

# The maturity of business ontologies and rate of adoption

Examples and Challenges from the domain of  
eCommerce standardisation and electronic business collaborations



Ontolog presentation, 2005-07-14

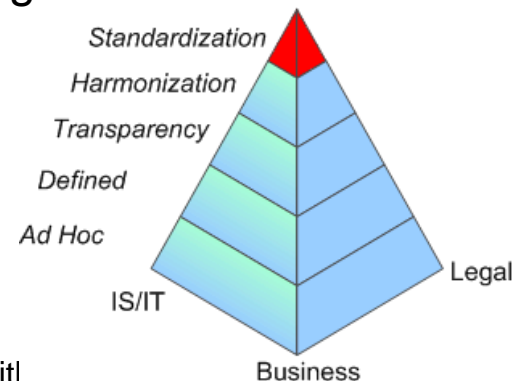
**Anders W. Tell**, <[anderst@toolsmiths.se](mailto:anderst@toolsmiths.se)>  
**Financial Toolsmiths AB**, <[www.toolsmiths.se](http://www.toolsmiths.se)>

# Agenda

- Mapping out the business, business collaboration and eCommerce domains
- T-Architecture
  - Presentation
  - Storage and knowledge representation
  - Business
  - Relationships and Collaborations
- Aspects of Business Collaborations
- Examples of current initiatives

# Startingpoint and scope

- Maturity
  - Methodologies, technologies
  - Applications of methodologies, technologies
  - Users of instruments
- Business technology vs technologies that can be used for business.
  - Technology that specially considers changes in social, business and legal relations,
- Guiding principles
  - Viewpoints: Business, Legal, Technical'
  - Integrated architecture and implementation
  - "Can you really show this to a district court judge?"
  - SME and Micro companies
  - Widespread adoption



# From paper to Electronic Collaborations

- Support for Business to Consumer transactions**
- Product catalogue
  - Shopping basket
  - Automated payment system

- Meeting space for multiple vendors and customers**
- Negotiating agreements
  - Comparing product offerings

**Brochure-ware**

**B2C  
eCommerce**

**B2B  
eCommerce**

**Electronic  
Marketplaces**

**eCollabo-  
rations**

1993

1995

1997

1999

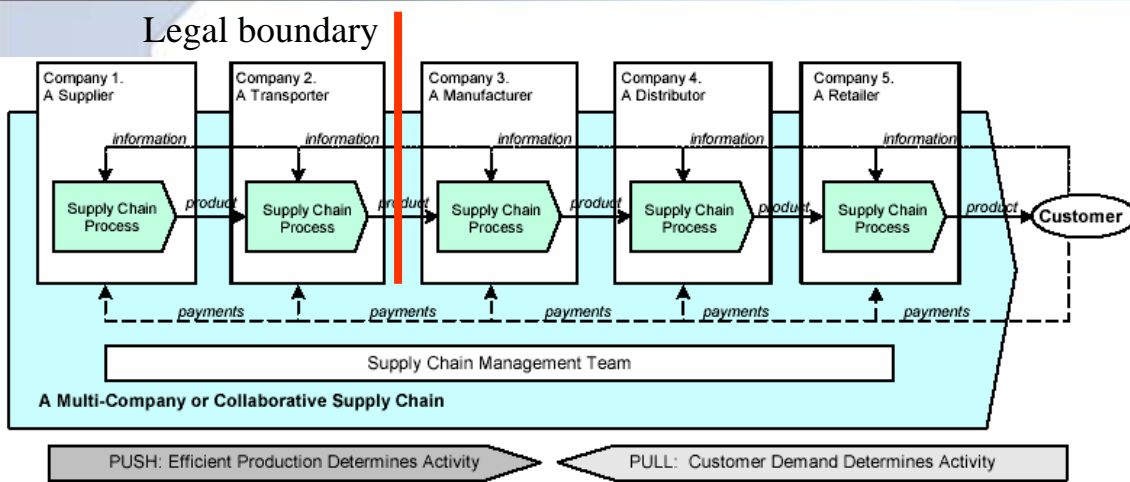
- Online access to product and company information**
- no support for business transactions

- Support for Business to Business transactions**
- Initially similar to B2C systems
  - Reduced transaction costs

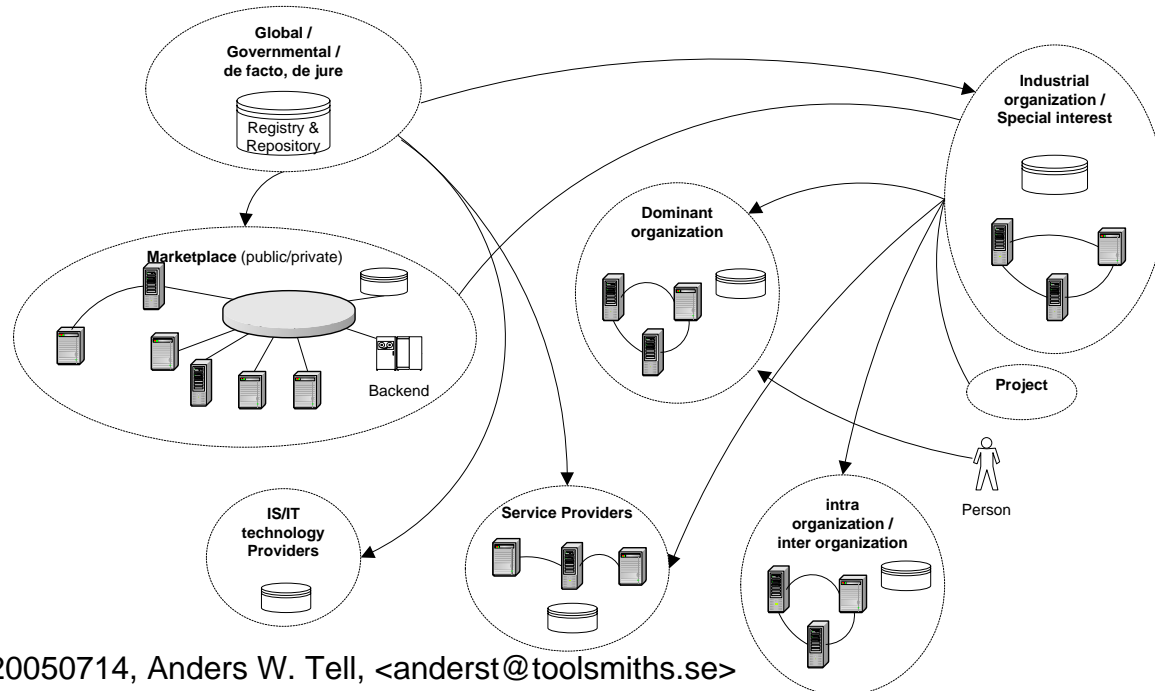
- Beyond purchase and sales of products**
- Scheduling activities
  - Inspecting outcomes
  - Resolving conflicts

(Copyright: Prof. Paul Johannesson, 2002, modified)

# International supply chains and Standardization landscape

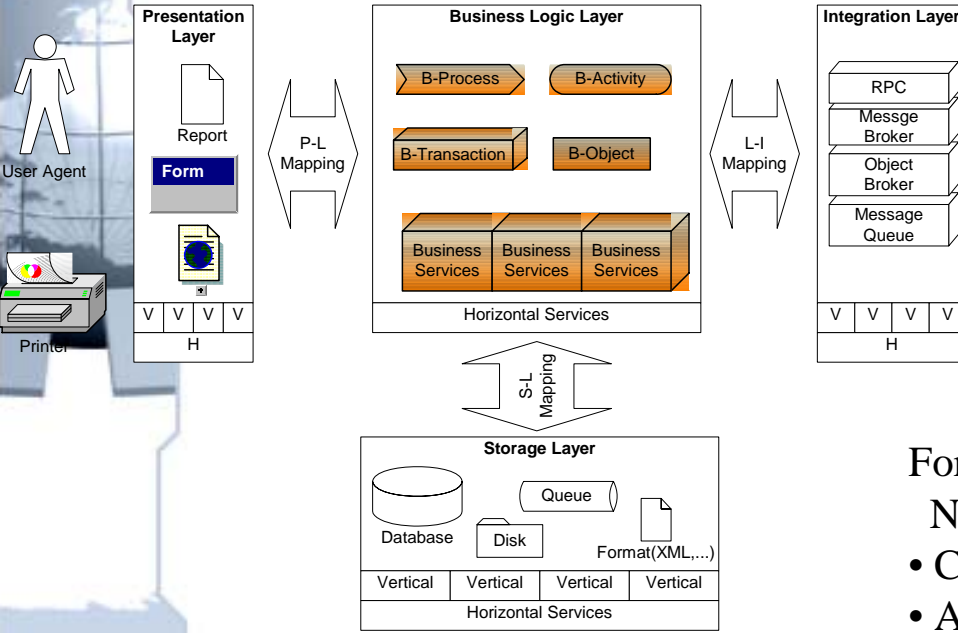
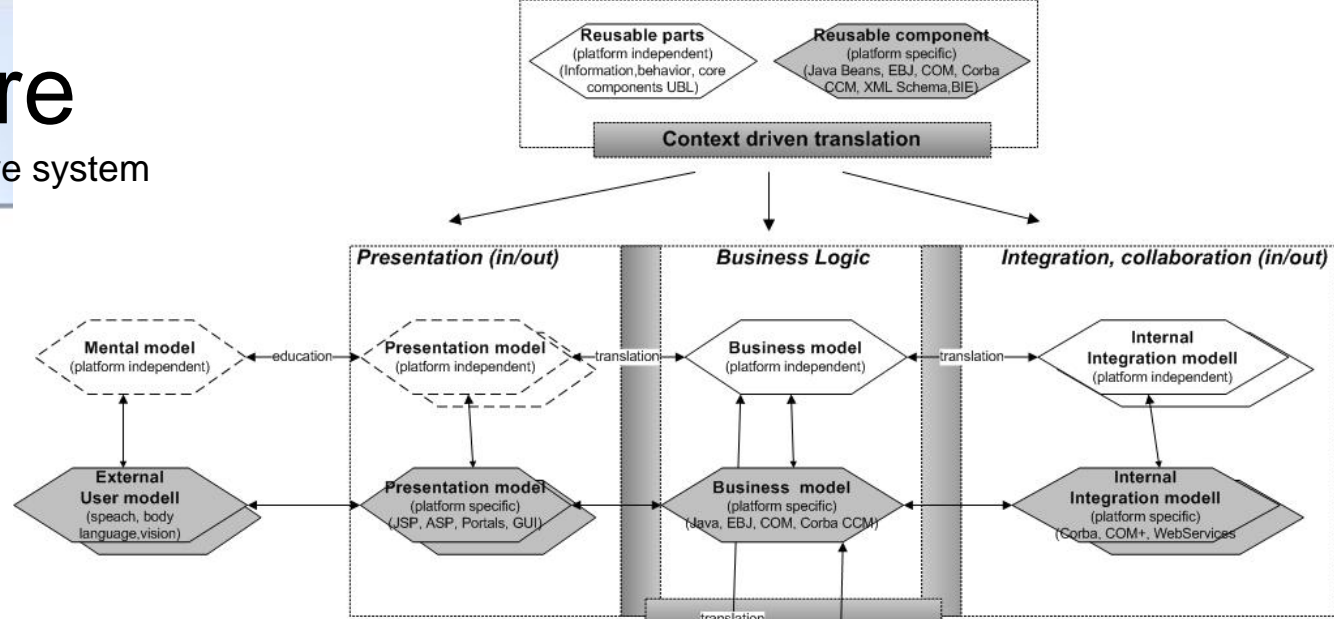


