

UN/EDIFACT Research, Strategic Advice and Implementation Planning (AC.1)

Benefits of Modelling for the design of EDI

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0. Introduction

This paper shows the benefits of modelling activities, processes and data as a pre-requisite to EDI design. The method of moving from the model to the EDI design depends on the nature of the EDI design i.e., on whether the EDI design is based upon the current message design rules or on a future design technique such as an Object Oriented approach.

In order to show consistency and synergy between the modelling techniques, parts of IDEF have been used for each (IDEF0, IDEF1X and IDEF3). Furthermore, the example of ordering from a catalog has been used throughout. The Activity model shows *what* should happen so that an order can be made from a catalog. The Process model shows *how* to order from a catalog and the required sequence of events; the Data Model shows the relationship between the business rules that must be obeyed (from a data perspective) so as to order from a catalog (e.g., an order has one or many line items).

Needless to say, the requirement for modelling comes from the need to specify unambiguously all aspects of a repetitive process.

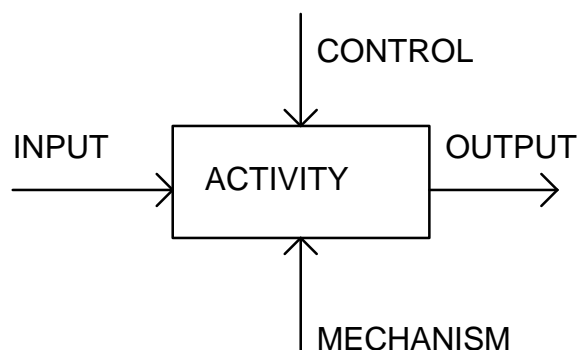
1. Activity Modelling

What is activity modelling?

IDEF0 is an activity modelling technique which can help to define rigorously the business activities in a process. It does not describe an organisational structure or a business program, a product or set of products. An activity model shows the decisions, actions and activities of an organisation or a system. The activity model provides a complete view of a business process by showing an activity in relation to its inputs, outputs, controls and mechanisms. The same modelling technique can be used to model current and future business processes (in different models) and also alternative processes for achieving the business objectives.

Reading an IDEF0 Model

Activities are represented by boxes, all inputs enter the left of the box, all controls enter into the top of the box, all outputs exit from the right side of the box and all mechanisms enter into the bottom.



An activity must always have at least one output and at least one control. There can be zero or many inputs and zero or many mechanisms.

An input is transformed by an activity into an output under the controls (such as conditions required) specified and using the mechanisms (i.e., the means to perform the function) stated.

EXAMPLE Activity Model: Ordering from a Catalog

A-0 Diagram: Catalog Order

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

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.

