, that would cause product to be shipped by the supplier when scheduled.

The Sales Forecast is designed to communicate when products are needed not when they will be sold. The use of the message requires a specific level of sophistication required by both the buyer and supplier. The buyer must have a fairly automated method of controlling and anticipating future stocking levels. Issues of concern include the level of detail, frequency and length of forecast increments. Some organisations are forecasting six months to a year in advance of anticipated needs. Developing and implementing an automated forecasting system may be costly. The supplier has to have the ability to process and apply the forecasted data to the appropriate applications such as Manufacturing, Production and Control, Ship Floor, Customer Service and Accounting.

4.1.8 Reports - Financial Transactions



4.1.8.1 Multiple Debit Advice

The Multiple Debit Advice message is sent by a Bank to its customer (normally the Buyer in EANCOM®) to report amounts which have been (or will be) debited from the customer's account in settlement of a referenced business transaction(s). A Multiple Debit Advice message may cover the financial settlement of one or more commercial trade transactions, such as invoices, credit notes, debit notes, etc.

4.1.8.2 Multiple Credit Advice

The Multiple Credit Advice message is sent by a Bank to its customer (normally the Supplier in EANCOM®) to report amounts which have been (or will be) credited to the customer's account in settlement of a referenced business transaction(s). A Multiple Credit Advice message may cover the financial settlement of one or more commercial trade transactions, such as invoices, credit notes, debit notes, etc.

4.1.8.3 Banking Status

The Banking Status message is sent by a bank to its customer (usually the Buyer in EANCOM®) providing status information on previously sent financial message. The Banking Status message may cover the response given to any previously sent message, such as a commercial or payment instruction, a request for information, etc. This message provides a means to report on errors and inconsistencies found in the original message at application level. It is not intended to report on syntactical errors or to provide a non-repudiation response.

4.1.8.4 Financial Cancellation

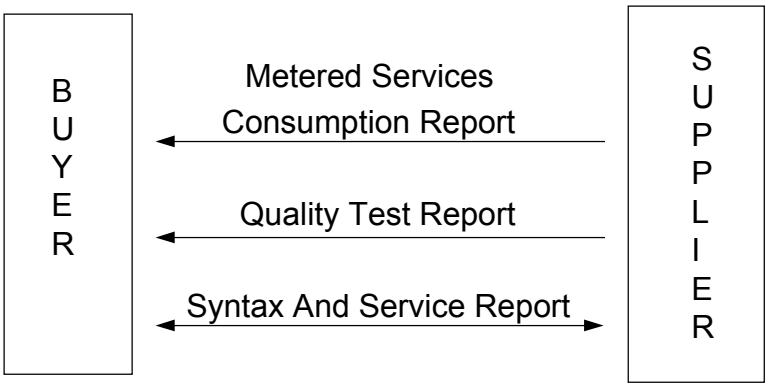
A Financial Cancellation message is sent by the Ordering Customer (usually the Buyer in EANCOM®) to the Ordered Bank to request cancellation of a previously sent financial message(s), or one or many orders contained within a previously sent financial message(s). A Financial Cancellation message must always be responded to by a Banking Status message.

4.1.8.5 Financial Statement

The Financial Statement message is sent by a financial institution to provide for a customer a statement of booked items confirming entries on the customer's account.

4.1.9 Other Reports

Other Reports



4.1.9.1 Metered Services Consumption Report

A Metered Services Consumption Report is a communication between trading parties, or their agents, providing consumption and where required associated technical information at a location(s) for a product(s) or service(s) where the supply is recorded using a meter(s). The Metered Services Consumption Report may be used to provide consumption information which may directly relate to other business functions, e.g. invoicing or process control.

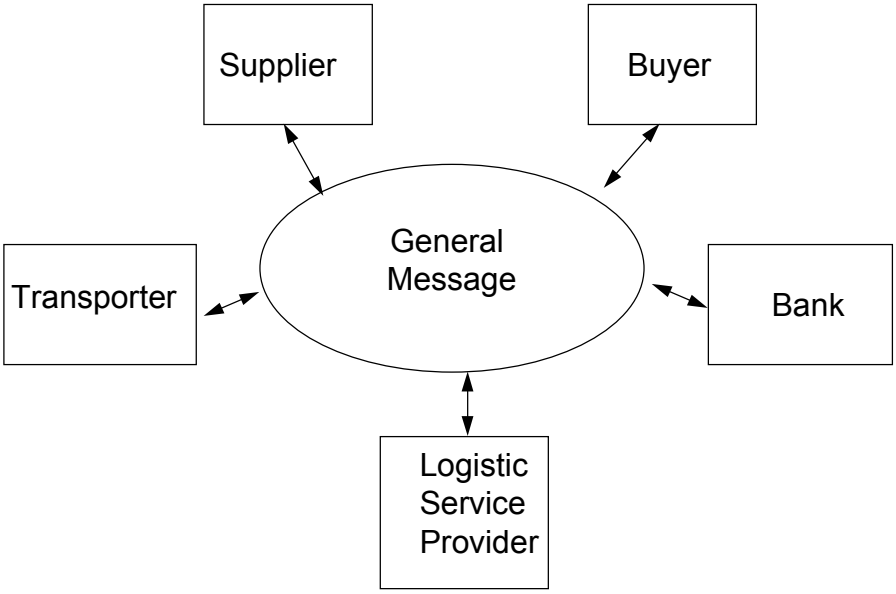
4.1.9.2 Quality Test Report

A message to enable the transmission of the results of tests performed to satisfy a specified product requirement. The content includes, but is not limited to, test data and measurements, statistical information, and the testing methods employed.

4.1.9.3 Syntax and Service Report Message.

The Syntax and Service Report Message is used by the receiver of an EDIFACT message to acknowledge receipt of and/or detail any errors contained in an interchange. This message is used to report on the syntax level of a message and is not used to report on the business data contained. The Syntax and Service Report may be provided by a third party, i.e. a value added network, operating on behalf of the trading parties.

4.1.10 General Message



The General Message may be used to send required data for which there is no specific standard message. It was designed primarily to facilitate early transmission testing between new EDI partners or to transmit text (preferably structured or coded) to supplement or further clarify previously transmitted EDI standard messages. Use of the General message for free format messages is not encouraged, nor is it meant to serve as a replacement for third party e-mail services currently available.

5.

Implementing an EDI Project

EDI is a complex business methodology, which can be used in various ways to meet different objectives or requirements, each with varying impact throughout an organisation. As such, an EDI strategic plan is absolutely necessary to determine whether EDI makes good business sense and, if so, to develop an efficient and organised EDI implementation.

5.1 Feasibility Study

As a preliminary phase, the person or project team designated to look into EDI will have to consider the potential direction and impacts of EDI. Which suppliers, customers and competitors are practising EDI, why and how are they doing it. What are the likely impacts with suppliers and customers of doing EDI or ignoring EDI. What are other companies in the industry doing?

5.2 Upper Management Commitment

EDI commitment from upper management in the very initial phases is critical for the success of the project. Upper management commitment is needed not only to liberate the labour and financial resources for the initial evaluation phase but also to obtain active support and collaboration from the different functional managers and department staff for the work carried out by the EDI project team.

The initial task of the project team will thus be to ensure that top management has a basic understanding of the principles and benefits of EDI. To accomplish this, it is important for the project team to understand the level of upper management commitment to the EDI project. If upper management support for EDI is simply a reaction to pressure from important customer's, then EDI will likely be considered as just another cost, and the investment and benefits of EDI will be minimal. If upper management is instead searching to improve customer service and satisfaction, improve the supply chain, cut internal costs or increase market share, then commitment is likely to be high, as well as possible investments and EDI benefits.

Because of the impact EDI can have on the information flows within an organisation, traditional job functions, responsibilities and the decision making process, it is not unusual for personnel outside the project to feel threatened or be reluctant to co-operate. A good EDI internal education and communication program informing the affected personnel what EDI is and is not and what its objectives and effects will be, will go a long way to easing the work of the project team in the future.

5.3 Operational Evaluation

5.3.1 Current Internal Process Analysis and Review

The central element of the EDI strategic plan will be an operational evaluation of the organisation's current business procedures. The operational evaluation should detail the way the organisation's internal departments are processing business, analysing information flows, processing procedures and the time required and costs involved. The functional manager of each department should be responsible for collecting this information, focusing on developing a sequential list of procedures and specific employee job tasks and time involved to process the document and paying special attention to productivity bottlenecks and time delays as a result of the current procedures. The functional managers will need to understand the organisational, investment and business strategy implications of EDI, focusing on commercial rather than

technical issues. To accomplish this they will require a good understanding of EDI, to be provided by the project team. The IT/DP Manager should also be involved in order to understand and evaluate the technical implications of EDI and to ensure that the EDI project does not conflict with the strategic direction of systems development within the organisation. The cost of doing business in a paper-based environment should be estimated (see Chapter 1, 1.4 The Cost and Benefits of EDI).