BPTrends, 2004



# T-Architecture

Communicative and collaborative system



For each set of concepts →

- $N * 6$  conceptions, ontologies +  $M * 4$  translations
- Conceptual, logical, physical:  $3 * 6 \Rightarrow 18$
- Above exemple:  $2 * 6 \Rightarrow 12$

# T-UI: Presentation for humans

- Paper, Rich User Interface, Mobil phones, Devices
  - Over 80% of trade documents still on paper
- Used as media channel, in marketing, for film
- Technical solutions in abundance
  - Maybe too many...
- Trustworthy translations to and from virtual electronic world
  - Trust in Technology, method, process or processor
    - May remove signatures if process or person is trustworthy
- Maturity
  - Knowledge and experiences exist,
  - Can repeat successes and may optimise processes
  - Many vendors exist
- Weakness
  - Legally prepared interfaces.
  - Legislation is still maturing
  - Few widely adopted dialog, scenario, scene, natural-languages
- Missing
  - Visual communication language



Originator

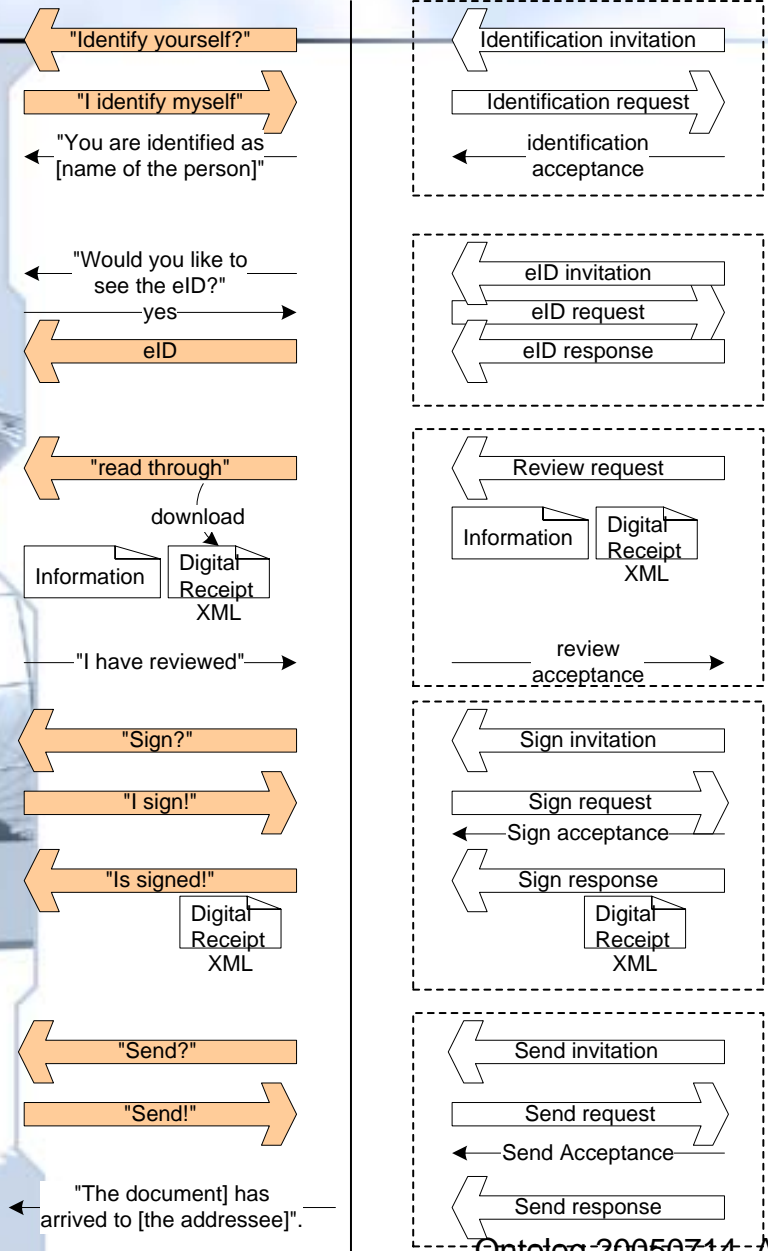


User Agent

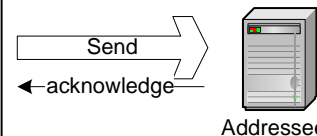


e-Service

# Legal User interface



- Web Interface
- Used in Sweden, SAMSET
- Increased understanding
- Common set of Icons
- Some vulnerability to statistical recognition attacks



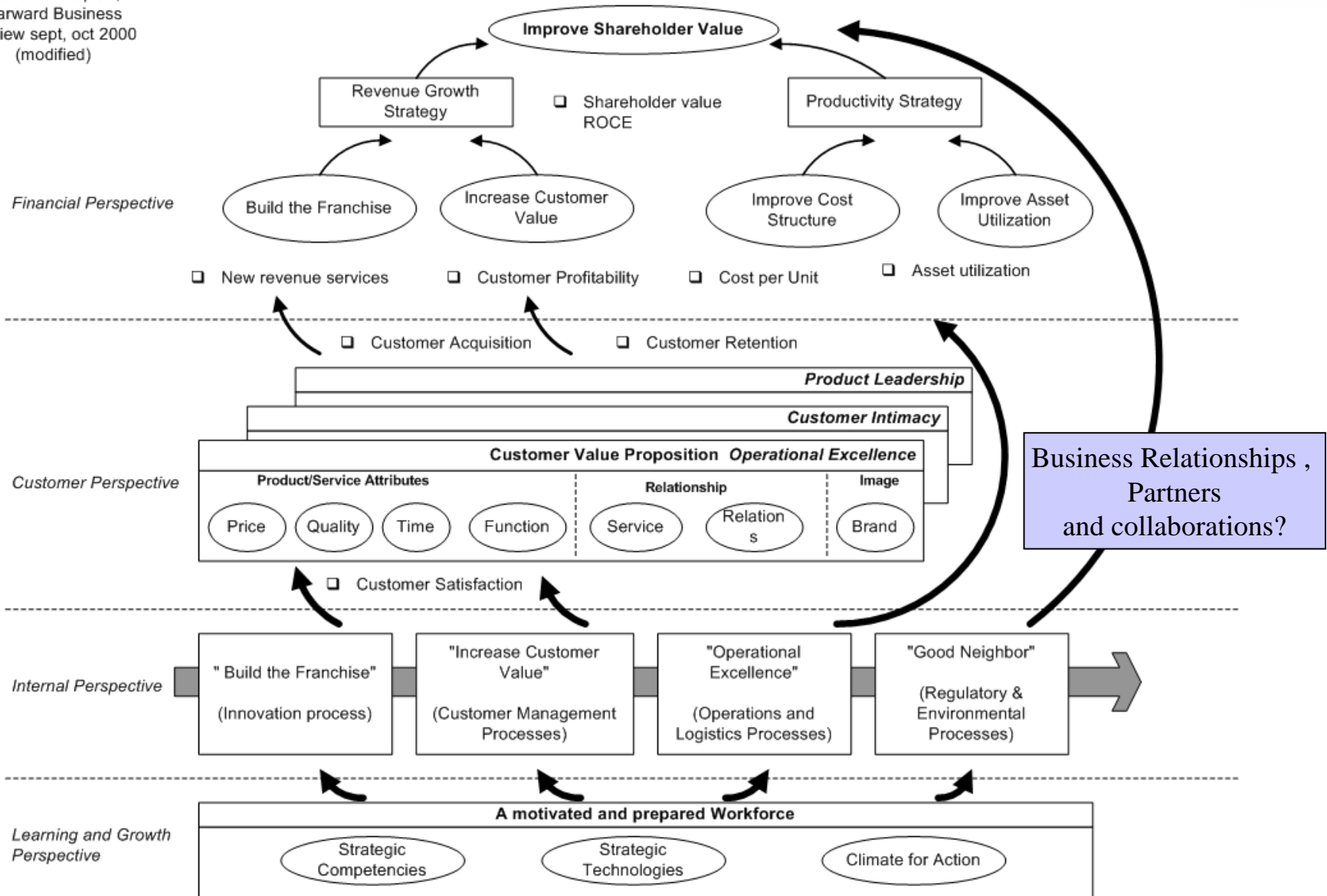


# T-S: Storage

- Storable/retainable, accessible for future reference, persistence
  - Text, diagram, grammarbased text,...
  - Relational and object database,..
  - XML, RDF triplets,OWL, KIF, ...
- Media: Paper, microfiche, optical, disks, RFID,...
- Query languages: SQL, OQL, XPath, XQuery, ...
- Archive system:
  - Regulatory compliance, preservation of evidence
  - Procedure guarantess authenticity, not the record itself
  - Store information, context and meta data.
- Maturity
  - Knowledge and experiances exist,
  - Can repeat successes and may optimise processes
  - Many established vendors
- Weakness
  - Archival still an issue significant due to regulatory requirements.
  - Fast technology evolution.
  - eCommerce: how much should be stored and how long
- Missing
  - Long term storage principles (readability,references,...) and devices

# T-B: Internal management perspective

Robert S. Kaplan,  
Harvard Business  
Review sept, oct 2000  
(modified)



Business Relationships,  
Partners  
and collaborations?

