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Information technology — Business Operational View —

Part 4: Business transaction scenarios — Accounting and economic ontology

Technologies de l'information — Vue opérationelle d'affaires —

Partie 4: Scénarios de transactions d'affaires — Ontologie comptable et économique

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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/IEC JTC 1, *Information technology*, SC 32, *Data management and interchange*.

This second edition cancels and replaces the first edition (ISO/IEC 15944-4:2007), of which it constitutes a minor revision.

ISO/IEC 15944 consists of the following parts, under the general title *Information technology — Business Operational View*:

— *Part 1: Operational aspects of Open-edi for implementation*

— *Part 2: Registration of scenarios and their components as business objects*

— *Part 4: Business transaction scenarios — Accounting and economic ontology*

— *Part 5: Identification and referencing of requirements of jurisdictional domains as sources of external constraints*

— *Part 6: Technical introduction to e-Business modelling* [Technical Report]

— *Part 7: eBusiness vocabulary*

— *Part 8: Identification of privacy requirements as external constraints on business transactions*

— *Part 9: Business transaction traceability framework for commitment exchange*

— *Part 10: IT-enabled coded domains as semantic components in business transactions*

— *Part 20: Linking business operational view to functional service view to functional service view*

The following parts are under preparation:

— *Part 11: Descriptive techniques for foundational modelling in Open-edi*

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0 Introduction

0.1 Purpose and overview

This work is motivated with important ideas from the ISO Open-edi specifications as represented in ISO/IEC 15944-1. In ISO/IEC 15944-1 and in some of its earlier foundational expositions, such as ISO/IEC 14662, there were important concepts defined and interrelated such as business transaction, fundamental activities of a business transaction, commitment, Person, role, scenario, and others. A need for relating all of these concepts in a formal framework for the Open-edi work is apparent.

This is a question of ontology: a formal specification of the concepts that exist in some domain of interest and the relationships that hold them[17]. In this case, the domains of interest are those that encompass Open-edi activities, that is, law, economics, and accounting in an extended sense, not the internal accounting of one particular firm, but the accountabilities of each of the participants in a market-based business transaction.

Ontologies are generally classified as either upper-level ontologies, dealing with generalized phenomena like time, space, and causality, or domain ontologies, dealing with phenomena in a specific field like military operations, manufacturing, medical practice, or business. The economic and accounting ontology being used in electronic business eXtended Markup Language (ebXML), in the UN/CEFACT modelling methodology, and E-Commerce Integration Meta-Framework (ECIMF) work is entitled the Resource-Event-Agent (REA) ontology[1)]. REA is used here as an ontological framework for specifying the concepts and relationships involved in business transactions and scenarios in the Open-edi sense of those terms. The resulting framework is titled the Open-edi business transaction ontology (OeBTO).

The REA ontology is actually an elementary set of concepts derived from basic definitions in accounting and economics. These concepts are illustrated most simply with a UML class diagram. See Figure 1, which illustrates the simple Resource-Event-Agent structure that gives REA its name. A business transaction or exchange has two REA constellations joined together, noting that the two parties to a simple market transfer expect to receive something of value in return when they trade. For example, a seller, who delivers a product to a buyer, expects a requiting cash payment in return.

