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Information technology — Open-ed reference model

Technologies de l'information — Modèle de référence EDI-ouvert

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Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work.

In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.

International Standard ISO/IEC 14662 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 30, *Open electronic data interchange*.

Annexes A to F of this International Standard are for information only.

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0 Introduction

The economic advantages of Electronic Data Interchange (EDI) are widely recognised. However, the cost of setting up an EDI relationship is still very high due to the need for a detailed bilateral business and technical agreement between the involved business partners. The initial high cost of establishing such an agreement does not justify short term partnerships. It has also been found that implementations involving the management of a large number of partners and their associated agreements are not productive. Consequently, most EDI implementations have been successful only:

- in long term partnerships;
- between a limited number of partners.

Open-edi lowers these barriers by introducing standard business scenarios and the necessary services to support them. Once a business scenario is agreed upon, and the implementations conform to the Open-edi standards, there is no need for prior agreement among trading partners, other than the decision to engage in the Open-edi transaction in compliance with the business scenario. Since Open-edi takes a generic approach, it enables organisations to establish short term relationships quickly and cost effectively. Business scenarios and the necessary supporting services will be available to all who wish to use them, thus providing the necessary means for implementing Open-edi.

The field of application of Open-edi is the electronic processing of business transactions among autonomous multiple organisations within and across sectors (e.g., public/private, industrial, geographic). It includes business transactions which involve multiple data types such as numbers, characters, images and sound.

The Open-edi Reference Model has been developed primarily in order to provide standards required for the inter-working of organisations, through interconnected information technology systems. This model is independent of specific:

- information technology implementations;
- business content or conventions;
- business activities;
- organisations.

The Open-edi Reference Model identifies the required standards for Open-edi and provides a reference for those standards by defining the basic concepts used to develop them. It serves as the basis for co-ordination of work between the different agencies involved in EDI standardisation. It provides the framework for this co-ordination and for the integration of existing and emerging standards and the development of future standards. The Open-edi Reference Model places existing EDI standards in perspective. Some of Open-edi standardisation areas and types of standardisation activities are presented in Annex A and some of the requirements for Open-edi standards in Annex B.

The Open-edl Reference Model uses two views to describe the relevant aspects of business transactions:

- the Business Operational View (BOV);
- the Functional Service View (FSV).

The BOV, addresses the aspects of

- a) the semantics of business data in business transactions and associated data interchanges;
- b) the rules for business transactions, including:
 - operational conventions;
 - agreements;
 - mutual obligations,

which apply to the business needs of Open-edl.

The FSV addresses the supporting services meeting the mechanistic needs of Open-edl. It focuses on the Information Technology aspects of:

- a) functional capabilities;
- b) service interfaces;
- c) protocols.

Such functional capabilities, services interfaces and protocols include:

- capability of initiating, operating and tracking the progress of Open-edl transactions;
- user application interface;
- transfer infrastructure interface;
- security mechanism handling;
- protocols for inter working of information technology systems of different organisations;
- translation mechanisms.

Figure 1 sets out the relationship between the model and these views.

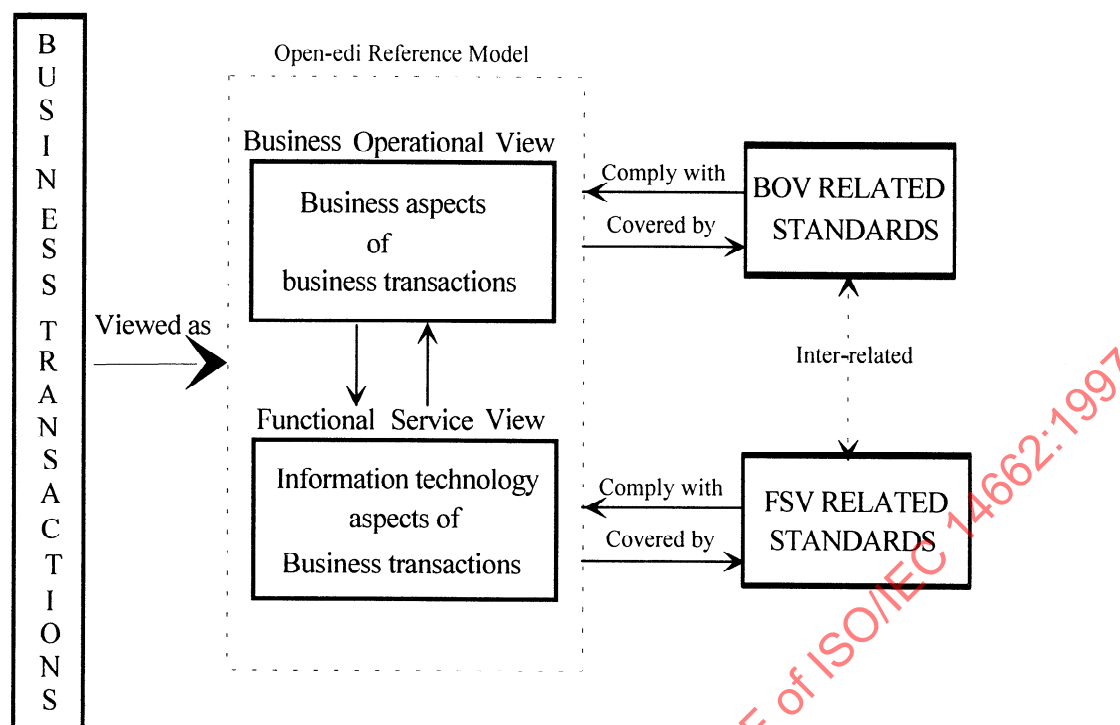


Figure 1 - Open-edi environment

0.1 The co-ordination needs of the Open-edi Reference Model

Standards required for Open-edi cover a large spectrum of areas including but not limited to:

- business aspects;
- support for national and international law and regulation;
- information technology generic standards, such as information modelling standards;
- software engineering standards;
- data modelling standards;
- information technology standards specific to one sector;
- interconnection standards, such as message handling, file transfer, transaction processing, network management;
- security standards.

Development of EDI standards is already taking place in several standardisation bodies and industry groups.

The co-ordination of standards development is essential in order to:

- avoid duplication of effort;
- ensure interoperability of standard conforming solutions;

- ensure technical consistency of standards;
- identify and remedy deficiencies and voids in standards;
- identify and eliminate redundancies and overlaps in standards.

Annex A describes how the Open-edl Reference Model can serve as the basis for co-ordination of work of the different agencies involved in EDI standardisation.

0.2 The technical requirements of the Open-edl Reference Model

Each view of the Open-edl Reference Model corresponds to a class of necessary standards. One class of standards, associated with the BOV in the Open-edl Reference Model, addresses the business issues of Open-edl. Another class of standards, associated with the FSV in the Open-edl Reference Model addresses Information Technology (IT) issues. Each class of standards requires a specific type of expertise needed for their development. By separating the business user aspects of Open-edl from the IT aspects, the Open-edl Reference Model and its associated standards provide flexibility in accommodating changes in IT and user demands without impacting the Open-edl standards related to the business user aspects of Open-edl. Methods of implementing the standards which comply with this framework are not constrained by the model. Therefore inter working among Open-edl systems will be guaranteed while preserving flexibility in implementation.

The implementations of Open-edl will require the co-operation among different types of experts, primarily business users aided by information analysts and IT specialists including telecommunications experts.

In order to support an Open-edl activity, models must be developed which consider aspects of both the external and internal behaviour of organisations. The boundary between the external and internal behaviour will vary among organisations depending on how the implementation has been carried out. The models to be developed must consequently take into consideration those aspects which are necessary to ensure interoperability. Only the external behaviour of organisations affects the interoperability of Open-edl systems. The description of the internal behaviour of Open-edl systems is provided in the model only to support the definition and exposition of the interoperability aspects, and to offer insight to the definitions of the external interfaces required.

0.3 EDI and Open-edl: areas of activity and participation

The following tables illustrate the general context within which EDI activities take place. Table 1 presents the areas of activity; Table 2, the types of bodies which should fulfil those areas of activity; Table 3 identifies typical actors at the time of this International Standard. It is expected that working documents will be created identifying all relevant sectorial actors.

The application of the Open-edl reference model specified in this International Standard enables the evolution of the organisation of the activities detailed in Table 1. That evolution is found in Annex A, and in particular in Tables A.1 and A.2.

Table headings are explained in Annex A. Tables 1, 2 and 3 have, in addition, a new dimension, below that of Environment, which is characterised as "Formal Recognition". This is a specific stage between Environment, which is understood to be the existence of all that there is in the development of standard frameworks, and Activity Models, which are understood to be business modelling methods and techniques identified by the frameworks.