# T-B: Enterprise Architectures

## Internal process perspective

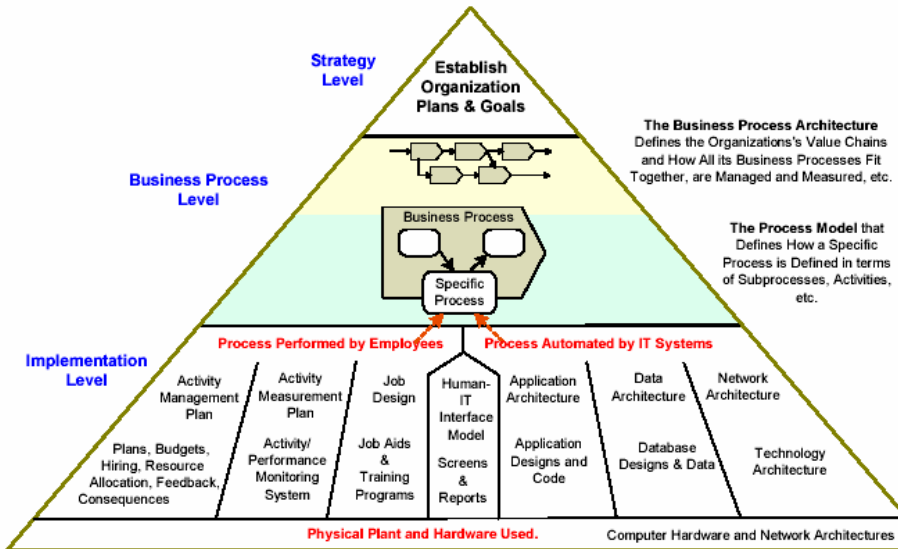
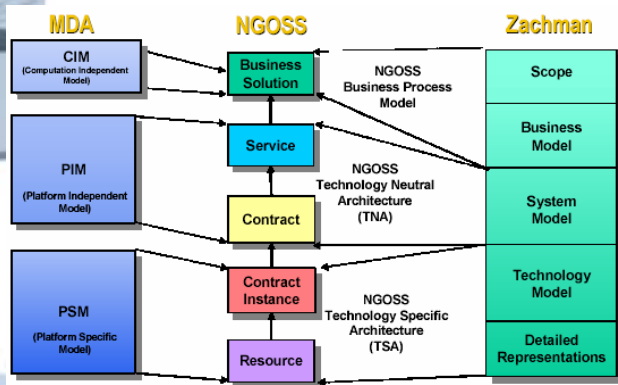
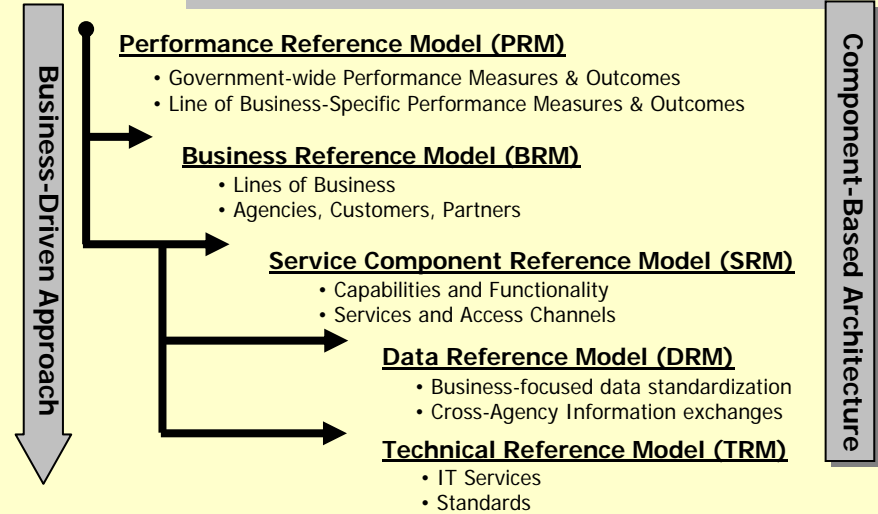


Figure 1. The BPTrends Enterprise Architecture Pyramid

Copyright, Paul Harmon, BPTrends, Jan 2004



## Federal Enterprise Architecture (FEA)

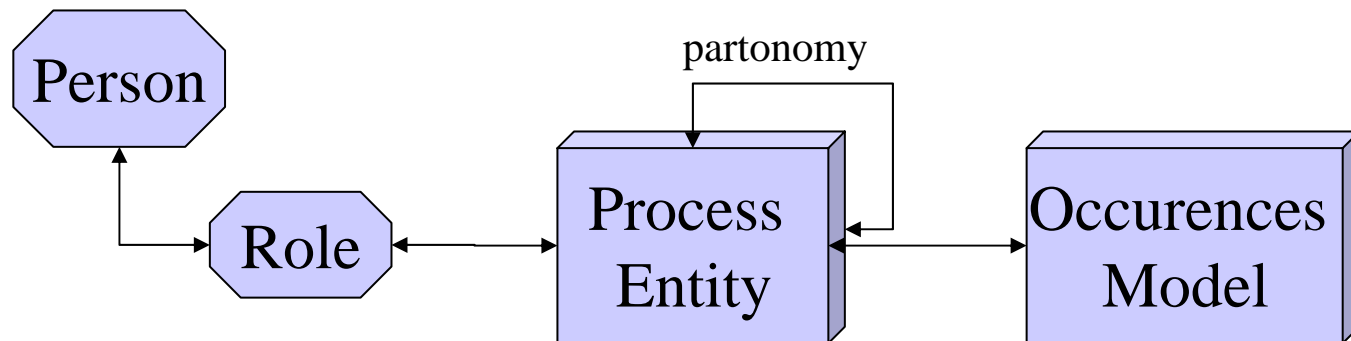


“Ontolog Forum, Marion A. Royal, November 06, 2003”

SOA, POA?

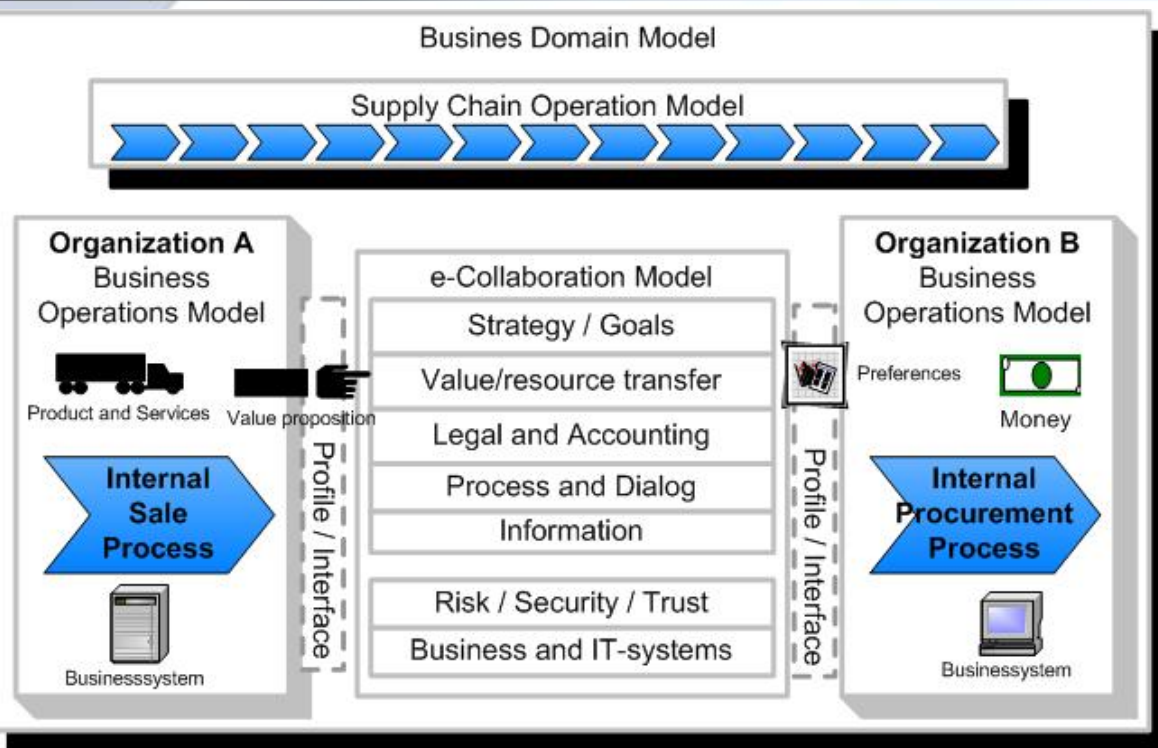
# T-B: Process languages

- Many principles and technologies for ...  
"who is doing what with whom at which time"



- But fewer that integrates responsibilities, authorisation, capability, capacity, accounting, duties and rights, collaboration, negotiation, ....
  - Policy, access and rights languages are areas under string development
- Are only interaction behavior of interest in a collaboration specification?
  - Some industry organisations want to describe what all parties must do before sending and after receiving communications.
- Is it necessary to become formal directly or is there a migration path for the common user?

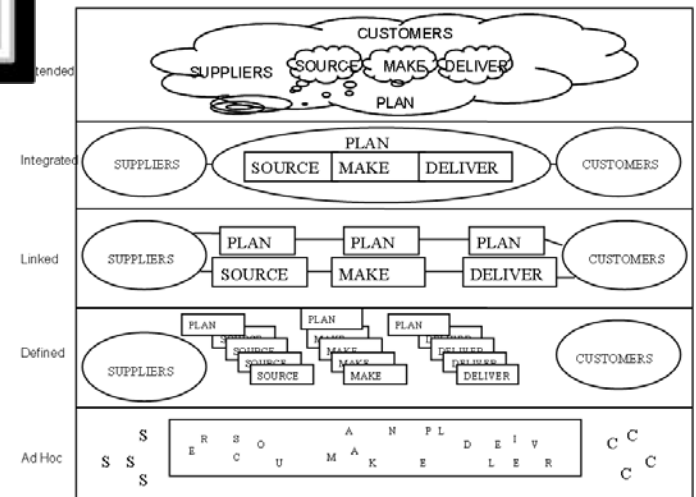
# T-C: Business Collaborations and Alignment



UN/CEFACT (modified)

Supply Chain Management Maturity Model

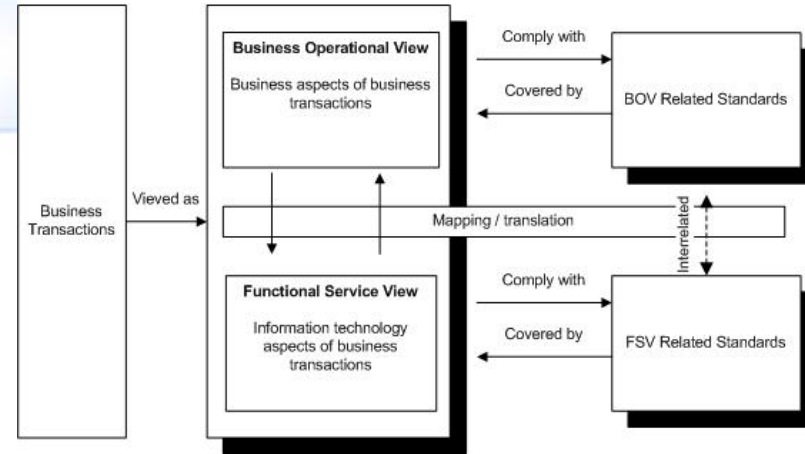
SCOR?



