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INTERNATIONAL STANDARDIZATION AFFECTING TRADE INTERCHANGE

Standards Liaison Meeting Report

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STATUS: RAPPORTEUR REPORT  
ACTION: FOR INFORMATION; GE.1 Session, agenda item 7, September 1997

**ISO/IEC JTC1/SC30/WG1, Helsinki, Finland, April 7-11, 1997**

1. Based on a French contribution, the work of WG1 was restructured to work on Topics 14 (Identification and analysis of classes of business requirements in relation to Open-edi scenarios) and 15 (Requirements on FDTs and registration procedures) in parallel, with deliverables from these topics to be contained in a new base document WG1 N061 (Evolving working document for Topics 14 and 15). This base document will be an internal working document of WG1, not a standard. However, some parts of the work regarding Topics 14 and 15 may be candidates for standardization in the future.
2. Accordingly, the bulk of the meeting was spent on organizing and developing material for WG1 N061, with the intent that it would be distributed for review and comments by the end of April 1997. Since one of the primary tasks of Topic 14 was to provide example(s) of Open-edi scenario(s), much discussion took place on deciding what the first example scenario should be. The "Catalog Order" scenario detailed in AC.1's contribution of the Reference Guide - The Next Generation of UN/EDIFACT (Revision 6), was eventually chosen because of its relevance and completeness of description, analysis and modeling. The "Catalog Order" example was recast into the terminology of the Open-edi Reference Model, ISO/IEC IS 14662, completing all of the information required for Roles, Information Parcels and Scenario Attributes. This exercise for a specific scenario yielded a template for specifying any scenario, which became a key section of N061.
3. The "Catalog Order" example in N061, as the first scenario to be specified, serves as a baseline for any other scenario examples that might be included later. Furthermore, the IDEF models related to this example were accepted as an application of a formal description technique and were included as Appendix A of N061. The AC.1 Reference Guide will also be included as a reference.
4. While a personal contribution from the UN/ECE Standards Liaison Rapporteur and Paul Levine (US Delegate) had been submitted on the Open-edi metamodel, discussion was deferred because the metamodel doesn't relate to any of WG1's topics. Resolution WG 1 97/06 referred the metamodel to SC 30 to clarify how metamodel issues should be handled.
5. Resolution WG 1 97/07 was also addressed to SC 30, asking for clarification regarding object classes. The request to SC 30 was to confirm that IS 14662 does not exclude object classes that contain data and methods from Information Parcels, and in particular, does not exclude object class(es) from being associated with Semantic Component(s) in the Open-edi Reference Model. This clarification is important in recognition of the alignment of the work of AC.1 with SC 30.
6. The next meeting of SC30 and its WG1 will be held in Paris October 13-17, 1997.

## **Appendix A**

(available via the Internet at <http://www.unece.org/trade/untdid/sessdocs>)

## ISO/IEC JTC 1/SC 30/WG1 N061



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**ISO/IEC JTC 1/  
SC30/WG 1**

**OPEN-EDI**

**TITLE** : Evolving working document for Topics 14 and 15 (Base document)

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## **INTRODUCTION**

### **0.1 Purpose of the document**

### **0.2 Organisation**

### **1 Characteristics of Open-edi**

This part of the text will be taken from SC30 N206 (=WG1 N020), (second part) chapter 2. (not available in electronic format)

## 2. Detailed specification of open-edi scenarios and their components

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

An Open-edi scenario may be composed of two or more roles.

### Template on how to describe a scenario:

#### Scenario

Registration and management

- Name
- Purpose (may state exclusions)
- Class(es) of business requirements
- Laws and regulations
- Cross referense to other scenarios

#### Role (many instances)

Registration and management

- Name
- Purpose
- Business goal(s)
- Business rules
- Regulations

Demands on OeP

- Constraints on OeP characteristics
- Constraints on maximum number of OePs playing a role
- Constraints imposing a role to be conditional
- Constraints on different OePs playing this role
- ...

Demands on interoperability

- IPs for role
- Timer expiration
- Error conditions
- IP sequence
- ...

Demands on Open-edi Support Infrastructure

- From catalogue

#### Information Parcel (many instances)

Registration and management

- Name
- Purpose
- Business rules controlling content or concept(s) of IP
- Regulations governing content or concept(s) of IP

Information for interoperability  
-List of SCs and definitions  
-Relationships of Scs within Ips

Demands on Open-edi Support Infrastructure  
-From catalogue

### **Scenario attributes**

Demands on OePs

Demands on interoperability  
-Relationships among roles  
-Relationships among Scs of different Ips

Demands on Open-edi Support Infrastructure  
-From catalogue

### **2.1 Scenario attributes**

An Open-edi scenario may be described with the following attribute types:

- Name
- Purpose
- Business requirements
- Laws and regulations
- Generic scenario reference (potentially)
- Security requirements
- Role constraints
- Communication service quality
- Response time

### **2.2 Role**

A role is the description of the business behaviour of a participant within an open-edi scenario.

A role may be described with the following attribute types:

- Name
- Purpose
- Generic role reference
- Business requirements
- Laws and regulations
- Constraints
- Security features

A role must be a component of one or more scenarios.

A role may be related to one or more roles.

The behaviour of a role may be described by states, transitions, events, actions and internal functions.



### 2.2.1 STATE

A state describes the status of a role, and may be changed when a transition has occurred.

A state may be described by the following attribute types:

- Name
- Definition

A state may be current state to one or more transitions, and may be next state to one or more transitions.

A state must belong to only one role.

### 2.2.2 TRANSITION

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

- the current state of the role,
- the event which triggers the transition,
- the actions started by this transition,
- the next state of the role after this transition.

A transition may be described by the following attribute types:

- State/transition matrix row number; is an user-specified display sequence number.

A transition must belong to only one role.

A transition may be triggered by only one event, and may start one or more actions, and may have one current state and may have one next state.

### 2.2.3 EVENT

An event triggers a transition, and is triggered by only one information parcel or by only one internal function of a role.

An event may be described with the following attribute types:

- Name
- Definition

#### 2.2.4 ACTION

An action is started by a transition, and may send one or more information parcels and/or trigger one or more internal functions.

An action may be described by the following attribute types:

- Name
- Definition

#### POTENTIAL NEED: 2.2.5 INTERNAL FUNCTION

An internal function is a procedure which describes the internal behaviour of a role.

An internal function may be described by the following attribute types:

- Name
- Definition

An internal function may trigger one event, and may be triggered by one or more actions.

Editor's note: it is still unclear whether internal functions need to be included in the text or not. If this paragraph will be decided to be a part of the final document, text from WG1 N040 could be taken here.

### 2.3 Information Parcel

An information parcel is the formal description of the semantics of the information exchanged by Open-edi Parties playing roles in an Open-edi scenario. Information parcels are constructed using semantic components.

An information parcel may be described by the following attribute types:

- Name
- Purpose
- Business rules
- Laws and regulations
- Confidentiality
- Integrity

An information parcel must be sent by only one action, and must trigger only one event. An information parcel shall be composed of one or more semantic components.