The operational evaluation will involve identifying what information/paper documents are the best EDI candidates. Prioritising documents will allow the project team to focus their EDI investigation time and energy where they are likely to produce the greatest benefits, accelerating the return on the EDI investment and ensuring initial success. When prioritising documents one should consider the monetary volume of business the document represents, the total quantity of documents processed (factoring the number of internal departments the document passes through), the importance of the document to customers or suppliers and to the business cycle and productivity in general. Purchase Orders or Invoices are traditionally the selected documents to start EDI.

5.3.2 Design and Development of EDI Process

Once this is completed, a model for processing the information in an EDI environment should be developed, paying particular attention at enhancing information flows and redesigning existing business procedures and estimating the costs involved. The EDI model should include an evaluation and appropriate modifications to paper-based procedures and job-tasks. It will also create new EDI procedures/job tasks and re-focus newly available employee work hours to more productive tasks. The potential for new or improved data that could be exchanged with potential trading partners should also be explored. The EDI model should analyse the computer and automated business systems needed by each department responsible for processing the respective EDI message.

The model should also provide an estimate of the EDI start-up costs. The costs will include computer hardware purchases and modifications, applications software modifications, application integration costs, EDI enabling software and communications software purchases, installation costs and EDI communication costs (e.g. VAN service and transmission costs).

5.3.2.1 Hardware Analysis

The cost of EDI in terms of computer hardware, should not be a major obstacle to the organisation. Of primary concern is the ability to match the system to current and future EDI activity. The costs will largely depend on whether the organisation is implementing EDI reactively (following an important customer's demand) or strategically. For reactive implementation, a dedicated front-end PC might be all that is required. For strategic implementations, a mid-range to mainframe computer front-ended by a PC configuration might be more appropriate, depending on the volume of data exchanged, types of applications and level of application integration expected.

Location of the computer system should also be considered. If the computer system is to be located in the department directly affected by the business transaction (e.g. purchasing), somebody in the department will have to be trained to handle all EDI communications. As other functional departments become involved with EDI, the PC might be transferred to data processing, near the host computer where the business applications reside. The information will then have to be networked out to the appropriate departments. As the volume of transactions

grows, and assuming that some level of application integration has been achieved, the processing speed of the PC passing data in and out the business applications can create a bottleneck.

Since integration is a key element in EDI, proper planning is essential to minimise the costs and disruption involved in transporting the EDI program from computer system to computer system as the number of EDI trading partners and communications increases.

5.3.2.2 Software Analysis

The software analysis will include the purchase of an EDI enabling software package which best fits the short and long-term goals of the organisations EDI implementation as well as the software costs related to internal business management systems (see Chapter 6).

The software analysis and costs linked to internal business systems will include any application modifications which are required to receive or generate the relevant EDI messages, the time required to map internal data to message standards, the time to program, install and test the applications interface and the EDI enabling software.

While an organisation may be tempted to avoid purchasing software that could be considered overkill for the current EDI program, it must consider its long term expansion of the program. Dealing with a software vendor whose products allow upward migration to more sophisticated software would be advisable.

5.3.3 Identifying Trading Partners

Though internal consideration will be the focus of the operational evaluation and the design of the EDI process, external factors such as trading partner interest for EDI will also be essential. It should be determined which documents trading partners investigating or having implemented EDI are most likely to want to exchange. Trading partners who have not considered EDI and EDI-ready customers of non-EDI competitors should also be targeted.

5.4 EDI Strategic Plan and Pilot Test

Once the operational evaluation has been completed, and associated benefits, costs and savings projected, the project team is in a position to prepare an EDI strategic plan. The EDI strategic plan should be presented to upper management for approval and incorporation to the overall business plan. The strategic plan should document in detail a three to five year EDI implementation strategy, including costs and savings projections. The strategic plan should outline which messages will be implemented with which trading partners and in what sequence. A timetable for each stage of the initial implementation and a schedule for future EDI message implementations should be included. Aggressive expansion of the EDI program is the main thrust of the EDI strategic plan.

Once the strategic plan has been approved by upper management, the project team can begin on the initial implementation or pilot test. The first implementation should focus on a business-specific transaction such as purchase orders or invoices. Ease of implementation and expected benefits should dictate the choice of the first implementation to ensure its success. Bearing in mind that application integration not only provides the EDI benefits but also is one of the more difficult, costly and time-consuming tasks, the IT/DP manager should provide recommendations on the best (cheapest and quickest) area to trial EDI from the software point of view.

Choosing a trading partner for the initial pilot is an important decision. Ideally the best choice would be a trading partner with whom you have a good trading relationship and which has already implemented an EDI system, preferably involving the exchange of the same message type. The trading partners should both have the commitment to make the EDI trial a success. A list of success parameters should be drawn by the partners, as well as the scope of the trial and the project implementation timetable.

The trial should cover tests on the sending and receiving processes both for low and high data volumes, character representations, invalid and exceptional data conditions, communications or network errors and recoveries. Normal paper-based processing will run in parallel to the EDI implementation until both trading partners are confident that all components of the EDI system are working properly, at which time the paper-based document is discontinued.

During the initial implementation, it is important for the project team to document actual costs and savings, not only for future comparisons to the strategic plan but also to prove EDI's effectiveness with future prospective EDI trading partners.

5.4.1 Operational (Interchange) Agreement

An operational agreement should be drafted between both trading partners identifying the legal companies involved, indicating their agreement on establishing and starting an electronic exchange of data, and allocating the same legal status to electronic transactions as was previously done for transactions based on paper documents.

The agreement will mainly cover operational issues and will usually include the following:

- the basis of the agreement including a statement on the standards supported and used (e.g. EANCOM® as a subset of EDIFACT);
- specification(s) of the EDI message(s) based on the referenced standards and including any rules and restrictions on sent data based on internal systems requirements and limitations;
- technical and commercial aspects of the communications link
- identification of parties, including VAN mailboxes (test and live) address location numbers, as well as location numbers identifying the parties involved in the relevant transactions;
- use, access and filing of data sent and received, including the time period during which data should be stored;
- plan of the test period, activities and responsibilities
- a plan for daily operations effective following a successful testing period, including expected transaction flows, transmission schedules, error and emergency procedures, etc.
- the key participants in each Organization involved in EDI operations, including persons to contact in case of specific problems or queries;
- conditions applicable to the termination of the agreement.

5.5 EDI Program Roll-Out

Following success of the initial implementation, the project teams attention will have to focus on selling the EDI concept to other trading partners and on developing new EDI opportunities within the organisation. Attaining critical mass is exchanging business data via EDI with those trading partners that account for a majority of the organisations business. The often cited figures are implementing EDI with 20% of the organisations trading partners who account for 80% of the

business. A critical mass of EDI trading partners will maximise the return on the EDI investment.

A marketing plan and budget should be developed for the expansion of the EDI program. Initially, a trading partner survey may be helpful to measure the receptivity of trading partners to EDI. Formal meetings can be held with non-competing trading partners to discuss EDI, with tours of the facilities and presentations on the EDI project illustrating improvements in efficiency and productivity. Periodic reviews to ascertain the EDI-readiness status of trading partners should also be conducted.

Supportive media, such as EDI information packs, video presentations or internal newsletters can also be employed to spread the EDI message. Participating in relevant trade association committees and events and general EDI conference and seminars might also prove to be useful in establishing trading partner contacts. Departmental managers and other staff must also be able to discuss the benefits of EDI during their day-to-day business communications with trading partners. It is therefore important to maintain on-going internal EDI educational programs.

Depending on the trading relationship, more forceful methods might be used to convince or increase the speed of EDI implementation with slower moving trading partners, such as making EDI one of the conditions to be fulfilled in order to have a preferred-supplier status, demanding an additional processing fee for paper documents. However, it should not be forgotten that part of the concept of EDI is creating strategic partnerships between trading partners which will require a joint effort to achieve mutually defined benefits.

6.

EDI Enabling Software

This section will describe in more detail the options a user has when looking to acquire EDI enabling software, the types of software packages available and their primary functionalities. The chapter will also look at the problems and issues linked to application integration as well as the possible methods.

6.1 Options to Acquiring EDI Software

There are basically three approaches a user can take to acquiring EDI enabling software.

1. Write the software yourself. This approach will require sufficient in-house resources and will be time consuming and expensive. It is therefore only justifiable if the next two options would require too much customisation to meet the business application requirements in an economical way.

