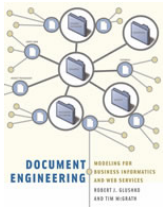


Document Engineering with UBL:
Patterns for business document exchanges

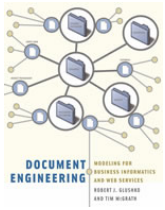
Tim McGrath

MSc (Ecom&Icomp)

Expert Address Series

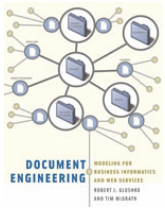
(2004-2005)

May 20th 2005



Who Am I ? – Tim McGrath

- EDI and e-commerce marketplace in Australia.
- Background in international trade and transport.
- Led the Quality Review Team for ebXML.
- Co-author of “Professional ebXML Foundations” .
- Chair of the Library Content subcommittee of the OASIS Universal Business Language (UBL).
- Co-author of “DOCUMENT ENGINEERING: Analyzing and Designing Documents for Business Informatics and Web Services”.
- Promoting UBL and the Document Engineering approach in Australia, Hong Kong, Singapore, Japan, Korea and China.



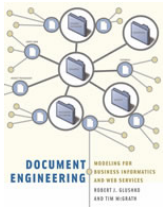
Overview

- Why Businesses use Documents
- Document Engineering
- Models for Document Exchanges
- Why Patterns are Important for Interoperability
- The Universal Business Language

Using documents for exchanging business information is an old idea

Administrative documents
Early Dynastic III, about 2500 BC
Probably from Shuruppak (Fara)

Left: the governor receives 14 shekels of silver from 5 persons, and 46 shekels remain unpaid by 13 other persons. The total amount of silver is 1 mina.

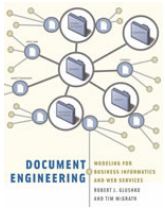


Doing business by document exchange is natural and intuitive

- Every major advance in technology has brought a corresponding evolution in business processes and the document exchanges they require.
- We don't use pottery, papyrus, and parchment anymore, and electronic versions have replaced many paper documents.

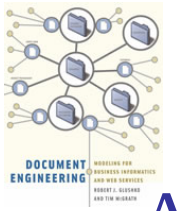
BUT

- The basic idea of document exchange has changed very little.



Service-oriented Architectures

- Using documents to hide hiding implementation details underlies the idea of service-oriented architectures
  - a way to create new applications as services by integrating or combining components of others.
- Web Services can be anything and do anything, as long as the information needed to request it and the work or results that it produces can be effectively described using XML.
- Their document interfaces allow businesses to maintain a clean and stable relationship to partners and customers.



Web Services

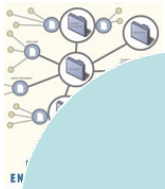
- A virtual enterprise can be created by using services provided by separate businesses or applications.

- A Web Service encapsulates these business functions in an XML wrapper.

BUT

- Web Service "standards" don't address the requirement for business interoperability – they ignore it.

- That's why we need Document Engineering



The Virtual Enterprise

Distributor

Shipping Note

Customer Reference	HSGF1220
Goods Description	1 of Document Engineering, Glushko & McGrath
Shipping Address	New Bedford, Rhode Island, USA

Delivery Service

Purchase Order

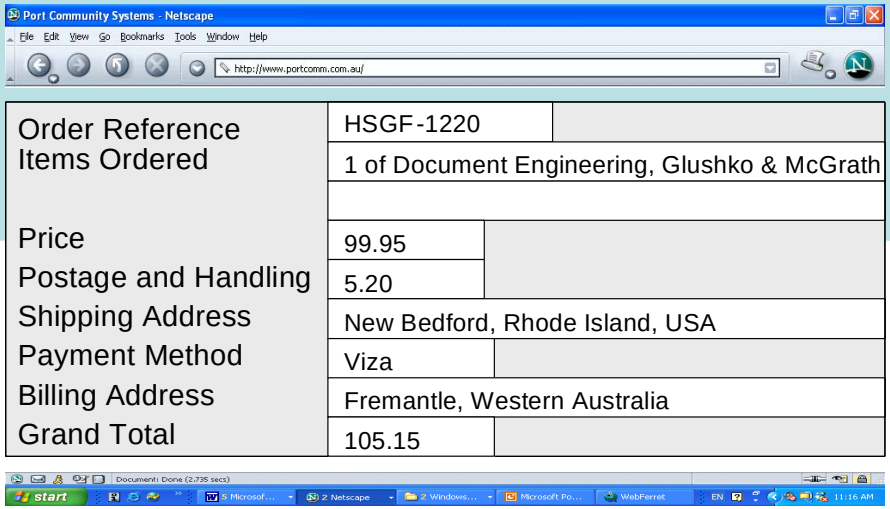
Order Reference	HSGF1220
Item Ordered	Document Engineering, Glushko & McGrath
Quantity Required	1
Shipping Address	New Bedford, Rhode Island, USA

Credit Authority

GMBooks.com

Transaction Advice

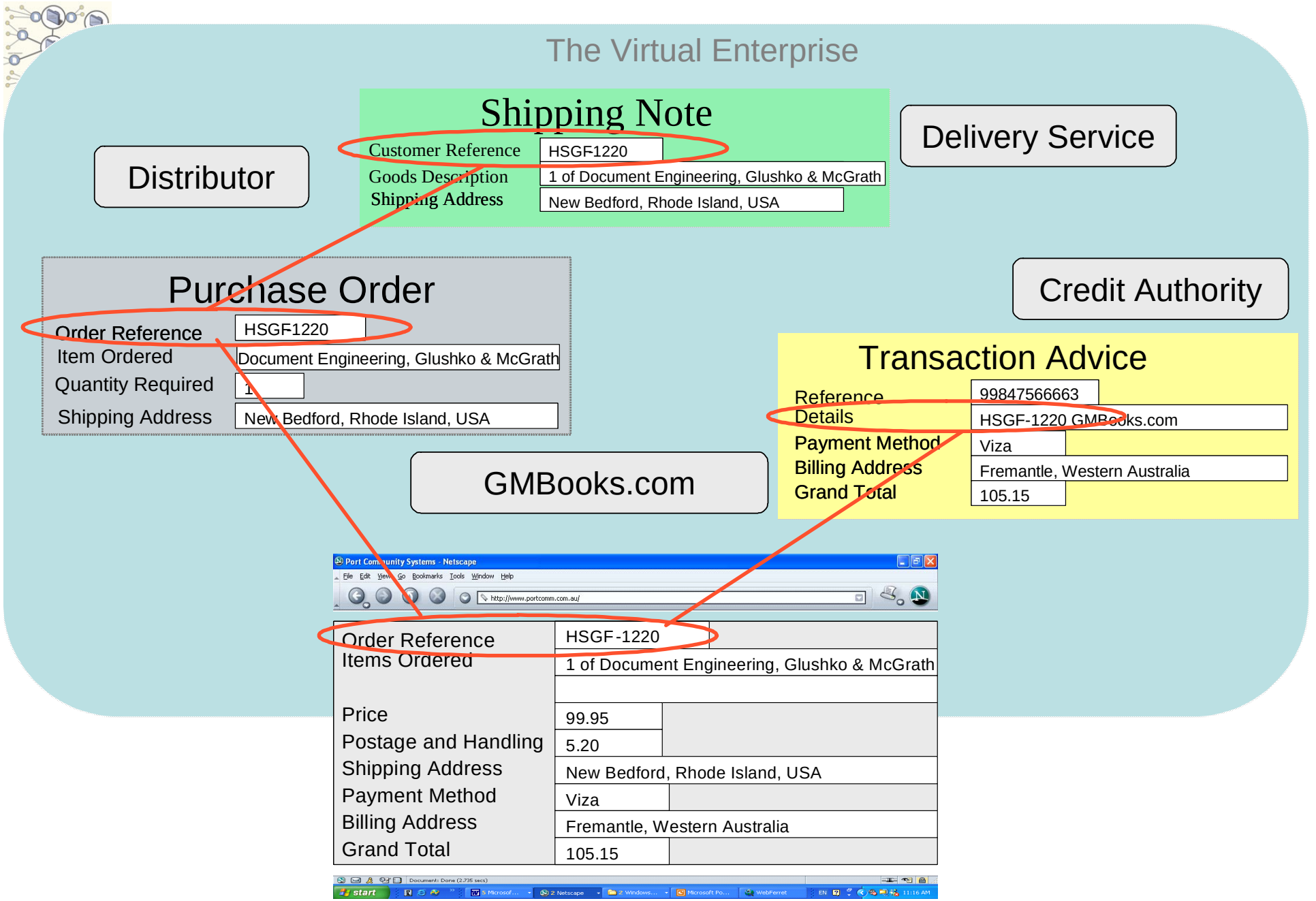
Reference	99847566663
Details	HSGF-1220 GMBooks.com
Payment Method	Viza
Billing Address	Fremantle, Western Australia
Grand Total	105.15