Table 1 - Areas of activity

	Meta-standards A	Standards B	Guidance C	Produce product D	Conformance & certification E	Take into use by F
1. Environment	Languages	Laws, Practices	Business Guidelines		Courts, Tribunals	Contracts
2. Formal recognition	Frameworks	Reference Models	BOV & FSV		Testing Bodies	Toolsets
3. BOV activity models	Modelling Languages	Business Scenarios	Conventions		Test Definitions	Applications
4. BOV data models	Modelling Languages	Message Standards	Usage Guidelines		Test Definitions	Actual data
5. FSV technology	Tools, Techniques	Inter-operability Standards	Profiles		Inter-operability Standards	Software, Hardware

Table 2 - Types of bodies that should be involved in performing the different tasks for each cell

	Meta-standards	Standards	Guidance	Produce product	Conformance & certification	Take into use by
	A	B	C	D	E	F
1. Environment	LEGAL and	REGULATORY BODIES	FRAMEWORK	IMPLEMEN- TORS and USERS	TESTING and CERTIFICATION BODIES	IMPLEMEN- TORS and USERS
2. Formal recognition	STANDARDISATION					
3. BOV activity models	PROCESS					
4. BOV data models	BODIES					
5. FSV technology						

Table 3 - Current participants

	Meta-standards	Standards	Guidance	Produce product	Conformance & certification	Used by
Environment	Languages	International National Bilateral			Courts	
Formal recognition	ISO/IEC JTC 1/SC 30	National standards bodies UN/ECE ISO/IEC	ISO/IEC JTC1 SC 30		ISO/IEC	Standards bodies Suppliers Users
BOV activity models	ISO/IEC JTC 1/SC 7 and SC 30 ISO TC 184	ISO and IEC sectorial bodies National standards bodies		non-standard products		Users
BOV data models	ISO/IEC JTC 1/SC 14, SC 21/WG 3 and SC 30	Trade bodies User groups UN/ECE	as previous column plus sectorial groups EWOS	Suppliers	UN/ECE/WP.4/ GE.1	Users
FSV technology	ISO/IEC JTC 1	ISO/IEC JTC 1	ISO/IEC JTC 1/SC 30	Manufacturers Suppliers	Many	Users

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Information technology — Open-edi reference model

1 Scope

This International Standard specifies the framework for co-ordinating the integration of existing standards and the development of future standards for the inter-working of organisations via Open-edi and provides a reference for those standards. As such it serves to guide the standards work necessary to accomplish Open-edi by providing the context to be used by developers of standards to ensure the coherence and integration of related standardised modelling and descriptive techniques, services, service interfaces, and protocols.

This International Standard describes, through two perspectives of business transactions, significant aspects relevant to the interoperability of information technology systems used by organisations engaging in Open-edi. The perspectives are:

- a) business aspects such as business information, business conventions, agreements and rules among organisations;
- b) information technology aspects which are necessary in the Open-edi systems to support the execution of business transactions.

This International Standard is not an implementation specification nor is it a basis for appraising the conformance of implementations.

2 Normative reference

The following standard contains provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the edition indicated was valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent edition of the standard indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 6523: 1984, *Data interchange - Structure for the identification of organizations*.

3 Technical normative elements

3.1 Definitions

For the purposes of this International Standard, the following definitions apply:

3.1.1 Application Program Interface (API): a boundary across which application software uses facilities of programming languages to invoke services. [JTC1 directives]

3.1.2 business: a series of processes, each having a clearly understood purpose, involving more than one organisation, realised through the exchange of information and directed towards some mutually agreed upon goal, extending over a period of time.

3.1.3 Business Operational View (BOV): a perspective of business transactions limited to those aspects regarding the making of business decisions and commitments among organisations, which are needed for the description of a business transaction.

3.1.4 business transaction: a predefined set of activities and/or processes of organisations which is initiated by an organisation to accomplish an explicitly shared business goal and terminated upon recognition of one of the agreed conclusions by all the involved organisations although some of the recognition may be implicit.

3.1.5 Electronic Data Interchange (EDI): the automated exchange of any predefined and structured data for business purposes among information systems of two or more organisations.

3.1.6 Formal Description Technique (FDT): a specification method based on a description language using rigorous and unambiguous rules both with respect to developing expressions in the language (formal syntax) and interpreting the meaning of these expressions (formal semantics). [JTC1 directives]

3.1.7 Functional Service View (FSV): a perspective of business transactions limited to those information technology interoperability aspects of IT Systems needed to support the execution of Open-edi transactions.

3.1.8 Information Technology System (IT System): a set of one or more computers, associated software, peripherals, terminals, human operations, physical processes, information transfer means, that form an autonomous whole, capable of performing information processing and/or information transfer.

3.1.9 Open-edi: electronic data interchange among multiple autonomous organisations to accomplish an explicit shared business goal according to Open-edi standards.

3.1.10 Open-edi Standard: a standard that complies with the Open-edi Reference Model

3.1.11 Open-edi Party (OeP): an organisation that participates in Open-edi.

3.1.12 Open-edi scenario: a formal specification of a class of business transactions having the same business goal.

3.1.13 Open-edi transaction: a business transaction that is in compliance with an Open-edi scenario.

3.1.14 organisation: unique framework of authority within which a person or persons act, or are designated to act, toward some purpose. [ISO 6523]

3.2 Symbols and abbreviations.

API	Application Program Interface
BIM	Business and Information Modelling
BOV	Business Operational View
CASE	Computer Aided Software Engineering
DMA	Decision Making Application
EDI	Electronic Data Interchange
EDIFACT	EDI For Administration, Commerce and Transport
EWOS	European Workshop for Open Systems
FDT	Formal Description Technique
FSV	Functional Service View
GE	Group of Experts
IB	Information Bundle

IPD	Information Processing Domain
IT	Information Technology
MHEG	Multimedia Hypermedia Expert Group
OeCI	Open-edition Control Information
OeDT	Open-edition Descriptive Technique
OeP	Open-edition Party
OeSE	Open-edition Support Entity
OeUD	Open-edition User Data
OSI	Open System Interconnection
SC	Semantic Component (in the context of Open-edition scenarios)
SC	Sub-Committee (in the context of ISO or IEC)
SGML	Standard Generalised Mark-up Language
STEP	STandard for the Exchange of Product model data
TC	Technical Committee
TDID	Trade Data Interchange Directory
TI	Transfer Infrastructure
UN/ECE	United Nations / Economic Commission for Europe
UNSM	United Nations Standard Message
WG	Working Group
WP	Working Party

4 The Open-edition Reference Model

The Open-edition Reference Model provides a reference framework for the identification, development, and co-ordination of Open-edition standards. This framework addresses two perspectives of business transactions. One, the BOV, captures the business users aspects, the other, the FSV, captures the information technology aspects. A class of standards is associated with each view. They are respectively called the BOV related standards and the FSV related standards.

These perspectives are defined as follows:

- **Business Operational View (BOV):** a perspective of business transactions limited to those aspects regarding the making of business decisions and commitments among organisations, which are needed for the description of a business transaction;
- **Functional Service View (FSV):** a perspective of business transactions limited to those information technology interoperability aspects of IT Systems needed to support the execution of Open-edition transactions.

The BOV related standards are tools and rules by which users, who understand the operating aspects of a business domain, may create scenarios. Registration authorities will reference the BOV related standards when considering scenarios for registration.

If those Open-edition scenarios are standardised they are called standardised Open-edition scenarios and are not "BOV related standards".

The FSV related standards are used by the information technology experts. The information technology experts are those within an organisation who use this technology to design and/or build IT systems which support the business needs. These experts produce products and services conforming to FSV related standards (Open-edi systems) which can potentially support the execution of Open-edi transactions.

As shown in figure 2, the effective inter-relationship between these two classes of standards is a critical factor of the Open-edi reference model. The FSV related standards shall take into account the BOV related standards and vice-versa. Open-edi scenarios, built using BOV related standards, formulate requirements which are demands placed on the IT product and services conforming to FSV related standards executing the corresponding Open-edi transaction. These demands include:

- identification of functional capabilities necessary to support Open-edi transactions;
- the quality of service required from the functional capabilities for these Open-edi transactions.

Formal specification(s) of the functional components needed to support Open-edi transactions, through IT Systems, are developed using FSV related standards.

The intention is that, once an Open-edi scenario is agreed upon, if implementations conform to the FSV related standards, there is no need for prior agreement between the organisations, other than the agreement to engage in the Open-edi transaction in compliance with the Open-edi scenario. The intention is that the sending, by an Open-edi party, of information from a scenario, conforming to Open-edi standards, shall allow the acceptance and processing of that information in the context of that scenario by one or more Open-edi parties by reference to the scenario and without the need for agreement. However, the legal requirements and/or liabilities resulting from the engagement of an organisation in any Open-edi transaction may be conditioned by the competent legal environment(s) or the formation of a legal interchange agreement between the participating organisations. Open-edi parties need to observe rule-based behaviour and possess the ability to make commitments in Open-edi (e.g., business, operational, technical, legal and/or audit perspectives).

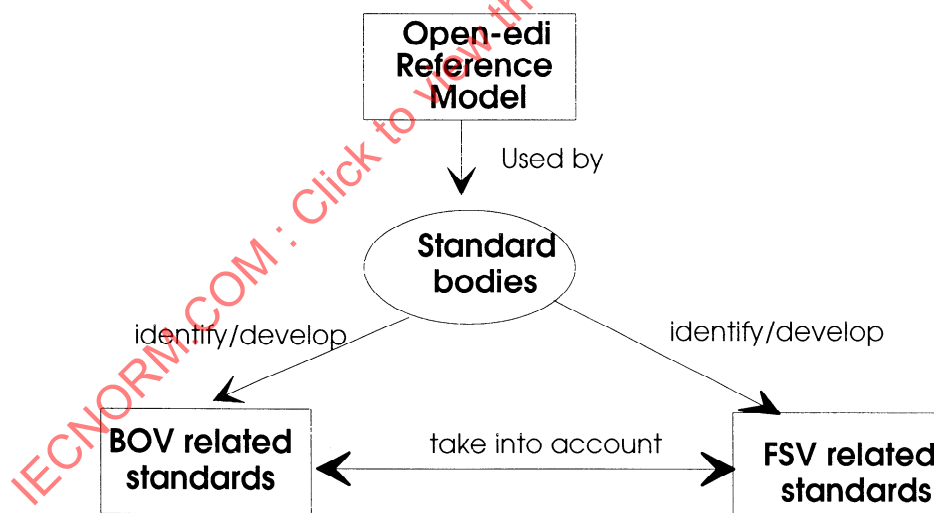


Figure 2 - The creation of BOV and FSV standards

4.1 Business operational view

The BOV addresses the business requirements for inter-working among Open-edi Parties, as well as demands on supporting IT products and services. These business requirements include business conventions, agreements and rules among organisations.

4.1.1 BOV related standards

BOV related standards provide the tools for formal business description(s) of the external behaviour of organisations, as seen by other organisations, in view of achieving a business goal. As such, the BOV related standards provide a means for capturing the static and dynamic requirements of business.