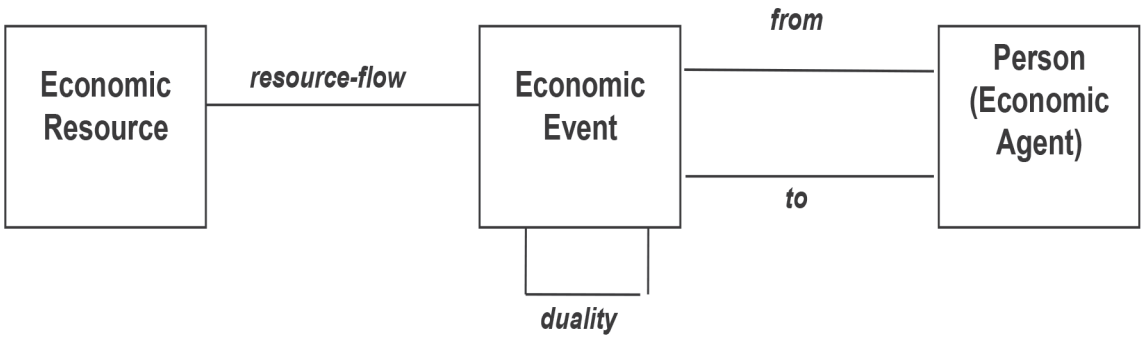


Figure 1 — Basic economic primitives of the Open-edi ontology

There are some specific points of synergy between the REA ontology and the ISO Open-edi specifications as represented in ISO/IEC 15944-1.

ISO/IEC 15944-1, 3.9 defines commitment as *"the making or accepting of a right, obligation, liability, or responsibility by a Person..."*. Commitment is a central concept in REA. Commitments are promises to execute future economic events, for example, to fulfill an order by executing a delivery event.

ISO/IEC 15944-1, 6.1.3, Rule 1 states: *"Business transactions require both information exchange and commitment exchange."* REA firmly agrees with and helps give definition to this assertion. Reciprocal commitments are exchanged in REA via economic contracts that govern exchanges, while information

1) Elements of the REA ontology as they are used in other standards work are explained in Annex B.

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exchange is tracked via business events that govern the state transitions of business transaction entities that represent various economic phenomena.

ISO/IEC 15944-1, 6.3.1, Rule 39 states: *"Conceptually a business transaction can be considered to be constructed from a set of fundamental activities. They are planning, identification, negotiation, actualization, and post-actualization."* For REA, actualization is the execution of economic events that fulfill commitments. Planning and identification involve business partners with types of economic resources, events, and persons, while negotiation is finalized by an economic contract which is a bundle of commitments. The UN/CEFACT Business Process Group has also defined negotiation protocols that assist in forming commitments. The Open-edi set of activities and the REA economic concepts will help each other tie together all the activities into a cohesive business transaction, and then unite that transaction definition with its related information models.

Finally, with regard to the preliminary agreement between Open-edi and REA, the two major sets of ideas that characterize the Open-edi work, the specification of business transactions and the configuration of scenarios, correspond well at the aggregate level to what the REA ontology calls the accountability infrastructure and the policy infrastructure. A business transaction specifies, in a descriptive sense, actual business events of what has occurred or has been committed to. Conversely, a scenario is more prescriptive: it configures what could be or should be. The realm of both descriptions and prescriptions is important both to Open-edi and REA, and they can work well in developing standards for each.

0.2 Definition of Open-edi Business Transaction Ontology (OeBTO)

According to the most widely accepted definition from Tom Gruber (1993), an ontology is a formal, explicit specification of a shared conceptualization.[2)] The individual components of this meaning are each worth examining.

— formal = machine-readable;

— explicit specification = concepts, properties, relations, constraints, and axioms are explicitly defined;

— of a shared = consensus knowledge;

— conceptualization = abstract model of some phenomenon in the real world.

At present, the REA model is certainly an explicit specification of a shared conceptualization of economic phenomena in the accounting community. A formal, machine-readable specification is not proposed in this part of ISO/IEC 15944; however, such extensions may follow in other standards work.

This part of ISO/IEC 15944 focuses on integrating the Gruber definition of ontology with a REA-based approach. It does so from an accounting and economic ontology perspective within an Open-edi Reference Model context. This is achieved through the introduction of the concept (or construct) of "Open-edi Business Transaction Ontology (OeBTO)", which is defined as follows:

formal, rule-based specification and definition of the concepts pertaining to business transactions and scenarios and the relationships that hold among those concepts.