Order Reference	HSGF-1220	
Items Ordered	1 of Document Engineering, Glushko & McGrath	
Price	99.95	
Postage and Handling	5.20	
Shipping Address	New Bedford, Rhode Island, USA	
Payment Method	Viza	
Billing Address	Fremantle, Western Australia	
Grand Total	105.15	

Customer's View of Buying a Book

Taken from: Document Engineering, Glushko and McGrath, MIT Press, 2004©



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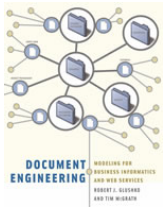
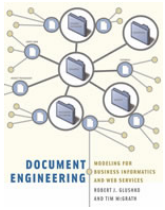


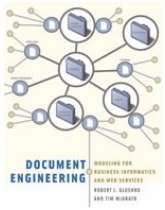
Interoperability

- A basic requirement for two businesses to conduct business is that their business systems interoperate.
- Easy to express but hard to achieve.
- Variations in strategies, technology platforms, legacy applications, business processes, and terminology.
- Interoperability doesn’t require that two systems be identical.



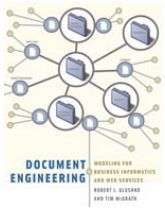
Understanding the Documents

- Interoperability means understanding the meaning of documents and their information components.
- This is facilitated when their **semantics**, **structure** and **syntax** conform to common models.
- XML has become the preferred **syntax** for representing information in documents.
- Now we need to define common models for the **semantics** and **structure** of business documents.



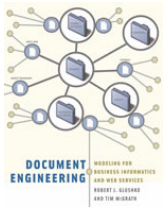
What is a Model?

- Simplified description of a subject that abstracts from its complexity to emphasize some features or characteristics, while intentionally de-emphasizing others.
- Can model structures
  - objects, their characteristics, their static relationships with each other like hierarchies and references.
- Can model functions
  - processes, behaviors
  - dynamic activities that create and affect structures.



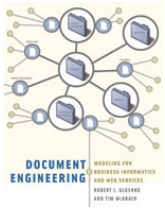
Modeling for Interoperability

- The names of components are only a small part of their semantic definition:
  - XML is not self-describing.
  - modelers will often choose different names for the same component.
- Different document samples can lead to incompatible models.
- The earlier in the modeling process that two parties make different decisions, the greater the possibilities for their models to be incompatible.
- So how do we solve this challenge?

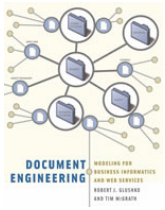


Document Engineering

- A set of analysis and design techniques that yield meaningful and re-usable models of document exchanges.
- Applies a document-centric adaptation of the classical three-level modeling framework.
- Document Engineering isn’t only concerned with modeling documents.
- It is also concerned with modeling the document exchanges between enterprises as a means of customizing them for particular industries or domains (contexts of use).

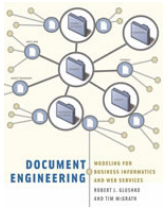


The Big Ideas of Document Engineering



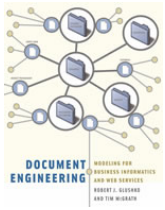
Varying Granularity of Models

- The Business or Organization Model:
  - Models are coarse with just the most important roles and relationships visible.
  - High level, strategic view.
  - Establishes the context of use
  - The “context of use” is the union of all known rules and requirements.
- Process Models:
  - More details of the relationship are visible
  - We begin to see the documents that are exchanged to carry out each process.
  - Resources, timing, sequences and dependencies.
  - Provide end-to-end understanding of the flow of information.



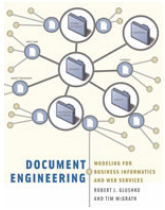
Varying Granularity of Models

- Document or Information Models:
  - The most granular perspective, and we can see specific information components within the required documents.
  - Syntax, structure and semantics of document content.
- To understand the meaning of document exchanges we need to recognize all three levels.
- And be aware of the “level of abstraction” differences.



Varying Abstraction of Models

- Implementations - “What”:
  - Specific instances of business documents, processes, or other artifacts.
  - So, a document instance can be considered a model of the thing it describes.
- Physical Models – “How”:
  - Physical models are more general because they describe a set or class of instances
  - But tightly bound to the technology of implementation.
    - Limited design and reuse capabilities.
  - Seen as implementation models (such as XML schemas).