The BOV related standards provide a specification of how to model the business and associated requirements as an Open-edi scenario. This specification includes the modelling standard containing the Open-edi Description Technique to be used.

Open-edi Description Technique (OeDT): a specification method such as a Formal Description Technique, another methodology having the characteristics of a Formal Description Technique, or a combination of such techniques as needed to formally specify BOV concepts, in a computer processible form.

The BOV related standards provide the tools and rules to permit and ensure:

- the specification of an Open-edi scenario;
- the reusability of components of Open-edi scenario;
- the harmonisation of components of Open-edi scenario among user communities.

4.1.2 Open-edi scenarios

Different user groups will generate Open-edi scenarios in accordance with the specification given in the BOV related standards. Open-edi scenarios shall be specified in conformity to the BOV related standards. Business communities can propose Open-edi scenarios as candidates for standardisation and registration into (an) Open-edi scenario repository (ies). Procedures to be used for introducing new Open-edi scenarios and updating Open-edi scenarios in one or more repositories are specified in a BOV related standard.

Parties will have a need for both generic and specific scenarios. Generic scenarios set out the overall scenario structure for a business transaction; however, these are realised through profiles for specific scenarios which support particular sectorial, legislative and other requirements.

All the specifications included in an Open-edi scenario are made at an abstract level. This is independent of matters such as data representation, coding, encoding.

The OeDT to be used for these scenarios shall therefore allow for both hierarchical decomposition and a modular approach.

Therefore, BOV related standards shall provide for the possibility of defining Open-edi scenarios with different levels of granularity.

Open-edi scenarios include the following components:

- roles;
- information bundle(s);
- scenario attribute(s).

4.1.2.1 Roles

role: a specification which models an external intended behaviour (as allowed within a scenario) of an Open-edi Party.

Businesses carry out their activities by performing roles, e.g. buyer, seller. Roles describe external business interactions with other parties in relation to the goal of the business transaction.

The behaviour of an OeP playing a role is expressed through the OeDT as specified in the BOV related standards. Example FDTs used to describe the behaviour of a role are shown in Annex C.

A role includes the following characteristics:

- all information relevant to the interoperability, within the BOV perspective, of Open-edl systems. It provides the means for the Open-edl system to determine the allowable sequence(s) of information bundles exchanges and the conditions in which a role is allowed to send an information bundle. Such conditions include, but are not limited to:
 - the receipt of an information bundle from another role;
 - internal decisions;
 - timer expiration related to the goal of the business transaction (for example payment delay);
 - exceptional conditions or errors related to the business goal of the business transaction (for example receipt of damaged goods).
- demands on Open-edl Support Infrastructure which reference the functional capabilities (see 4.2.1) and their quality of service satisfying the Open-edl scenario requirements on a role. The catalogue of predefined demands on Open-edl Support Infrastructure is a BOV related standard. Security features associated with a role are such an example. The related Open-edl configuration (see 4.2.2) satisfies these demands.
- demands on OePs which specify the Open-edl scenario constraints imposed on a role. Such constraints impose restrictions on how roles may be assumed by OePs. Such constraints include but are not limited to:
 - constraints on the characteristics for the OeP which can play this role;
 - constraints imposing a role being played only by a maximum number of OePs;
 - constraints imposing a role to be conditional;
 - constraints of preconditions before a role can be played;
 - constraints on the ability of an OeP to assign all or part of a role to another OeP;
 - constraints on different OePs playing a role, i.e. as it moves through the various "acts" or "scenes" in an Open-edl scenario.

The related Open-edl configuration (see 4.2.2) satisfies these demands.

- registration and management information pertinent to the reusability of a role such as:
 - purpose of the role;
 - business goals of the role;
 - business rules controlling the role;
 - regulations governing the role.

4.1.2.2 Information bundles

Information Bundle (IB): the formal description of the semantics of the information to be exchanged by Open-edl Parties playing roles in an Open-edl scenario.

The IB is used to model the semantic aspects of the business information. Information bundles are constructed using Semantic Components.

Semantic Component (SC): a unit of information unambiguously defined in the context of the business goal of the business transaction.

A SC may be atomic or composed of other SCs.

SCs are defined by knowledgeable parties such as user groups and proposed for standardisation and registration in one or more repositories. Procedures to be used for defining, introducing and updating SCs are BOV related standards. Technical procedures for electronic access to one or more repositories are candidates for standardisation.

The information bundle includes the following characteristics:

- all information relevant to the interoperability, within the BOV perspective, of Open-edl systems. It is composed of SCs and describes their relationships;
- demands on Open-edl Support Infrastructure which reference the functional capabilities (see 4.2.1) and their quality of service satisfying the Open-edl scenario requirements on IBs. The catalogue of predefined demands on Open-edl Support Infrastructure is a BOV related standard. Such features include but are not limited to:
 - confidentiality of the IB;
 - integrity of the IB.
- registration and management information pertinent to the reusability of an information bundle such as:
 - name of the IB;
 - purpose of the IB;
 - business rules controlling the content or concept(s) of the IB;
 - regulations governing the content or concept(s) of the IB.

4.1.2.3 Scenario attributes

scenario attribute: the formal specification of information, relevant to an Open-edl scenario as a whole, which is neither specific to roles nor to information bundles.

Classes of scenario attributes include the following:

- all information relevant to the interoperability, within the BOV perspective, of organisations for example:
 - relationships among roles;
 - relationships among SCs of different IBs;
 - syntax of these relationships.

- demands on Open-edl Support Infrastructure which reference the functional capabilities (see 4.2.1) and their quality of service satisfying the Open-edl scenario requirements. The catalogue of predefined demands on Open-edl Support Infrastructure is a BOV related standard. Such features include but are not limited to:

- the quality of service required for the communication services to support the execution of the business transaction;

- the security features required to support the execution of the Open-edl transaction.

- demands on OePs which specify the Open-edl scenario constraints. Such constraints impose restrictions on how roles may be assigned to OePs. Such constraints include but are not limited to:

- the constraint imposing that two specific roles be played by different OePs;

- the constraint imposing that two or more roles be played by the same OeP.

The related Open-edl configuration (see 4.2.2) satisfies these demands.

- registration and management information pertinent to the reusability of an Open-edl scenario such as:

- name of the Open-edl scenario;

- class(es) of business requirements of Open-edl scenario;

- purpose of Open-edl scenario;

- laws and regulations governing the Open-edl scenario.

4.2 Functional Service View

Within the FSV, the interoperability addresses the interactions between the IT Systems supporting the Open-edl Parties. Interoperability implies that two or more IT systems, conforming to the standards related to the FSV, are able to co-operate and support the execution of business transactions that are in compliance with Open-edl scenarios. FSV related standards address information technology interoperability aspects which are generic to business transactions.

The FSV identifies and models the generic functional capabilities of IT Systems which are needed to support the execution of Open-edl transactions. In addition, it provides the basic concepts which will allow the FSV related standards to accommodate different configurations of organisations and IT systems to provide these functional capabilities. For example, the FSV related standards will accommodate the need for Open-edl Parties to delegate a part of the execution of Open-edl transactions to service providers.

4.2.1 Functional concepts and capabilities

Open-edl System: an information technology system which enables an Open-edl Party to participate in Open-edl transactions.

An Open-edl system may be considered as containing two functions. The first is a Decision Making Application function. The second is the function of an Open-edl Support Infrastructure needed to support the carrying out of Open-edl transactions for an organisation.

Decision Making Application (DMA): the model of that part of an Open-edl system that makes decisions corresponding to the role(s) that the Open-edl Party plays, as well as originating, receiving and managing data values contained in instantiated information bundles, which is not required to be visible to the other Open-edl Parties.

The DMA functions are one aspect of the FSV. Decisions made by the DMA are not necessarily business decisions.

Open-edl Support Infrastructure (OeSI): a model of the set of functional capabilities for Open-edl systems which, when taken together with the Decision Making Applications, allows Open-edl Parties to participate in Open-edl transactions.

The Open-edl support infrastructure applies to all Open-edl transactions and specifies:

- a) the services offered to Decision Making Applications;
- b) the inter-working of components of the Open-edl support infrastructure.

The set of functional capabilities modelled in the OeSI provides for initiating, operating, and tracking the progress of Open-edl transactions.

The list of functional capabilities includes:

- handling of DMA requests;
- negotiation of role playing;
- specification of the Open-edl configuration;
- interpreting and processing of a role;
- making available the data values received from information bundles from Open-edl systems;
- capture of the data values provided as a result of behaviour choice;
- provision of security services and auditing services;
- tracking and notification of Open-edl transaction status and progress across applications;
- management of error reporting;
- management of communications.

In addition to the functional capabilities required to execute any business transaction, the set of functional capabilities of the Open-edl Support Infrastructure shall implement the catalogue of predefined demands on the Open-edl Support Infrastructure which are specified in a BOV related standard.

Decision Making Application Interface (DMA Interface): the set of requirements that permit a Decision Making Application to interact with the Open-edl Support Infrastructure.

The purpose of the DMA interface is to promote the independence of DMAs from the structure of the OeSI.

The generic mechanisms used to translate SC values into a transfer syntax from the information bundle specification (or SC specification) and vice-versa, are specified in a FSV related standard.

The objective of DMAs is to make business decisions. In order to conduct business transactions, DMAs will exchange information (logical exchanges). These exchanges are accomplished when DMAs request services from the OeSI.

4.2.2 Implementation concepts

Information Processing Domain (IPD): an Information Technology System which includes at least either a Decision Making Application and/or one of the components of an Open-edl Support Infrastructure, and acts/executes on behalf of an Open-edl Party (either directly or under a delegated authority).