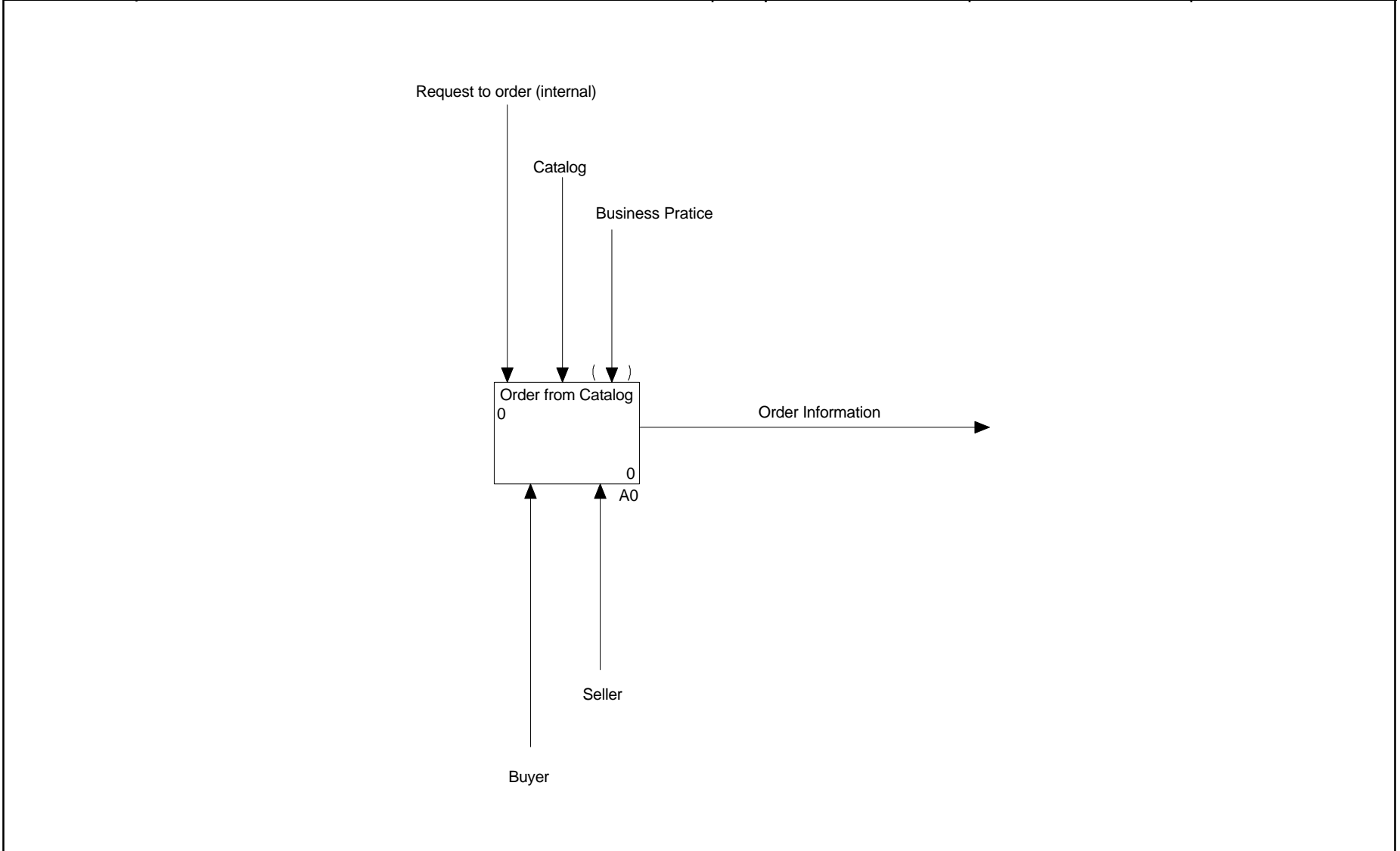
A1 Diagram: Provide Buyer Information

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.