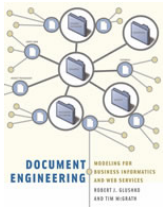


Varying Abstraction of Models

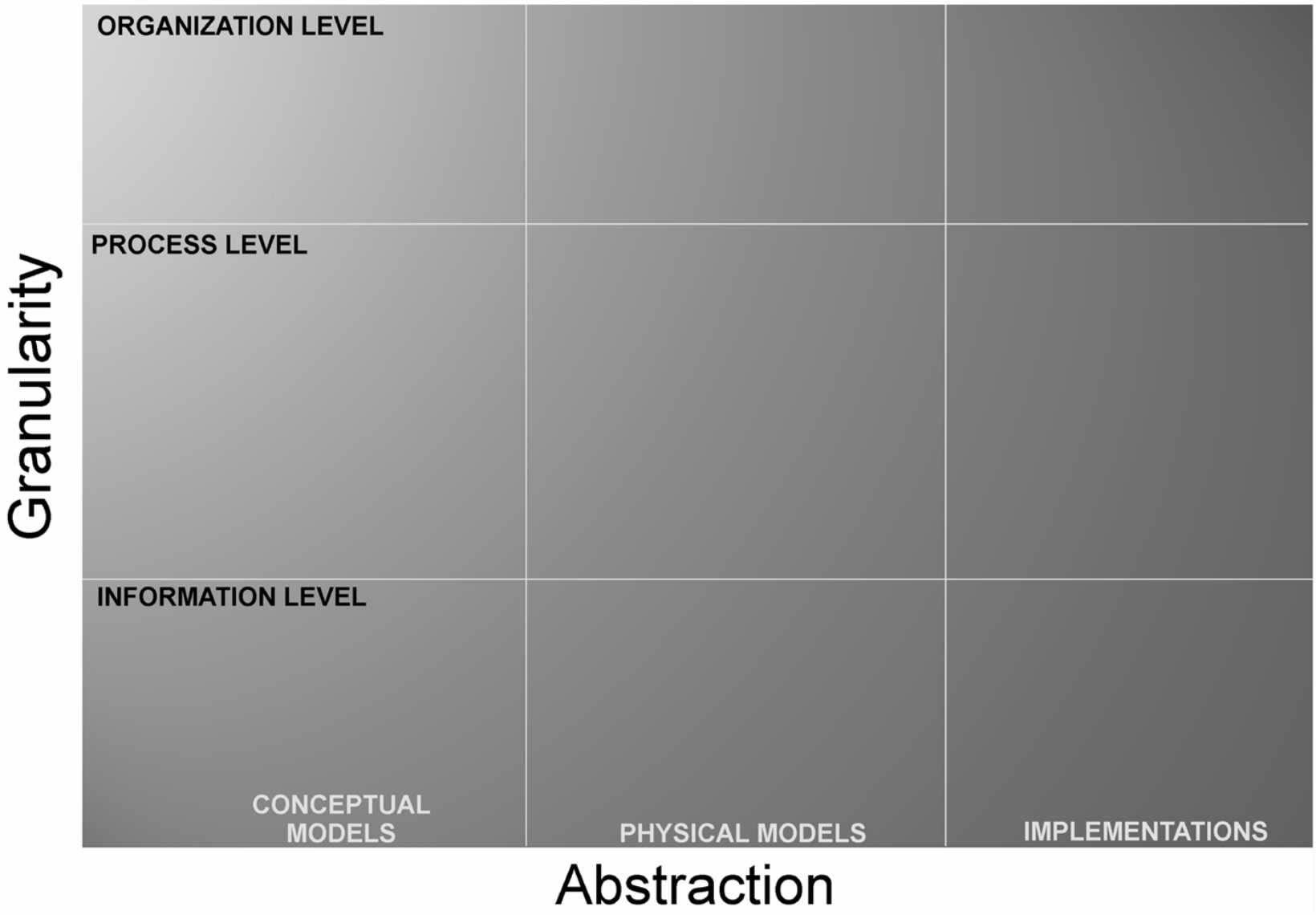
- Conceptual Models –"Why":
  - Remove the implementation technology to emphasize the semantic meanings and relationships.
  - Immune to technology changes.
  - Easier to customize.

  - We can plot the levels of granularity and abstraction on a two dimensional matrix…

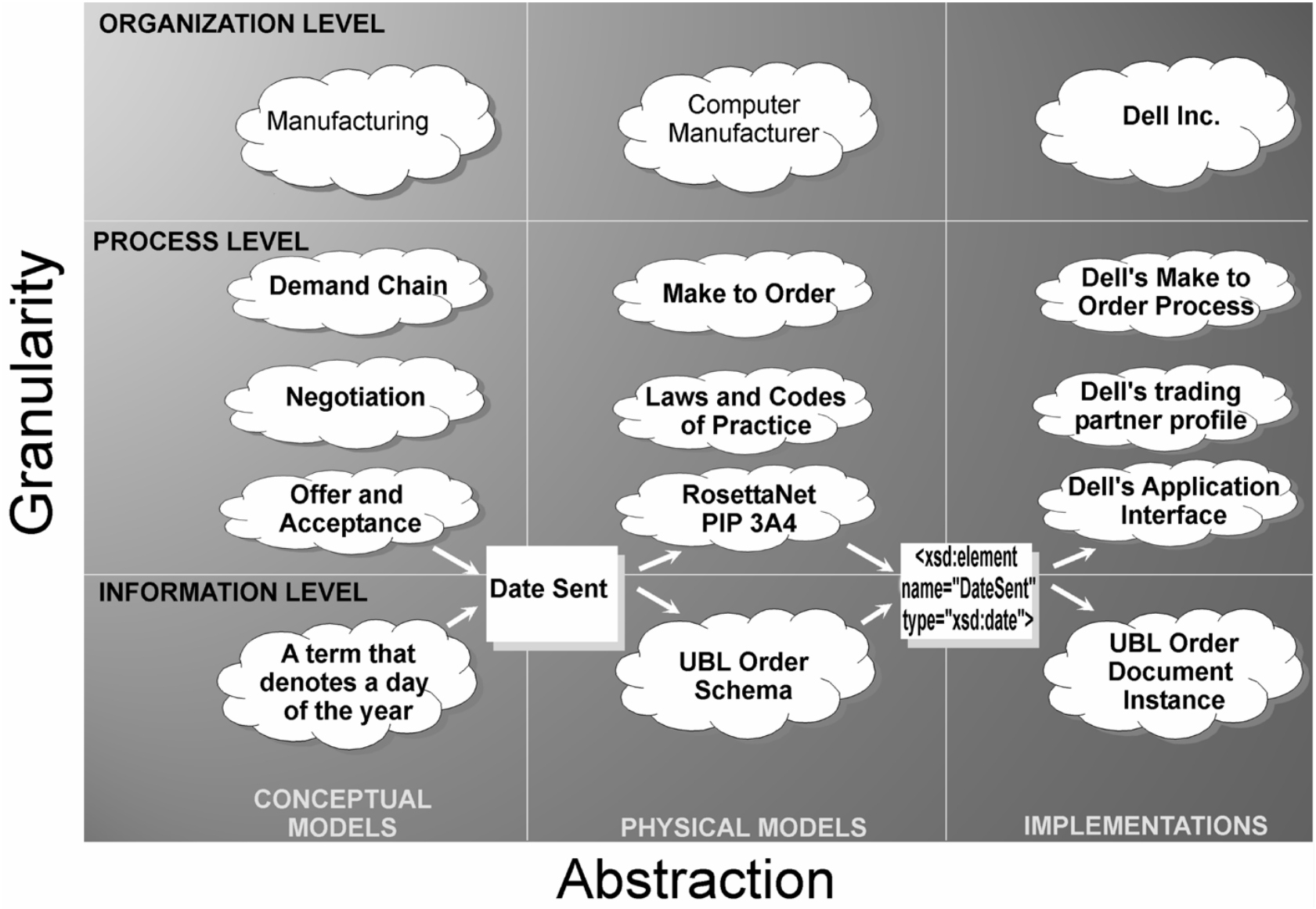
  … the Document Engineering Model Matrix.