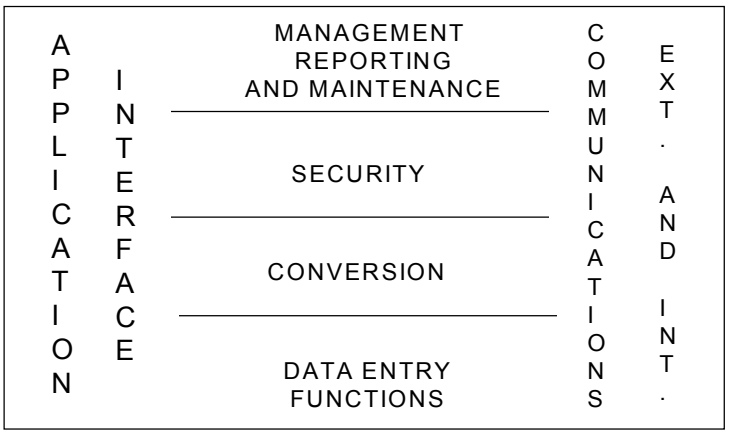
2. Purchase an off-the-shelf EDI enabling software package. This option has the advantage of acquiring a relatively low-cost, high performance specialised software package but has the disadvantage that it will leave the more complex task of integrating the outgoing and incoming EDI messages with the business applications up to the user, either through in-house resources or through a specialised EDI consultancy.

3. Purchase an off-the-shelf business application package which has an integrated EDI capability. Unfortunately, there are not yet very many packages of this type available on the market today. Application software suppliers claim that the interest in EDI modules has been low so far and believe that the cost of developing such modules would be too expensive, pricing their products out of the market, especially for smaller businesses, many of which are still unaware of EDI and its benefits.

6.2 Basic EDI Software Function

Software functionalities can be broken down into six different categories summarised in the figure below.

Software Functions



6.2.1 Conversion

The primary function of EDI enabling software is to convert Company A's data files structured according to internal formats to an EDI standard message, a process commonly referred to as construction of EDI messages, and to convert EDI messages into data files structured according

to Company B's own internal format, a process commonly known as EDI message translation.

The greater the flexibility offered by the converter on the internal file format, the more likely that modifications to the application will not be required. This is especially important as the sequence and relationship of records and fields in an in-house database will rarely correspond to the sequence of segments and data elements in an EDI message standard. As minimal changes to the existing applications will be preferable, it is best if the EDI software offers the maximum flexibility in this respect, so that the message standard becomes transparent to the application.

Converter functions can be further split into three categories: syntax conversion, semantic conversion and grouping and splitting.

6.2.1.1 Syntax Conversion

Internal format messages are constructed to a syntactically correct message standard according the standards syntax rules (control of service segments, segment tags, separator characters, character sets, repetitions and mandatory statuses).

It is important to consider the number of message standards to be supported by the software (e.g. EDIFACT/EANCOM®, ANSI X12, TRADACOMS, etc) and whether the package is delivered with the standard's message definitions and updated with new message versions. The package should be able to handle specific trading partner conversions and multiple versions for one message to suit the requirements of individual trading partners. This type of information will be held normally in tables and will be part of the trading partner profile.

The converter should also be able to automatically include default and standard data element values such as control counts, hash totals and reference numbers by means of tables and parameter files, a useful functionality as this type of data is usually not contained within the application database.

6.2.1.2 Semantic Conversion

Semantic conversion relates mainly to the representation and meaning of data to and from a standard message. EDI message standards use standard codes which will not correspond to the codes used in the in-house application. Code conversion is therefore an important semantic function.

This is especially true for qualifiers, code values which give a specific meaning to a generic data element in an EDI message standard. Part of the evolution in EDI message standards has been a move towards more and more generic standards, with EDIFACT as one of the most generic standards relying heavily on the use of qualifiers. The advantage of being generic is that it provides stability to the structure of segments and data elements (the building blocks of a message standard) as new functions can be introduced by new code values. As in-house applications do not use qualifiers, semantic conversion includes converting application data to the appropriate qualifier and vice-versa.

Semantic conversion will also include the conversion of units, lower-case capital conversion and the adjustment of length and precision of data elements (variable length fields common in EDI message standards to fixed length fields of an application).

6.2.1.3 Grouping and Splitting

This includes the grouping of out-going messages into one interchange per recipient for sending in one communication session and the splitting of incoming interchanges into message types which may be sent as one file to the relevant application for processing.

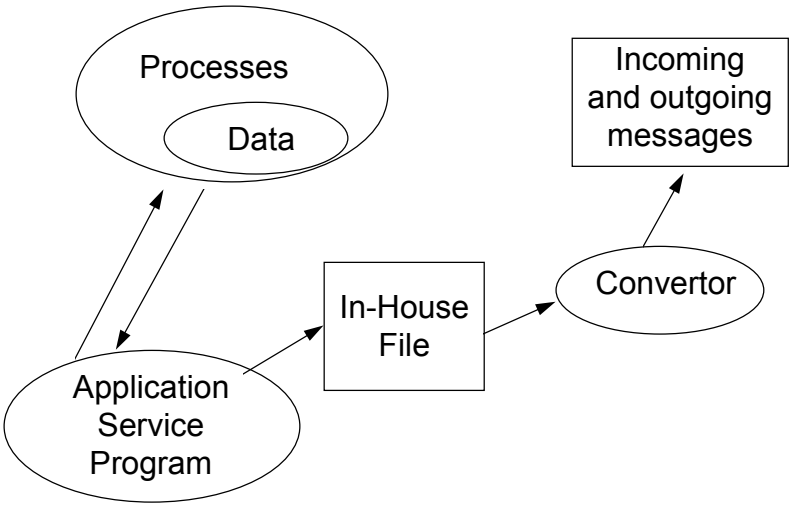
6.2.2 Application Integration

Integrating the data from a incoming message which has been converted by the EDI software into an in-house or flat file with a business application is one of the more difficult and time-consuming tasks. And yet, until full application integration has not been accomplished, EDI will not have been fully and successfully implemented and the benefits it was meant to produce will not materialise.

EDI software will not be able to directly handle the data contained within a business application. There are generally speaking three different approaches to application integration.

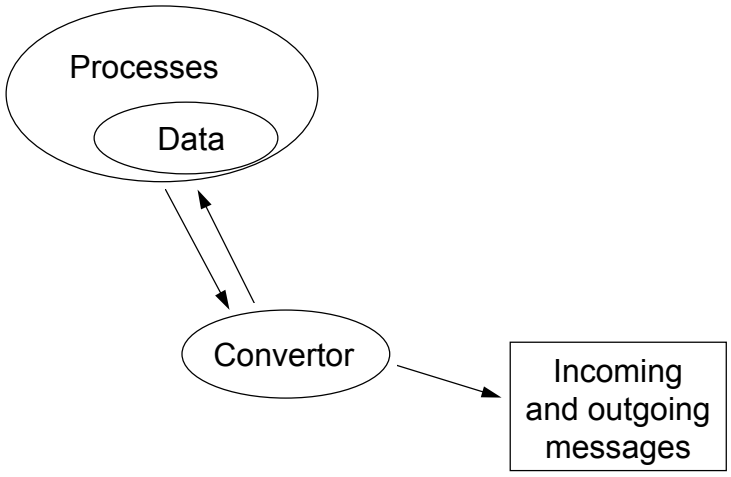
The first approach and probably most common approach is to submit the application data through an intermediary program, sometimes referred to as an application service program, which will prepare an in-house file or flat file which can be processed by the software converter. We have already mentioned that the more flexible the format of the in-house file, the less likely it will be necessary to disturb existing applications.

Application Service Program



The second more complex approach is to go through an Application Program Interface or API, available in some EDI software packages. Through an API, the application directly communicates with the EDI software through a standard interface. The principal difference between an application service program and an API is that the first is driven by the application data while the API is driven by application processes and is therefore more interactive.

Application Program Interface



The final approach is to key enter data manually through an input screen in the EDI software. Although this is no longer EDI as it involves human intervention and not a direct application-to-application exchange of data it may be a practical solution until full application integration is finalised or to provide data needed in the EDI transaction but which cannot be generated or is not contained within the business application. Some EDI software packages may contain data-entry modules for this function (see below).

6.2.2.1 Data Mapping

The problem of application integration with EDI is solved through data mapping. Data mapping is required to get data sent in the form of an EDI message standard into the database of a business application software. Although message standard implementation guidelines such as EANCOM® (reviewed in Chapters 3 and 4) have eased the problem of data mapping by specifying the type of data which might be sent and where in the message it should be sent, trading partners still have to know and agree on the data the customer is going to send and the data the supplier will need to receive. These type of agreements are usually formalised into what are known as interchange agreements. Many times the data contained in a customer's data base will not contain the data required in a supplier's database. As a result, trading partners will have to be willing to change their database definitions to satisfy their trading partners business requirements.