0.3 Use of the "independent" and "trading partner" perspective in the Open-edi ontology work

In normal business use, the naming perspective for the ontological primitives would be that of the entrepreneur or of one of the two trading partners engaged in collaborative commerce. The other trading partner would ordinarily have a mirror-image view. Thus, a sale, a cash receipt, or a resource inflow for a particular entrepreneur would become a purchase, a cash disbursement, or a resource outflow for a corresponding trading partner. From this perspective, business events and their accompanying economic phenomena would be modeled twice, once in the database of each trading partner. However, for Open-edi purposes, or for that matter for any other independent modeling of business collaborations like the Business Requirement View BRV level of the UN/CEFACT modeling methodology, this redundancy

2) See also the expert contribution by Dr. Jake V. Knoppers in the JTC1/SC32/WG1 document N0220, "*Draft Definition for Open-edi Business Transaction Ontology (OeBTO)",* 2002-05-06.

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is not acceptable because it allows the states of the two representations to become inconsistent. This difference in naming perspective is explained below and illustrated in Figure 2.[3)]

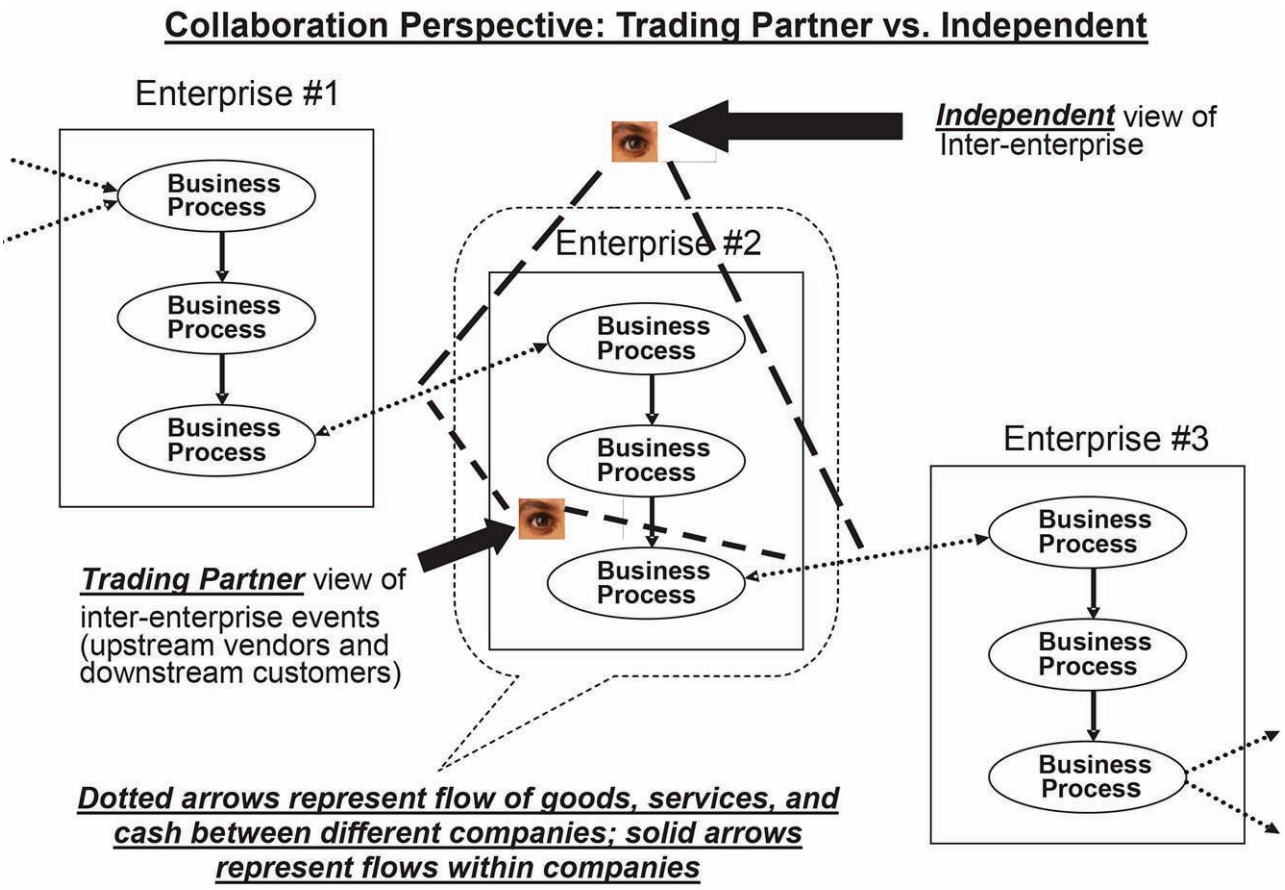


Figure 2 — Different views of business collaboration

Figure 2 illustrates three independent value chains for three different enterprises. Each company has a connected network of business processes that takes its initial input of resources (called factor inputs for their production functions) and transforms them via cumulative flows of goods, services, rights, and/or cash into an output for that firm's downstream customers. For Open-edi collaboration modeling, these internal processes are not relevant until a resource flow crosses enterprise boundaries, as is illustrated for Enterprise #2 which accepts materials from Enterprise #1 and which delivers materials to Enterprise #3 (most probably in both cases for cash payments in return). The two dotted lines with double-headed arrows show these inter-enterprise events.