#### 2.3.1 SEMANTIC COMPONENT

**Editor's note: Text in this subchapter is not agreed to be a part of the final document**

A semantic component must be component of one information parcel.

A semantic component may be using an object class as root node in a hierarchical information parcel structure.

A semantic component must be using a relationship and an object class as a branching node in a hierarchical information parcel structure.

### **3. Open-edi parties' constraints of the use of open-edi scenarios**

The concepts in the Open-edi BOV are related to business transactions. The following relationships exist:

- A business transaction may be specified as one or more Open-edi scenarios.
- An Open-edi scenario may specify one or more business transactions.
- An organization may play one or more roles.
- A role may be played by one or more organizations.
- An activity may be performed as one or more roles.
- A role may perform one or more activities.
- An information flow may consist of one or more information parcels.
- An information parcel may belong to one or more information flows.

## **4. Example of an open edi scenario**

### **4.1 Catalog Order**

#### **4.1.1 BUSINESS CASE DESCRIPTION**

Two scenarios depicting the process of a Buyer executing a Catalog Order with a Seller are shown. Scenario A depicts a first time Buyer initiating a relationship with a Seller by providing required buyer information. Scenario B depicts the process of a Buyer ordering items from a catalog, having previously established a relationship with the Seller by providing Buyer information and receiving a Buyer ID.

Certain assumptions are made as part of these scenarios. The Buyer has a copy of the Seller's catalog. Both Buyer and Seller have a private/public security key pair using the same security method. How the Buyer acquired the catalog and how the public keys are made available are not important for this discussion. The cost of each item is not always included, as this is

calculated from the listed Product Unit Price and the Quantity the Buyer orders. However, product price and currency are required when the catalog offers a product in multiple currencies. The Seller requires the buyer information before any Catalog Order is placed. As soon as the required buyer information is transmitted, the Buyer will indicate to the Seller a time in which a response is expected. Receiving no response in the specified time period terminates the scenario.

The benefit of a Buyer, having provided information about itself prior to ordering, is that the amount of information to be exchanged and the number of steps required to subsequently place a Catalog Order are reduced. This results in saving both the Buyer and the Seller processing time that reduces the cost of doing business.

It should be noted that additional scenarios could be added to the Catalog Order Process, e.g., Buyer acquiring and maintaining a copy of the Seller's catalog, exchange of security keys, invoice and payment. Such an expansion of the business case would provide further illustration of the power of reuse of Open-edi scenario components in the Open-edi scenario description. Moreover, the power of reuse would become even more evident in the modeling phase.

**Scenario A:** a Buyer wanting to place a Catalog Order must have a Seller assigned Buyer Identification. This scenario must be used to obtain such an ID. The Buyer will supply the Seller with up to five information parcels before receiving a Seller assigned Buyer Identification:

- Buyer provides Buyer Information, Billing Information, Ship-to Information (if different from Billing), and Accounting Information. In order to ensure that the Buyer can be validated and to keep the Account Information secure, the Account Information is signed and encrypted using a private/public security keying method.
- Buyer provides to Seller a time period in which to expect the Buyer Identification response. If the Buyer Identification is not received in that time period, the Scenario is terminated.
- Seller either assigns the Seller's Buyer ID or rejects the request (stating the reason) and sends it to Buyer to complete the scenario.

**Scenario B:** a Buyer placing a Catalog Order with a Seller will supply the Seller with three information parcels before the Order can be acknowledged. This is because the Seller has Buyer information on file that is keyed to the Seller's Buyer ID. There is no need to resend Buyer information unless the Buyer has changed this information since previously sending it to the Seller.

- Buyer sends to Seller a Catalog Order containing Seller's Buyer ID and Order Information.
- Buyer provides to Seller a time period in which to expect the Order

Identification response. If an acknowledgement is not received in that time period the scenario is terminated.

- Seller either assigns the Order Identification or rejects the request (stating the reason) and sends it to the Buyer, to complete the scenario.

#### 4.1.1.1 DETAILED EXPLANATION OF SCENARIO A

A Buyer finds one or more items in a Catalog which the Buyer needs. The Buyer has never conducted business with the Seller before. Thus the Buyer expects that the Seller will need specific information from the Buyer before the Catalog Order can be placed using Scenario B.

The Buyer starts the scenario by sending to the Seller the following information:

a. Buyer Information to include:

- Buyer's name [Business name by which the Buyer wants to be known by the Seller]

b. Billing Information to include:

- Address [Address to which the Buyer wants the bill to be sent]
- Contact Name [Name of the person to whom the Buyer wants billing inquiries to be directed]
- Phone Number [Telephone number of the person to whom the Buyer wants billing inquiries to be directed]

c. Ship-to Information to include (only required if different from Billing Information):

- Address [Address to which the Buyer wants ordered goods to be shipped]
- Contact Name [Name of the person to whom the Buyer wants shipping inquiries to be directed]
- Phone Number [Telephone number of the person to whom the Buyer wants shipping inquiries to be directed]

d. Accounting Information (signed and encrypted) to include:

- Credit Card Number [Identification of the credit account that the Buyer chooses to provide to the Seller as a credit reference]

- Credit Card Holder Name [Name of the owner of the credit account the Buyer chooses to provide to the Seller as a credit reference]
- Credit Card Issuer Name [Name of the financial institution issuing the card]
- Type of Credit Card [Type of credit account, recognized by the credit card industry, that the Buyer chooses to provide to the Seller as a credit reference]
- Expiration Date [Date on which the credit account that the Buyer chooses to provide to the Seller as a credit reference is no longer valid]

To conclude the exchange the Buyer sends to the Seller the Response Time Information to indicate by what date a response is expected from the Seller. If no response is received the scenario is terminated.

e. Buyer ID Respond-By Date Information to include:

- Respond-by Date [Final date on which the Seller can respond to the Buyer with a Buyer ID before the scenario is terminated]

When the Respond-By Date Information is received, the Seller assigns a Seller's Buyer ID or rejects the request (stating the reason) and sends it to Buyer to complete the scenario:

f. Buyer Identification Information to include:

- Seller's Buyer ID [Seller assigned identification by the which the Seller uniquely recognizes a Buyer]

OR

g. Buyer ID Rejection Notice to include:

- Type [Code for Seller's reason for not assigning a Seller's Buyer ID]
- Reason for rejection [Seller stated reason for not assigning a Seller's Buyer ID to the Buyer, e.g. insufficient Billing Information, invalid credit account, etc.]

#### 4.1.1.1 DETAILED EXPLANATION OF SCENARIO B

A Buyer, having a Seller assigned Buyer Identification, finds one or more items in a Seller's Catalog that the Buyer needs. Since the Seller knows the Buyer, the Buyer only needs to provide the Seller assigned Seller's Buyer ID, the Ordering information and Order ID Respond-By Date Information. The

Seller will respond either with an assigned Order Identification or reject the request (stating the reason) and send it to the Buyer to complete the scenario.