The concept of IPD is used in the implementation of Open-edl scenarios. An OeP may encompass all the functional components (DMA and OeSI) into a single IPD or may delegate the provision of some functional components to different IPDs (Service Providers). Different OePs may play the same role. An OeP may play different roles of an Open-edl scenario. These roles may be played by the same IPD or different IPDs of the OeP.

An Open-edl System includes at least an IPD having a DMA. An IPD which supports several Open-edl Parties is part of each Open-edl System associated with these OePs. An Open-edl System must include one and only one IPD having a DMA, however it may include multiple IPDs.

An IPD shall conform to the FSV related standards associated with interfaces and protocols it implements.

Open-edl support organisation: an organisation, acting on behalf of an Open-edl Party(ies) to provide necessary support enabling execution of Open-edl transactions, but which is not modelled as a role(s).

IPD(s) operated by an Open-edl Support Organisation have no DMA.

Open-edl Configuration: a formal specification of an operational configuration of Open-edl Parties and their associated IPDs, which can execute Open-edl transactions corresponding to a given Open-edl scenario.

An Open-edl Configuration refers to the all set of Open-edl Systems participating in the execution of an Open-edl scenario. It satisfies the demands specified in the Open-edl scenario and includes:

- the identifier of the OeP (s) for each role of the scenario;
- the address of the IPDs, for each OeP.

Based on the Open-edl configuration, the instantiation of the scenario can be accomplished by the initiation of an Open-edl transaction.

Figure 3 shows a possible relationship among the functional components of two sample Open-edl Systems. The goal of these relationships is to support the interaction between DMAs of the Open-edl Parties. For this interaction, DMAs use, through their DMA Interface, the services of the OeSI. Although figure 4 shows two Open-edl systems, the concept is extended to more than two Open-edl Systems.

The configuration of Open-edl systems may reflect the delegation of parts of OeSI to other Open-edl Parties. Whenever this situation occurs, an IPD will be configured with OeSI. This IPD will support other IPD(s) within the same Open-edl system, and may be shared by different Open-edl systems.

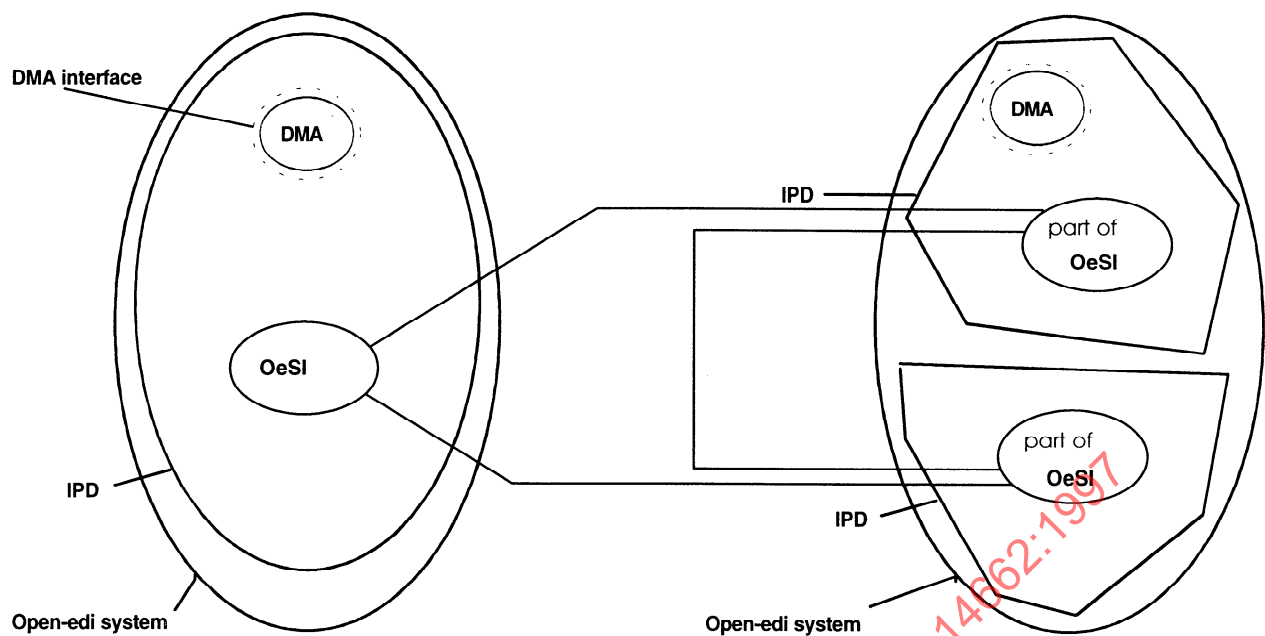


Figure 3 - Open-edl system relationships

Some informative additional implementation concepts are specified in Annex D, clause D.2.

4.3 Open-edl Reference Model related standards

The BOV related standards include:

- a modelling standard including the OeDT to be used for specifying Open-edl scenarios;
- procedures to be used for introducing new Open-edl scenarios and updating Open-edl scenarios in a repository(ies);
- procedures to be used for introducing new SCs (atomic or compound) and updating SCs (atomic or compound) in a SC repository(ies);
- catalogue of predefined demands on Open-edl infrastructure.

The FSV related standards include:

- the specification of the OeSI and its components with their associated interfaces and protocols (see Informative Annex D);
- the specification of DMA interface;
- the generic mechanisms used to translate SC values into a generic transfer syntax from the information bundle specification (or Semantic Component specification) and vice-versa.

The FSV related standards shall rely on communication standards for communication among IPDs.

4.4 Use of BOV and FSV related standards

The BOV and the FSV related standards are used in the following activities:

- production of Open-edi scenarios by user communities and the registration of Open-edi scenarios by registration authorities;
- production of Open-edi compliant IPDs.

IT implementors are expected to enable the execution of Open-edi transactions using registered scenarios and compliant configured IPDs.

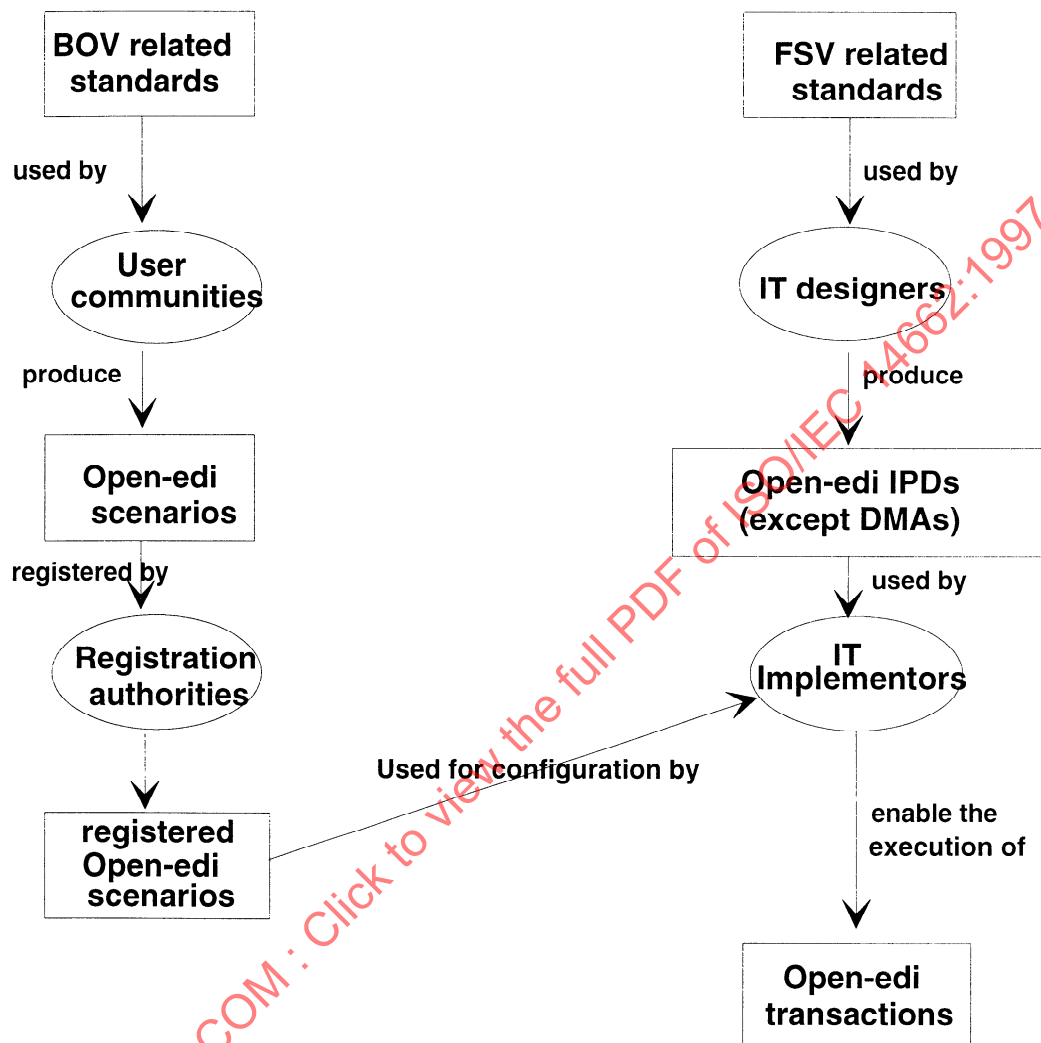


Figure 4 - The use of BOV and FSV standards

5 Conformance Statement

Conformity to the Open-edi Reference Model shall apply only to BOV and FSV related standards.

BOV and FSV related standards in conformity to this Open-edi Reference Model shall state:

- the class of the standard it belongs to, that is either the BOV or FSV related standards;
- which item of 4.3 of this Open-edi Reference Model it pertains to;
- the list of the basic concepts of the Open-edi Reference Model to which it refers (reference to the number of the concept in clauses 3 and 4 of this Open-edi Reference Model);
- that all other concepts of the standard are consistent with and defined in reference

to the here above mentioned basic concepts.