It is this aspect of EDI which helps to build trading partner relationships and enhances collaboration and co-operation in the business relationship. Companies need to discuss their business at the data level which leads to a much better understanding of their business processes and relationships and provides an opportunity to understand and resolve underlying problems. As a result, data mapping cannot be left solely to the technical people. It is a business problem that business functional managers who understand the business, supported by data-processing staff, must resolve. Organisations that involve functional management in the mapping process will be far more effective in using the business information to their advantage than those that delegate the responsibility solely to data-processing.

6.2.3 Management - Reporting and Maintenance

Is EDI involves business transactions and the objective is to have an unattended, automated

process, it is essential for the software to be able to control the message flow. The following functionalities should be included:

- Logging of files - an overview of the messages sent and received (including acknowledgements). The information should include the type of data and time sent or received, the employees and applications concerned, length and status of messages, etc.
- Audit trails - a complete trace of each separate message.
- Recovery files - contain the actual contents of the message and can be used to re-process messages in case of errors.
- Error reports - usually produced by the software indicating errors that occurred during the translation process.
- Status reports - reflecting the status of messages, i.e. message sent or received, translated, error status, etc.
- Purging and archiving - storing or deleting completely processed messages.

Maintenance of the EDI software is also of importance and the user should ensure proper maintenance of the translation tables for new messages or new message versions, etc. either through an editor, a module in the software itself or by the software vendor.

6.2.4 Communications - External and Internal

The software may include a communications module which provides an interface with the network or networks used to send messages. Most EDI users subscribe to the services of a Value Added Network (VAN). The EDI software should enable the connection to one or more VAN's, may support various different communication protocols used by the different trading partner's and also support direct point-to-point communications with specific trading partners. The various network and protocol communication options are covered in more detail in Chapter 7. The software will control the communications sessions, including modems and log-on's and log-off's from the network service.

For external communications, the network will automatically route interchanges via the appropriate network channel (e.g. appropriate VAN, direct link, etc.) to the receivers mailbox and will also retrieve awaiting messages from the organisation's own mailbox.

If the software is operating on the host computer where the applications which will process the message reside, then internal communications will not be a requirement. However if the EDI software is installed on a dedicated computer (e.g. a front-end PC) or if the relevant applications are spread out over several departments within an organisation then the routing of incoming messages to the appropriate application and vice versa for outgoing messages will also have to be controlled.

6.2.5 Data-Entry and Output Functions

Some software packages will also offer data-entry modules, presented above as an interim solution before fully automated application-to-application EDI can be accomplished. Data-entry will be usually driven by input screens whose format should be able to be defined by the user. Features which should be included in the data-entry module are the holding of standard and default values in tables, menu-driven code selection, print-out or fax possibilities for non-EDI trading partners, amongst others.

6.2.6 Security

Systems and communications security functions may also be included in the software package. The degree of security required (and cost) will vary depending on the nature of the business application. Security might range from the basic access control via a simple password to authentication of the parties involved in the business transaction, non-repudiation of messages received, encryption of data or digital signatures.

6.3 Types of EDI Software

EDI software can vary from simple converters and stand-alone dedicated PC packages to more complex mid-range or mainframe packages and EDI gateways. From the functional aspect, converters as the name suggests will usually only handle the conversion and management and reporting functions. More elaborate PC workstations will usually include in addition communications and data-entry modules and some application interface functionalities. In large organisations where data-processing has been decentralised into several semi-autonomous or independent business units, EDI gateways enable incoming and out-going messages to be routed to the appropriate applications through one central point in the organisation. The gateway will include sophisticated external and internal communications functions, multi-standards support and usually sophisticated API's. EDI gateways usually operate on mid-range or mainframe computers.

6.4 Selecting EDI Software

The choice of EDI software will first of all be limited by the hardware operating system (i.e. AS/400, IBM MVS, UNIX, MS DOS, etc.). Selecting the appropriate software package will require determining which of the software functions from the one's listed above and others are most important or needed, the volume and the speed at which data should be processed now and in the future, the commercial viability, support, service, maintenance and help-desk provided by the software vendor, the cost, to list but a few criteria.

7.

Communications Options

Along with message standards and EDI enabling software, there is the requirement to transmit the information contained in a message from sender to receiver. Communications within EDI covers the transmission of information which includes the physical transmission circuits and networks, the hardware and software components required to support the data communications functions, procedures for detecting and recovering from errors, standards for interfacing user equipment to the transmission network and a variety of rules or protocols ensuring the disciplined exchange of information.

EDI standards for data formats have been developed independently from the communications medium used for the actual transfer of information. Trading partners therefore have a variety of options to exchange information either through physical media such as tapes or diskettes or via a telecommunications link. Which option is used will depend on the specific requirements of the application and will be defined by factors such as the volume and speed at which the information needs to be exchanged, scheduling of communications sessions, costs, security, etc.

If physical media transfer is the preferred method for a given application, trading partners will still require media compatibility between systems and agreements on the methods and schedules of physical deliveries. Telecommunications being part of the EDI concept, this document will focus on the five basic options within this domain: point to point private leased lines, public telephone networks, public packet switching networks, the Internet, and value added networks or VAN's.

7.1 Point to Point Private Leased Lines

Of the five options this will be the one which requires the greatest implementation effort due to the need to establish for each individual link common speeds of synchronous or asynchronous transmissions, data encoding formats and communication protocols (e.g. Asynchronous, IBM 2780/3780, BSC 3270 or SNA SDLC, DECnet, UNISYS, etc). It will therefore probably be justified for very high volumes of data exchange between stable long-term communicating partners, e.g. intra-organisational communications.

7.2 Public Telephone Networks

Although the public telephone networks have the advantage of being widely available with no interconnection constraints, they were designed primarily for analogue voice communications and are not ideally suited for data communications. Although most telephone networks are slowly up-grading to full digital networks, the large amount of analogue equipment still limits the speed and volume of communications and is more prone to errors due to noise distortions on the communication lines.

Though telecommunications via the pubic telephone network will not require a dedicated link as with point to point telecommunications described above, common transmission speeds, types and protocols will still have to be agreed between trading partners. Both private leased lines or public telephone networks will usually require the use of a modem (or a network terminating unit in case of digital communication circuits) to convert the digital data from a computer to analogue form before transmission. The CCITT (International Telegraph and Telephone Consultative Committee) has established a series of recommendations for modems known as the V-series recommendations for the transmission of data over telephone circuits.

The introduction of ISDN (Integrated Services Digital Network's) will form the basis of the next

generation of public telephone networks offering full voice and data communications across high density, low distortion telecommunication lines. However, ISDN will not solve any of the communication protocol problems.

7.3 Public Packet Switched Networks - X.25

As a result of the ISO work on Open Systems Interconnection (OSI) and its publication in 1980 as a CCITT recommendation, X.25 has become the standard interface between a data communications terminal and most public packet switching networks. The international packet switched networks now provide coverage in most countries and since they are based on the X.25 recommendations, an international standard, most are interconnected. X.25 hardware and software interfaces are also readily available as standard products.

The services provided by an X.25 network interface are well-suited for carrying EDI traffic, as they have been specifically designed for data transmission. The interface offers a connection oriented service (use of virtual circuits) which is implemented over a packet switch network. X.25 users and applications request call connections with other users and applications, send and receive packets of data over the established connection and then disconnect. The X.25 packet level protocol maintains packet sequence into and out of the network interfaces, ensures integrity of the data packets and acknowledges the correct receipt of all packets.

Despite the advantages of X.25, X.25 does not address any functions concerned with the identification and movement of information, so there is still a requirement to implement a common file transfer protocol on top of the communications functionality provided by X.25. These can be proprietary such as the widely used ODETTE File Transfer Protocol or in conformance with the OSI reference model: FTAM (File Transfer, Access and Management) for point to point communications or X.400 for store and forward communications.

7.3.1 X.400

X.400 is the international standard for electronic messaging. Maintained by the CCITT (revised with additional functionalities every 2 - 4 years), X.400 was conceived in 1980 so that companies could exchange information using one standard protocol, thus eliminating the complexity of using proprietary gateways and conversion software to communicate. The X.400 series of recommendations specifies a Message Handling System (MHS), including all the functions and protocols necessary for electronic mail between users (people or application programs).

The services provided by X.400 involve the enveloping of messages (e.g. text, graphics, binary files, etc.) across one or more administrative or private domains (i.e. public or private X.400 networks), and the receipt of the message at the destinations. X.400 addressing is based on international organisation identifiers. As world-wide EDI directories become important, the associated X.500 directory service protocols will allow X.400 to provide world-wide company identification, location, network address lookups and resolution of address formats. Additional X.400 services include message delivery notification, replies and multi-recipient delivery. The store and forward, reliable messaging service provided by X.400 is well-suited to the communications requirements of EDI. X.400 provides a reliable, non-real time service with multiple levels of priority, X.400 users being able to specify the urgency and security of their messages. Most X.400 products use X.25 interfaces for communications.