The Buyer starts the scenario by sending to the Seller the following information:

a. Buyer ID:

- Seller's Buyer ID [Previously defined]

b. Order Information to include:

- Product Identification [Unique identification of a product in the Seller's catalog]
- Unit Price Amount (if required; is required when the catalog offers the product in multiple currencies) [Monetary amount cost per single item (or per unit of measure) of the product as stated in the Seller's catalog]
- Unit Price Currency Code (if required; is required when the catalog offers the product in multiple currencies) [Identification of the currency of the Unit Price Amount]
- Line Item Quantity [Number of items (or units of measure) of the product to be ordered]
- Line Item Unit of Measure ID (if required) [Unit of measure as stated in the Seller's catalog for selling bulk products]
- Product Characteristics Type (if required) [Product variation such as color, size, etc.]
- Product Characteristics Code (if required) [Product offerings within a product variation]
- Delivery Method [ Means and timing of delivery per order as selected by the Buyer from Seller provided options]

To conclude the exchange the Buyer sends to the Seller the Response Time Information to indicate by what date a response is expected from the Seller. If no response is received the scenario is terminated.

c. Order ID Respond-By Date Information to include:

- Respond-by Date [Final date on which the Seller can respond to the Buyer with an Order ID before the scenario is terminated]

When the Respond-By Date Information is received, the Seller assigns an Order Identification or rejects the request (stating the reason) and sends it to Buyer to complete the scenario:

d. Order Identification Information to include:

- Order Reference ID [Seller assigned order identification for tracking the status of an order in a Buyer's account until payment is made]

OR

e. Order Rejection Notice to include:

- Type [Code for the Seller's reason for rejecting the order]
- Reason for rejection [Seller stated reason for not assigning an order from the Buyer, e.g., no Seller's Buyer ID, insufficient Order Information, insufficient credit, etc.]



## 4.1.2 Open-edi SCENARIO description

The two scenario business case for catalog order is formally described according to the proposed Open-edi scenario template in Sections 4.1.2.1 and 4.1.2.2. Refer to Appendix A for the application of an FDT to these scenarios.

### 4.1.2.1 Scenario A

#### Scenario Registration and Management

**Name:** Buyer ID (Scenario A)

**Purpose (may state exclusions):** to establish Buyer ID with Seller. Excluded are any requirements related to jurisdictional and geographical constraints, etc. because they are not part of the scenario

**Class(es) of business requirements:** none (there's no fixed classification of business requirements at the moment. An issue is raised regarding this subject)

**Laws and regulations:** none

**Cross reference to other scenarios:** none

#### Role Registration and Management

**Name:** Buyer

**Purpose:** establish a trading relationship with a Seller

**Business goal(s):** send Buyer information and receive Buyer ID

**Business rules:** must contact Seller to supply buyer information; must have Seller's assigned Seller's Buyer ID before placing an order

**Regulations:** none

**Demands on OeP:** Buyer acts as OeP

**Constraints on OeP characteristics:** none

**Constraints on maximum number of OePs playing a role:** only the Buyer can play this role

**Constraints imposing a role to be conditional:** none

**Constraints on different OePs playing this role:** none

**Demands on interoperability**

**IPs for role:**

Input IPs

- Buyer Identification Information OR Buyer ID Rejection Notice

Output IPs:

-Buyer Information

-Billing Information

-Ship-to Information

-Accounting Information

-Buyer ID Respond-By Date Information

**Timer expiration:** handled explicitly by Buyer ID Respond-By Date Information IP

**Error conditions:** none

**IP sequence:**

**Buyer**

**Seller**

>> Buyer Information >>

>> Billing Information >>

>> Ship to Information >>

>> Accounting Information >>

>> Buyer ID Respond-By Date Information >>

<< Buyer Identification Information OR Buyer ID Rejection Notice <<

**Demands on Open-edi Support Infrastructure**

**-From catalogue:** 8859-1 character set limitation for all IPs

#### Role Registration and Management

**Name:** Seller

**Purpose:** establish trading relationships with buyers

**Business goal(s):** receive Buyer information and send Seller's Buyer ID

**Business rules:** must have buyer information prior to qualifying a buyer; must have a catalog; assignment of Seller's Buyer ID is a prerequisite to receiving an order; must issue Buyer ID rejection if buyer not qualified.

**Regulations:** none

**Demands on OeP:** Seller acts as OeP

**Constraints on OeP characteristics:** none

**Constraints on maximum number of OePs playing a role:** only the Seller can play this role

**Constraints imposing a role to be conditional:** none

**Constraints on different OePs playing this role:** none

**Demands on interoperability**

**IPs for role:**

Input IP's:

- Buyer Information
- Billing Information
- Ship-to Information
- Accounting Information
- Buyer ID Respond-By Date Information

Output IP's:

- Buyer Identification Information OR Buyer ID Rejection Notice

**Timer expiration:** handled explicitly in acting on Buyer ID Respond-By Date Information IP

**Error conditions:** none

**IP sequence:**

**Seller**

**Buyer**

- << Buyer Information <<
- << Billing Information <<
- << Ship to Information <<
- << Accounting Information <<
- << Buyer ID Respond-By Date Information <<
- >> Buyer identification Information OR Buyer ID Rejection Notice >>

**Demands on Open-edi Support Infrastructure**

**-From catalogue:** none

**Information Parcel Registration and Management**

**Name:** Buyer Information

**Purpose:** to identify Buyer by name

**Business rules controlling content or concept(s) of IP:** none

**Regulations governing content or concept(s) of IP:** none

**Information for interoperability**

**List of SCs and definitions:**

Buyer's name [Business name by which the Buyer wants to be known by the Seller]  
(any character string)

**Relationships of SCs within IPs:** none

**Demands on Open-edi Support Infrastructure**

**-From catalog:** none

**Information Parcel Registration and Management**

**Name:** Billing Information

**Purpose:** to specify billing information related to credit card account information

**Business rules controlling content or concept(s) of IP:** credit card account information must exist

**Regulations governing content or concept(s) of IP:** none

**Information for interoperability**

**List of SCs and definitions:**

Address [Address to which the Buyer wants the bill to be sent]  
(one or more character strings)

Contact Name [Name of the person to whom the Buyer wants billing inquiries to be directed]  
(character string)

Phone Number [Telephone number of the person to whom the Buyer wants billing inquiries to be directed]  
(character string)

**Relationships of SCs within Ips:** Phone Number is associated with Address

**Demands on Open-edi Support Infrastructure**

**-From catalog:** none

#### **Information Parcel Registration and Management**

**Name:** Ship-to Information

**Purpose:** to specify information about where an order is to be shipped.

**Business rules controlling content or concept(s) of IP:** must have contact point by phone; address supplied must be delivery point.