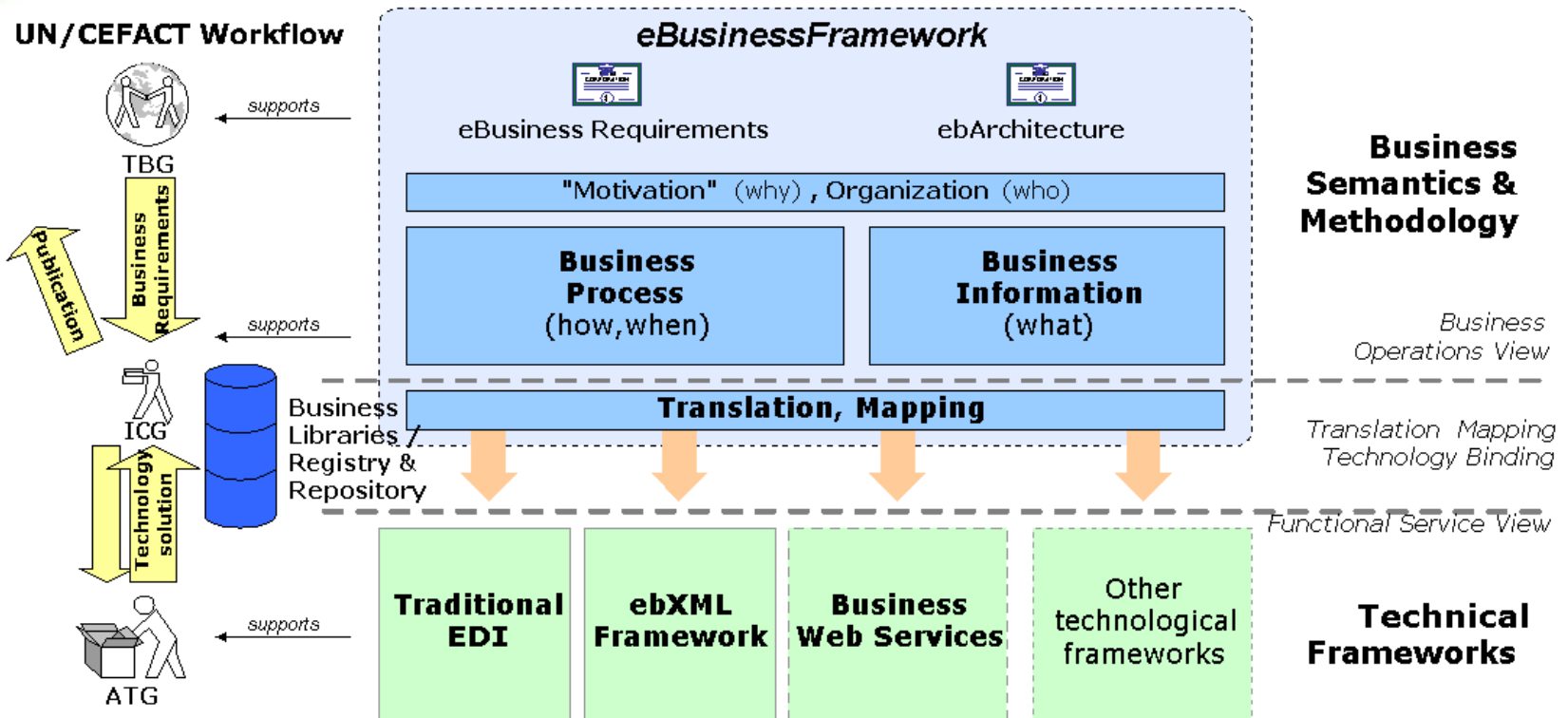
# T-C: UN/CEFACT

## Open EDI

Open EDI Reference Model, ISO/IEC 14662



*Idealistic diagram of UN/CEFACT eBusinessFramework*



# Are BC as simple as it seems?

Example: Check inventory-level:

- Define a WebService through WSDL
  - CheckInventory(Product prd, Time t) -> Level
- Implement RequestResponse Message Exchange Pattern (MEP) using java webservices package and Eclipse.
- Operating software in less than 1 hour
  
- Raises business questions
  - What happens when *exception* is raised at client (i.e services is not available)?
    - Who is responsible for making sure the query is handled?
    - Alternative communication channels?
  - How accurate should/must the returned *Level* be?
  - What happens if requestor act on *Level* but finds out that its was not accurate?

# General Business characteristics and the electronic virtual world

- Less human involvement
- Faster interactions
- Increased complexity for humans
- Fast evolution of technologies and emergence of legacy
- Lack of deep knowledge amongst users
- Security and trust
  - Less human interactions
  - Spam, statistical and phishing attacks,





# Aspects of Business Collaborations

- Involves 2 or more parties
- Parties
  - Between units in same organisation
  - Between different legal entities but with high level of trust and integration
  - Between two or more legal entities
    - with lower level of trust
    - in different legal domains
- Multiparty collaborations can often be broken down into pairs
  - can often be broken down into pairs
  - Has all parties access to all information?
    - Analysis of Multiparty collaborations often benefits from including business relationship aspects and agreements
- Characteristics
  - Sometimes more conversational than request-response
  - Negotiation: propose, accept, reject,...
  - Disputes, litigation,...
  - No time reversal, compensation,...

# Aspects of Business Collaborations - 2

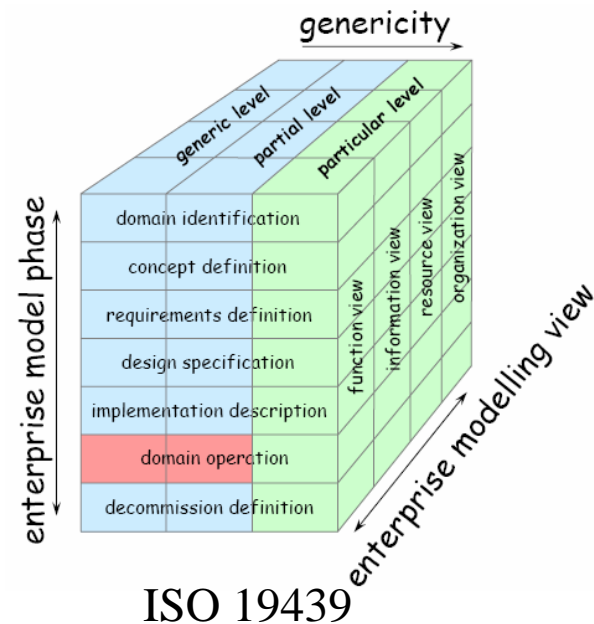
- What to do with benefits vs risk?
  - Commercial and contract managers considers risk
  - Reduce likelihood and/or consequence
    - Detect , recove and create incentives for good behavior
  - Avoid och absorb may not be economical.
  - Example
    - Use HTTP/S on public URL ,
    - XML to send RequestForPayment
    - Check payment instruction
    - Accept risk of spam

- Business Entities
  - Has life cycles
  - Survives interactions

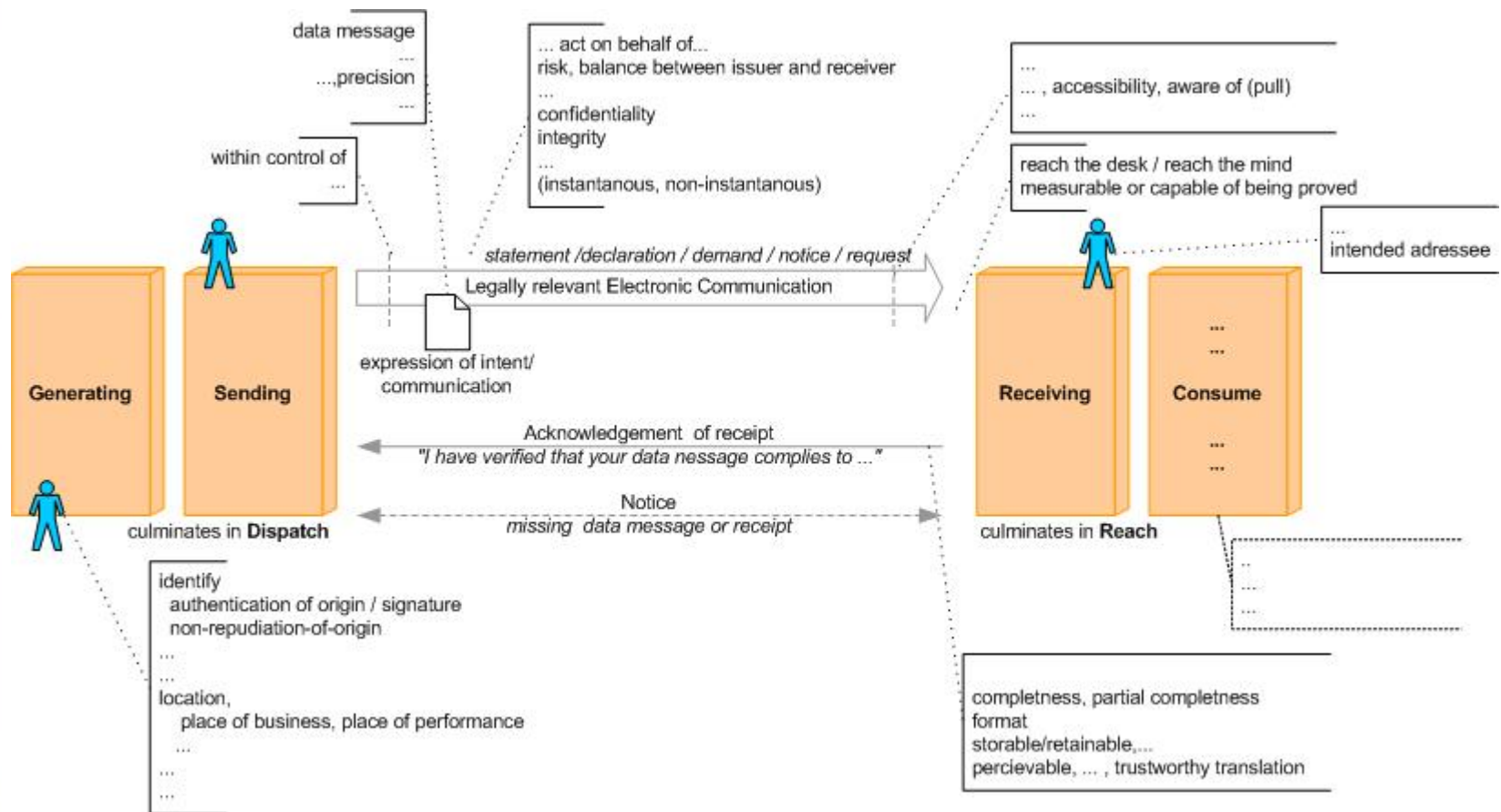
- "What you see is what you get"
  - observable behavior

- Principles valid within one technological framework
  - what happens with long distributionchains with legacy middleware?
  - Example: verb expressed in WSDL instead of in communication

Negotiation?