X.400 offers many user benefits. Through X.400 message tracing, a sender knows the transmission status of the transaction through delivery notification, even if the recipient is on a

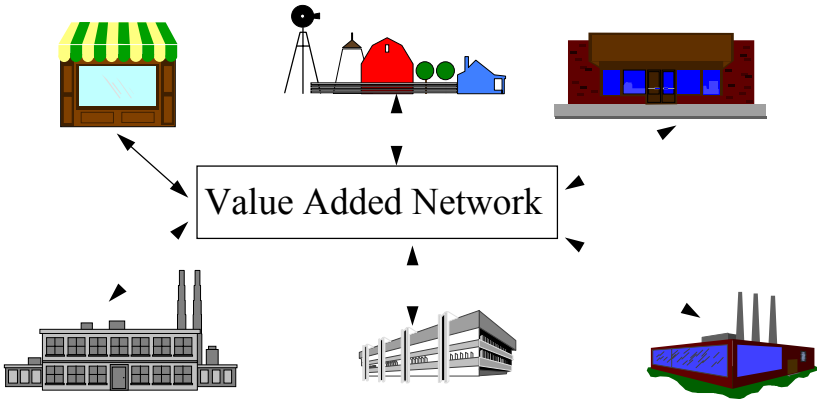
different X.400 network. At each point of the exchange, a positive delivery notification is sent back to the original sender, noting the time and date of the message delivery. Message tracing enhances the audit trail by providing the sender the ability to trace the path of a transaction. X.400 multi-recipient delivery enabling a single message to be sent to multiple trading partners is not only convenient but saves on transmission costs. X.400 also offers a more comprehensive level of data security through secondary logons and password sequences and through data encryption since the X.400 protocol supports binary data exchange, the traditional product of encryption. Binary data support also means that EDI data can be combined with CAD/CAM data, spreadsheets, etc. in the same interchange. Finally, as an international standard, X.400 provides global accessibility with most major VAN's supporting X.400 standards and supporting interconnections with other X.400 VAN's.

Unfortunately, X.400 was designed for electronic messaging (e.g. e-mail) but not specifically for EDI. EDI interchanges need to be "wrapped" in an X.400 digital envelope. Though this provides a solution, duplicate information such as trading partner information and VAN addresses are sent, adding significantly to the communication costs when sending high volumes of messages. To solve the problem, an EDI specific protocol based on the X.400 standards, known as X.435 (or PEDI) was designed. X.435 not only allows EDI interchanges to function as X.400 files but provides the ability to send supporting data such as CAD/CAM, graphics, etc.

Another X.400 drawback is that products supporting the different versions of X.400 (1984, 1988, 1990 and 1992) are slow to appear on the market (3 year time lag). Most of the products on the market support the X.400 1984 version with some products supporting the 1988 version. This means that users will have to wait some time before being able to benefit from all the functionalities that X.400 will offer EDI users in the future. Both X.400 (and FTAM) implementations will grow as software products supporting later versions of X.400 (including X.435) become more readily available.

7.4 Value Added Networks - VANs

Value Added Networks are by far the most popular option of the various options described above in terms of the number of EDI users which subscribe to these type of services. VANs provide a number of advantages compared to the other options described above. Each of the previous solutions (except X.400 networks) requires users not only to use the same communications protocols for every link but also to establish a communications sessions with the trading partner before actually exchanging information. This inevitably causes problems in terms of communications co-ordination and availability of trading partners. Although the other techniques might suffice initially or for specific trading partners, as the number of trading partners increases, different telecommunication protocols have to be catered for and scheduling problems become more acute. The services of a VAN become more appropriate as illustrated by the figure below.



VANs operate as a central clearing house for EDI interchanges between trading partners, offering a message store and retrieve service. Each trading partner is assigned a specific mailbox or network address in the VAN. When the sender of an EDI interchange is ready to send its messages, it simply sends the interchange to its mailbox address in the VAN without having to communicate directly with the recipient. The VAN in turn routes the message to the recipients mailbox on the basis of the EDI interchange recipient address information where it will be in turn collected by the message recipient when the latter is ready. Sender and receiver can send out-going interchanges and collect in-coming interchanges on a single communications session with the VAN.

The decoupling of the EDI interchanges from the communications process in not the only advantage offered by VANs. Connections to VANs can be achieved in a number of ways, from dial-up using the public telephone network to X.25 and with a number of communication protocols supported by the VAN. The VAN therefore also acts as a buffer between the user and the rest of its trading community, the user being able to communicate by whatever method and protocol is more suitable for its systems. VAN service providers also ease the implementation of EDI by providing consultancy and support services, help desks, EDI software and other value added services.

One of the disadvantages of communicating via a VAN, is that sender and recipient must both have a network subscription to be able to communicate, unless their different VAN services are interconnected. Since there has been a reluctance by certain VAN service providers to interconnect their services (a result of commercial rather than technical problems), a user might find that he needs to subscribe to various VANs to communicate with all his trading partners. Though, as a result of user pressure, VANs have started interconnecting, users might find the interconnection services to be below expectations in terms of cost, time delays, problem resolutions or interchange receipt acknowledgements.

7.5

Criteria for Selecting a VAN

When assessing the services proposed by various VAN service providers the following criteria amongst others, should be considered:

7.5.1 Service Availability

Users should be able to access the service as required to meet their business needs. The service should normally be available 24 hours a day, 365 days a year. Planned network outages should be limited to a maximum number of hours per month (e.g. 2 hours) and should occur at predetermined times, with sufficient advanced warning (e.g. 6 months).

7.5.2 Distribution

The service provider should ensure the end-to-end distribution of EDI messages, both nationally and internationally, between business partners in a timely manner. Messages should be distributed with appropriate levels of security and audit (see 4.6.4 and 4.6.5 below) and the same levels of security and audit should be guaranteed if other service provider networks are used in the communication. Distribution of messages from sender mailbox to recipient mailbox should occur in a timely fashion, for example within 5 minutes for batch EDI nationally and within 30 minutes for batch EDI internationally. The service should also provide high volume direct data links (e.g. > 9.6 kilobytes per second).

7.5.3 Access

The service provider should provide an 'open' service that supports access by a variety of user hardware and software systems, i.e. access using industry standard protocols (2780, 3780, SNA) and international standard protocols (X.25, X.400). The access network should not impose constraints on these standard protocols. The service provider should also be able to provide interconnection on the basis of standard protocols and with suitable levels of audit and security.

7.5.4 Securit

The service provider should ensure the integrity and privacy of the user data at all times. The provider should be able to demonstrate that the mailboxes are secure from unauthorised access and that procedures are in place to record and investigate attempts to obtain unauthorised access. Standard facilities should be in place enabling both the provider and the user to undertake message integrity checking. The service provider should also secure the user from unauthorised message exchange by trading partner, message type and message syntax. Users should also be able to operate on test mode without compromising the performance and security of the production service. Finally the service provider should be able to demonstrate that suitable personnel procedures are implemented to safeguard the integrity of the service.

7.5.5 Audit

The service provider should demonstrate that sufficient levels of audit are available to the users to "track" their data within the service. The service provider should be able to provide an audit trail for each interchange, available to the sender, which is time and date stamped for the receipt of interchanges to the senders mailbox, delivery to the receivers mailbox and extraction from the receivers mailbox. The service provider should also provide an audit trail for each interchange, available to the recipient, which is time and date stamped, including the details of the sender, the type and volume of data and its status, e.g. extracted or not extracted. The audit logs should include reasons for unsuccessful transmissions and a record of all incomplete interchanges. The

service should also prevent duplicate submissions or extractions.

7.5.6 Assurance of Security and Audit

The service provider should ensure that the service is audited on a regular basis by independent auditors (e.g. every two years).

7.5.7 Backup

The service provider should demonstrate that appropriate facilities exist to enable service provision in the event of service failure. Suitable backup facilities for hardware and network access, should be available at the normal processing site(s) enabling, in the event of failure, normal service to be restored within an agreed time scale. The service provider should also demonstrate that equipment is in place at a remote site to provide a complete backup facility within an agreed time scale.

7.5.8 Service Facilities

The service provider should offer a range of facilities to support user control and management of the service. Users should have the ability to submit or output EDI messages on magnetic media. Messages should be securely stored within the system until the recipient retrieves them. Selective retrieval of messages, e.g. by type of data, by sender, should be possible. The user should also be able to control the re-extraction and deletion of interchanges and should be provided with management reports which clearly state where a message is in the process. Comprehensive user documentation describing the user operation and responsibilities of both parties should also be furnished.

The service provider should also provide user support which include: published service level objectives and contractually binding service level agreements, a help desk manned and available at published times with published response times and a start up package which will include training courses for new users, consultancy services, service time for testing and published prices for additional services.