**Regulations governing content or concept(s) of IP:** none

**Information for interoperability**

**List of SCs and definitions:**

Address [Address to which the Buyer wants ordered goods to be shipped]  
(one or more character strings)

Contact Name [Name of the person to whom the Buyer wants shipping inquiries to be directed]  
(character string, optional)

Phone Number [Telephone number of the person to whom the Buyer wants shipping inquiries to be directed]  
(character string)

**Relationships of SCs within IPs:** Phone Number is associated with Address; one address and phone number must be provided per IP.

**Demands on Open-edi Support Infrastructure**

**-From catalog:** none

#### **Information Parcel Registration and Management**

**Name:** Accounting Information

**Purpose:** to specify information about a buyer's credit card account.

**Business rules controlling content or concept(s) of IP:** none

**Regulations governing content or concept(s) of IP:** none

**Information for interoperability**

**List of SCs and definitions:**

Credit Card Number [Identification of the credit account that the Buyer chooses to provide to the Seller as a credit reference]  
(identifier)

Credit Card Holder Name [Name of the owner of the credit account the Buyer chooses to provide to the Seller as a credit reference]  
(one or more character strings)

Credit Card Issuer Name [Name of the financial institution issuing the card]  
(one or more character strings)

Type of Credit Card [Type of credit account, recognized by the credit card industry, that the Buyer chooses to provide to the Seller as a credit reference]  
(character string)

Expiration Date [Date on which the credit account that the Buyer chooses to provide to the Seller as a credit reference is no longer valid]  
(date)

**Relationships of SCs within IPs:** One of each SC is mandatory.

### **Demands on Open-edi Support Infrastructure**

**-From catalog:** This IP must be signed and encrypted for security.

### **Information Parcel Registration and Management**

**Name:** Buyer ID Respond-By Date Information

**Purpose:** to tell the Seller the time limit of a response to Buyer Information IPs

**Business rules controlling content or concept(s) of IP:** Buyer expects Buyer Identification assignment or a rejection back with the given time.

**Regulations governing content or concept(s) of IP:** none

#### **Information for interoperability**

##### **List of SCs and definitions:**

Respond-by Date [Final date on which the Seller can respond to the Buyer with a Buyer ID before the scenario is terminated]  
(date)

**Relationships of SCs within IPs:** One and only one time is mandatory.

### **Demands on Open-edi Support Infrastructure**

**-From catalog:** none

### **Information Parcel Registration and Management**

**Name:** Buyer Identification Information

**Purpose:** to indicate that a buyer is qualified to buy. Seller assigns a Buyer Identification to the Buyer in order to identify a buyer / to allow a buyer to later reference the ID assigned by the Seller.

**Business rules controlling content or concept(s) of IP:** Buyer can only place an order with a Buyer ID.

**Regulations governing content or concept(s) of IP:** none

#### **Information for interoperability**

##### **List of SCs and definitions:**

Seller's Buyer ID [Seller assigned identification by the which the Seller uniquely recognizes a Buyer]  
(identifier)

**Relationships of SCs within IPs:** One and only one Seller's Buyer ID is mandatory.

### **Demands on Open-edi Support Infrastructure**

**-From catalog:** none

### **Information Parcel Registration and Management**

**Name:** Buyer ID Rejection Notice

**Purpose:** to indicate to a buyer that an attempt to establish a trading relationship with the seller has failed. Subsequent orders will be rejected.

**Business rules controlling content or concept(s) of IP:** Buyer can only place an order with a Seller's Buyer ID. Any order placed without a Seller's Buyer ID will be rejected.

**Regulations governing content or concept(s) of IP:** none

#### **Information for interoperability**

##### **List of SCs and definitions:**

Type [Code for Seller's reason for not assigning a Seller's Buyer ID]  
(code)

Reason [Seller stated reason for not assigning a Seller's Buyer ID to the Buyer, e.g., insufficient Billing Information, invalid credit account, etc.]  
(character string)

**Relationships of SCs within Ips:** One and only one Reason is mandatory.

### **Demands on Open-edi Support Infrastructure**

**-From catalog:** none

### **Scenario attributes**

**Demands on OePs:** both Buyer and Seller must be present

**Demands on interoperability**

**-Relationships among roles:**

Some of the IP's are optional and the sequence may vary. The first four IP's must be sent by the buyer but there's no particular order between those four, yet all those IP's must be sent. When the Buyer ID Respond-By Date Information IP is sent, the Seller is expected to respond by sending "Buyer Identification Information IP" or a Buyer ID Rejection Notice.

Several options are possible: either all the first four information parcels must be sent together, or one or more IP's can be sent. In the latter case one more components (a common factor) must be included in all the parcels in order to make it possible to the receiver to combine the information parcels and understand that they belong together. This new component belongs to the FSV level (i.e. the receiving system must keep track where the IP's came from).

The role "buyer" gets the Seller's Buyer ID from the role "seller" by sending the first four IP's to the role "seller". The buyer initiates the scenario by sending an IP to the role "seller".

When the Seller receives Buyer ID Respond-By Date Information, it is known that all IPs have been received from the Buyer.

**-Relationships among SCs of different IPs**

Billing Information is used as a default in the absence of Ship-to Information

Billing Information Contact Name equals Credit Card Holder Name

**Demands on Open-edi Support Infrastructure**

**-From catalogue:** none

**Editor's note: is it a scenario attribute to state which role can initiate and terminate a scenario? right now the initiation rule is mentioned in the role description.**

#### **4.1.2.2 Scenario B**

**Scenario Registration and Management**

**Name:** Catalog Order (Scenario B)

**Purpose (may state exclusions):** to order from a catalog. Excluded are any requirements related to jurisdictional and geographical constraints, etc. because they are not part of the scenario

**Class(es) of business requirements:** none (there's no fixed classification of business requirements at the moment. An issue is raised regarding this subject)

**Laws and regulations:** none

**Cross reference to other scenarios:** Buyer ID (Scenario A)

**Role Registration and Management**

**Name:** Buyer

**Purpose:** purchase articles from a catalog

**Business goal(s):** place an order and receive acknowledgment

**Business rules:** must have Seller's catalog; must contact Seller to supply buyer information; must have Seller's assigned Buyer ID before placing an order; Buyer has internal order reference number.

**Regulations:** none

**Demands on OeP:** Buyer acts as OeP

**Constraints on OeP characteristics:** must have Seller's Buyer ID

**Constraints on maximum number of OePs playing a role:** only the Buyer can play this role

**Constraints imposing a role to be conditional:** none

**Constraints on different OePs playing this role:** none

**Demands on interoperability**

**IPs for role:**

Input IP's

- Order Identification Information OR Order Rejection Notice

Output IP's:

-Buyer ID  
-Order Information  
-Order ID Respond-By Date Information  
**Timer expiration:** handled explicitly by Order ID Respond-By Date Information IP  
**Error conditions:** none

**IP sequence:**

**Buyer**

**Seller**

>> Buyer ID >>  
>> Order Information >>  
>> Order ID Respond-By Date Information >>  
<< Order Identification Information OR Order Rejection Notice <<

**Demands on Open-edi Support Infrastructure**

**-From catalogue:** 8859-1 character set limitation for all IPs

**Role Registration and Management**

**Name:** Seller

**Purpose:** sell articles from a catalog

**Business goal(s):** receive an order and acknowledge the order

**Business rules:** must have a catalog; assignment of Seller's Buyer ID is a prerequisite to receiving an order; upon acceptance of an order, an Order Reference ID is assigned and transmitted; a negative acknowledgment is transmitted for any rejected order.