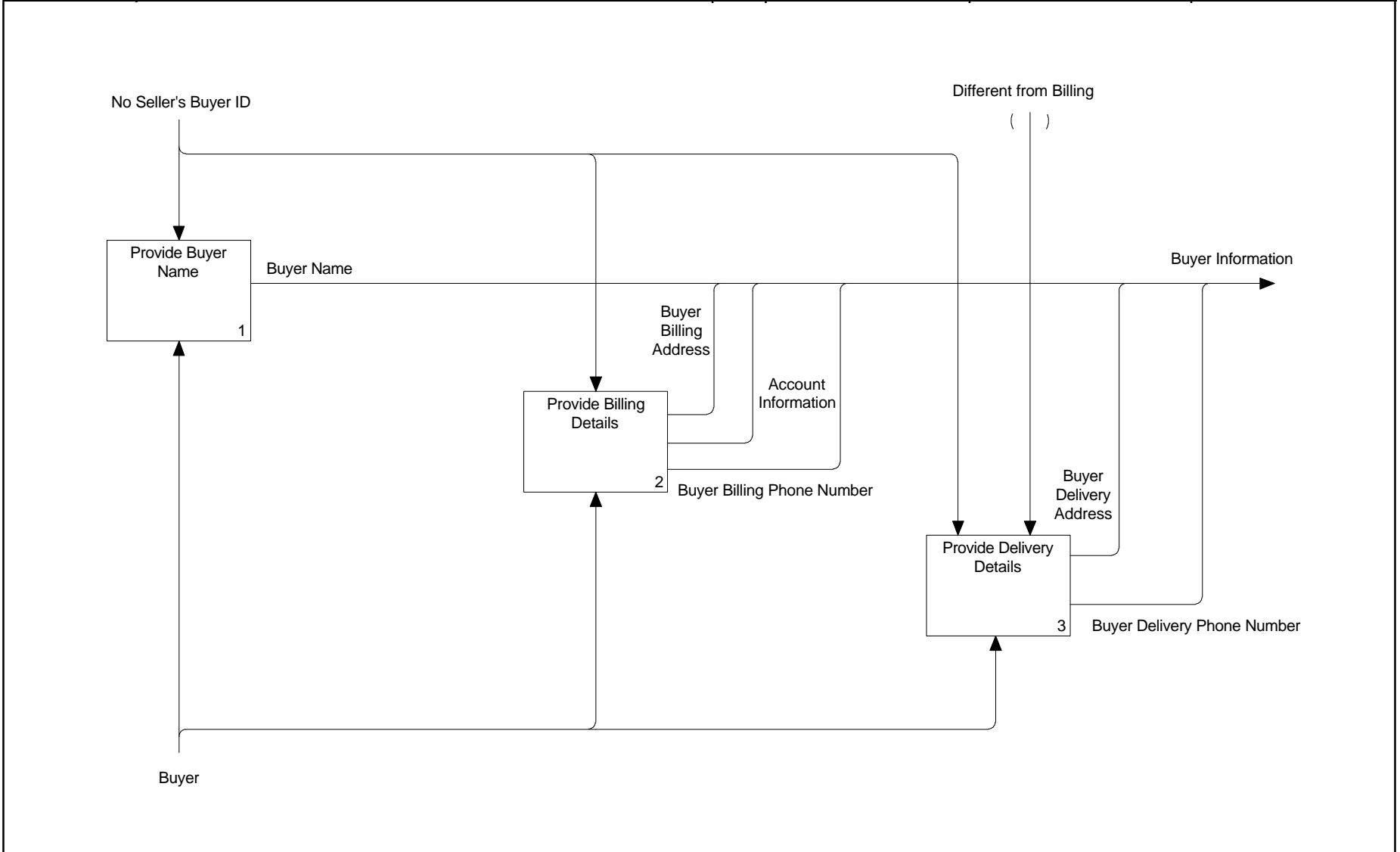
A3 Diagram: Provide Order Information

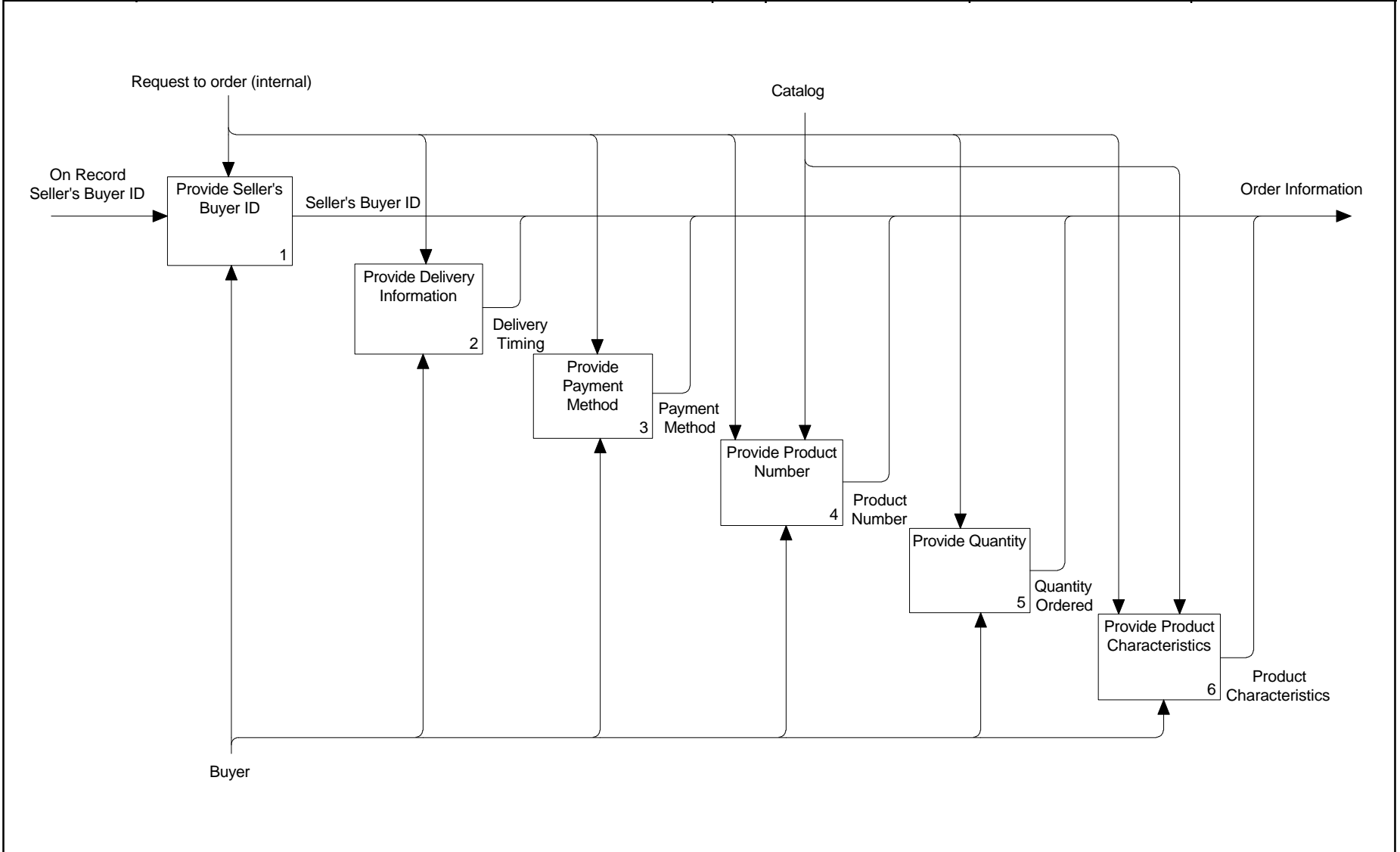
The order information provided by the buyer to the seller is: the Seller's Buyer ID, the Delivery Information, Payment Method, Product Number, Quantity Ordered and Product Characteristics. The Product Number, Quantity Ordered and Product Characteristics are extracted from the Seller's catalog.

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2. Process Modelling

What is Process Modelling?

Process modelling (IDEF3) has two components: process flow descriptions and object state transition network (OSTN) descriptions. A process flow description captures the knowledge of how things work in an organisation. The OSTN description summarises the allowable transitions an object may undergo throughout a particular process: it describes the world from the perspective of an object.