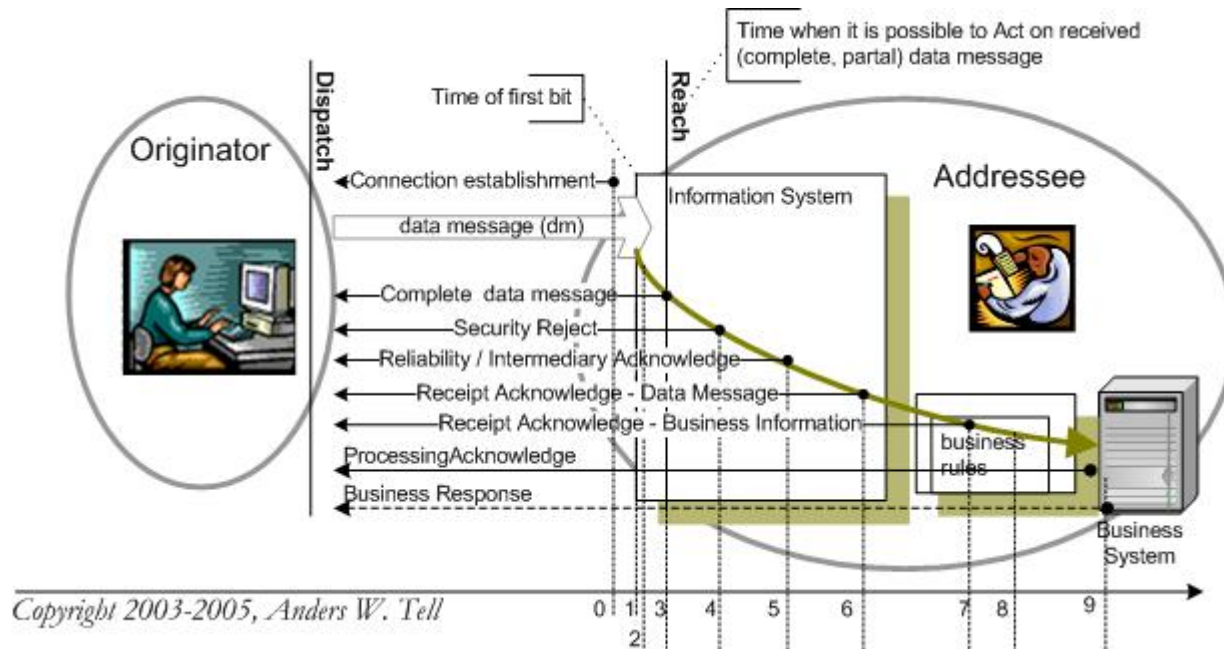


# Aspects of legally relevant collaborations



Many aspects can be derived from technology or use of technology but many aspects are not part of the technology.

# Business Collaborations and its Interactions



- Riskbalancing, who is responsible for the transfer, is missing from most technical frameworks.
  - Needed to minimize financial and legal risk
  - Does formal principles considers riskbalancing when linking interactions together?
- Business success and business failure?

# Business Communications and a Legal view

- “**Communication**” means any statement, declaration, demand, notice or request, including an offer and the acceptance of an offer, that the parties are required to make or choose to make in connection with the [negotiation] [formation] or performance of a contract;
- “**Electronic communication**” means any communication that the parties make by means of data messages;]
- “**Data message**” means information generated, sent, received or stored by electronic, optical or similar means including, but not limited to, electronic data interchange (EDI),<sup>18</sup> electronic mail, telegram, telex or telecopy;

From: UN/CITRAL WG4, Vienna, 11-22 October 2004

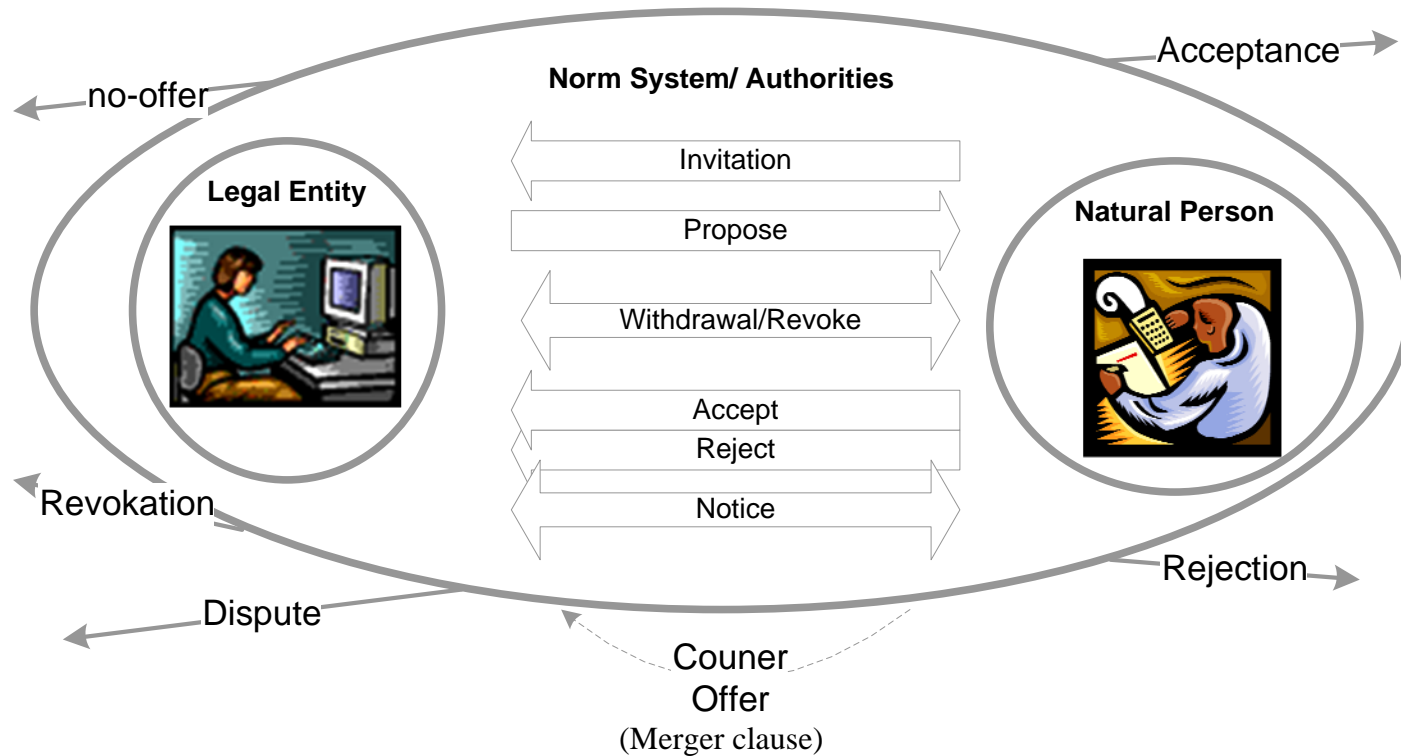


# Contract formation: a few principles and theories

- Principles:
  - Promises
    - A promise and accept are independently binding
  - Contracts
    - None of the parties are bound until agreement is made.
- Theories:
  - Intent: a contract must reflect shared will,intent
  - Trust: A contract must correspond to trust in the counterparts performance of legally relevant acts
  - Hybrid: a contract must reflect parties expression of intent
- Notes :
  - An offer is not binding for ever
  - consent by communicating acceptance or by other act, not necessary by the same way as offer.
  - Angloamerican: "Doctrine of consideration"

(translated from Swedish Law course)

# Contract formation process and its key end states

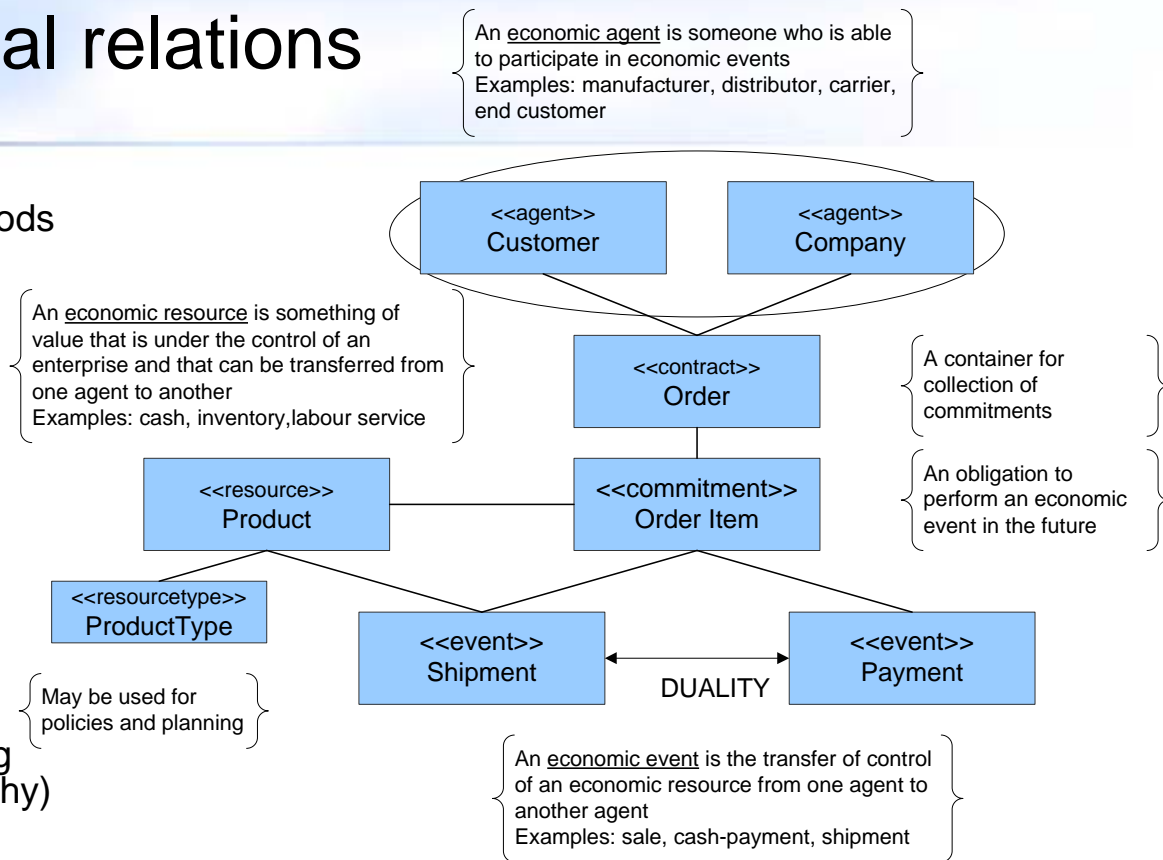


- What about exceptions?



# Change in economical relations

- Transfer of payment or goods
- Change of location
- ....