The conformity statement shall be in the following form:

"This standard is in conformity to the Open-edl Reference Model in that it is a "BOV/FSV" related standard which pertains to item X of 4.3 of the Open-edl Reference Model. It uses the following basic concepts (X,Y,Z) as defined in clauses 3 and 4 of the Open-edl Reference Model. All new concepts introduced in this standard are defined in reference to these basic concepts and are consistent with them."

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Annex A (informative)

Standardisation areas and types of standardisation activities for Open-edi

The purpose of this annex is to identify areas of standardisation activities related to Open-edi in order to serve as the basis for the co-ordination of Open-edi standardisation. This Annex outlines the framework for this co-ordination, and for this purpose it provides a matrix of activities based on the areas and levels of activity in standardisation and classification of Open-edi standards. As one example it places existing EDIFACT standardisation work in perspective.

The figure A.1 illustrates the relationships between the Open-edi standardisation areas and other standardisation areas. The work of ISO/IEC JTC 1 SC 30 focuses on the development of the generic Open-edi standards in the "INFORMATION TECHNOLOGY GENERIC STANDARDS" box.

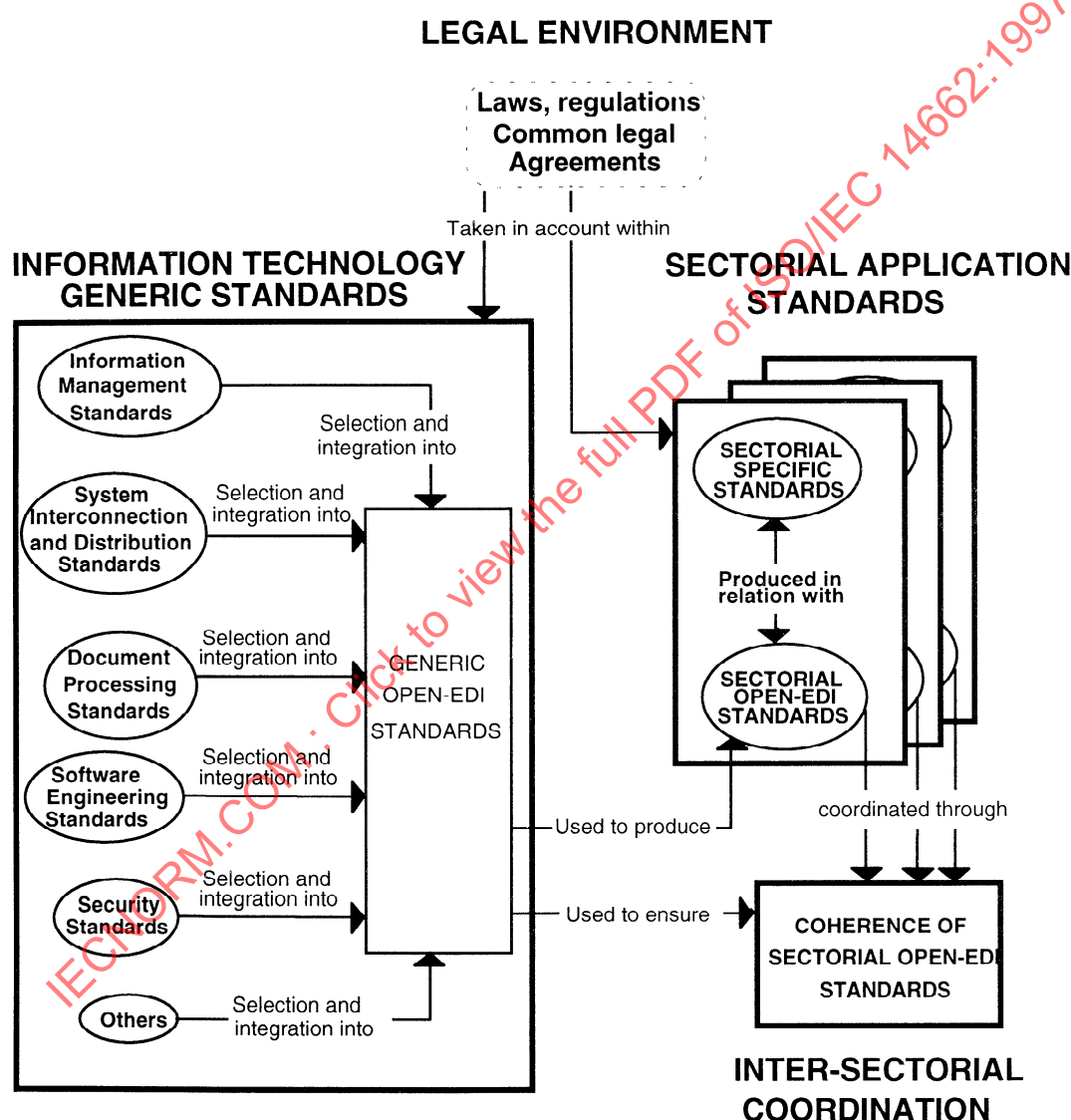


Figure A.1 - Relationships of Open-edi standardisation areas with other standards and impact of the legal environment.

A.1 Open-edition Standardisation areas

Following from the Open-edition reference model, the following standardisation areas are identified as necessary to achieve Open-edition:

- a) legal environment for Open-edition;
- b) generic Open-edition standards;
- c) sectorial Open-edition standards;
- d) inter-sectorial co-ordination of Open-edition sectorial standards.

A.1.1 Legal environment for Open-edition

The legal environment is the framework of requirements, (e.g. provisions, procedures, constraints, etc.) arising from laws and regulations which govern business transactions executed through Open-edition.

A.1.2 Generic Open-edition standards

The generic Open-edition standards are Information Technology Generic Standards. They include the BOV related standards and the FSV related standards.

The BOV related standards are the generic tools used by all sectors to define their own Open-edition sectorial standards and to ensure the inter-sectorial coherence.

The FSV related standards are the standards used by implementors to develop Open-edition implementations which interoperate and offer the required services to support the execution of Open-edition transactions.

These generic Open-edition standards are closely related to other Information Technology generic standards areas such as Software Engineering, Security, Open Systems Interconnection and Distribution, Document Processing and Information Management.

Generic Open-edition standards may include existing EDI related standards where these comply with the Open-edition Reference Model.

A.1.3 Sectorial Open-edition standards

The sectorial Open-edition standards cover the contents, and processes of the business transactions, by defining Open-edition scenarios. This area is therefore dependent on the existence of the BOV related standards. In addition, for a given sector, the sectorial Open-edition standards are closely related to other Information Technology standards of this sector.

Sectorial Open-edition standards may include existing EDI related standards where these comply with the Open-edition Reference Model.

A.1.4 Inter-sectorial co-ordination of Open-edi sectorial standards

Coherence of various sectorial Open-edi standards is ensured by harmonisation of Open-edi scenarios developed by various sectors. It is done through the use of the common formalism and the registration procedures included in the generic Open-edi standards. This area is therefore dependent on the existence of the BOV related standards.

A.2 Classification of Open-edi Standards

Four typical areas of activity are encountered when realising a business transaction using EDI.

A.2.1 Environment

The framework of legal provisions, business codes, practices, and trade procedures within which all business transactions occur.

A.2.2 Activity Models

Definitions of the business and technical processes which transfer information in a business transaction. These models capture the dynamic aspect of the transaction.

A.2.3 Information models and representation

Models for the data transferred in a transaction, including models for its possible presentation in data elements or documentary format for example on paper, fax, or a visual display unit.

A.2.4 Technology

The means that enable computers to interoperate including APIs which allow application to access the services providing interoperability.

A.3 Levels of activity

From the generic subject of meta-standard down to the specific subject of an implementation, there are intermediary levels of subject of activity such as standards and conformity and certification.

A.3.1 Meta-Standards

The generic standards, definitions languages and other tools and techniques used to specify and express standards, guidance's material, tests and implementations.

A.3.2 Standards

Document established by consensus and approved by a recognised body, that provides, for common and repeated use, rules, guidelines or characteristics for activities or their results, aimed at the achievement or the optimum degree of order in a given context.

A.3.3 Guidelines

Guidelines development result in materials which interpret the standards into more specific form for the guidance or assistance of the users of the standards.

A.3.4 Conformity and certification

Assurance of conformity: confirmation by examination of evidence that a product process or service fulfils specified requirements.

Certification: procedure by which a third party gives written assurance that a product process or service conforms to specified requirements.

A.3.5 Implementation

The action taken by software and hardware suppliers and by the ultimate business user.

A.4 Standardisation activity table

Based on the definition of areas of activities in A.2 and levels in A.3 a table can be built to serve as a framework where existing EDI activities and projected Open-edl activities can be relatively positioned.

A cell of the table can be defined by applying the subject levels of the first line described in A.3 to the activity areas of the first column described in A.2.

A.4.1 Application to Open-edl

This framework can be populated by Open-edl related activities. The result is shown in Table A.1.

The two perspectives of BOV and FSV are mapped in the 5 activity areas:

- BOV corresponds mostly to the areas of environment, activity models and information models and to a limited extent to technology area required for the link with FSV related standards.
- FSV related standard correspond mostly to the technology area and to a limited extent to data models area required for the link with BOV related standards.

Table A.1 - Positions of Open-edi activities

	meta-standards		standards	guidelines	conformity and certification	implementation
environment	B	Open-edi	Open	business and legal guidelines		Open-edi transaction
activity models	O	Description	edi			
information models	V	Technique	scenario			
representation	F S V		SC values to Transf. Syntax translation			
T E C H N O L O G Y	B O V	catalogue of demands	demands on Open-edi support-Inf.			IPDs of an Open-edi Configuration
	F S V	OeSI specifications	DMA interface OeSI components interfaces and protocols			
			interconnection protocols			Transfer Infrastructure

A.4.2 Example of application to existing EDIFACT

This framework can be populated by existing EDIFACT activities, as shown in Table A.2.