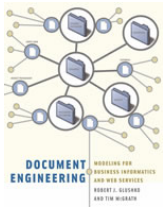


The Model Matrix

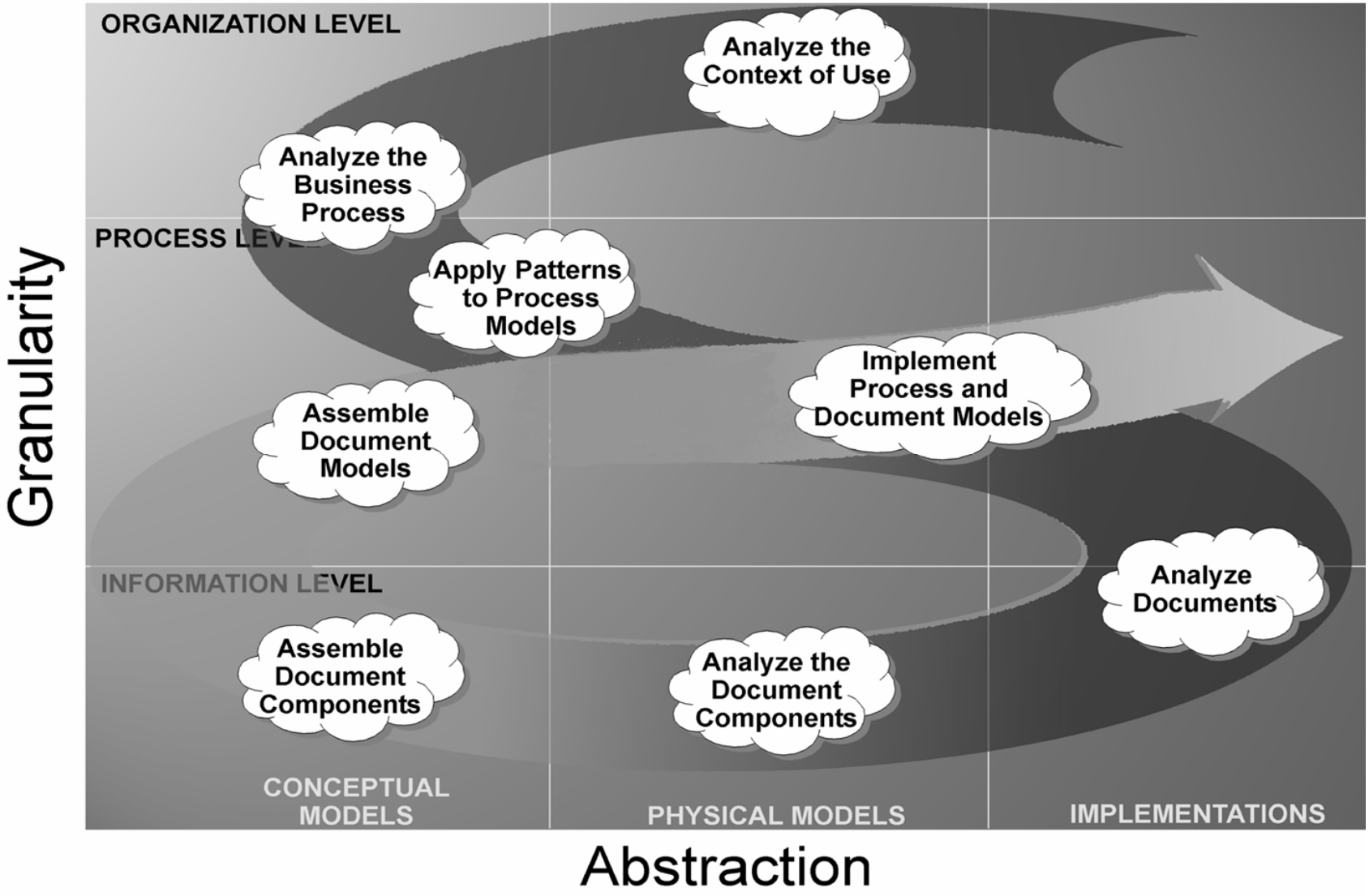


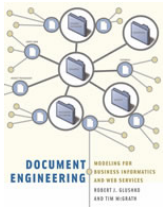
The Model Matrix - example





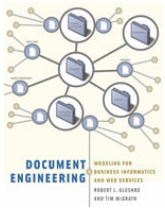
The Document Engineering Approach





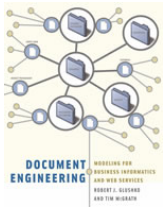
Patterns

- Patterns are models that are sufficiently general, adaptable, and worthy of imitation that we can use them over and over again.
- In addition to improving designs (by replacing an ad hoc approach with a successful one)
  - patterns promote reuse.
- Reuse:
  - immediate benefit of reduced costs.
  - longer term benefit of encouraging and reinforcing consistency.
  - encourages interoperability between models.



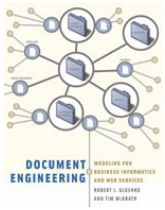
Why Businesses Follow Patterns

- They may be affected by common laws or regulations.
- They want to:
  - minimize the cost of hiring and training workers.
  - reduce development and maintenance costs.
  - improve performance.
  - enhance relationships with suppliers and customers.
  - better understand their environment.
  - be more flexible in their activities.
- "Good business practice" is a pattern.



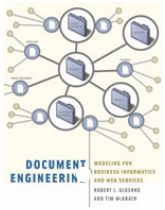
Document Exchange is the Mother of All Patterns

- Business model patterns:
  - marketplace, auction, supply chain, build to order, drop shipment, vendor managed inventory, etc.
- Business process patterns:
  - procurement, payment, shipment, reconciliation, etc.
- Document or Information patterns:
  - catalog, purchase order, invoice, etc. and
  - components they contain for party, time, location, measurement, etc.



Patterns and Standards

- Standards are common patterns that have sanction or traction.
- Sanction
  - officialy approved
  - de jure (ISO/UN/IEC)
- Traction
  - widely used
  - de facto (everyone else)
- History tells us traction is more important than sanction (HTML, TCP/IP, MS-Word, etc..)
- Sanction is a means to achieve traction – not a goal in itself!



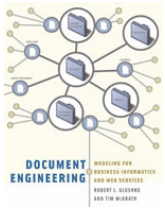
Document Engineering and UBL

•.Document Engineering is a new discipline for analyzing and designing new business documents.

• Synthesizes complementary ideas from business analysis, task analysis, document analysis and data analysis.

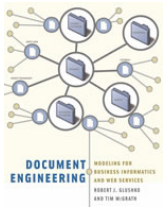
• The OASIS UBL TC has document engineered re-usable patterns for common business requirements…

… known as the **Universal Business Language**.



The Universal Business Language

- International effort to define a royalty-free library of standard electronic business documents
- Designed in an open and accountable vendor-neutral OASIS Technical Committee
- Eliminates re-keying of data in existing fax- and paper-based supply chains
- Fills the “payload” slot in B2B web services frameworks
- Maintains close alignment with existing EDI systems
- Presents vendors with a standard target for cheap off-the-shelf business software