Relationship between Process Flow Description and Activity Modelling

A process flow description model takes the activities identified in an activity model (IDEF0) and adds the sequence in which the activities are performed and shows which activities may be optional.

Example Process Model: Ordering from a Catalog

(i) Process Flow Description

Reading a Process Flow Description

The basic unit of the process flow description is the Unit of Behaviour (UOB), represented by a box. A UOB can be further classified as a function, activity, action, act, process, event, decision or a procedure. The arrows indicate sequence. The junction boxes indicate requirements. An X in a junction box denotes a set of activities which are mutually exclusive. An & in a junction box denotes a set of activities all of which are required.

Top level Diagram (Ordering from a catalog)

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)

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)

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.

(ii) Object State Transition Network (OSTN)

Reading an OSTN

An OSTN describes the world from an object's viewpoint recording all of the changes that the object undergoes and the processes which cause the changes to occur. Object states are represented by circles. The transition from one state to another is represented by the lines (known as state transition arcs) that connect the circles. The process that assists in the state transition is represented by specifying the relevant UOB to the transition arc between the two object states.

Example OSTN: Ordering from a Catalog

OSTN Diagram for Object: Buyer Information

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: Order Information

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.

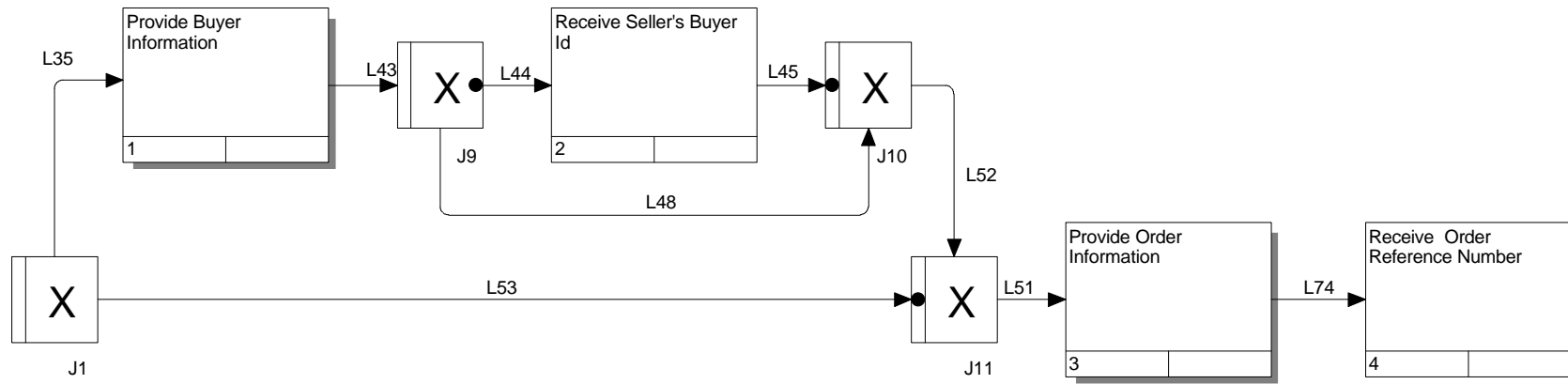
OSTN Diagram for Object: Seller's Buyer ID

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 Seller's Buyer ID has to be received.

OSTN Diagram for Object: Order Reference Number

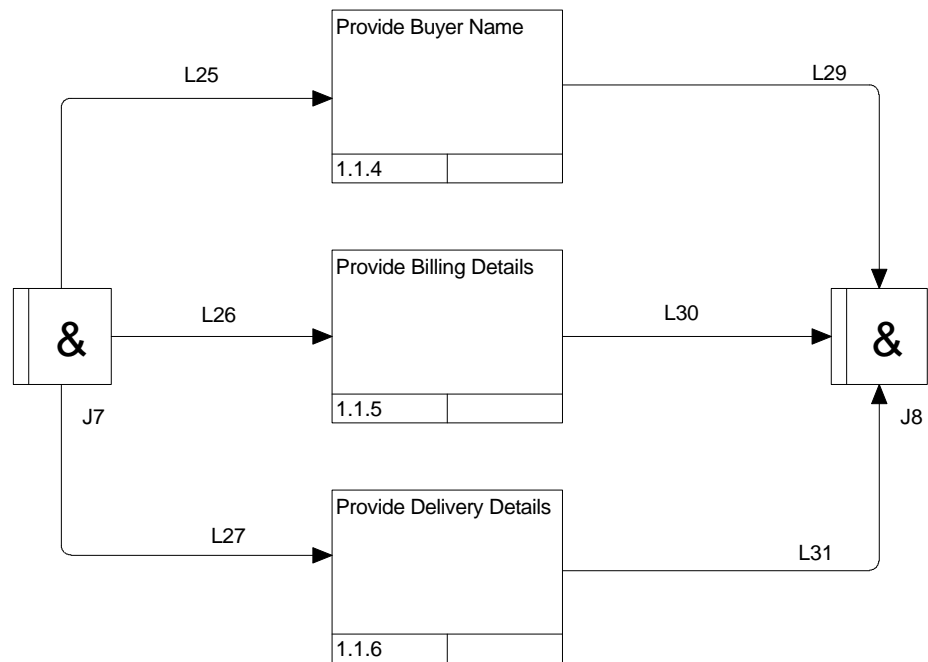
Moving from the state of *No Order Reference Number* to *Order Reference Number Received* requires order information to be provided.