Table A.2 - Positions of EDIFACT activities

	meta-standards	standards	guidelines	conformity and certification	implementation
environment			business guidelines		interchange Agreement
activity models			BIM		user application processing
information models representation	EDIFACT message design	UNSM TDID	BIM Messages implementation Guidelines		actual message data
Technology	EDIFACT Transfer syntax	interoperability standards			Users implementations

Annex B (informative)

Requirements for Open-edi standards

B.1 Business organisational requirements

B.1.1 Multi-sectorial EDI

The evolution of information and communication technology has created a need and opportunity for different user groups to engage in business relationships, using these technologies. This requires automatic methods to carry out EDI among organisations. These organisations have not only different computer systems and independent data bases, but also different business partners and a variety of business practices. Their business exchanges involve different types of data representations, syntaxes, protocols and communication systems.

The user groups whose requirements should be taken into account are active in very diverse sectors, such as: trade, commerce, banking, transport, manufacturing, health care, libraries, education, public administration, public services, construction industry etc. Since it is likely that these groups will eventually engage in EDI with each other, there is a need for a solution which crosses all sectors.

B.1.2 Open environment

An environment is said to be open in the sense that all requirements for inter-working are satisfied by the implementation of publicly available, non-proprietary standards or rules. There should be no need for private agreements in order to resolve ambiguities in exchanges. The freedom to use private agreements in addition to and in the framework of a shared agreement is of course always available.

The lack of such an environment means:

- bilateral agreements may be necessary between EDI participants. These extend to technical matters, not only to the "agreement to inter-work". Such agreements must cover all necessary domains, involving the participants at many different levels (i.e. business aspects, general policies, telecommunications, information systems);
- individual organisations may have to support a range of different sets of inter-working facilities depending on the participants. This support must be ready to evolve across time, domains and technologies, thus loading each participant with increasing duties and problems.

Partially open approaches (such as market sector based communities of common interest) only ease this requirement; they do not eliminate it. They may even entrench incompatibilities between communities when cross-community and cross-border traffic is a major growth area for EDI. Furthermore, business users have also highlighted the need for an open environment to facilitate and minimise the set-up costs for EDI relationships with new business partners entering their business environment.

B.1.3 Organisational flexibility

Organisations require flexibility in their operation, for example for delegating a part of their business to sub-contractors. The introduction of EDI should not limit these possibilities to achieve such a flexibility. Also, organisations may want to delegate a part of the operation of the required services to support EDI. Open-edi needs to provide this flexibility, in the description of the business models and in the systems needed to support Open-edi.

B.2 Business information requirements

B.2.1 Integration of different data types

Exchanges of all information types need to be covered, as long as they are predefined, structured and processible by applications at both ends. These include alphanumeric structured data, but may also cover the exchange of Computer Aided Design drawings, images, texts, voice recordings, etc. within a business transaction. The need is to integrate many different data types and components and to express relationships between these components. It is also necessary to maintain these relationships throughout the business transaction. For example in the Computer Aided Logistic Support environment, there is a need to include the specification of a product into the order, or to condition the payment of a documentation received to the verification of its conformance to the original specification.

Integration of these different data-types needs to be in line with existing or future standards like SGML, STEP, MHEG.

B.2.2 Modelling

The early development of EDI standards has been carried out largely on the basis of reproducing in electronic form the equivalent transactions to those previously handled with paper. User groups are now finding that it is necessary to agree on a high level description of re-engineered business transactions. The reasons for this need are the following:

- management of change or business process re-engineering cannot take place unless the processes in question have been documented;
- functions where EDI is to be applied need to be identified in relation to the overall business. Traditional boundaries and functions may be affected;
- it is necessary to identify the regulations and any requirement for legislative compliance which are met by current non-EDI solutions and would need to be met by any EDI solution;
- the selection or use of a specific EDI solution in terms of standards and techniques should be as transparent as possible to business functions;

In addition to the need to describe business transactions, user groups have identified the need to agree on information models at the semantic level before agreeing on specific data structures and data representations to be exchanged between parties. Such agreement on information models are needed for the following reasons:

- agreement on semantics of information flows can be achieved faster than agreement on data representation;
- agreement on semantics of data is needed to reconcile and co-ordinate different data representations used in different industry sectors;

- agreed information models allow completeness and consistency controls on data exchanged between parties.

B.2.3 Registration of business models

Finally the user groups have identified the need to use modelling facilities to produce business and information models expressed in a common formalism in order to be registered.

Registration of these models facilitates their reusability by different user communities and industry sectors. Such registration is necessary to harmonise these models.

B.3 Business interchange requirements

B.3.1 Independence of business aspects from information technology aspects

User groups have expressed the need for EDI to be independent from the communication services. In particular, business and information models should be independent of the type of communication used.

Despite this need for independence of business aspects from communication, EDI requires communication and data transfer. In addition, some business constraints may have consequences on communication characteristics. Examples of such constraints are the following:

- in specific cases (e.g. "Interactive EDI") there are strict constraints on the response time needed for data transfer, for example in the airline industry;
- some EDI transactions imply high volume of data transfer, some others do not.

B.3.2 Interoperability of business interchanges

The present use of communication services for EDI are mainly provided by closed proprietary services. Interconnection of such services is needed, taking into account the already existing standards, (e.g. OSI standards such as message handling systems, file transfer and distributed transaction processing).

B.3.3 EDI transactions

There is the a need for cross-references to relate business interchanges with each other. Therefore, it is necessary to consider a multi-partner EDI transaction as well as bilateral exchanges. This requires specific capabilities in the systems supporting EDI and the consideration of the interoperability aspects for the support of EDI transactions. This consideration is very relevant to "interactive EDI".

B.3.4 Standardised APIs

The lack of APIs in the EDI area currently results in significant implementation efforts specific to the proprietary EDI software used to support any application.

Standardised APIs are needed to provide portability thereby offering more flexibility in the choice of suppliers for individual components. They also allow application developers to ignore the underlying services used. Furthermore, they ensure independence of the application from the underlying services.

B.3.5 Conformance testing

There is a need for the availability of a conformance testing environment for relevant components of an Open-edi implementation.

B.4 Security

Businesses have created and evolved procedures and controls to safeguard their assets. Some controls have been devised to protect businesses from their trading partners, others to protect them from competitors and some to ensure compliance with legislation. These safeguards must be identified and where a common requirement is identified, made available for use in EDI. Appropriate services and tools need to be available.

B.5 Legal aspects

Many uses of EDI have legal or regulatory impacts which may be determined by the countries of parties using EDI, or even the countries through which the EDI messages are transmitted. This may range from sending a purchase order (contract law) to transferring medical information (data protection legislation) or shipping pharmaceuticals (bilateral drugs agreements). It is essential that there is significant co-ordination between those preparing Open-edi standards and relevant legal and security experts to ensure that a framework is created which can be modified and adopted as electronic trade replaces paper based trading systems. Although legal implications of business interactions vary in different jurisdictions, it should be possible to model concepts such as rights, obligations, permissions, prohibitions and contract formation.

B.6 Migration

Users have been investing in standardisation of EDI messages for the past years. Implementations based on these standards are used. Therefore there is a need to offer a migration path from existing EDI towards Open-edi. This migration path concerns both the existing standards and the existing implementations.

Annex C

(informative)

Example formal description techniques for modelling role behaviour

This informative annex presents some example formal description techniques (FDTs) that may be used for the modelling of the role behaviour. FDTs are needed to be able to specify this behaviour in a formal and abstract manner. They will provide unambiguous role descriptions. Furthermore, most FDTs are supported by Computer Aided Software Engineering (CASE) tools, which will facilitate the modelling and implementation of role descriptions. Although this annex only focuses on the role behaviour, similar techniques will be needed for other Open-edl Scenario concepts. The FDTs eventually chosen for the various Open-edl Scenario concepts will be BOV related standards.

This annex does not mandate any specific FDT technique. Examples of decomposing one particular scenario are now given to illustrate the validity of alternate methods. The scenario is now described, and is followed by decomposition using different methods.

A relatively simple situation from the health care sector is chosen as an example. Consider the situation in which a business participant acts as a centre or agency of acquiring organs for those that need organ transplants. The roles to be modelled are the organ requester, the organ centre, the organ donor.

In this example only one organ requester, organ centre and organ donor are shown, while in general there could be several requesters and donors connected to one centre. It would also be possible to extend this example to include transporters, finance departments, banks, etc. However, the goal with an example is illustration, not exhaustive.

The behaviour of the different roles of our example may briefly be described as:

- the organ requester will request the organ centre for organs, remind the organ centre of earlier requests, accept organs, cancel requests (patient died (or recovered!), or internal supply of organ), receive refusal of request from organ centre;
- the organ centre will receive and reply to requests for organs from the organ requester, request organs from organ donor if no organ is locally available, receive organs from organ donor, refuse requests, cancel requests towards organ donor (request cancelled by organ requester or internal supply available);
- the organ donor will receive requests for organs from the organ centre, receive cancellations for earlier request, offer organs to the organ centre.

Several concepts of role behaviour can be distinguished. This is illustrated in figure C.1.