- Economics and accounting REA-model, W. E. McCarthy)
    - Is the commitment to pay an amount the same as the obligation to to send a data message with payment instructions?
    - Can a payment be executed even the communication channels are broken?
  - "The effecient contract:
    - Creates this commitments (obligations and rights) that induce the value maximizing set of acts. If the parties do not create the effecient contract they leave the money on the table."
- Henrik Lando, Copenhagen Business Scholl, Lefic, Proactive Law confenece 2005.

# Legal relations

Similar to Directed obligation, REA and doctrine of consideration. (Hohfeld)

If a party has a ..	underlying meaning	another party has a ...	and others does not have a ...
<b>Right</b>	Legal ability to act	Duty	Privilege
<b>Duty</b>	A legal obligation to act or refrain from acting	Right	No right
<b>Privilege</b>	No legal obligation to act or refrain from acting	No right	Right
<b>No right</b>	No legal ability to act	Privilege	Duty
<b>Power</b>	Ability to affect a change of legal relations	Liability	Immunity
<b>Liability</b>	Subject to a change in legal relations	Power	Disability
<b>Immunity</b>	Free from the legal power of another	Disability	Power
<b>Disability</b>	No ability to affect a change of legal relations	Immunity	Liability

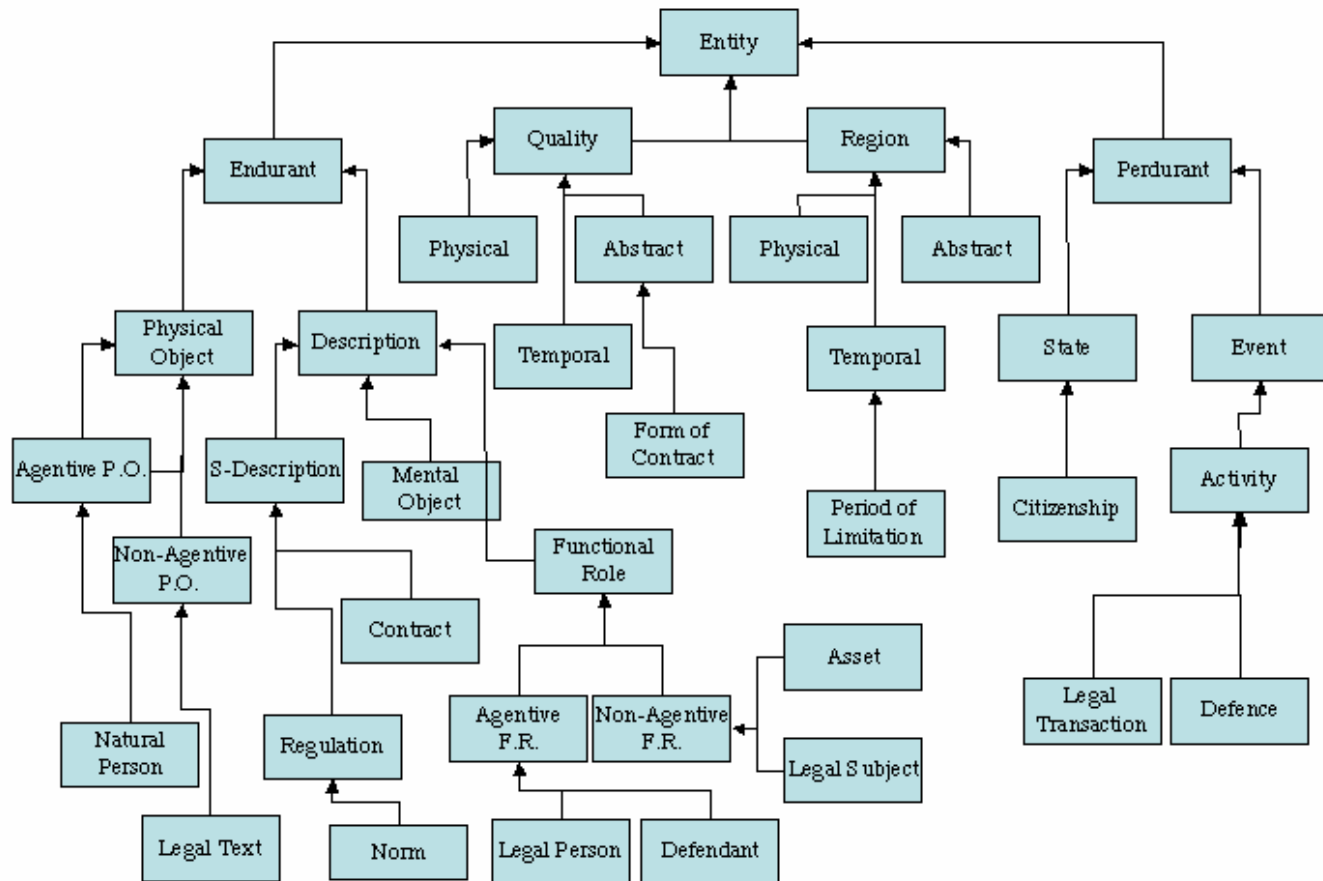
## Other aspects

- Ownership: collection of rights,...
- Liability,....,

Deontics: Obligation, permission,...., right, promise.

# Jur WordNet Ontology

- Dolce + extension



# Terminologi and conceptions

- "BusinessTransaction"
  - Everybody knows business transactions!
  - But should BT be part of generic specifications of exchange of information possibly relating to business.
- "AcceptanceAcknowledgement"
  - "The Acceptance Acknowledgement Business Signal, if used, signals that the message received (Request or Response) has been accepted for business processing and that processing is complete and successful by the receiving application, service or a receiving business application proxy."
  - Similar to *Reach the Mind*
  - But ... Is not equivalent to contractual consent, acceptance, or is It?
  - But ... Doesn't say much about performed business processing – imprecise
- "Business Success" and "Failure"
  - But ... is this a statement that should be made in common procedural description?
  - Success and failure could be considered as internal value-statements
- "Service"
  - Service-directive of EU-commission offers different definitions than SOA services i framework with different focus

# EU Services directive (06.10.24)

## DIRECTIVE ON SERVICES IN THE INTERNAL MARKET

From explanatory notes

### WHAT ACTIVITIES ARE COVERED?

- *A wide variety of economic service activities such as: business services (such as accountancy, management consultancy, advertising agencies, employment agencies); services provided both to businesses and to consumers (such as legal or fiscal advice, real estate services, construction, distributive trades, car rental, travel agencies, and security services); consumer services (such as health care services, household support services, audio-visual services, leisure services).*
- **Not covered:** non economic services (such as national education) or services explicitly excluded (transport and financial services).

[SEC(2004) 21]

”For the purposes of this Directive, the following definitions shall apply:

- (1) "**service**" means any self-employed economic activity, as referred to in Article 50 of the Treaty, consisting in the provision of a service for consideration;
  - (2) "**provider**" means any natural person who is a national of a Member State, or any legal person, who offers or provides a service;
  - (3) "**recipient**" means any natural or legal person who, for professional or non-professional purposes, uses, or wishes to use, a service;
  - (4) "**Member State of origin**" means the Member State in whose territory the provider of the service concerned is established;
  - (5) "**establishment**" means the actual pursuit of an economic activity, as referred to in Article 43 of the Treaty, through a fixed establishment of the provider for an indefinite period;
  - (6) "**authorisation scheme**" means any procedure under which a provider or recipient is in effect required to take steps in order to obtain from a competent authority a formal decision, or an implied
- 14) "**commercial communication**" means any form of communication designed to promote, directly or indirectly, the goods, services or image of an undertaking, organisation or person engaged in commercial, industrial or craft activity or practising a regulated profession. ...”

# Separation of concerns

- Dividing problem, solution domains into parts, layers, views,...
- Intended vs. un-intended function
  - Is it reasonable to state that functions belonging to a layer have no intended business or legal meaning?
- Example from preliminary work on next version "low level" data messaging standard
  - “The reliable messaging elements of the XX supply reliability to the communications layer; they are not intended as business-level acknowledgments to the applications supported by the XX.  
...  
The acknowledgment defined in this specification does not indicate the payload of the XX message was syntactically correct. It does not acknowledge the accuracy of the payload information. It does not indicate business acceptance of the information or agreement with the content of the payload.  
The XX is designed to provide the sender with the confidence the receiving YYY has received the message securely and intact.”

# Including legal language in technical specifications

- Requires that users have knowledge about possible implications.
- Applications should be reviewed by internal legal counsel
- Specification must be developed with legal knowledge available
- W3C Web Services Choreography Definition Language
  - "Request exchange completes successfully for the requesting Role once it has successfully sent the information of the Variable specified within the send element and the Request exchange completes successfully for the accepting Role once it has successfully received the information of the Variable specified within the receive element"
- OASIS ebBP
  - "If it fails it is null and void, and each partner MUST relinquish any mutual claim established by the transaction. In addition, if it fails from protocol perspective, each party MUST synchronize their state to the state prior to the start of the transaction."

# Restrictivness of business rules

- Humans are flexible and make deals
- Does commercial and contract managers accept that the business information system says no to a transaction?
  - Raises the question: how strict should a formalisation be?
  - Does business "protocols" include restarts, breakout dialogs, dispute resolution or other fixing mechanism?
- Difference between invariants that breaks the integrity of the system and "business" and "commercial" rules that can be broken at a cost.
  - A communication that breaks invariant rules may be cause for rejection.
- Enforcement level, resonable and best effort, must , may, should,...
- Breach of B.R ->
  - Immediate materialisation of compensation or...
  - The power to instantiate compensation





# Aspects of State-alignment

- Two or more parties can trust the collaboration principles that the other parties have same view of state-of-affairs
  - Problems known since collaborative behavior started
  - Instantaneous vs non-instantaneous communication
  - Of statistical and risk nature
  - Mailbox rule
- Exchange of data messages from Speaker to Listener
  - One Communication S->L
    - May be sufficient for some if communication seldom fails or it is easy to detect or repair
  - One communication S->L + One acknowledgement L->S
    - Raises trust but not to 100% since L cannot be certain that S got the Ack.
- State-alignment may be unfamiliar term for business persons

# Aspects of Time reversibility

- Transaction protocols are based on technical two phase commit protocol
  - Few options on Point-of-control
  - Can a party make state conditions on when to enter and exit the transaction?
  - Are long running transactions realistic?
  - Any legal implications of canceling a multiparty-transaction?
- Rollback difficult in a multiparty business and legal context
  - Indicates new business path
  - Immediate compensation or power to initiate compensation
  - Merger clause for contract formation
- Corporate Governance directives may induce considerations
- Is there a difference between not-having sent, withdrawn, revoked a communication?