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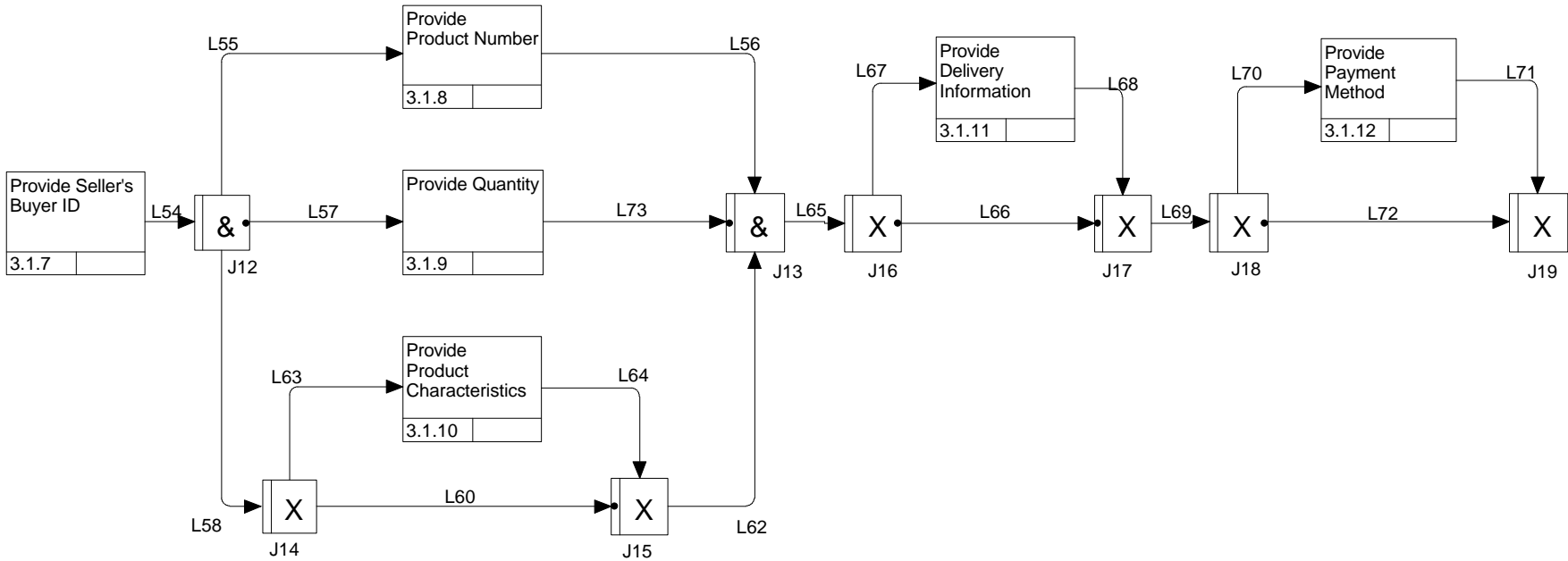
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OBJECT:			

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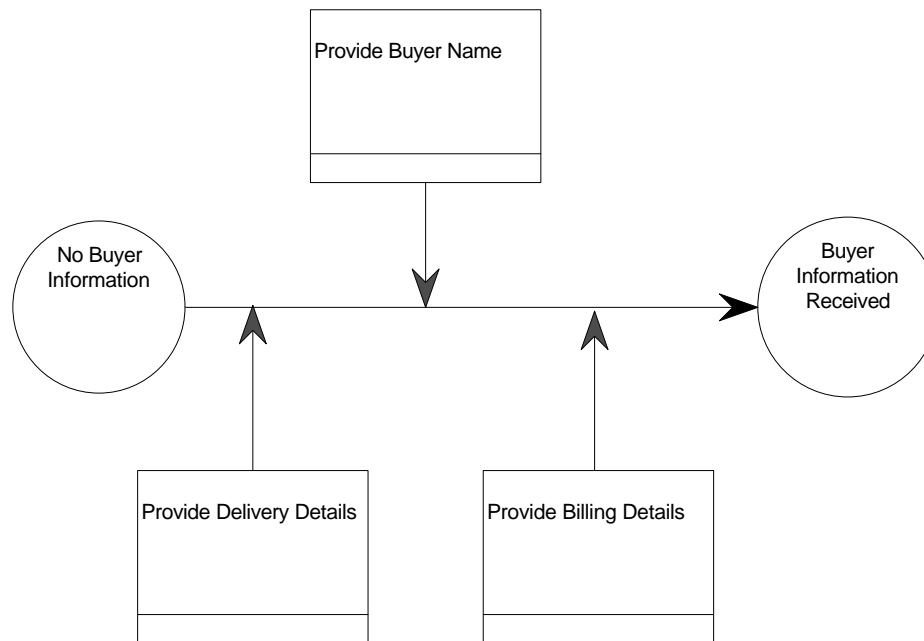
SCENARIO: "Catalog Order Example"	DESCRIPTION NAME: Provide Buyer Information	NUMBER:	6
OBJECT:			