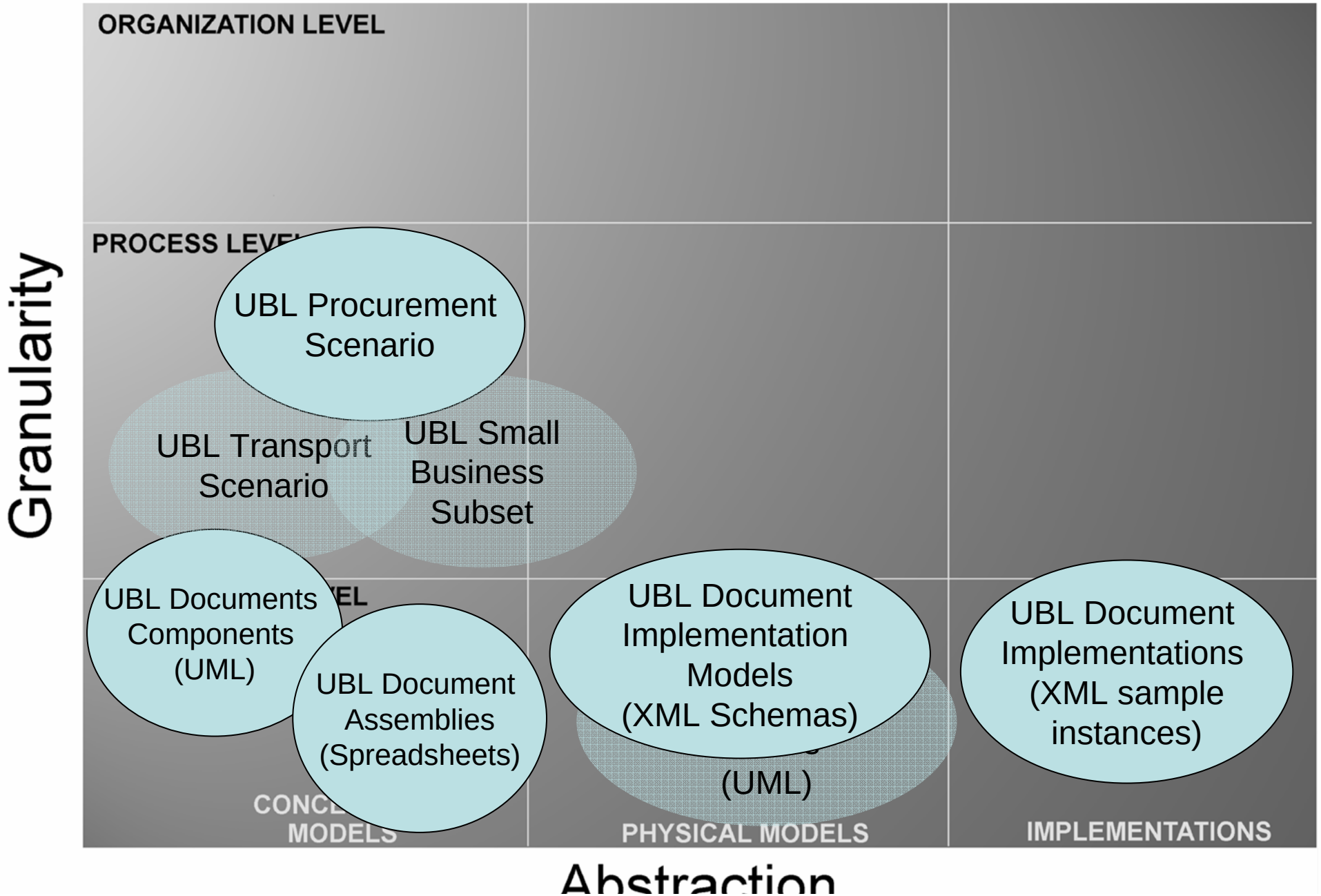


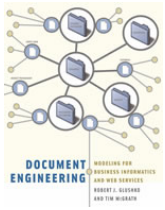
UBL is a business vocabulary for XML

HTTP + HTML = Web Publishing

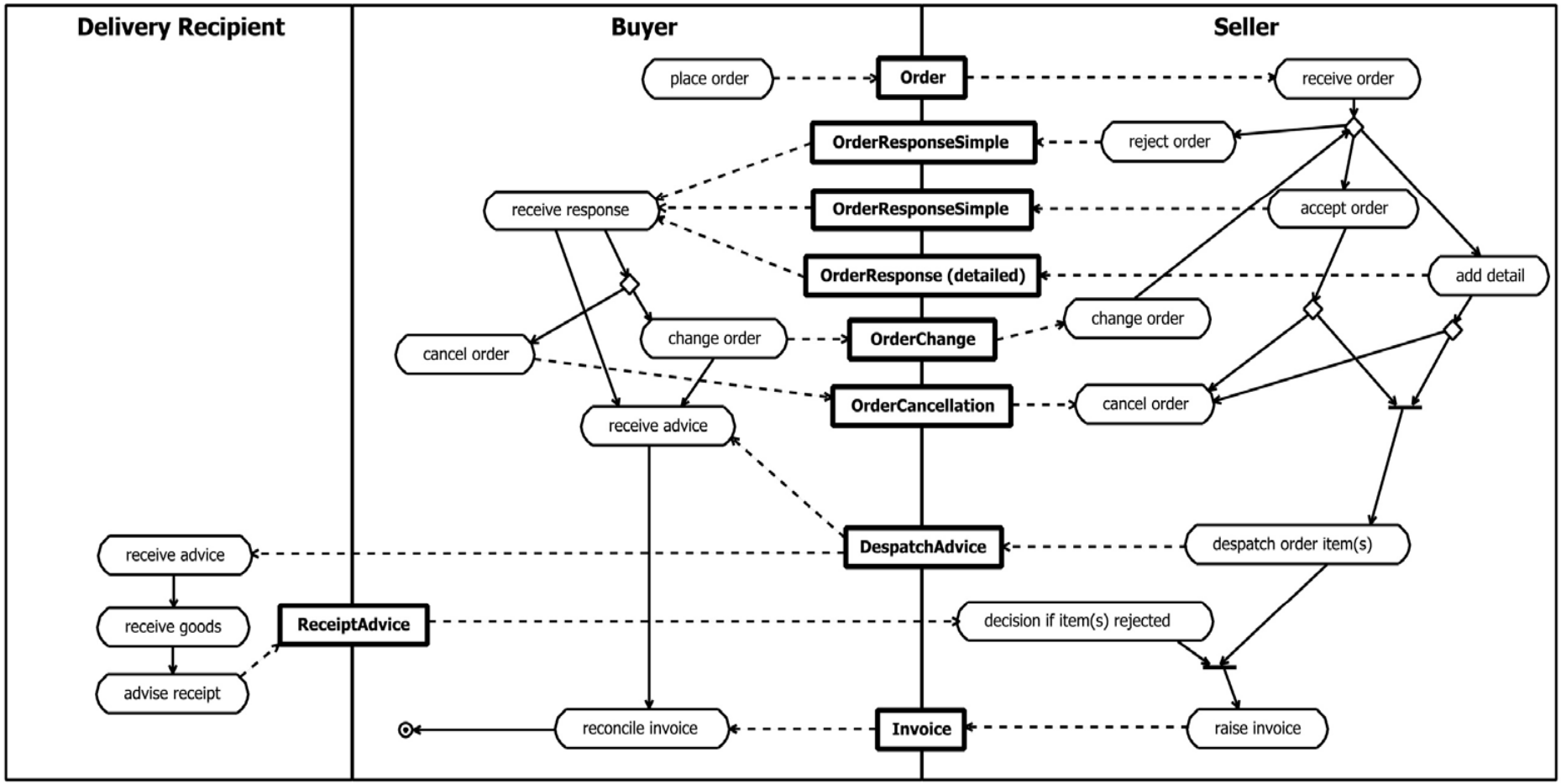