The independent or collaboration perspective of resource flows is anchored on the view of the eye outside of Enterprise #2. This view sees both exchanges as conceptually similar with flows of materials being requited by flows of funds. Such a perspective is quite different from that of the eye inside of Enterprise #2, which sees the flow between Enterprise #1 and Enterprise #2 as a "purchase" and the flow between Enterprise #2 and Enterprise #3 as a "sale". Note that an eye inside of Enterprise #1 (not shown on diagram) would have modeled the "purchase" of Enterprise #2 as a "sale" of Enterprise #1, hence the redundancy and the inevitable inconsistency.

Business process modeling can take either of the perspectives shown by the eyes of Figure 2, but the independent perspective is clearly the choice for Open-edi. This leads to the concept of a business

3) Figure 2 was contributed by the Japanese delegation to SC 32, led by Katsuhiro Morita, during the Open-edi group meeting in Victoria in October 2001. {See further, the JTC1/SC32/WG1 document N1 N0190 "*AIW15944-4, Information technology — Business Agreement Descriptive techniques Part 4: Open-edi Ontology*", 2001-10-22} (Morita 2001). Some conceptual changes and naming conventions have been added since that first contribution.

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collaboration that is illustrated in Figure 3[4]. Most generally, there is a value exchange between two Persons, with one assuming the role of a "buyer" (has money, desires goods, services, and/or rights) and the other assuming the role of a "seller" (has goods, services, and/or rights, desires money). It is also possible to anchor the independent view on time, with one event being the initiating flow and the requiting event being the responding flow. For internal database purposes of corporate accountability, "trading partner perspective" terms are directly derivable from "independent perspective" terms.

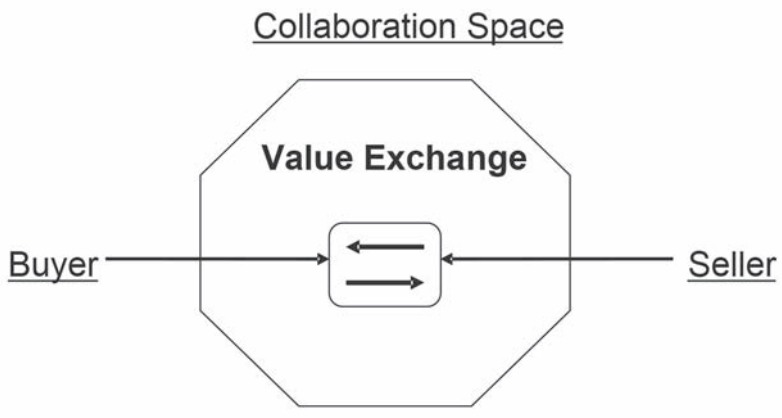


Figure 3 — Concept of a business collaboration

0.4 The "Open-edi Business Transaction Ontology" (OeBTO)

"Definition of Open-edi Business Transaction Ontology (OeBTO)" and "Use of 'independent' and 'trading partner' perspective in the Open-edi ontology work" have suggested

— that the components of the REA domain ontology model are sufficiently well-defined, stable, and well-known that they can clearly serve as the basis for an ontological specification of the concepts involved in collaborative exchanges between trading partners, and

— that the components of that model must be viewed from the outside perspective of a modeler viewing the economic phenomena independently.