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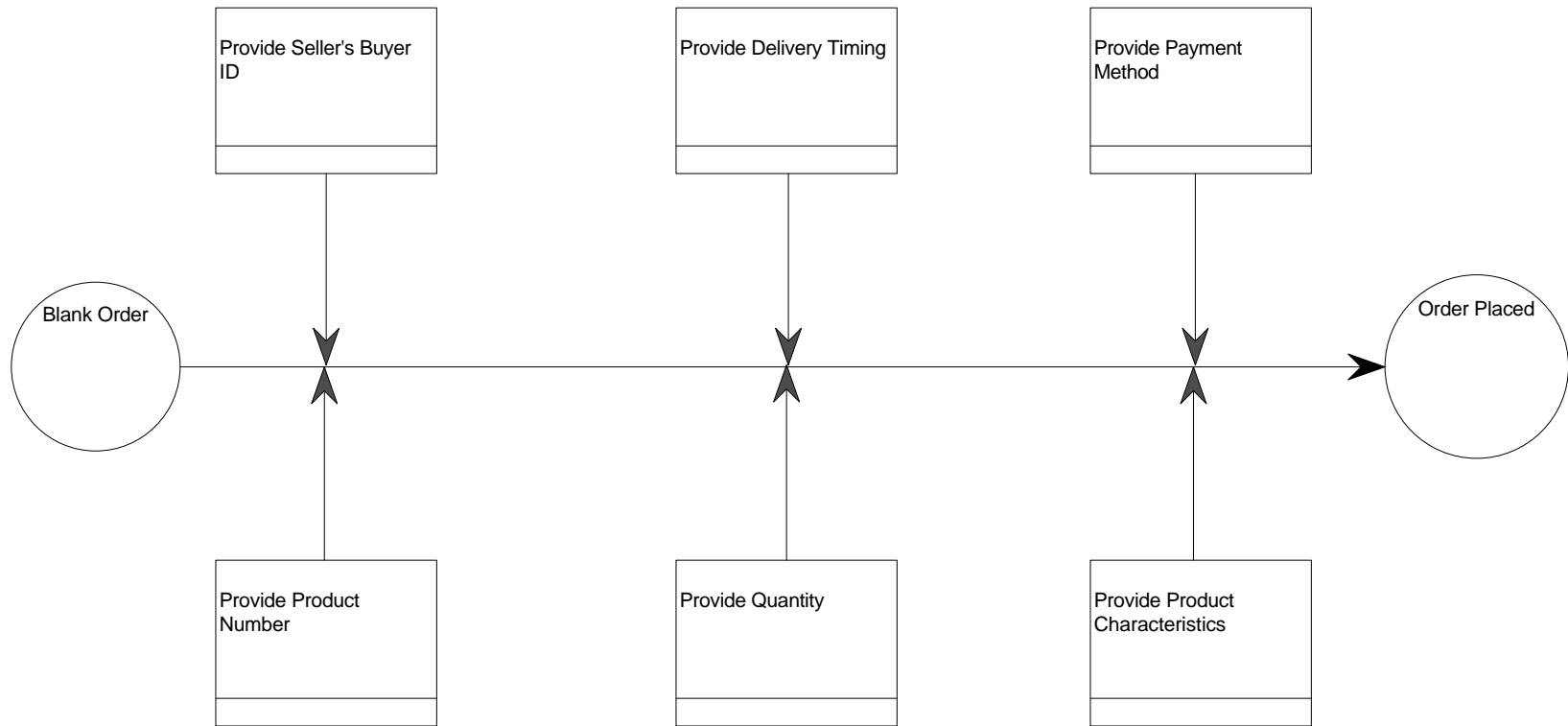
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OBJECT:			

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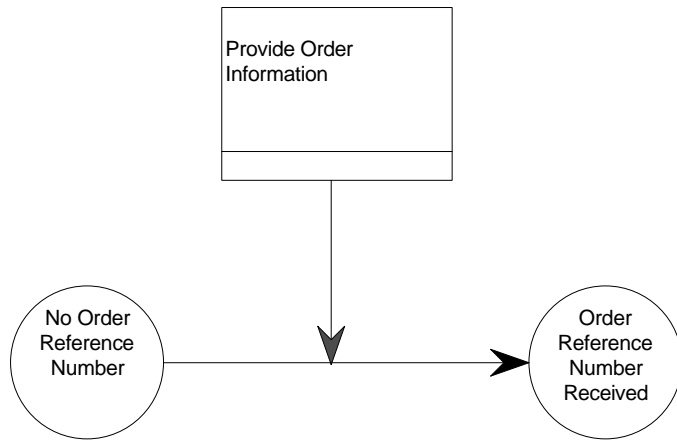
SCENARIO: "Catalog Order"	DESCRIPTION NAME: Provide Buyer Information	NUMBER:	8
OBJECT: "Buyer Information"			