ebXML/WS + UBL = Web Commerce

UBL Artifacts on the Model Matrix

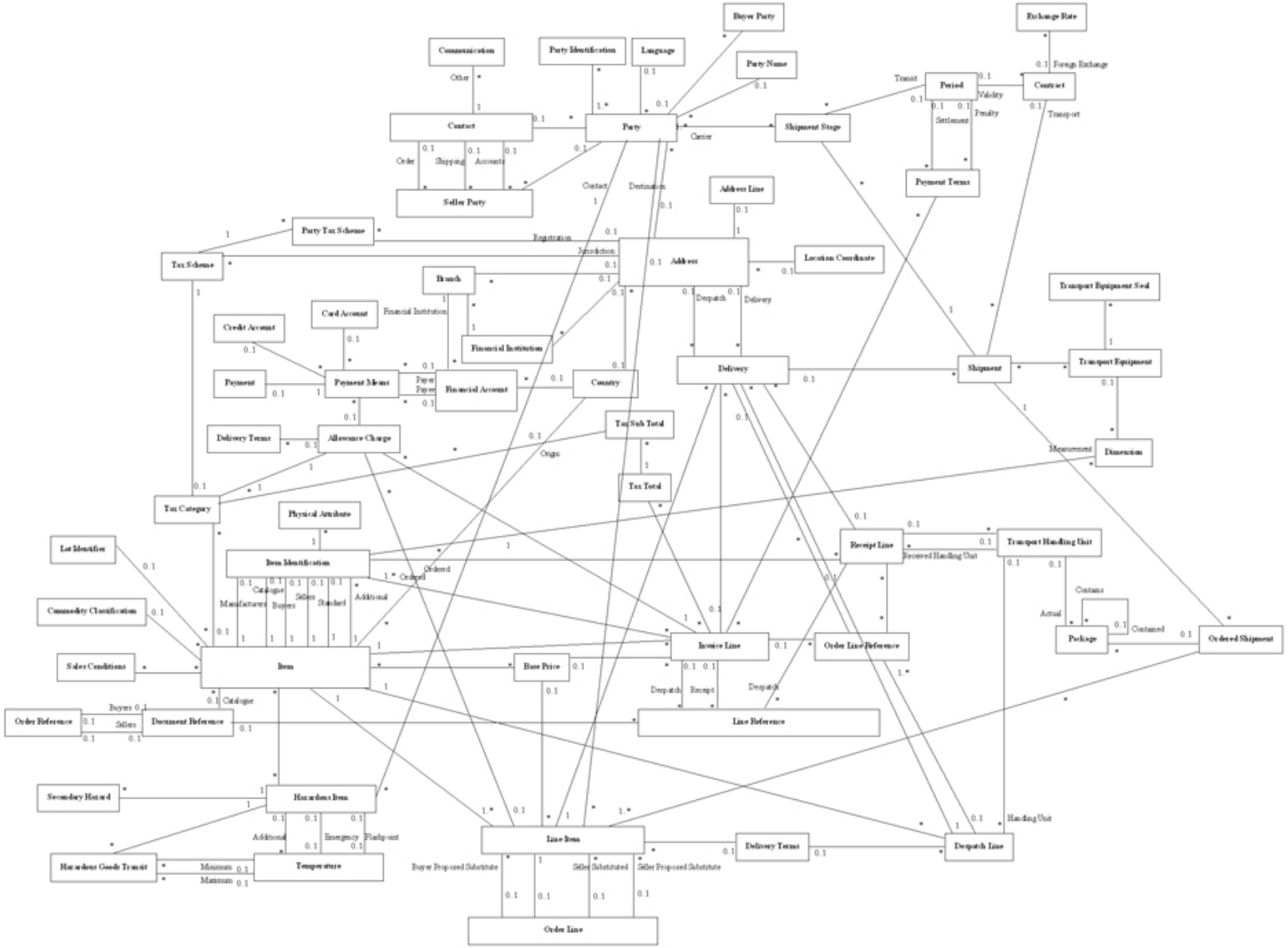




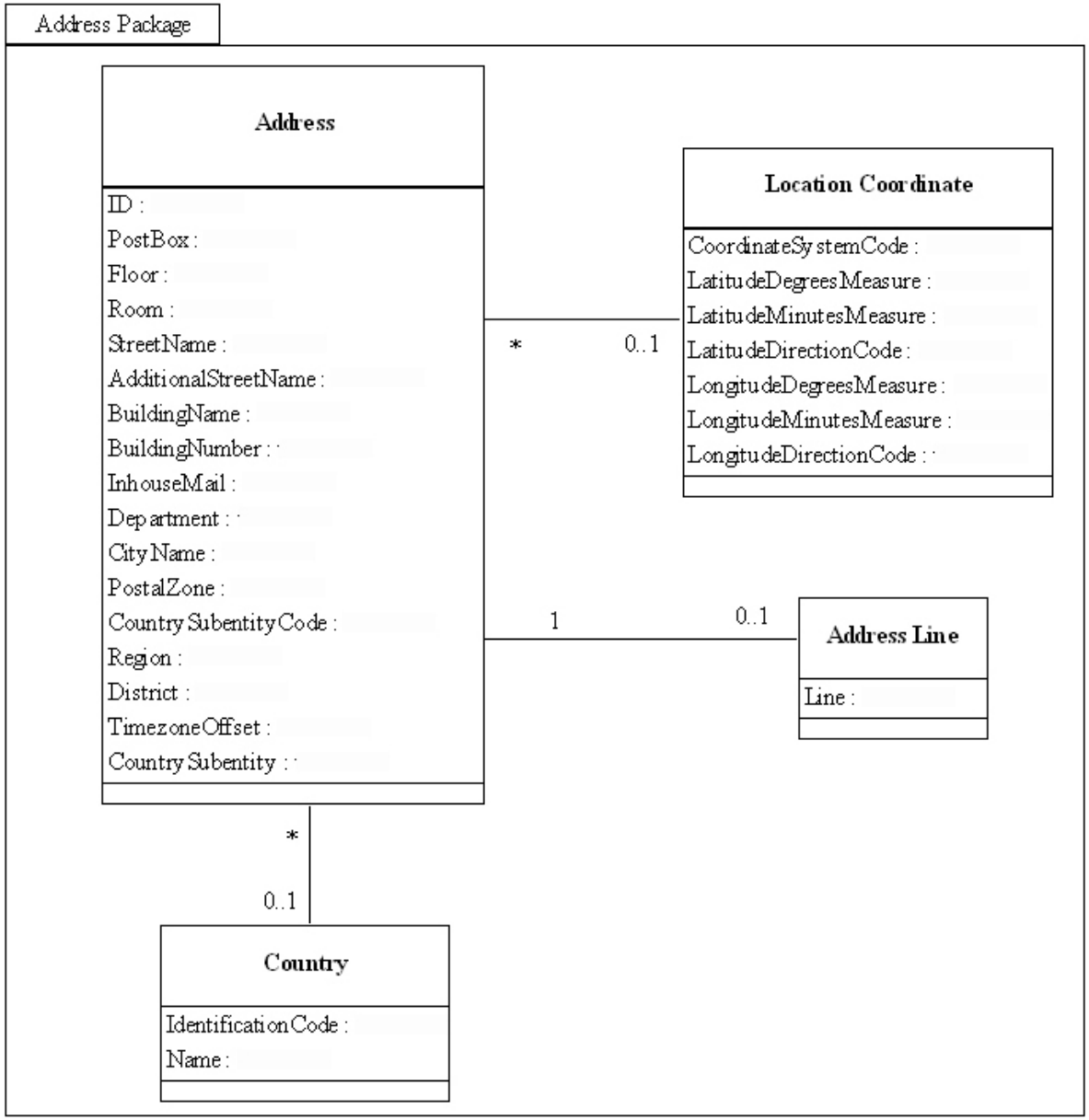
UBL 1.0 Business Process Model - Basic Procurement