Because the primitive economic terms are being adopted here for use with the operational aspects of Open-edi from ISO/IEC 15944-1, the ontology to be defined will be termed the "Open-edi Business Transaction Ontology" (OeBTO). Its definition is

formal, rule-based specification and definition of the concepts pertaining to business transactions and scenarios and the relationships that hold among these concepts

From the definitional foundations of both ISO/IEC 15944-1 and the REA model, it follows that the OeBTO will follow these five principles:

— as a business transaction ontology, a distinguishing characteristic of OeBTO is that in addition to information exchange, it incorporates commitment exchange among autonomous Persons;

— an OeBTO requires the use of clear and pre-defined rules, principles, and guidelines (see ISO/IEC 15944-1, 5.1);

— an OeBTO is neutral in terms of technology, representation, and application;

— the scope of an OeBTO covers all areas of business transactions (public/private, industry sectors, international, regional, etc.);

— the semantics of the concepts represented in an OeBTO are explicitly specified and constrained.

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4) Figure 3 was contributed by the Japanese delegation to SC 32, led by Katsuhiro Morita, during the Open-edi group meeting in Seoul, in May 2002.

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0.5 Organization and description of this part of ISO/IEC 15944

Clause 1 and Clause 2 provide scope and normative references for OeBTO. The basic OeBTO definitions are first enumerated in Clause 3, while Clause 4 provides a table of symbols and abbreviations. Clause 5 provides the declarative substance for this part of ISO/IEC 15944, which is a set of UML class diagrams and conceptual explanations that circumscribe the Open-edi Business Transaction Ontology. Clause 6 explains the mechanics of a business transaction state machine, which is the procedural component of an OeBTO, while Clause 7 explains the (internal) constraint component of OeBTO, which is its repository for business rules.

At the end of this part of ISO/IEC 15944 are some helpful Annexes that provide elaboration on the points raised in the main body. Normative Annex A is a consolidated list of all the terms and definitions used in this part of ISO/IEC 15944 in both ISO English and ISO French. The other normative annex is Annex C, which is common to ISO/IEC 15944-2, ISO/IEC 15944-4, ISO/IEC 15944-5, and ISO/IEC 15944-8. Annex B is informative text providing more detailed background information on the REA Model. This part of ISO/IEC 15944 concludes with a bibliography.

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Information technology — Business Operational View —

Part 4:
Business transaction scenarios — Accounting and economic ontology

1 Scope

This part of ISO/IEC 15944 provides a set of UML class diagrams and conceptual explanations that circumscribe the Open-edi Business Transaction Ontology (OeBTO). It explains the mechanics of a business transaction state machine, the procedural component of an OeBTO, and the (internal) constraint component of OeBTO, its repository for business rules.

This part of ISO/IEC 15944 addresses collaborations among independent trading partners as defined in ISO/IEC 15944-1. This part of ISO/IEC 15944 applies to both binary collaborations (buyer and seller) and mediated collaborations (buyer, seller, third-party). The ontological features described herein propose standards only for the Business Operational View (BOV), that is, the business aspects of business transactions as they are defined in ISO/IEC 15944-1.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

NOTE One or more terms and definitions of the referenced International Standards listed below are used in Clause 3 Terms and definitions.

ISO/IEC 6523-1:1998, *Information technology — Structure for the identification of organizations and organization parts — Part 1: Identification of organization identification schemes*

ISO/IEC 11179-3:2003, *Information technology — Metadata registries (MDR) — Part 3: Registry metamodel and basic attributes*

ISO/IEC 14662:2010, *Information technology — Open-edi reference model*

ISO/IEC 15944-1:2011, *Information technology — Business Operational View — Part 1: Operational aspects of Open-edi for implementation*

ISO/IEC 15944-5:2008, *Information technology — Business Operational View — Part 5: Identification and referencing of requirements of jurisdictional domains as sources of external constraints*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

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