**Regulations:** none

**Demands on OeP:** Seller acts as OeP

**Constraints on OeP characteristics:** none

**Constraints on maximum number of OePs playing a role:** only the Seller can play this role

**Constraints imposing a role to be conditional:** none

**Constraints on different OePs playing this role:** none

**Demands on interoperability**

**IPs for role:**

Input IP's:

-Buyer ID

-Order Information

-Order ID Respond-By Date Information

Output IP's:

- Order Identification Information OR Order Rejection Notice

**Timer expiration:** handled explicitly in acting on Order ID Respond-By Date Information IP

**Error conditions:** none

**IP sequence:**

**Seller**

**Buyer**

<< Buyer ID <<  
<< Order Information <<  
<< Order ID Respond-By Date Information <<  
>> Order Identification Information OR Order Rejection Notice >>

**Demands on Open-edi Support Infrastructure**

**-From catalogue:** none

**Information Parcel Registration and Management**

**Name:** Buyer ID

**Purpose:** to identify Buyer by Seller's Buyer ID previously assigned

**Business rules controlling content or concept(s) of IP:** none

**Regulations governing content or concept(s) of IP:** none

**Information for interoperability**

**List of SCs and definitions:**

Seller's Buyer ID [Seller assigned identification by the which the Seller uniquely recognizes a Buyer]  
(identifier)

**Relationships of SCs within IPs:** none

### **Demands on Open-edi Support Infrastructure**

**-From catalog:** none

#### **Information Parcel Registration and Management**

**Name:** Order Information

**Purpose:** to specify information about an order

**Business rules controlling content or concept(s) of IP:**content controlled by the Seller's catalog. Seller's Buyer ID must be previously assigned by the Seller (see Buyer Identification Information IP)

**Regulations governing content or concept(s) of IP:**none

#### **Information for interoperability**

##### **List of SCs and definitions:**

Product Identification [Unique identification of a product in the Seller's catalog]  
(identifier)

Unit Price Amount (if required; is required when the catalog offers the product in multiple currencies) [Monetary amount cost per single item (or per unit of measure) of the product as stated in the Seller's catalog]  
(amount)

Unit Price Currency Code (if required; is required when the catalog offers the product in multiple currencies) [Identification of the currency of the Unit Price Amount]  
(code)

Line Item Quantity [Number of items (or units of measure) of the product to be ordered]  
(number)

Line Item Unit of Measure (if required) [Unit of measure as stated in the Seller's catalog for selling bulk products]  
(code)

Product Characteristics Type (if required) [Product variation such as color, size, etc.]  
(code)

Product Characteristics Code (if required) [Product offerings within a product variation]

Delivery Method [Means and timing of delivery per order as selected by the Buyer from Seller provided options]  
(code)

**Relationships of SCs within IPs:** Only one delivery method allowed; one or more catalog numbers; one or more of the set (Unit Price Amount, Unit Price Currency Code, Line Item Quantity, Line Item Unit of Measure, Product Characteristics Type and Product Characteristics Code) per Product Catalog Number

### **Demands on Open-edi Support Infrastructure**

**-From catalog:** none

#### **Information Parcel Registration and Management**

**Name:** Order ID Respond-By Date Information

**Purpose:** to inform the Seller about the time period over which the order is valid

**Business rules controlling content or concept(s) of IP:**Buyer expects Order Identification Information IP or Order Rejection Information IP within the given time.

**Regulations governing content or concept(s) of IP:**none

#### **Information for interoperability**

##### **List of SCs and definitions:**

Respond-by Date [Final date on which the Seller can respond to the Buyer with an Order Reference ID before the scenario is terminated]  
(date)

**Relationships of SCs within IPs:** One and only one time is mandatory.

### **Demands on Open-edi Support Infrastructure**

**-From catalog:** none

#### **Information Parcel Registration and Management**

**Name:** Order Identification Information

**Purpose:** to confirm Seller acceptance of the order and to provide a Reference ID for the order

**Business rules controlling content or concept(s) of IP:**Receipt of this IP confirms to the Buyer the Seller's acceptance of the order.

**Regulations governing content or concept(s) of IP:**none

**Information for interoperability**

**List of SCs and definitions:**

Order Reference ID [Seller assigned order identification for tracking the status of an order in a Buyer's account until payment is made]  
(identifier)

**Relationships of SCs within IPs:**One and only one Order Reference ID is mandatory.

**Demands on Open-edi Support Infrastructure**

**-From catalog:** none

**Information Parcel Registration and management**

**Name:** Order Rejection Notice

**Purpose:** to inform the Buyer the order was rejected

**Business rules controlling content or concept(s) of IP:**If the order is rejected the Buyer expects the reason to be provided in an Order Rejection Information IP.

**Regulations governing content or concept(s) of IP:**none

**Information for interoperability**

**List of SCs and definitions:**

Type [Code for the Seller's reason for rejecting the order]  
(code)

Reason for rejection [Seller stated reason for not assigning an order from the Buyer, e.g., no Buyer Identification, insufficient Order Information, insufficient credit, etc.]  
(character string)

**Relationships of SCs within IPs:**One and only one Reason for Rejection is mandatory.

**Demands on Open-edi Support Infrastructure**

**-From catalog:** none

**Scenario attributes**

**Demands on OePs:** both Buyer and Seller must be present

**Demands on interoperability**

**-Relationships among roles:** none

**-Relationships among SCs of different Ips:**Expiration Date must not precede the order delivery date.

**Demands on Open-edi Support Infrastructure**

**-From catalogue:** none

## **5. Business requirements on FSV (Business demands on open-edi support infrastructure)**

Text about communications, security, quality of service, character sets, DMA, open-edi user data, audit trails, record keeping and other requirements comes here.

Input documents: Revised Norwegian contribution (WG1 N040) and WG1 N003, page 21, six first bullet points.



## 6. REQUIREMENTS ON FORMAL DESCRIPTION TECHNIQUES FOR OPEN-EDI SCENARIOS

### 6.1 Introduction:

In the Open-edi Reference Model the concepts of an Open-edi scenario and its components have been introduced as the key modelling entities for the Business Operational View. It is required by the Open-edi Reference Model that such scenarios should be expressed using Formal Description Technique(s). The purpose of this document is to provide a consolidated statement of the requirement for an Open-edi description technique (OeDT, see IS 14662) and the criteria for evaluation of the proposed OeDT for Open-edi scenarios. It should be noted that the main function of this document is to provide a working document for the definition of the requirements on the OeDT. As a consequence the structure of the document is as follows<sup>1</sup>. Section 1 presents the requirements on the FDTs to be used for the definition of scenarios. Section 2 provides evaluation criteria for the proposed OeDT. An informative annex contains a discussion on the main assumptions that serve as the basis for the requirements

### 6.2 Requirements on FDTs.

#### **POTENTIAL NEED 1.**

A FDT is required for the description of a scenario, and its component parts.