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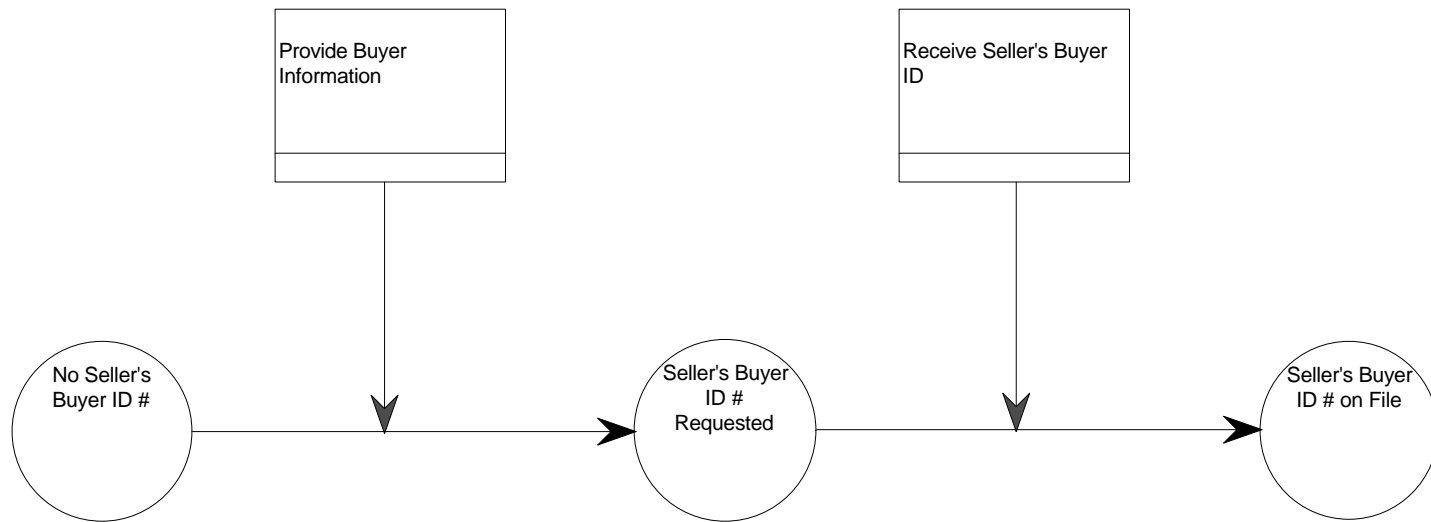
SCENARIO: "Catalog Order"	DESCRIPTION NAME: Provide Order Information	NUMBER:	9
OBJECT: "Order Information"			

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SCENARIO: "Catalog Order"	DESCRIPTION NAME: <i>Receive Order Reference Number</i>	NUMBER:	10
OBJECT: "Order Reference Number"			

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				RELEASED		
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SCENARIO: "Catalog Order"	DESCRIPTION NAME: Receive Seller's Buyer ID	NUMBER:	
OBJECT: "Seller's Buyer ID"			11

3. Semantic Data Modelling

What is Semantic Data Modelling?

The intent of Semantic Data Modelling is to model business rules and the relationship between the rules, such as: a company has many departments, a department has many employees, an employee can work for one department only.

Relationship between Data Modelling and Activity Modelling

The data model represents the structure of the input or output of the “activity” model in IDEF0. The modelling technique used to describe data is IDEF1X.

Using a limited version of IDEF1X

This model is constructed at the **conceptual** level. This is often called “the model of the business” or “Zachman row two” level. IDEF1X is designed to depict a model of an **information system** (i.e., “Zachman row three”) using relational technology. Since within the EDI environment the requirement is to be independent of the application, many IDEF1X features are disabled so that the model could be implemented in any technology including relational and object-oriented. Specifically these suppressed features are the Identification of key Identifiers and non-Identifier versus Identifier relationships. In addition, IDEF1X disallows many-to-many relationships and one-to-one relationships since they are wrong in relational technology.

Reading an IDEF1X Model

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 artefact 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.