7.5.9 Commercial Policy

The service provider should be able to furnish commercial information to users enabling them to readily identify service charges. Typical user profiles showing start up and on going charges should be made available for prospective users. The user invoice should be clearly related to the pricing structure. The provider should publish a pricing structure which will have schemes allowing large, medium and small companies to use the service. The structure of tariffs should be compatible with the mean size of messages that will be or are handled.

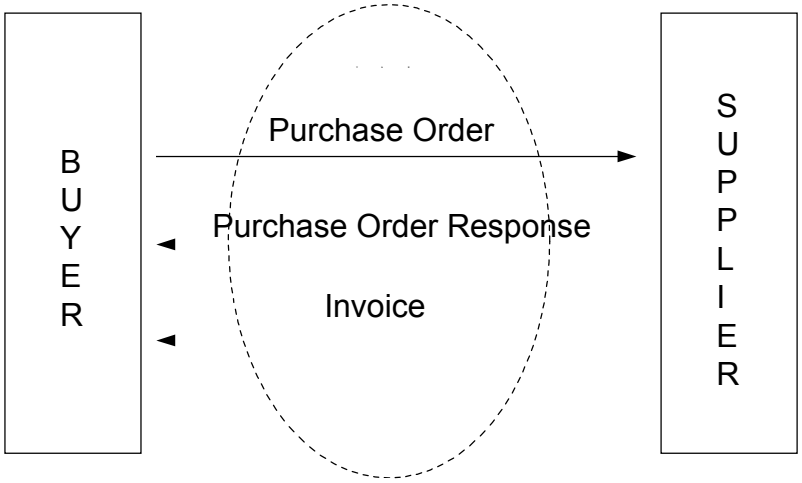
7.6

Van Selection Case Studies

Following you will find two case studies which provide information on the sort of situations and issues which you may encounter when starting to use EDI or expanding your existing EDI links.

7.6.1 Minimum Case: Entry-Level EDI

As a supplier to a number of food retailers, you have been instructed by one of your major customers that you are expected to be capable of receiving purchase orders from them by EDI within six months. They state that they would also prefer you to provide EDI order acknowledgements and invoices if you are able to do so.



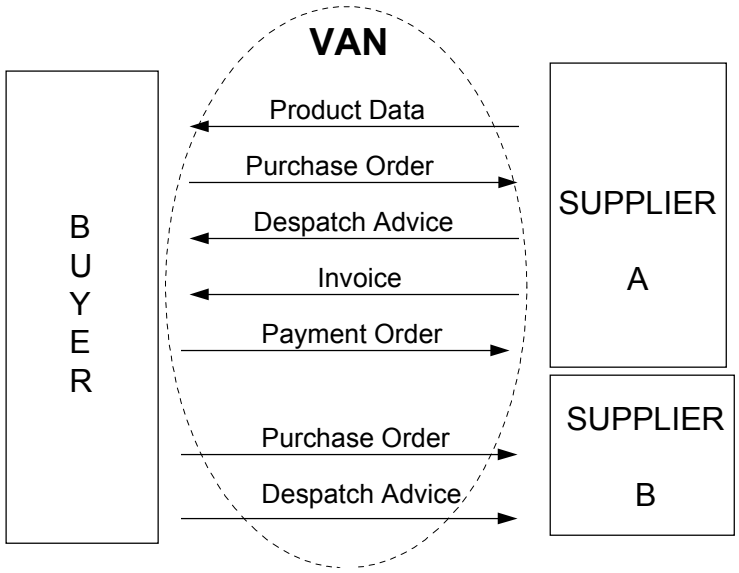
Issue	Solution
You may have no previous experience of EDI, and/or no in-house resources available to satisfy your customers requirement in the time scale.	The VAN should be able to provide comprehensive EDI consultancy, training and/or technical support and implementation.
How do you ensure that the EDI solution for this customer will also satisfy the requirement of your other major customers (and perhaps suppliers) in the future ?	The VAN should be able to provide you with a single EDI connection to all of your potential trading partners - either directly or via interconnections to other global VANs.
What are the EDI data standards issues that you may face - both with this first customer and in the future, to achieve full-cycle EDI ?	All VANs should support all of the necessary standards and be able to provide any necessary technical support or consultancy.
How to select the most appropriate EDI software. From a stand-alone PC Workstation to a complete translation and communications package to run on your existing	The VAN should be able to provide a complete software solution for your preferred environment. (This may even include the ability to generate the required order acknowledgements and invoices.)

Issue	Solution
computer hardware.	
What are the legal, security and tax implications of trading via EDI ? Do you need a formal electronic trading agreement ?	The VAN will be able to provide this advice, in the context of you proposed trading partners and trading environment.
How will you know that these new electronic documents have been received, on time, by your customer(s).	A complete audit trail should be provided by the VAN for each document, or batch of documents, with accurate date/time stamps.
You need to ensure a smooth transition from paper documents to EDI - without any adverse impact upon the service level to your customer. What testing and/or parallel running must be conducted before live operation ?	The VAN will be able to advise on all of these implementation issues - and may even provide a complete “test to live” service for you.
If you encounter technical problems which prevent you from receiving your orders in time the business impact could be critical !	The VAN should provide end-to-end technical support, 24 hours per day, with comprehensive service back-up facilities.

Typical Costs - VAN charges for a typical entry-level PC solution could be as low as EURO 2000 for registration and PC software plus Euro 65 per month for subscriptions and volume related charges. Consultancy, implementation services and training may be charged extra at Euro 1250 to 1700 per day.

7.6.2 Intermediate Case: Extending EDI Links

A grocery retailer, you established your first EDI links - transmitting store orders to several of your major suppliers some years ago. These links are working reliably and you also receive some product data by EDI - reducing the manual re-keying of new product information and changes. You are now being pressed to accept electronic invoices and make payments by EFT. At the same time you are still incurring the overheads of manual ordering to support your smaller, and seasonal, suppliers. There are also a growing number of overseas suppliers with whom you would like to establish EDI links.



Issue	Solution
To capitalise upon your investment in EDI, you need to roll out EDI trading relationships to as many suppliers as possible, as quickly as possible.	Recruitment and implementation of your EDI trading partners, quickly and effectively, is perhaps a VANs most valuable service.
The use of EFT will require you to establish new links with one or more clearing banks, together with the necessary security procedures.	Your VAN with have the banking links already in place and will be able to advise on the appropriate security procedures and hardware/software.
The EDI transactions involved in the payments cycle require integration into new computer applications, possibly on different hardware .	The VAN should be able to provide you with separate mailboxes and EDI translation/mapping software appropriate to each computer system.
Some of your suppliers are connected to other VANs and are reluctant to implement connections to your preferred VAN.	All major VANs are interconnected - offering an end-to-end service level which will be adequate for many applications. Alternatively, EDI software packages provide for multi-VAN connectivity.
How do you eliminate the overhead costs of continuing to operate paper-based systems for your small, or seasonal, suppliers?	VANs can enable you to trade electronically with 100% of suppliers - through low-cost PC solutions; EDI over the Internet; EDI to FAX.
How do you communicate, via EDI, with your growing number of overseas trading partners ?	A global VAN will provide you with seamless EDI connectivity to your trading partners, anywhere in the world. A local VAN may be able to provide the necessary links through VAN interconnections.
How do you go about recruiting, and implementing, these overseas trading partners - particularly in another language and/or time zone?	A global VAN will be able to help with both their recruitment and implementation - providing local language support, advice on data standards etc.
If you encounter technical problems which prevent you from	The VAN must provide end-to-end technical support, 24 hours per day, with comprehensive

Issue	Solution
communicating with a key supplier the business impact could become quite serious.	service back-up facilities.

Typical Costs - VAN charges for international traffic vary, but are unlikely to be a significant consideration - perhaps Euro 100 per megabyte. Many VAN interconnections in Europe are free of any additional charge. EDI connection software packages are available for all major hardware platforms and typically cost between Euro 3,000 and 30,000. For small suppliers, using forms-based EDI over the Internet, the cost could be as low as 1 or 2 Euro per document.

7.7 VAN Assessment Tables

Following you will find some samples of tables which will allow you to assess the services of the VAN's operating in your environment. Separate tables have been created under the following titles;

- Company background
- Mailbox Capabilities
- Communication Capabilities and Protocols Supported
- Customer Service
- Security Reliability Backup
- Standards Supported
- Reporting
- Billing
- Other Services

7.7.1

Company Background

VAN EVALUATION CRITERIA	RESPONSE
Company Size.	
Number of EDI customers.	
Level of ED experience.	
Participation in standards committees.	
Relevant industry expertise.	

7.7.2

Mailbox Capabilities

VAN EVALUATION CRITERIA	RESPONSE
Describe the mailbox features and functions.	
Describe the availability of the mailbox.	
Define the different ways the mailbox can be configured.	
How much time is required to process a document once it arrives in the mailbox ?	
Identify the hardware platforms that are supported.	
Describe how your network supports interconnects.	
Which networks have you established interconnects with ?	
Does your network support in-network or proprietary translations ?	