#### **NEED 2**

An FDT must have the ability to support a hierarchical decomposition of the scenario and its component parts.

#### **NEED 3**

It should provide for both a human and a computer interpretation, since human beings will have to be able to assess scenarios before they can instruct their computer systems to deal with them.

#### **POTENTIAL NEED 4.**

Several steps in the scenario have to be modelled and interrelated. This means that a process modelling technique has to be chosen for modelling role interaction, in contrast to a data modelling technique. SC30 N057 (WG1 N014) has identified several classes of such techniques and given specific examples of existing FDTs for each of these classes (for instance IDEF, Petri Nets, Data Flow Diagrams, etc.).

#### **POTENTIAL NEED 5.**

The OeDT has to be capable of representing both the choices made by roles and their concurrent interoperation in an efficient manner. The combination of both these

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capabilities is not a trivial matter, since many techniques are only strong in one area. For instance, state transition diagrams or networks are weak in the expression of concurrency but strong in choice. PERT diagrams are exactly the inverse.

#### **POTENTIAL NEED 6.**

Internal choices made by roles need to be represented, although it is questionable whether the actual rules governing these choices should be modelled as well. These are usually confidential to the organisation. For an Open-edi scenario the only relevant aspects of such choices are the possible outcomes. Since the input of such a choice may be some error message coming out of the FSV there should be a method of modelling events that trigger these internal decisions (other than the arrival of a new information parcel to be handled).

#### **POTENTIAL NEED 7.**

The state of each of the Open-edi parties should be represented in order to be able to analyse the dynamic properties of a scenario. The information in these states may also have to capture the level of commitments that parties have to each other if this turns out to be necessary information in the execution of an Open-edi transaction.

#### **NEED 8.**

The ordering of the exchanges of information flow may have strict temporal specifications, for instance in an i-edi transaction. Hence, both absolute and relative temporal constraints have to be expressible in the OeDT as well.

#### **POTENTIAL NEED 9.**

Open-edi scenarios will be written by different user communities and shall be compliant with the BOV related standards. For this reason, it is obvious that FDTs included in the BOV related standards need to be standardised.

#### **POTENTIAL NEED 10.**

In order to produce Open-edi scenarios, the user communities will need to use modelling tools which help them in producing specifications based on these FDTs. In order to speed up the use of Open-edi it is of the highest importance that such tools already exist on the market at the time the FDTs are chosen for the BOV related standards.

#### **POTENTIAL NEED 11.**

Moreover, it is highly desirable that several tools exist on the market and that the standards of the FDTs provide for a neutral format of exchange between the tools in order that specifications produced on one tool of the market can be reused and modified on another modelling tool of the market.

#### **POTENTIAL NEED 12.**

In addition, since the compliance of scenario descriptions against the FDT will need to be assessed. Therefore, the FDT shall be such that compliance checking of scenario descriptions against the syntax of the FDT can be verified.

**POTENTIAL NEED 13.**

Conformance testing of the implementations of Open-edi scenarios in the Open-edi systems will need to be assessed. Therefore any tool associated to the FDT which can facilitate the development of this testing environment will be helpful and welcome.

**POTENTIAL NEED 14.**

The FDT for information parcels :

1. Needs to represent the relationships between the semantic components.
2. Needs to describe both atomic and compound semantic components.
3. Needs to represent cardinality of relationships.
4. Needs to express constraints between the semantic components such as : if semantic component A is present, then semantic component B is mandatory. Another example could be : if the value of the instance of semantic component is XX, then semantic component B is mandatory.
5. Provide the capability to verify the compliance of the information parcel specifications with the syntax of the FDT. Therefore, the FDT shall be such that compliance checking of an information parcel description against the syntax of the FT can be verified.

**POTENTIAL NEED 15.**

An OeDT should model a scenario so, that it is capable to use other scenarios.

## **Part 3. Registration issues**

## Part 4. Criteria for measuring the quality of proposed FDTs.

The following five additional properties can be used as a yardstick to measure if a certain representation is primitive, in the sense that it has the sufficient and necessary modelling constructs to represent phenomena from a certain domain (in the case of Open-edi this domain is the exchange of data among parties)<sup>2</sup>:

**Finitude:** the number of modelling constructs must be smaller than the number of real-world phenomena these constructs can represent.

**Comprehensiveness:** every phenomenon within the boundaries of the domain to be modelled can be expressed as a structure of modelling constructs

**Completeness:** describing a phenomenon in terms of modelling constructs reveals all the necessary information about this phenomenon.

**Independence:** No modelling construct is definable in terms of another construct

**Canonicity:** no two unique phenomena are definable by the same structure of modelling constructs.

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<sup>2</sup> This list is based on a study by Winograd (1978) on typical features of semantic primitives.

## References

References from the document N003 (N005) are to be placed here

## **Informative annex A.**

### **General assumptions on the BOV related constructs.**

This section presents the general assumptions made at the construction of this document. Although these may have to change due to discussions related to Topic 14, it is assumed that this will be done explicitly. A motivation for such changes and a precise description of their nature should be provided in order to maintain the internal consistency of the document.

It is understood that the general idea behind Open-edi is to enable companies to participate in EDI with minimal prior agreements about the way the data are to be exchanged among them. In contrast with the current EDI, this means that not only the data has to be structured and standardized, but also the context in which this data is exchanged. More precisely, the computer systems of the Open-edi partners need to be able to handle incoming messages<sup>3</sup> automatically. The specification of this 'message handling' process is the essence of an Open-edi scenario. In some sense it can be compared with the current Message Implementation Guidelines, which usually not only describe how one single message needs to be interpreted, but also relates several messages with each other. The key difference however is that Open-edi scenarios are specified in a standardized, computer interpretable manner.

It is not the duty of SC30 to develop these scenarios themselves. However, in order to be computer interpretable and interoperable among autonomous parties, and that they have to be described in a formal way which can be understood by an automated system. The requirements on such an FDT are the final result that this document should achieve, hopefully in a limited amount of iterations.