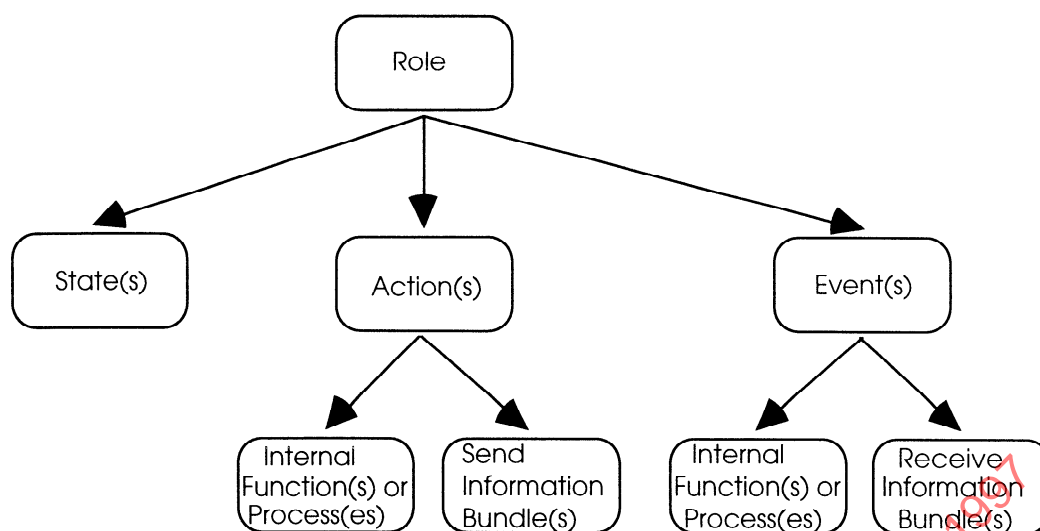


Figure C.1 - Concepts of role behaviour

C.1 Aspects of role behaviour based on a state transition FDT

A transition is the process of changing from one state to another within a given role. Within an Open-ed scenario, a transition is described by the following:

- the current state of the role;
- the event which triggers the transition;
- the action(s) produced by this transition;
- the next state of the role after this transition.

The first dynamic aspect of the Open-ed scenario is the sequence of information bundle exchanges. The sequence shows the order information bundles are expected to be sent and received by each role.

Business Operational View Ordering of possible Information Bundle Exchanges

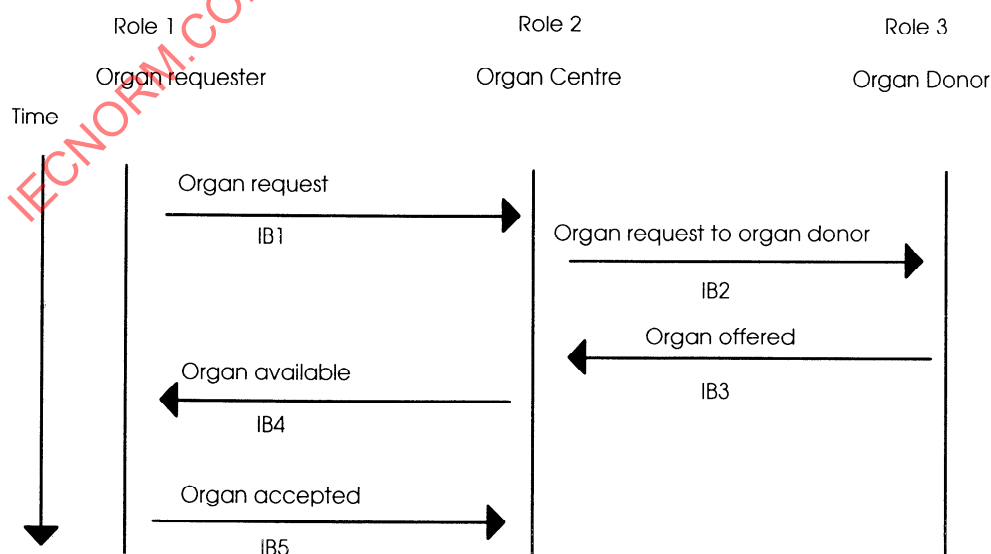


Figure C.2 - Information Bundle sequence chart

The second dynamic aspect of the Open-edi scenario is the state/transition. The behaviour of a role is described by states, transitions, and events. The purpose of a state/transition is to further define a role and capture its dynamic behaviour.

Table C.1 - State/transition table for role 2

Event	State	Actions	State
Receive Organ request IB1	Initial	Process request and send request to organ donor (IB2)	S1
Receive Organ offered IB3	S1	Process organ offer and send organ available (IB4)	S2
Receive Organ accepted IB5	S2	Request filled	Final

C.2 Aspects of Role Behaviour based on a Petri Net FDT

Another class of FDTs are based on Petri Nets. Petri Nets allow both a static and a dynamic representation of role behaviour. One of the main advantages of Petri Nets is that they offer a graphical representation but are nevertheless based on strong mathematical foundations. This allows the formal analysis of properties such as the avoidance of dead-lock states etc. The Petri Net representation shown below is an extension of the classical Petri Nets in order to include absolute time (deadlines) and to be able to distinguish various IB types, called Documentary Petri Nets¹⁾. In Figures C.3, C.4 and C.5 the Documented Petri Net models of the organ requester, the donor and the organ centre role are depicted. Circles represent regular control states and boxes represent information bundles.

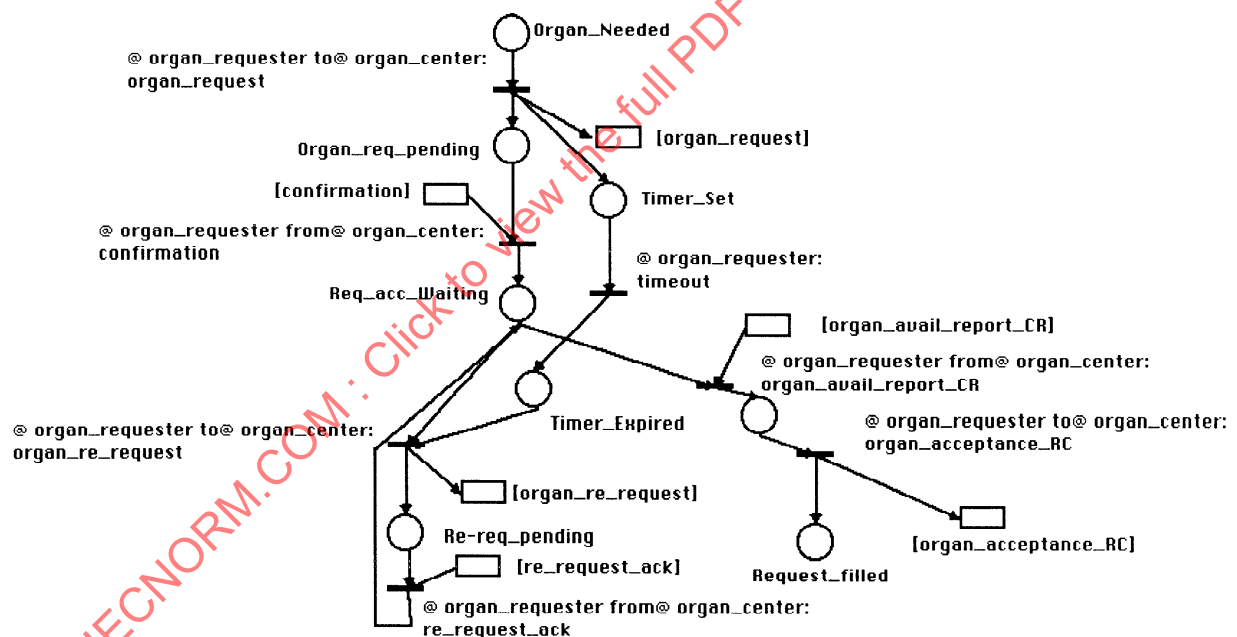


Figure C.3 - The Organ-Requester role

¹⁾ See for instance Bons, R.W.H., Lee, R.M., Wagenaar, R.W., Wrigley, C.D. Modelling Interorganizational Trade Procedures Using Documentary Petri Nets, Proceedings of the 28 Annual HICSS conference, IEEE Computer Society Press, 1995, ISBN 0-81866940-3.