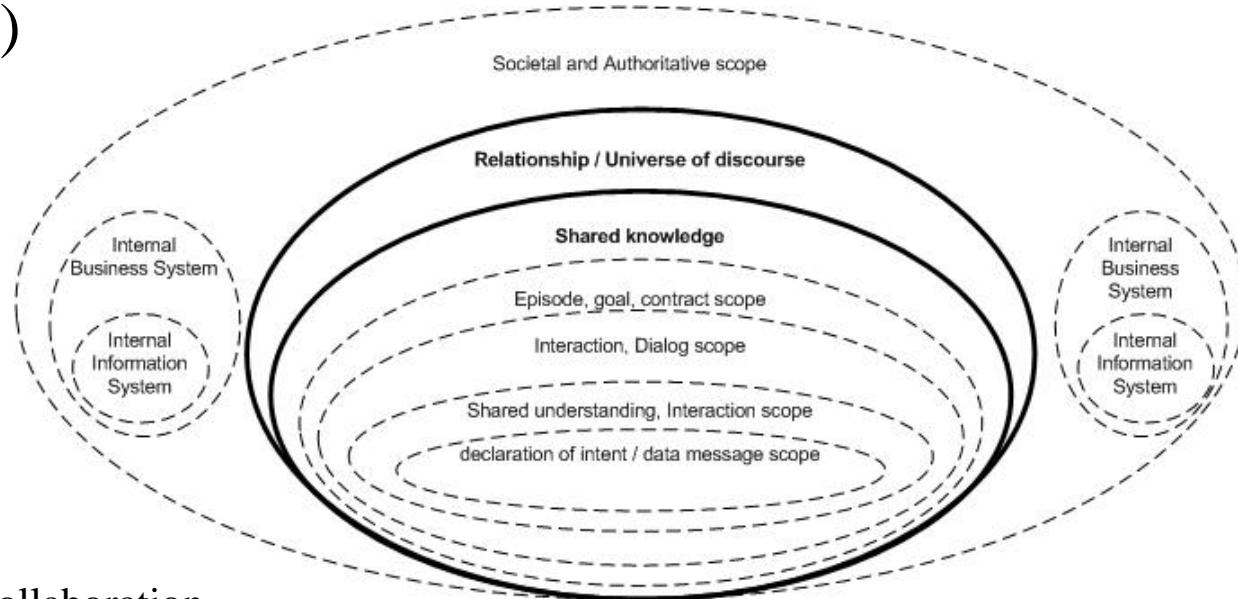
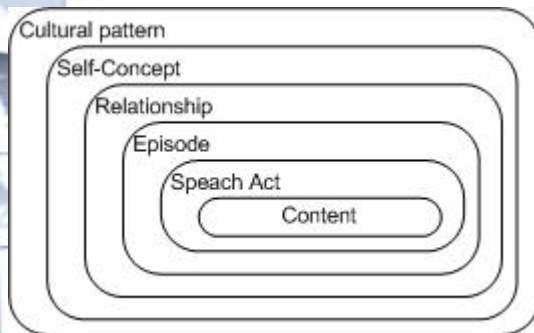
# Before and after the fact

- Aspects of one particular interpretation of Pre- and Post-conditions
- $\text{post} - \text{pre} \Rightarrow \text{what happened}$ 
  - Effect is derived
  - Depending on formulation of pre,post. May be very difficult to work with
  - may have multiple solutions
  - How many person can understand/program required solution algorithms?
  - Includes assumption that what happended between pre and post does not matter!
- $\text{Pre} + \text{effect} \Rightarrow \text{post}$ 
  - Easer to understand and program
  - Describes what has happened between pre –post.



# Memory and Communication within contexts

## Coordinated Management of Meaning (CMM)

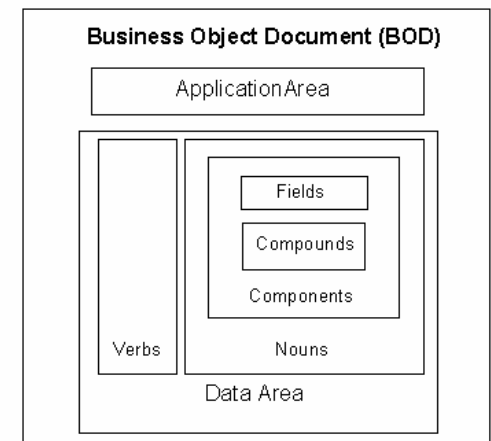


- Episode, dialog - BusinessCollaboration
- Relationship – Business Relationship, TPA, Contract
- Self-concept – Goals, strategies, capabilities
- Cultural patterns – law, business practices, communities

•Is it sufficient to regulate the order of Exchanged communication?  
Or does the parties need to remember more?

# Communicative Acts and Verbs

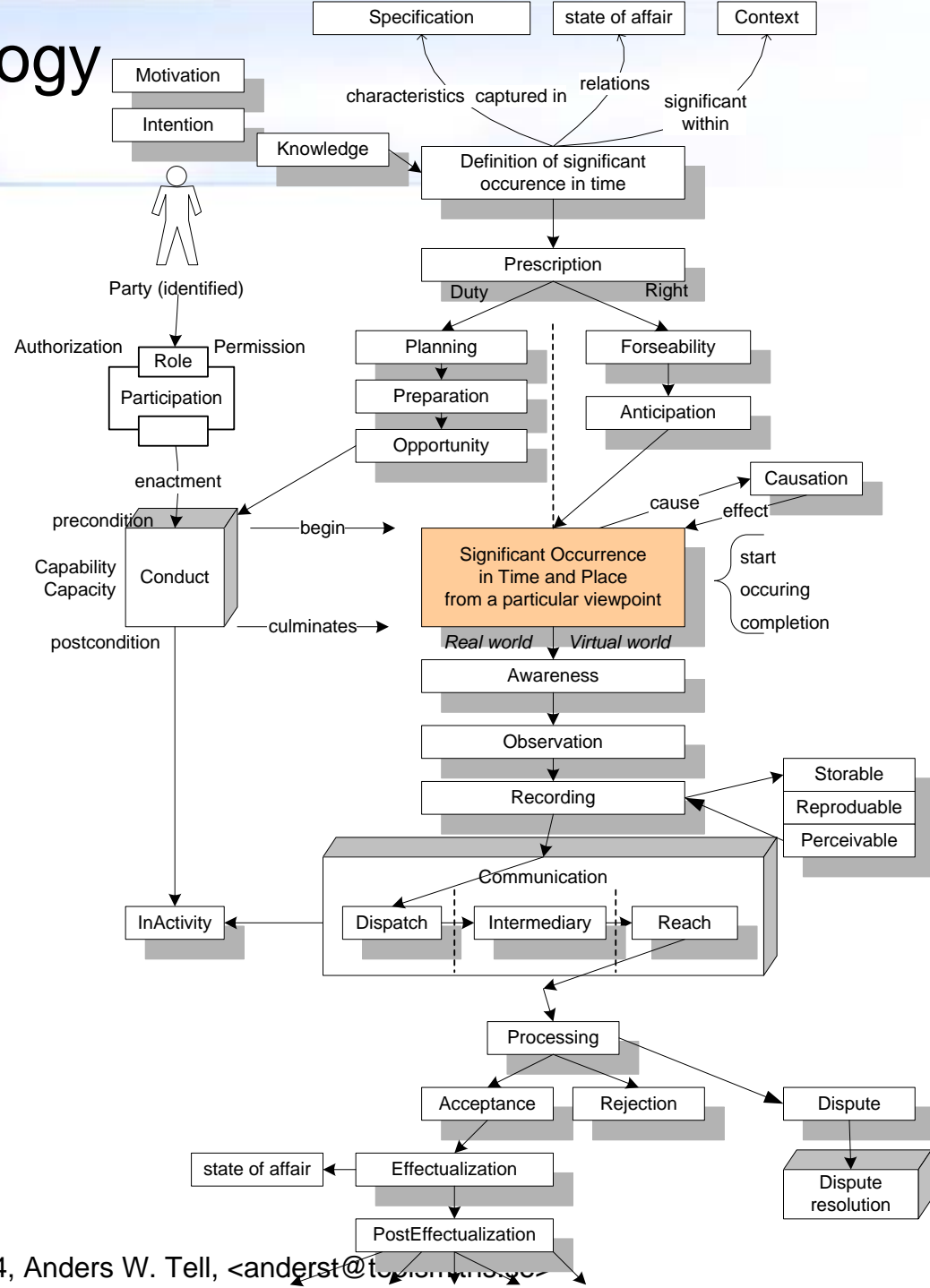
- Commonly used with nouns as indirect principle when naming Interactions
  - Ex: <Request> <Payment>
- Should verbs be
  - Explicitly or implicitly defined ?
  - part of Interaction, Document or Technology?
    - *A comment by a major software company:*  
We believe that the current structure— nouns compounded with verbs — is unnecessary, redundant, and confusing when content is used with Web Services. Our proposal is that for Web Services bindings, concentrates on the value of the nouns, and allows the logical equivalent of the verb to be expressed where it should be, in the wsdl.
- *From OAGIS 9.0 Architecture*
- *What happens if parts of a Communication is positioned in technology?*



# Communicative acts and business vocabularies

- Scott A. Moore: “A foundation for flexible automated electronic communication”, 2000, Illocutionary forces classified as constatives, directives, or commissives:
  - advisory, ascriptive, assentive, assertive, concessive, confirmative, deny, descriptive, disputative, dissentive, informative, offer, permissive, predictive, prohibitive, promise, question, requestive, requirement, retractive, retrodictive, suggestive, suppositive
- FIPA
  - Accept Proposal, Agree, Cancel, Call for Proposal, Confirm, Disconfirm, Failure, Inform, Inform If, Inform Ref, Not Understood, Propagate, Propose, Proxy, Query If, Query Ref, Refuse, Reject Proposal, Request, Request When, Request Whenever, Subscribe
- OAGIS (versions 8-9)
  - Acknowledge, Add, Allocate, Cancel, Change, Confirm, Create, Get, Issue, List, Load, Post, Process, Receive, Respond, Show, Sync, Update
- EAN COM
  - Add, ChangeByRefresh, Delete, Link, DocumentIdentification

# Aspects of an Event ontology (in partial temporal ordering)



*Story:* Three goldiggers dig for gold and a dispute occurs. One person stays in the camp and the two others leave.

No2 puts poison in No1 water so he will die if he drinks the water.