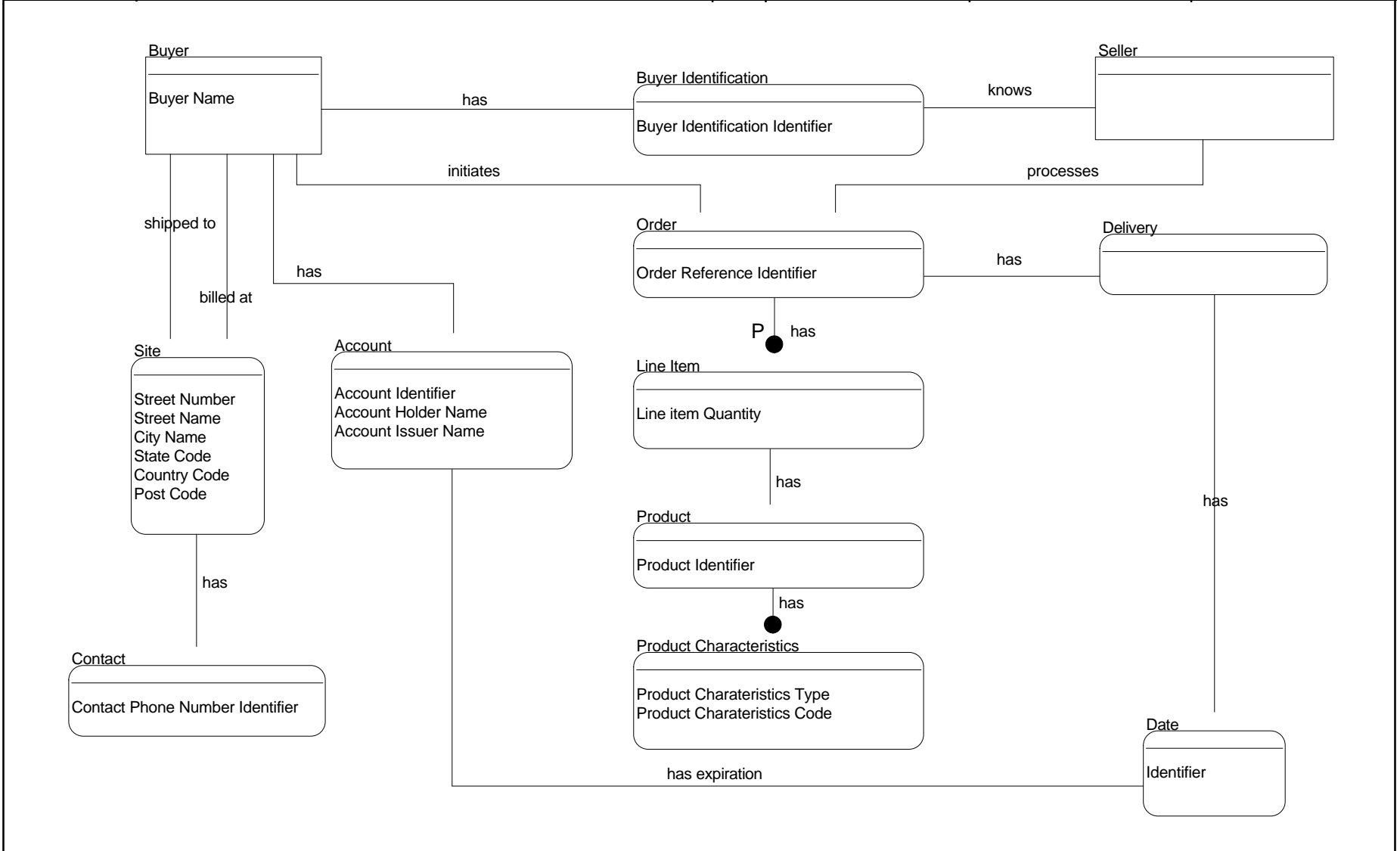
There are other features of a data model that are not covered here. Many other icons can be used in an E-R diagram, but are not of use in this structure. In addition, to be complete, there should be a description of each entity and attribute -- including its definition.

Example Data Model: Ordering from a Catalog

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 color, size, et cetera.

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4. Moving from the Data Model to EDI

Certain trends are observed by comparing the above IDEF1X model with current X12 and EDIFACT practices. These observations do not imply fixed rules, but seem to reveal different philosophies.

IDEF1X to X12	IDEF1X to EDIFACT
Each attribute is an element.	Identical
Each combination of entities having a one to one relationship is a segment.	Each entity is a segment.
Each entity that acts in multiple roles (has more than one relationship arrow coming into it in the diagram) is a generic segment (requires a segment qualifier) .	Identical
Entities referred as one to many are segment groups (loops).	Identical
<p>This model could be used to further define the EDI design discipline such as:</p> <p>Each entity is a composite data element. Each entity which can occur more than once is a repeating data element.</p>	<p>If each entity is a segment, composites and repeating data element can not be defined by the model.</p>
IDEF3 to X12	IDEF3 to EDIFACT
<p>Each scenario represents one or more transaction sets (messages). The number of transaction sets (messages) is determined by an examination of the IDEF3 diagrams (Flow and Object Transition). If all data flow is in one direction without a transition point, there could be just one message. There must be at least one message for each data flow.</p>	Identical

More to come, don't call us, we'll call you!