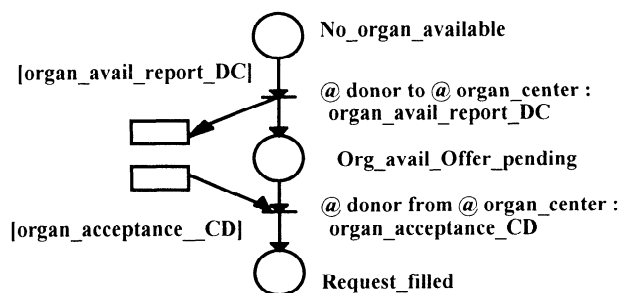


Figure C.4 - The Donor role

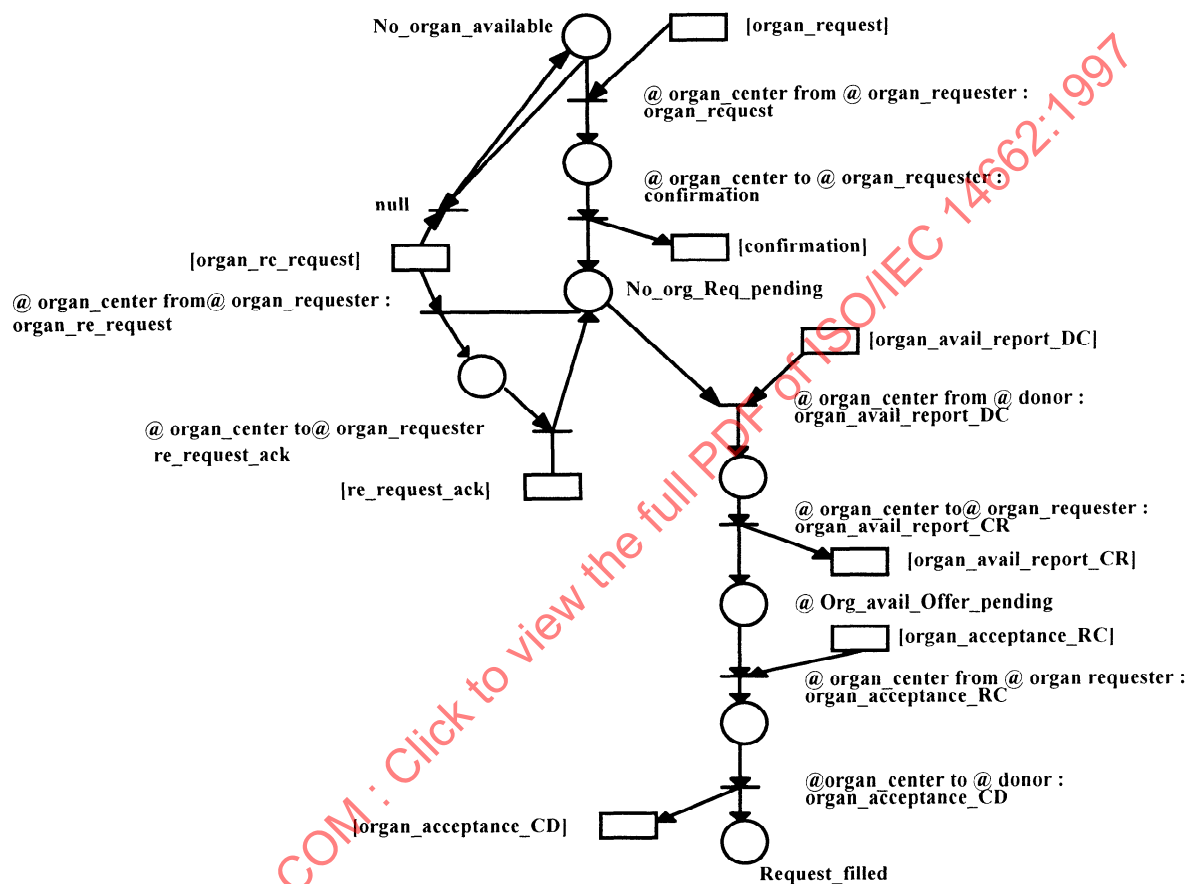


Figure C.5 - The Organ-Centre role

Annex D (informative)

An approach detailing concepts of the FSV

This annex suggests an approach for further detailing the concepts described in chapters 4.2 and 4.3.

The Open-edi Support Infrastructure is composed of:

- Open-edi Support Entities;
- Transfer Infrastructure.

D.1 Functional concepts

Open-edi Support Entity (OeSE): a functional component of the Open-edi support infrastructure used to model a subset of generic functional capabilities.

The identification of such a subset of functional capabilities shall take into account the possibility that the corresponding OeSE may be implemented in a different Open-edi system.

Open-edi Support Entity Interface: the set of specifications that allows access to the services the Open-edi Support Entity provides.

Transfer Infrastructure (TI): the complete set of functional capabilities offering interconnection services.

Transfer Infrastructure Interface: the set of specifications that allows Open-edi Support Entities to access the interconnection services the Transfer Infrastructure provides.

The TI Interface promotes the independence of OeSEs from the structure of underlying interconnection services and their functionality and protocols. The use of current available standards for interconnection services will be maximised. The TI allows OeSEs and DMAs to inter-work without concern to their location (location transparency).

Open-edi Support Entity Protocol: a set of rules and data formats (semantic and syntactic) which models the interaction among peer Open-edi Support Entities.

The purpose of the OeSE protocol is to ensure the interoperability of implementations of OeSEs which are operated by different organisations.

OeSE Protocol includes specification of Open-edi Control Information and possibly Open-edi User Data.

Open-edi Control Information (OeCI): the information exchanged among Open-edi Support Entities to co-ordinate their operation.

Open-edi User Data (OeUD): instances of information bundles or components of information bundles (as Semantic Components).

The OeSEs groups functional capabilities that provide services to support Open-edi transactions. As such, each OeSE inter-works with at least two of the other functional components, (DMAs, other OeSEs on the same Open-edi system, peer OeSEs on other Open-edi Systems and/or TI).

The purpose of the DMA interface is to promote the independence of DMAs from the structure of the set of OeSEs.

Figure D.1 depicts the logical inter-working of each component. Each column represents an Open-edi System and its inter-working relationships at each layer. The objective of DMAs (top layer) is to make business

decisions. In order to conduct business transactions, DMAs will exchange information (logical exchanges). These exchanges are accomplished when DMAs request services from the OeSEs through the OeSE Interface. The OeSEs inter-work with other OeSEs through OeSE Protocols (logical exchanges). The OeSEs request services from the TI through the TI Interface. Eventually, the TI provides a physical link to peer Open-edi System implementations. The process is repeated, in reverse, on the peer Open-edi system to complete the DMA to DMA logical interconnection.

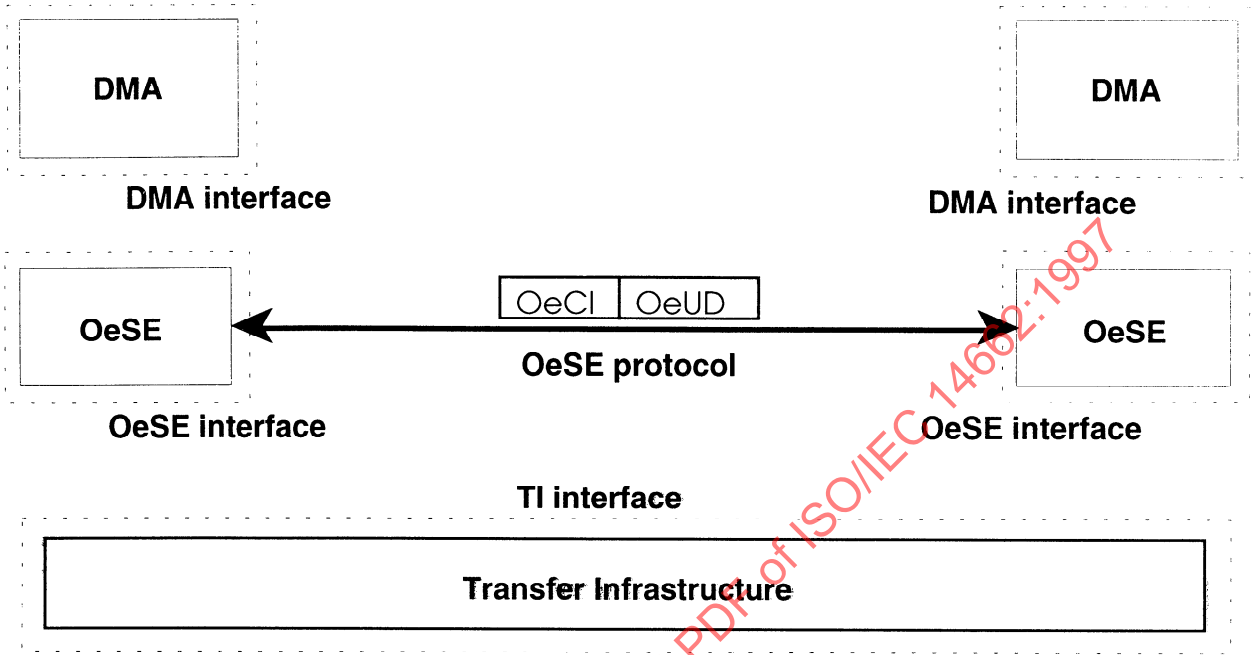


Figure D.1 - Relationships between functional components

Figure D.2 provides an expanded view of functional components in an Open-edi systems environment.

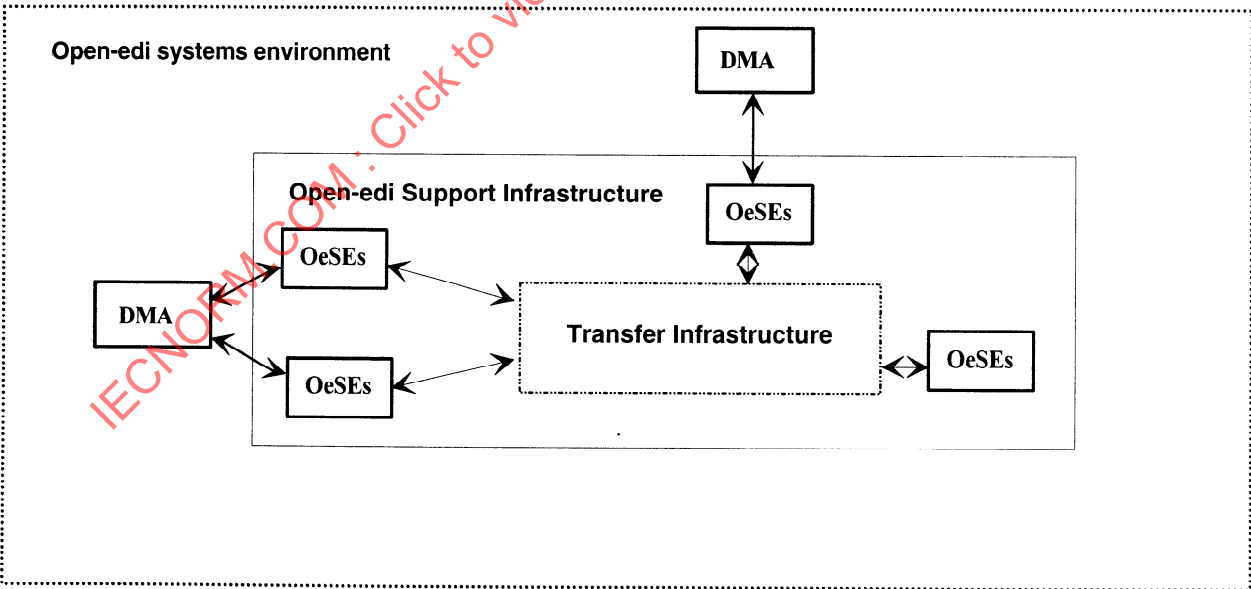


Figure D.2 - Functional Service View of the Open-edi systems environment