7.7.3

Communication Capabilities and Protocols Supported

VAN EVALUATION CRITERIA	RESPONSE
Describe the types of communication protocols your network supports.	
What line speeds are supported ?	
Do you support dial-up communications ?	
Do you support leased lines ?	
Describe the recovery process from a line drop.	

7.7.4

Customer Service

VAN EVALUATION CRITERIA	RESPONSE
What are the hours for customer support ?	
Do you provide installation support ?	
Do you have a hotline of help desk function ?	
Describe your problem resolution and escalation process.	
Do you provide a network user guide ?	
Is any additional training available ?	

7.7.5

Security Reliability Backup

VAN EVALUATION CRITERIA	RESPONSE
Describe the security process associated with a mailbox.	
Does your network have scheduled outages for system maintenance, if so define ?	
Does your network have a disaster recovery plan, and how often is the plan tested ?	
How is data restored to the mailbox ?	
Does your VAN conduct an independent audit by a third party ?	

7.7.6

Standards Supported

VAN EVALUATION CRITERIA	RESPONSE
Which EDI standards and what versions of those standards does your network support ?	
Does your network support industry specific or proprietary EDI standards ?	

7.7.7

Reporting

VAN EVALUATION CRITERIA	RESPONSE
What type of reporting does your network provide ?	
Is daily transaction and trading partner reporting available ?	
Are audit trails available?	
Describe your error reporting.	

7.7.8

Billing

VAN EVALUATION CRITERIA	RESPONSE
Do you have a published fee schedule ?	
Do you provide a monthly invoice ?	

7.7.9

Other Services

VAN EVALUATION CRITERIA	RESPONSE
Define the other types of services provided by your VAN.	
Do you provide EDI to Fax ?	
Do you provide electronic mail ?	
Do you provide access to the Internet ?	
Do you provide electronic catalogs ?	
Do you provide database or information services ?	

7.8

The Internet

The wide-spread accessibility and use in recent years of the Internet has added another option for EDI message exchange to the more traditional methods used in the 1980s and early to mid-1990s.

The Internet was originally developed by the US Department of Defence in 1969 to create an extended network between the Department of Defence, its suppliers, and universities carrying out research on it's behalf. As the technology for inter-connecting networks developed (e.g. Transmission Control Protocol / Inter-networking Protocol (TCP/IP)) so too did the number of networks connected to the Internet and its use expanded from only defence applications to one where companies and individuals could send and receive e-mails.

In the early 1990s the advent of the World Wide Web (WWW), the development of software packages which enabled users to 'surf' the Web, and the development of multi-media products with colourful images, sound and moving pictures, was the final stimulus which convinced private individuals and companies of all sizes that the Web and the Internet were powerful tools which could be used for communication, education, commercial and information purposes.

As the use of EDI has grown among large companies, major HUB companies have examined ways of persuading small to medium sized trading partners to communicate their business data via EDI. One of the most significant reasons why such moves have been resisted by small to medium sized companies has been the fact that EDI communication (using any of the four other methods detailed here) has been expensive to establish and operate, with no apparent additional benefits available to the companies.

Because of its flexibility, the Internet provides an alternative option for small to medium sized companies to communicate EDI messages at a reasonable cost while offering access to other services. Specifically the Internet offers a viable alternative option to VANs.

One of the major advantages to using the Internet is the fact that EDI messages may be exchanged with any trading partner (must at least have an Internet connection) regardless of the network being used. Because of its nature there are no interconnection issues to be faced when using the Internet. In addition trading partners need not have any specific agreements with a third party (i.e. the VAN) before exchanging EDI messages. Finally, it is estimated that the cost of using the Internet for the exchange of EDI messages is considerably lower than the cost of using a VAN for the same exchange.

While the advantages of using the Internet are strong, the disadvantages should also be considered seriously. The single biggest concerns for companies considering using the Internet are the fact that the exchange of EDI messages over the Internet is not secure (i.e. there are no in-built message security services) and that acknowledgement of message delivery is not automatically provided. While transmissions can be made secure and delivery acknowledgement can be provided with the addition of commercially available products (and/or other EDI messages), such an issue does not arise when using the services of a VAN as security and delivery acknowledgement are basic services offered by the VANs.

In addition to this, it must be remembered that the Internet is used by millions (estimated to reach 1 billion by the year 2000) of users for a wide range of diverse activities (including EDI,

e-mail, browsing, etc.) and this can seriously impact on the performance of the service. This must be compared to a VAN where the distribution of EDI messages is the primary objective of the service and minimum performance levels are guaranteed.

A valid conclusion which can be made from comparing the options of using the services of a VAN or the Internet to exchange EDI messages is that the Internet is good for low cost, low volume, and infrequent transmissions, while VANs are ideal for large and frequent transmissions which are more time critical and where receipt and security must be guaranteed.

8.

Ensuring a Reliable EDI Operation

An EDI application is often seen as being outside the internal information system of a company and limited to a communications issue. The quality of the EDI links with trading partners relies on four points in order to be effective:

- the quality of the communications option used;
- the accuracy of the integration procedures;
- the coherence of the data contained in the messages;
- the adherence to a message follow-up procedure.

The reliability of a communications solution for EDI cannot be defined in absolute terms. It depends on the requirements of the user (company), and depends on the EDI applications which are installed. What is essential is time, or more precisely, the time constraints between the preparation of the message to be sent and its processing by the receiving application.

Reliability in an EDI context may be defined with the following formula:

A communications solution for EDI is reliable if it guarantees, in all circumstances, to both the sender and the receiver that there will be a transfer of quality information, in a complete form, in a confidential manner, and within agreed time scales.

These four elements must be examined within the information chain, from the point of creation in the sender's information system, to the point of processing by the receiver. Key elements in this chain include:

- the computer applications which generate or integrate the information;
- the tools used for the internal transfer of the information;
- the EDI interface, including in particular the translator, and the monitoring of the exchanges;
- the telecommunication station;
- the supporting network (see **Chapter 7.3** for more information on this subject);
- the value added network (see **Chapter 7.4** for more information on this subject).

The above elements present an extensive representation of an EDI link between two computer applications. In certain instances, this link may be simplified. EDI exchanges may be carried out without using the services of a third party, known as a " value added network". This is the case, for example, in EDI in the banking or automobile sectors, where the users are directly connected to servers which are run by the banks or the car manufacturers. In the same way, solutions exist in which the EDI interface and the communications station are integrated into a single machine which operates all of the information systems.

Whatever the level of integration, the above elements are useful for a detailed analysis of the process. In practice these elements, even if only conceptual, are still autonomous systems with their own management rules.

8.1

The Internal Information Systems.

Where EDI is concerned, the internal information systems must respect processing time constraints and provide quality information, for both the internal users and external partners.

8.1.1 Processing Time Constraints.

An EDI exchange must always satisfy parameters which are fixed by computer applications or by a series of tasks in which a precise rhythm must be respected, as can be shown by the following examples:

- the reception and processing of orders must be done before 11 a.m. to enable the lorries to be loaded before midday, otherwise goods will not be delivered until the following day;
- the reception of goods receipt notes on Thursdays to trigger invoicing at the end of the week;
- the sending of sales statistics every Saturday to update the model which forecasts manufacture or delivery;
- etc.

Computer procedures must be carefully validated and backed up to provide the information needed in good time. This poses the problem of the integration of computer systems. In most cases, EDI information is processed in extremely varied applications, which must be co-ordinated. Orders, statistics and delivery notes are collected in the various operating centres of a company before being made available, via EDI, to suppliers, the administration department, or transport companies.

In some cases the late arrival of data can be tolerated, but other vital data cannot, such as data used in just-in-time applications. Without doubt, the reliability of the information systems, and the internal communications network, must be guaranteed by backup procedures such as mirror disks, backup machines or an alternative communications network. However, this could also be done by reverting to non-automated solutions such as fax, or the physical transfer of files by diskette (or computer tape) from one point to another, with the exceptional mobilisation of the necessary personnel.

8.1.2 Quality Of The Exchange.

Very often problems with EDI systems are caused by poor quality source information.

The most common problem of this nature is the non-arrival of an expected message, where one partner is waiting for data which does not arrive, and no warning has been issued by the sender that an internal problem is stopping the transmission of a message or messages. The opposite can also happen; an EDI user can receive a message type which is not expected.

In general, questions linked to the quality of the information relate to the following points:

- notification of incidents;
- the updating of technical directories and reference documents;
- the coherence of the data;
- the confidentiality of the data.

8.1.2.1 Notification Of Incidents.

One of the vital backup tools which must be provided for in an EDI exchange agreement is information on internal incidents. This enables the partners to be informed on the duration of an incident, the partners capacity to restart EDI communications, when or how the down-graded procedures will be installed. Such information may be distributed either by electronic mail using a value added network, by fax, or by voice communication after a pre-defined number of attempts to recover the situation.

