The REA Accounting and Economic Ontology – Its Use in ISO 15944-4 and Its Development as a Literary Warrant

by

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REA Overview

- REA = Resource-Event-Agent
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- In the enterprise (within the firm), it has been used as the basis for newer types of ERP systems (Workday and others).
- In the collaboration sphere, it has been used in ISO 15944-4 (Open-edi) as an economic and accounting ontology.
- We are currently summarizing and integrating the REA work in a research monograph commissioned by the American Accounting Association (coauthors are Guido Geerts and Graham Gal).
- We are striving to establish the AAA monograph as a literary warrant for the accounting domain (thanks for suggestion from Simon Spero).
- "In general, the warrant of a classification system can be thought of as the authority a classification invokes first to justify and subsequently to verify decisions about what classes/concepts to include in the system, in what order classes/concepts should appear in the schedules, what units classes/concepts are divided into, how far subdivision should proceed, how much and where synthesis is available, whether citation order are static or variable and similar questions."

Clare Beghtol (1986)
The evolution of accounting systems

Enterprise Economic Activities

Principal

Enterprise Accounting Systems

Collaboration Space Systems

Economic storytelling with semantic models of value creation by firms

Economic storytelling of interoperable communities of firms

Surrogates

“transactional memory external to the parties of the exchange”

Agrarian Age

Mercantile Age

Industrial Age

Enterprise Systems Age

Semantic Web Age

jar

memorandum

source document

Journal

A/Rec .... Sales...

computer files and General Ledger

Ledger

Financial statements

Financial Reporting View

Other Views of Enterprise Event-chains

Collaboration Space

transactional memory external to the parties of the exchange
Collaboration Perspective: **Trading Partner** vs. **Independent**

**Independent** view of inter-enterprise events

**Trading Partner** view of inter-enterprise events (upstream vendors and downstream customers)

*Dotted arrows represent flow of goods, services, and cash between different companies; solid arrows represent flows within companies* 

**Different Views of Business Collaboration**

*(ISO 15944-4)*
In philosophy and computer science, an ontology is a formal representation of a set of concepts within a domain and the relationships between those concepts. It is used to reason about the properties of that domain, and may be used to define the domain (Wikipedia).
Key REA ontological primitive = Economic Resource

Economic Resource

Something that is scarce and has utility, and is under the control of an enterprise (1982 paper & Ijiri)
Subtypes (possible) for ECONOMIC RESOURCE (ISO 15944-4)
Subtypes of Person (15944-4)
Person and Economic Resource as the Basis for Exchange (ISO 15944-4)
What has occurred

Normative primitives of a transaction ontology
An economic story

Once upon a time at the cookie store ......
Cookie-Monster (the customer) and Elmo (the entrepreneur) meet in the (real or virtual) marketplace, thus setting the stage for an Economic Exchange.
Cookie-Monster and Elmo engage in a SHIPMENT (transfer of Cookie Inventory)
Cookie-Monster and Elmo engage in a PAYMENT (transfer of Cash)
Modeling required transactions
What could be or should be

Adding Types
What is planned or scheduled

Economic Agreement

commitment

reciprocal

fulfills

economic event

duality

economic event

Adding Commitments
1. Green – “What has occurred” – REA, duality, stockflow {inflow, outflow}, participate {from, to} {inside, outside}

2. Yellow – What could be or should be – TYPES, typify, policy

3. Purple – What is planned or scheduled – COMMITMENTS, specify, fulfill, reciprocal, triggers
Business Process Network
(entrepreneur script for creating value)

1. **Planning**—Identification-Negotiation-Actualization-Post-actualization phases
2. inside/outside participate
3. 1-to-1, 1-to-n, n-to1, m-to-n duality

**Exchange (buy) Processes**

- take event
- give event

**Conversion (make) Processes**

- produce event
- use event

1. **Planning**—Negotiation-Actualization-Post-actualization phases
2. inside only participate
3. n-to-1 dualities (meronym)
ISO 15944-4 -- Business Objects with States
(ebXML source)
Granularity Hierarchy for REA Business Process Models (figure done by Cheryl Dunn)

Value System Level
External connections between enterprise and its business partners as indicated by resource flows

Value Chain Level
Internal resource flows within an enterprise, between its various business processes. Notice NO external business partners are included on this level. The value chain level describes what occurs inside the bubble labeled Enterprise at the value system level.