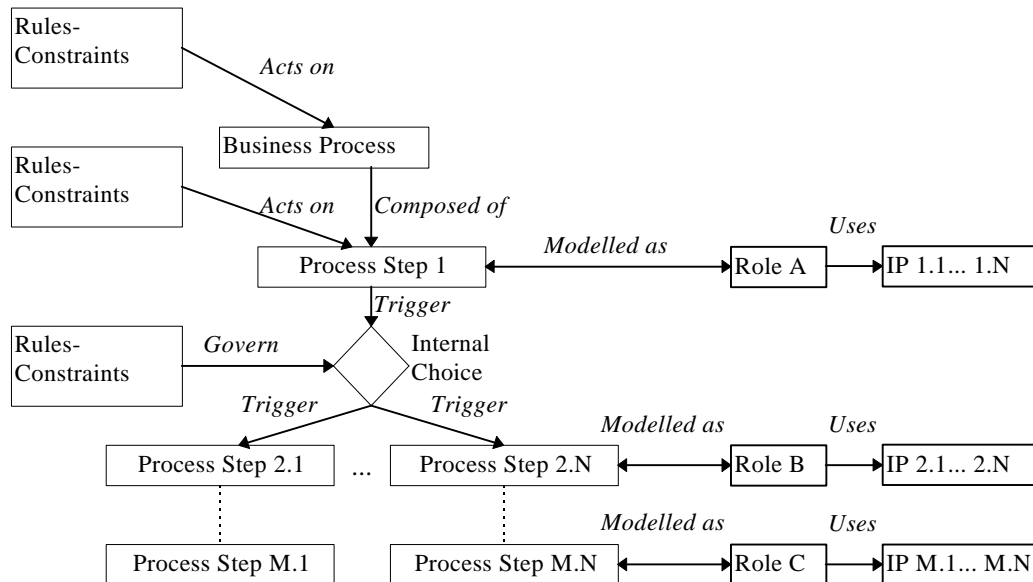
The concepts that have been provided by the Open-edi Reference model are roles, information parcels and scenario attributes. These concepts are discussed in Sections 1.1, 1.2 and 1.3 respectively.

#### **A.1 Roles**

The roles are understood to model the externally visible behaviour. It depends on the users of such descriptions to define the boundary between internal and external behaviour. It is not the responsibility of SC30 to decide whether for instance a large company should be seen as one single entity with a huge internal process or a number of individual entities (departments) with each a smaller internal process. The concept of a role should allow both cases to be modelled. The key knowledge the roles will entail is the knowledge on how to handle incoming and outgoing messages. In Figure 1 the concept of a role is related to business processes and information parcels.

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<sup>3</sup> The term 'message' is used to denote an information flow among two or more parties, which may not necessarily correspond with current ideas of 'messages' (compare for instance I-edi which consists of many small messages exchanged in a dialogue).



This figure is to be understood as follows. It represents an operation of Open-edi from the point of view of an autonomous organisation, which wants to use it to support a certain business process. The outside world may have constraints on this process (for instance particular jurisdictions may restrict certain activities), and the organisation may have internal rules governing their processes in general. This is represented in the top left-hand corner.

The process itself consists of a number of steps. After the completion of each step a new state is reached and some internal choice will be made to decide which step will be executed next. This decision is based on the result of the previous step using an internal rule-base. The choice can result in multiple steps executed in parallel or in a number of alternatives.

The Open-edi scenario is only concerned with those parts of these process steps that are related to the exchange of IPs. It is assumed that this particular information will be the role description. In other words, the role description in this view only contains knowledge on the inter-dependencies of the information parcel exchanges. This also implies that the entire specification of the EDI relevant part of the business process will be done by multiple roles which are inter-connected within a scenario (using scenario attributes). A different approach is to define the role as the combination of all these process steps, and call the different subsets differently, for instance episodes or activity units.

Although it seems that this is a rather fundamental decision to make, the view can also be taken that this is only a naming issue if it is assumed that multiple levels of decomposition can take place at the role level. From a modelling perspective it is not really relevant whether something is called a role, sub-scenario or episode, since the information that is captured in the models is of the exact same kind (sending-receiving of IPs). The relationships between all these modules need to be defined unambiguously, which is always the case if modularity or hierarchical decomposition is introduced.

Note that although the picture shows that a certain process step is implemented by a specific role, it may be the case that actually several alternative models can be used for this purpose. For instance, the process step 'get product information' can be implemented by a single IP exchange with the seller or by multiple exchanges of smaller IPs, for instance in an I-edi transaction. These two cases would probably be covered by different role descriptions with the same purpose.

The eventual scenario will consist of models for each Open-edi party involved in the business transaction and thus specifies the overall exchange of Information Parcels.



Note that process steps in one organisation should have 'mirror' steps in the other organisation to make the entire business transaction work (if someone sends an IP but the other party does not know about it, the scenario is clearly incorrect).

## **A.2 Information Parcels.**

Organisations that have to process information parcels they have never dealt with before need to be able to determine the meaning of them. The key criterium on this process is that the sender and the receiver of such IPs have the same understanding about the semantics of the data they have exchanged. For this purpose the Open-edi Reference Model notes that a SC may be autonomic or compound of other SCs.

Furthermore, the function of the information parcel as a whole needs to be representable as well. For instance, depending on the context in which it is send, a purchase order may have the function of an offer or an acceptance. The semantics of the underlying data is the same in both these cases. It seems that two options exist to solve this. The first option assumes that this knowledge can be represented as state changes inside the role description. Another approach would be to model these functions explicitly and associate this information with the information parcel instead of the role. The latter could be done by using theory from linguistic philosophy (the so-called Speech Acts) which identify some basic functions of utterances (such as Request, Confirm, Order etc.). This is an open issue.

It is necessary that the Open-edi description technique includes a formal way to describe the semantics of the content of information parcel. For example the role will need in some cases to refer to some values of instancs of semantic components.

Take the example of insurance, an information parcel which is an accident report and semantic components thereof which describes damages. These damages can be car damages or physical injuries. Let us suppose that when there is an accident report to an insurance company, if there are some human beings injured, then an expert must be involved if not no expert is required. Where an expert is required the description of the role will require to reference a value of a semantic component of the information parcel.

It is therefore necessary to document the requirements on the OeDT to describe Information Parcels.

A second advantage of this approach is that at the Open-edi scenario level, the only information needed is the identification of the information parcel and a reference to the repository where the formal description of the semantics can be found.

## **A.3 Scenario Attributes.**

The only scenario attributes that have been discussed so far are the requirements on the FSV. It is obvious that an Open-edi scenario should be capable of defining its needs on the underlying Open-edi System in terms of Open-edi Support Systems. At the moment it is assumed that this will be done through the catalogue of demands. From a modelling perspective this means that a formal way to describe these requirements is needed, possibly in the format of a simple syntax. Since each information exchange may require a different level of security, this information should be associated with the information parcels in the model. Hence, it can be envisioned that the description of an information parcel only contains the name and reference (see previous section) and a list of FSV requirements.