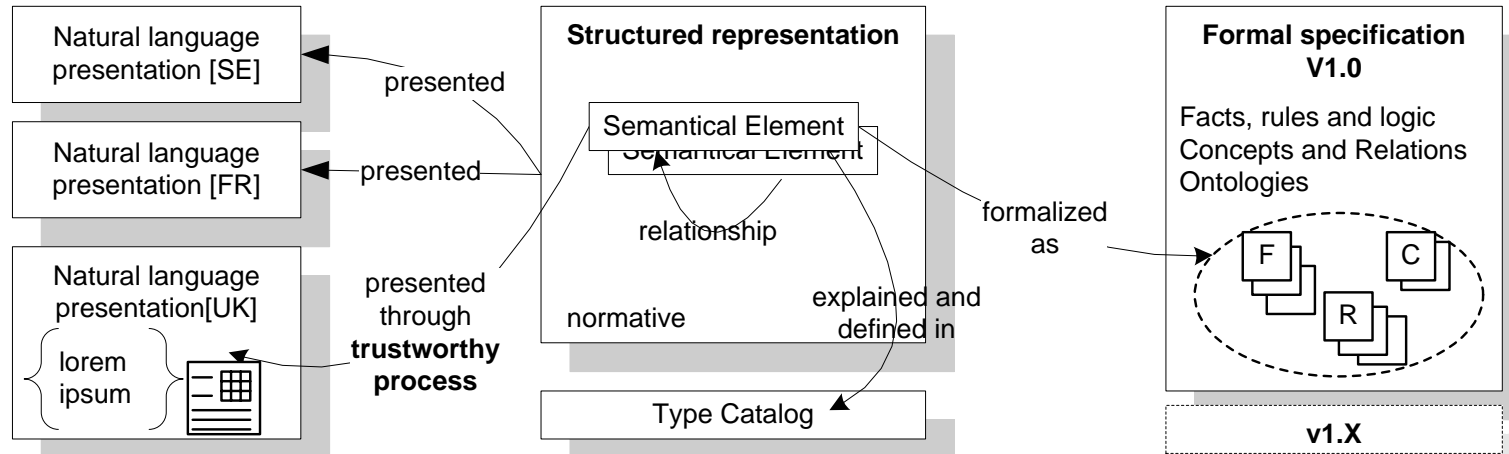
No3 buys a rifle and tries to shoot No1 but hits the No1's waterbottle so all water runs out.

No1 dies from lack of water.

Where is/are the legally relevant event(s)?

# Is there a migration path for the common user?

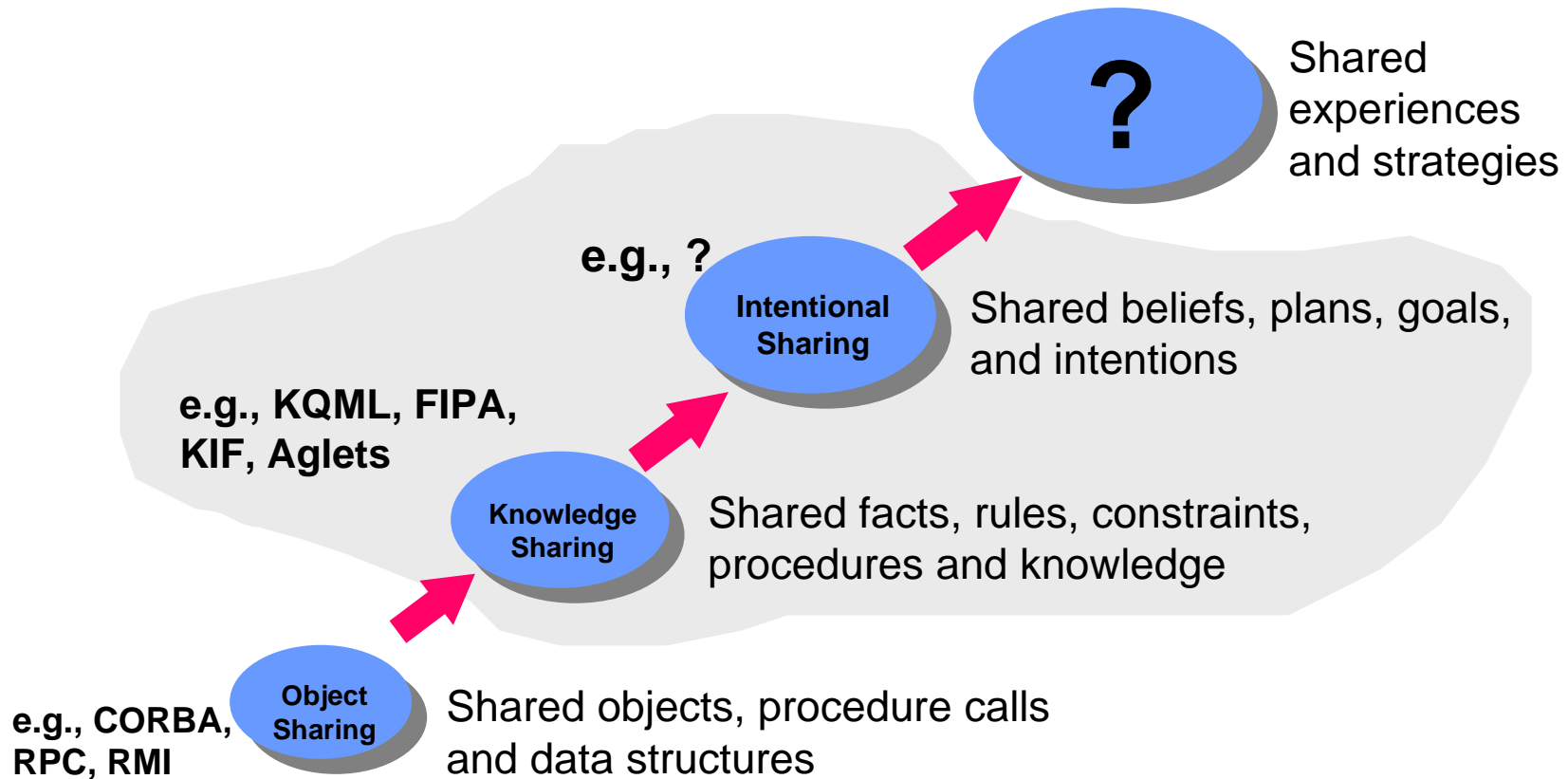
- How can statements, propositions, facts be expressed so that the common user (district court judge) can understand and work with it?
- Text ( natural language)
  - Do you have any Volvo S60 available ?
  - Yes I have 5.?
- Structured (english)
  - **Query:** resourcetype "Volvo S60" and is-in-state "available" , quantity
  - **Response:** 5
- Formal
  - ...





# Some Agent Communication Languages

(Dr Yannis Labrou)



# A few contemporary examples that attempts to addresses some adoption concerns

- Legal User Interface (SAMSET)
  - (see earlier slide)
- Common Business Acknowledgement
- UNCEFACT Standard Business Acknowledgement
- UNCEFACT Unified Business Agreements and Contracts

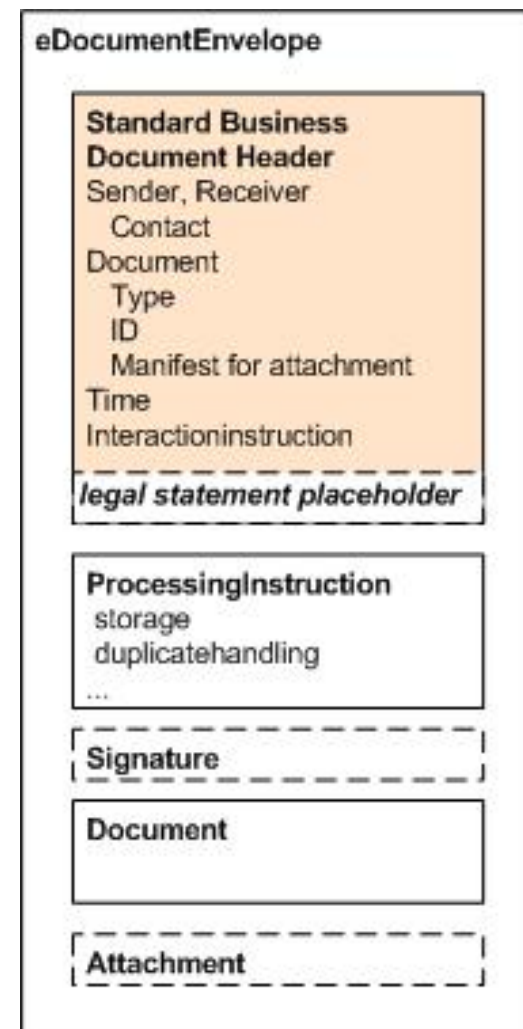
# Common Business Acknowledgement

- Principles and information structures for Receipts
  - Acknowledgement of Receipt
  - Processing Acknowledgement
  - ...
- Based on communicative principles and speech acts
- Intends to bridge the gap between Regulation, TPA and software
- Intends to bridge professional roles (business managers, process specialists, ICT, legal)
- Precise specification of rules and constraints
- Handles variations in geopolitical and official constraints
- Handles and integrates generic and technical criteria's
- Attuned to evidentiary requirements
- Based on event and criteria's
  - Event is a significant occurrence in time and place defined from a particular viewpoint
  - Criteria's describe, before the fact, what is expected and are used, after the fact, for reporting and communications
- A receipt is a statement from receiving party(ies) containing propositions about facts such as fulfilled and non-fulfilled criteria's



# UN/CEFACT Standard Business Document Header

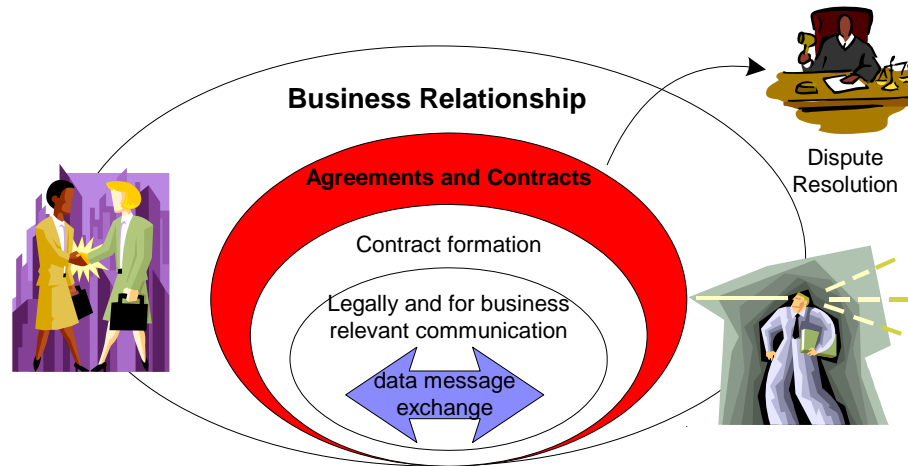
- Document Header that is Attributed to or embedded within eDocument
  - From Issuer to intended addressees
- Independent of technology
- Has a placeholder for future information structures related to legal information



# UN/CEFACT UBAC Project

## (Unified Business Agreements and Contracts)

Purpose: provide tools for trade facilitation and global supply chains



### Maturity levels: agreement and contracts

1. Store legal statements, identify (*LEGALTERMS*), classify, catalogue
2. Patternize statements: Payment of <amount> must be performed before delivery of <product>
3. Legal Expression Language (computable, interpretable)
4. ...

### Digital Receipt

# Questions and Answers

- ... ?