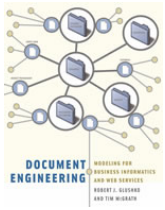


UBL Document Components



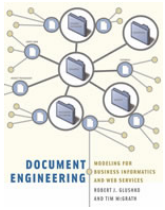
UBL Document Components





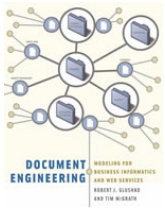
UBL Document Assembly Models

	B	Q
1	**Dictionary Entry Name**	**Definition**
2	Order. Details	a document that contains information directly relating to the economic event of ordering products.
3	Order. Buyers_ Identifier. Identifier	a unique identification assigned to the Order in respect to the Buyer party
4	Order. Sellers_ Identifier. Identifier	the identification given to an Order by the seller.
5	Order. Copy. Indicator	Indicates whether a document is a copy (true) or not (false)
6	Order. Globally Unique_ Identifier. Identifier	a computer generated unique identifier for the document, which is guaranteed to be unique
7	Order. Issue Date. Date	a date (and potentially time) stamp denoting when the Order was issued.
8	Order. Note. Text	contains any free form text pertinent to the entire document or to the document message itself. This element may contain notes or any other similar information that is not contained explicitly in another structure.
9	Order. Acknowledgement Response. Code	specifies the type of Response for the Order that the Buyer requires from the Seller.
10	Order. Transaction Currency. Code	the default currency of the transaction, to be used for Invoicing.
11	Order. Pricing Currency. Code	the currency in which all pricing on the transaction will be specified.
12	Order. Earliest Date. Date	the starting date on or after which Order should be considered valid
13	Order. Expiry Date. Date	the date on or after which Order should be cancelled if not satisfied.
14	Order. Validity Duration. Measure	the period for which the Order is valid.
15	Order. Tax Total. Amount	the total tax amount to be paid for the Order.
16	Order. Line_ Extension Total. Amount	the total of line item extension amounts for the entire Order, but not adjusted by any payment settlement discount or taxation.
17	Order. Total_ Packages Quantity. Quantity	the count of the total number of packages contained in the Order.
18	Order. Gross_ Weight. Measure	the total gross weight of the order. (goods plus packaging plus transport equipment)
19	Order. Net_ Weight. Measure	the total net weight of the order. (goods plus packaging)



UBL Document Implementation Models

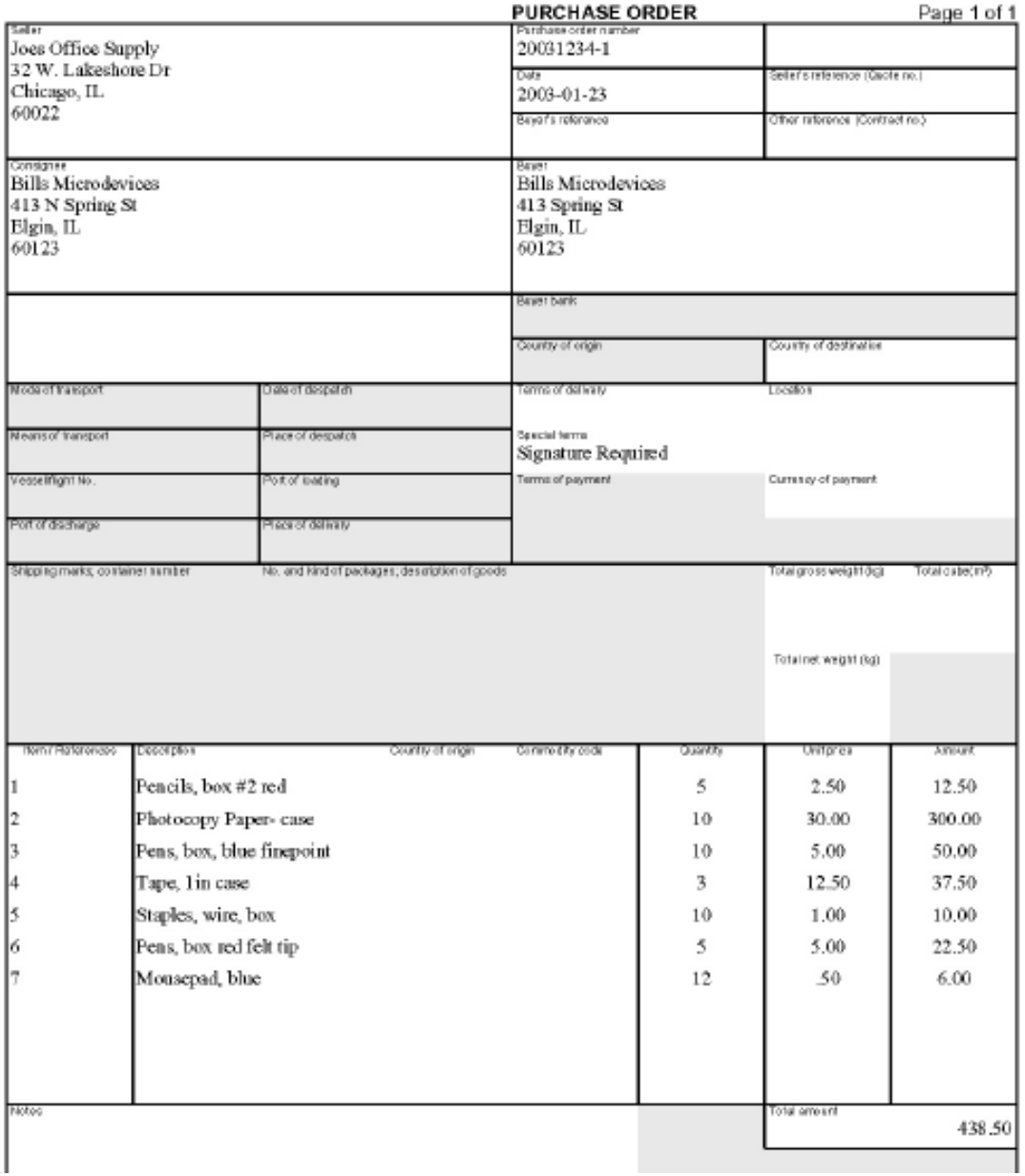
```
<xsd:element name="Order" type="OrderType"/>
 <xsd:complexType name="OrderType">
  <xsd:annotation>
   <xsd:documentation>
    This element MUST be conveyed as the root element in any instance
document based on this Schema expression.
   </xsd:documentation>
   <xsd:documentation>
    <ccts:Component>
     <ccts:ComponentType>ABIE</ccts:ComponentType>
     <ccts:DictionaryEntryName>Order. Details</ccts:DictionaryEntryName>
     <ccts:Definition>a document that contains information directly relating to the
economic event of ordering products.</ccts:Definition>
     <ccts:ObjectClass>Order</ccts:ObjectClass>
     <ccts:AlternativeBusinessTerms>Purchase
Order</ccts:AlternativeBusinessTerms>
    </ccts:Component>
   </xsd:documentation>
  </xsd:annotation>
```