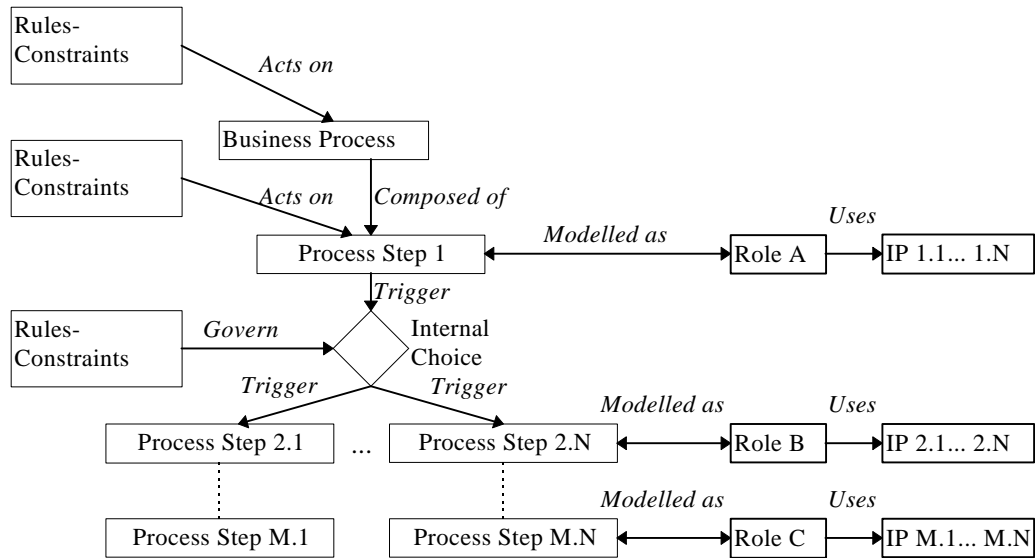
The other attributes specified in the Open-edi reference model still have to be dealt with. Certain scenario attributes will need an FDT to be computer interpretable. An example of such a scenario attribute is the relationship amongst roles.

**Informative annex B**  
**Questionnaire**

## **Informative annex C**

### **Terminology considerations**

## Informative annex D Implementation considerations



## Informative annex

### Scenario description using IDEF diagrams

#### *IDEF Diagrams for Catalogue Order Scenario*

##### IDEF0 (ACTIVITY) DIAGRAMS

###### A-0 Diagram: Catalog Order (*Diagram Page 1*)

Purpose: This model describes a buyer ordering from a seller's catalog. The buyer may or may not have an established business relationship with the seller.

Viewpoint: the model is described from the viewpoint of the buyer.

###### A0 Diagram: Order from Catalog (*Diagram Page 2*)

Having determined that there is a requirement to order, there are two possibilities depending upon whether or not the buyer has a Seller's Buyer ID (i.e., depending on whether or not the buyer and the seller already have a business relationship).

If the buyer does not have a Seller's Buyer ID, the buyer provides information to the seller after which the buyer receives an Identification number from the seller (Seller's Buyer ID).

If the buyer has a Seller's Buyer ID (i.e., a business relationship is established), the order information can be provided from the catalog.

Ultimately, the seller provides the buyer with an Order Reference Number.

###### A1 Diagram: Provide Buyer Information (*Diagram Page 3*)

The buyer information provided to the seller in order to receive a Seller's Buyer ID is the Buyer Name, Billing details (Billing Address, Phone Number and Account Information) and delivery details (Address and Phone Number) if different from the billing details. Note, add to text on this diagram the fact that account information includes credit card information.

###### A3 Diagram: Provide Order Information (*Diagram Page 4*)

The order information provided by the buyer to the seller is: the Seller's Buyer ID, the Delivery Information, Payment Method, Product Number, Quantity Ordered and Product Characteristics. The Product Number, Quantity Ordered and Product Characteristics are extracted from the Seller's catalog.

## IDEF3 (PROCESS) DIAGRAMS

### *IDEF3, Process Flow Description (PFD) Diagrams*

**Top level Diagram (Ordering from catalog)** (*Diagram Page 5*) In our example, complete buyer data must be supplied at some point resulting in the seller assigning a buyer ID. Then, the order information can be provided. Finally, the seller returns an order reference identifier to the buyer.

Level Two Diagram (Provide Buyer Information) (*Diagram Page 6*)

The buyer information includes the buyer name, billing details (address, phone number, and account information), and delivery details (address and phone number). For simplicity, it is assumed that there is only one delivery point for the entire order.

Level Three Diagram (Provide Order Information) (*Diagram Page 7*)

The order information includes the buyer ID, product information, delivery timing and payment method. Products are identified by supplying their numbers and quantities, and, if applicable, additional characteristics. The delivery timing and payment method are optional data which complete the order.

### *IDEF3, Object State Transition Network (OSTN) Diagrams*

OSTN Diagram for Object: Provide Buyer Information (*Diagram Page 8*)

The state of *No buyer Information* is moved to the state of *Buyer Information received* through the provision of buyer name, delivery details and billing details.

OSTN Diagram for Object: Provide Order Information (*Diagram Page 9*)

The Order is moved from the state of *Blank Order* to the state of *Order Placed* by the provision of the seller's buyer ID, the Delivery Timing, Payment Method, product number, quantity and product characteristics.

OSTN Diagram for Object: Provide Order Reference Number (*Diagram Page 10*)

Moving from the state of *No Order Reference Number* to *Order Reference Number Received* requires order information to be provided.

OSTN Diagram for Object: Provide Seller's Buyer ID  
(Diagram Page 11)

Moving from the state of *No Seller's Buyer ID* to the state of *Seller's Buyer ID Requested* required the provision of Buyer Information. In order to move to the state of Seller's Buyer ID on File the Sellers Buyer ID has to be received.

#### IDEF1X (DATA) DIAGRAM (PAGE 12)

##### Reading an IDEF1X Diagram

The boxes are "entities". These are persons, places, things, concepts, et cetera that are of importance in this context. Entities are "object classes" without behavior. The name of the entity is written above the box. (Boxes with rounded corners are considered "child entities" and have no relevance in this model. Along with other features mentioned above, they are an artifact of the normal use of IDEF1X for providing structure to relational databases.)

The links among entities are "relationships". The relationships are labelled with a verb phrase written along the line. The relationship is normally read toward the end with the dot. The number of entity instances to be expected at each end of the relationship is called "cardinality". A dot on the end indicates zero, one, or more. A dot with a P means one or more. No dot means one.

"Attributes" are equivalent to "data elements" in EDI. The names of the attributes describing an entity are listed in each box.

There are other features of a data model that are not covered here. Many other icons can be used in an E-R diagram, but are not of use in this structure. In addition, to be complete, there should be a description of each entity and attribute—including its definition.

In this model:

*A Buyer has a Buyer Identification by which the Buyer is known by the Seller.*

*A Buyer has a "shipped to" Site and a "billed at" Site.*

*The Site has a Contact person who can be telephoned for information.*

*A Buyer has an Account and the Account has an expiration Date.*

*The Buyer can place an Order with a Seller.*

*The Order has a Delivery that has a Date.*

*The Order has one to many Line Items.*

*Each Line Item has a Product.*



Each *Product* has zero to many *Product Characteristics* such as colour, size, et cetera.