8.1.2.2 Updating Technical Directories And Reference Documents.

The reliability of communications also depends on the updating of the addresses of the partners and the registration of new partners. The increasing number of companies using EDI (many companies are today in EDI contact with approximately 500 suppliers or customers) makes the quality of the address book more important.

A procedure for the on-going maintenance of the EDI address book must be established, for example using the PARTIN message. During the start-up phase, part of the exchange agreement must deal with this prior exchange of address information.

8.1.2.3 Coherence Of The Data.

The communication of data by EDI imposes new constraints on computer applications. The manual checks previously carried out (knowingly or unknowingly) by a data entry clerk must be re-designed within the framework of automatic integration.

Because the transmission of incoherent data may cause users to question the efficiency of EDI, procedures must be established to check the coherence of the data in the applications which generate or receive EDI data. These checks normally cover the following points (not exhaustive):

- that the quantities detailed in the message are correct compared to messages normally received, e.g., a ordered quantity is not 10 times greater than the usual ordered quantity.
- the checking of copies of documents based on their references, e.g., that the order number has not already been used by an earlier EDI order or an order by fax.
- a check of the validity of document references against those which should logically come before, e.g., receipt of an invoice should trigger a check of the validity of the purchase order(s) and delivery note(s) references.
- the validation of the partners, e.g., refuse a message received from a partner who is unknown, unauthorised, or subject to restrictions.

8.1.2.4 Confidentiality.

Confidentiality begins by ensuring that the trading partner addressed is one who can be trusted. It therefore involves the careful management of the trading partners and their accurate identification using a unique and unambiguous identification system such as the EAN location number.

Confidentiality is never better ensured than when it is controlled at the stage of initial data creation. At that time, the sender has the opportunity to apply the means which are appropriate

to the level of protection which he judges to be necessary, in agreement with his partners.

The most efficient means of ensuring the confidentiality of any information remains its encryption, within the limits set by the law.

8.2 Internal Transfer Tools.

Today the information systems of a company depend more and more on internal communications networks. Such networks connect not only the various installations or offices of a company, but also the various applications within the information systems. For this reason, the internal communications network must be considered in many cases as a link in the EDI chain, to which some of the following safety precautions must be applied:

- mirror disk backup for the network server;
- server backup;
- degraded procedure in case of total unavailability.

8.3 The EDI Interface.

The EDI interface is made up of the following two essential elements:

- monitoring of the exchanges between the internal application and the other modules such as those used to manage the trading partner relationships and trace messages.
- one or more translators which converts data to be sent into a form that is in accordance with the EDI standard (or standards), and converts data received into a format that can be interpreted by the internal applications, etc.

Because this interface is another application of the information system it is therefore subject to the same reliability constraints.

The person responsible for the EDI interface is a key person whose competence and availability are two of the major conditions which ensure the reliability of the system. It is to this person that the other EDI players will turn when a problem occurs and the company should therefore commit itself to make available all the necessary means to carry out his or her responsibilities, such as training, remote maintenance of the system, and replacement during holidays. This is necessary if a permanent EDI service is to be assured.

Monitoring
Monitoring is probably the most delicate operation of an EDI application and it is upon this that the tracking, tracing, and the follow-up of messages depends. The monitoring function enables the EDI operator to know the following:

- whether a message has been sent, stored, received, and even processed by a trading partner;
- whether messages have been received normally, and if not why not;
- the time taken for message transfer;
- whether the messages have been translated correctly, and if not why not.

The quality of a translator and a communications station is measured by their ability to provide detailed operational audit reports which enable the persons operating the system to monitor

the progress of a message.

The translator
The translator provides the interface between the imposed data of the exchange (i.e. the standard) and the internal data. Its quality depends mainly on its ability to be integrated with the internal applications, but also on the range of its translation formats and the power of it's code translation functions.

8.4 The Communications Station.

The communications station is the EDI point of access to the outside world. Regardless of the supplier of the station, it will have a certain number of elements which will influence its reliability, such as the equipment, software, or data storage. However, its reliability also depends on the safety functions it provides.

The equipment
As the communications station will be installed on a computer, a backup of the communications station must be kept at all times to cover any event which might make the computer unavailable, e.g., a disk crash, a lightning strike (the two most frequent causes of problems), etc.

The simplest solution for this is to have a backup communications station on a micro-computer (which has access to a communications line), which is always ready to take over with an identical configuration to that of the original communications station. The objective of such a backup facility is to maintain at all times the link with trading partners.

The modem or communications card.
The communications card is a sensitive piece of equipment for which a backup card should be kept. Normally the backup card should be of the same type as that normally installed. This precaution should also avoid the problem of unavailability of the support network assuming that the server will accept several types of connections.

The software.
Caution dictates that EDI users should keep a copy, on the original installation media, of the EDI software, and that members of staff be trained to carry out a possible re-installation.

The configuration files
The configuration files for the communications station contains permanent information used by the software, such as telephone numbers, passwords, address books, etc. These files may be saved to a separate location on the system in case the EDI station needs to be re-initialised. This would enable a re-start to be made with a minimum of effort.

The message files.
The files which contain the messages exchanged are extremely volatile. In an EDI communications station which experiences heavy use they may change from one hour to the next. The only efficient, but expensive backup solution for these is a mirror image disk. At a minimum a daily back-up of the EDI communications station is a precaution which should be carried out in addition to the normal application backups. It should be remembered that every file which passes through the station is processed by both the EDI interface and the internal applications.

The functions.
Reliability is also related to the functions provided by the communications station. An example of such functions follow:

- the management of copies: the EDI station's software must be capable of detecting an attempt to send a copy of a message, or its reception twice, and be able to indicate this to the EDI interface or the operator;
- integrity: during communication, the software must guarantee the integrity of the data transmitted, by enabling re-starts should interruptions in the communication occur;
- access protection: depending on the sensitivity of the data exchanged, access to the EDI station may be protected by operator identification codes;
- intervention: it is advisable that the EDI station should cater for exceptional operations such as the re-transmission of a message, re-processing of a copy, or the cancelling of a message received or to be sent. These functions enable problems to be solved with minimum intervention.

9.

Additional Documents.

In addition to the EANCOM® manual, the EAN General Specifications, and the sector specific application guides a number of publications exist which provide additional non-technical support on the subject of EANCOM® EDI in particular, and the EAN standards in general. Additional EAN International documents are today available on the following subjects;

9.1 EANCOM® Manual.

This document is the EDI (Electronic Data Interchange) standards manual developed and made available by EAN International. It is an implementation guideline of the EDIFACT standard (Electronic Data Interchange For Administration, Commerce and Transport) developed under the auspices of the United Nations.

9.2 An Introduction to EANCOM® in Trade and Transport.

A non-technical introduction to the EANCOM® messages in trade and transport. In particular this document examines the links and inter-dependencies between the messages from the trade and transport sectors looking at such issues as data flows, referencing between the messages, the trade and transport parties, and a glossary of terms from both environments.

9.3 An Introduction to EANCOM® in Trade and Finance.

A non-technical introduction to the EANCOM® messages in trade and finance. In particular this document examines the links and inter-dependencies between the messages from the trade and finance sectors looking at such issues as data flows, referencing between the messages, the trade and finance parties, a high level guide to the issues related to the security of EDI messages, and a glossary of terms from both environments.

9.4 A Guide to Security for EANCOM® Messages.

An introductory document to the subject of securing EANCOM® messages against au-authorised access. This document explains the potential threats facing EANCOM® messages and the solutions to these threats. *Note: This document will be published DURING 1998.*

9.5 General EAN Specifications.

A document providing all of the basic technical information required by those involved in any way in the application of EAN numbering or symbol marking.

9.6 An Introduction to the Serial Shipping Container Code.

An introduction to the EAN Serial Shipping Container Code which is used for the unique identification of logistic units.

9.7 Vital in Communications - EAN Location Numbers.

An introduction to EAN location numbers including information on the benefits of using the EAN location number, answers to some frequently asked questions about the EAN location number, and a set of case studies from EAN member companies which have implemented EAN location numbering.

9.8 EAN International Annual EDI Survey Results.

EAN International surveys its numbering organisations each year to evaluate the development of

EDI usage, and in particular EANCOM® usage, world-wide. This document is revised and re-released in March of each year.

All of the above publications are available in English from the EAN numbering organisations. In addition several numbering organisations have translated one or more of the above documents into their local language. For copies of any of the above or any general information on other non-EDI publications available from EAN International please contact your local numbering organisation.

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Canada - Product Code Council of Canada (PCCC)
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References

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- Electronic Trader
- NCC EDI in Action
- VICS EDI Architectural Guide