Business Process Level
Each transaction cycle from the value system level is decomposed into the resources, economic events (both increment and decrement events), agents, as well as other entities. Relationships between entities include duality, stockflow, participation, and many others. Business process level models from each of the transaction cycles are integrated into one overall conceptual model for the company, merged on common entities and relationships. Once merged, the conceptual model is converted into relational database tables or some other type of physical data store.

Data Processing

Task Level
Each event from the Business Process Level is decomposed into the workflow by which the event is accomplished, including the inputs, processes, and outputs as well as identifying areas of responsibility. Task Level models may be represented in many different formats including document flowcharts, process maps, data flow diagrams, and others. The flowchart shown at left is only a small piece of a flowchart to represent purchase and payment.
REA Modeling at the Value System (Supply Chain) level -- Trading Partner View
• **Planning**: In the Planning Phase, both the buyer and seller are engaged in activities to decide what action to take for acquiring or selling a good, service, and/or right.

• **Identification**: The Identification Phase pertains to all those actions or events whereby data is interchanged among potential buyers and sellers in order to establish a one-to-one linkage.

• **Negotiation**: The Negotiation Phase pertains to all those actions and events involving the exchange of information following the Identification Phase where a potential buyer and seller have (1) identified the nature of good(s) and/or service(s) to be provided; and, (2) identified each other at a level of certainty. The process of negotiation is directed at achieving an explicit, mutually understood, and agreed upon goal of a business collaboration and associated terms and conditions. This may include such things as the detailed specification of the good, service, and/or right, quantity, pricing, after sales servicing, delivery requirements, financing, use of agents and/or third parties, etc.

• **Actualization**: The Actualization Phase pertains to all activities or events necessary for the execution of the results of the negotiation for an actual business transaction. Normally the seller produces or assembles the goods, starts providing the services, prepares and completes the delivery of good, service, and/or right, etc., to the buyer as agreed according to the terms and conditions agreed upon at the termination of the Negotiation Phase. Likewise, the buyer begins the transfer of acceptable equivalent value, usually in money, to the seller providing the good, service, and/or right.

• **Post-Actualization**: The Post-Actualization Phase includes all of the activities or events and associated exchanges of information that occur between the buyer and the seller after the agreed upon good, service, and/or right is deemed to have been delivered. These can be activities pertaining to warranty coverage, service after sales, post-sales financing such as monthly payments or other financial arrangements, consumer complaint handling and redress or some general post-actualization relationships between buyer and seller.

**SOURCE**: ISO FDIS 15944-1 – *Operational Aspects of Open-edi for implementation*
REA Class Model of Different Granularity Levels
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Collaboration Messaging for:

- Planning
- Identification
- Negotiation
- Actualization
- Post-Actualization

Company A

- General Ledger Taxonomy:
  - AccRec (B) – xx
  - Sales – xx
  - COGS – yy
  - Inventory – yy
  - Cash – xx
  - AccRec (B) – xx

Company B

- General Ledger Taxonomy:
  - Purchases – xx
  - AccPay (A) – xx
  - AccPay (A) – xx
  - Cash – xx

Collaboration System

Traditional financial statements

Transaction-level processes (ISO 15944-4)

Transfers & transformations, types, commitments, business events, etc.
ELMO sold cookie to COOKIE-MONSTER

ELMO received cash from COOKIE-MONSTER
a cookie was shipped from ELMO to COOKIE MONSTER