UBL Document Implementation

```
<cac:BuyerParty>
  <cac:Party>
    <cac:PartyName>
      <cbc:Name>Bills Microdevices</cbc:Name>
    </cac:PartyName>
    <cac:Address>
      <cbc:StreetName>Spring St</cbc:StreetName>
      <cbc:BuildingNumber>413</cbc:BuildingNumber>
      <cbc:CityName>Elgin</cbc:CityName>
      <cbc:PostalZone>60123</cbc:PostalZone>
      <cac:CountrySubentityCode>IL</cac:CountrySubentityCode>
    </cac:Address>
    <cac:Contact>
      <cbc:Name>George Tirebiter</cbc:Name>
    </cac:Contact>
  </cac:Party>
</cac:BuyerParty>
```

UBL Document Transformation



PURCHASE ORDER Page 1 of 1

Seller
Joes Office Supply
32 W. Lakeshore Dr
Chicago, IL
60022

Purchase order number: 20031234-1
Date: 2003-01-23
Buyer's reference:
Seller's reference (Sacle no.):
Other reference (Contract no.):

Consignee
Bills Microdevices
413 N Spring St
Elgin, IL
60123

Buyer
Bills Microdevices
413 Spring St
Elgin, IL
60123

Buyer bank:
Country of origin:
Country of destination:

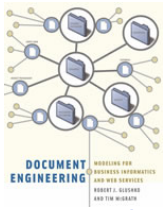
Mode of transport:
Date of despatch:
Means of transport:
Place of despatch:
Vessel/flight No.:
Port of loading:
Port of discharge:
Place of delivery:

Terms of delivery:
Location:
Special terms
Signature Required
Terms of payment:
Currency of payment:

Shipping marks; container number:
No. and kind of packages; description of goods:
Total gross weight (kg):
Total cube (m³):
Total net weight (kg):

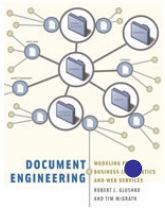
Item/ Reference	Description	Country of origin	Commodity code	Quantity	Unit price	Amount
1	Pencils, box #2 red			5	2.50	12.50
2	Photocopy Paper- case			10	30.00	300.00
3	Pens, box, blue finepoint			10	5.00	50.00
4	Tape, 1in case			3	12.50	37.50
5	Staples, wire, box			10	1.00	10.00
6	Pens, box red felt tip			5	5.00	22.50
7	Mousepad, blue			12	.50	6.00

Notes:
Total amount: 438.50



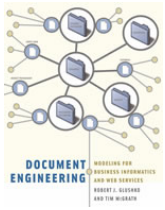
UBL 1.0

- Released May 1st 2004
- Basic Procurement Business Process Model
- XML Schemas (W3C XSD)
  - Basic Documents
  - Re-usable Common Component Library
- Component and Assembly Models
- XML (XSD) Naming and Design Rules
- Guidelines for customizing UBL schemas
- Forms Presentations and sample documents
- See also:http://www.oasis-open.org/committees/ubl



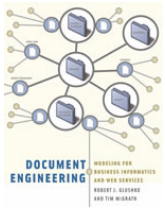
Some Recent UBL Developments

- UBL 1.0 ratified as an OASIS Standard (2004)
- UBL International Data Dictionary: more than 600 standard data elements translated into Chinese (Simplified and Traditional), Japanese, Korean, and Spanish
- UBL Naming and Design Rules (NDR) adopted by chemical industy (CIDX), petroleum (PIDX), agriculture (RAPID), real estate (OSCRE/PISCES), U.S. Department of the Navy (DON), U.S. Taxation (IRS)
- As of February 2005, UBL Invoice is required by the public sector in Denmark
  - Estimated savings 94 million Euro annually
  - If the UBL Purchase Order is implemented, annual savings are estimated at 160 million Euro
  - More than one million invoices exchanged in first two months



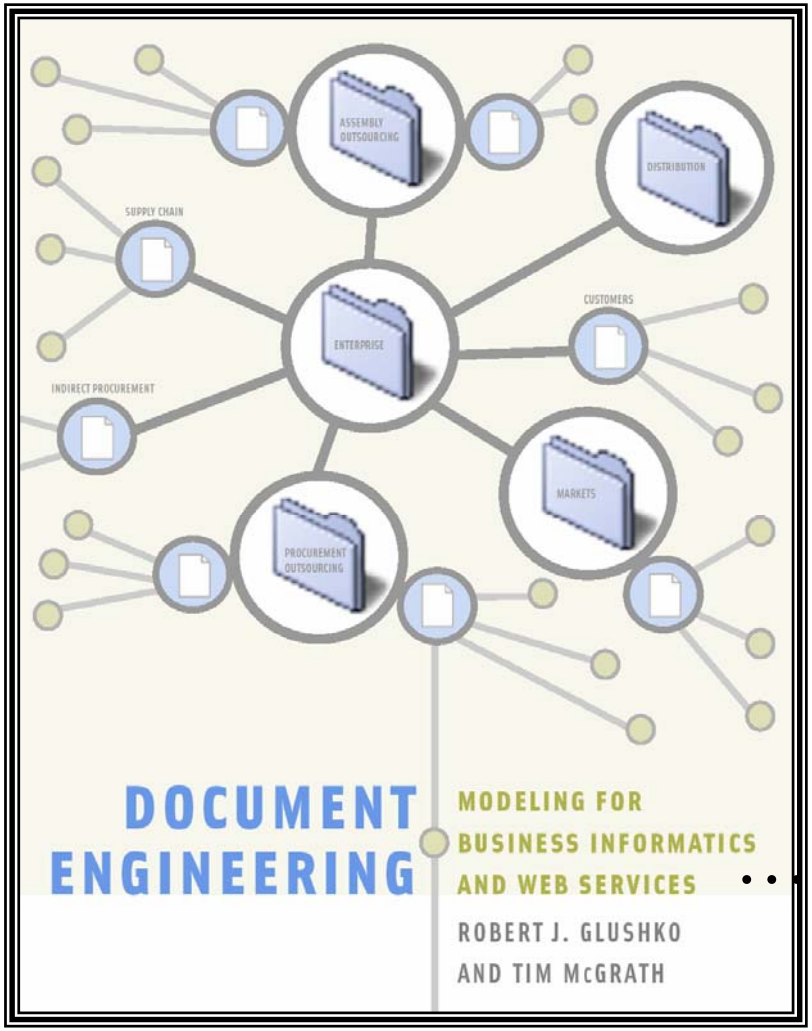
Work Plan for UBL 2.0

- **European Community Localization**
- **Extend UBL library**
  - **Extended Procuremnt Process**
  - **International Trade Process Documents**
- **Refining UBL library**
  - **Improve architecture**
  - **Improve semantics (ontology, terms and definitions)**
- **Use UN/CEFACT Core Component library**
- **Release early 2006**



Summary

- Doing business by document exchange is an old, natural and intuitive idea.
- Document exchange requires agreement on the processes and the documents involved.
- Document Engineering is a new approach for analyzing and designing business documents
- An important aspect of Document Engineering is the use of patterns or standards.
- UBL has been engineered as a library of common business components as both conceptual and physical patterns.
- Document Engineering {web services + UBL} = an approach for implementing new business models.



Thank You

. . . coming soon from MIT Press

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