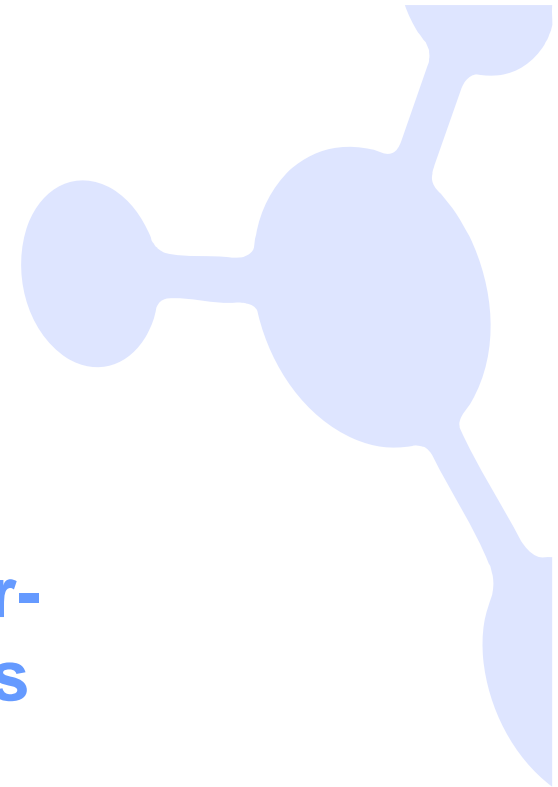




Universität Münster
Institut für Wirtschaftsinformatik

Lehrstuhl für Wirtschaftsinformatik
und Interorganisationssysteme
Prof. Dr. Stefan Klein

www.wi-ios.de
mail@wi-ios.de



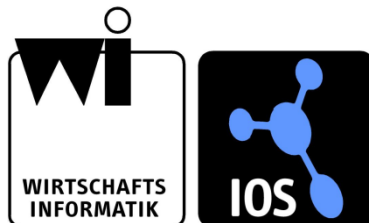
Building Blocks of Inter- Organisational Systems - Standards -

Stefan Schellhammer

Lehrstuhl für Wirtschaftsinformatik und
Interorganisationssysteme

Institut für Wirtschaftsinformatik

Universität Münster



Agenda

A. Role of standards in IOS

B. Standards used in IOS

C. Excursus: The Irish case

D. Enterprise Application Integration (EAI)

Agenda

A. Role of standards in IOS

1. Motivation
2. Scope of standardisation
3. Electronic Data Interchange (EDI)

B. Standards used in IOS

C. Excursus: The Irish case

D. Enterprise Application Integration (EAI)

Standards: What for?

- A Russian proprietor of a major machinery outlet in the 1880s:
 - „The German traction engines are very good, but not suited to this locality.[...] : the crankshaft for driving a threshing machine on a 12-HP traction engine was broken.“
 - „Telegram to Germany: Send crankshaft for 12-HP traction engine 580 at once.“
 - „Reply: Send exact drawing with dimensions.“
 - 3 months later: Spare part arrives, harvest has ended.

Source: Haeder (1927) cited by Hesser, Inklaar (1997), p. 25.

- Costs due to non-harmonized standards in the European telecommunication market were estimated to amount for 4,8 billion ECU (Cecchini 1988)

Aims of standardization

- Non-technical objectives (according to Verman 1973):
 - Economy of costs, human effort and essential materials
 - Convenience of use
 - Solutions to recurring problems
 - Quality definition and evaluation

- => To facilitate the exchange of goods and services
- => To develop mutual cooperation in the spheres of intellectual, scientific, technological and economic activity

Standards as an instrument to achieve compatibility

1. Role of Standards

2. IOS-Standards

3. Exkursus

4. EAI

- Types of compatibility:
 - Farrel/Saloner (1987): „We call products compatible when their design is coordinated in some way enabling them to work together.“
 - Distinction between:
 - Physical compatibility
 - Communicative compatibility
 - Compatibility by agreement
 - Pfeiffer(1989): „Kompatibel sind solche Güter, die hinsichtlich einer durch eine Schnittstelle definierten Funktion vollständig substituierbar sind.“

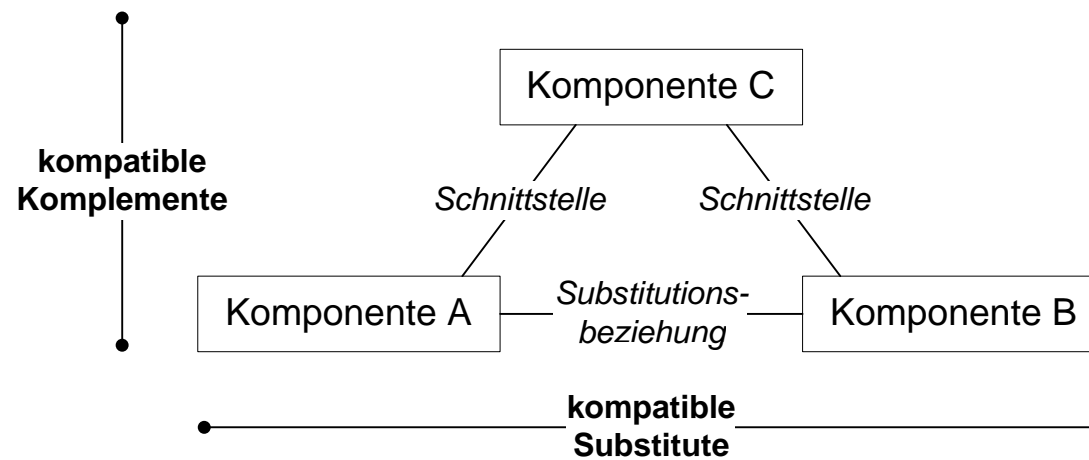
Standards as an instrument to achieve compatibility

1. Role of Standards

2. IOS-Standards

3. Exkursus

4. EAI



Quelle: Borowicz (2001), S.11 und Pfeiffer (1989), S. 23.

Scope of standardisation

1. Role of Standards

2. IOS-Standards

3. Excursus

4. EAI

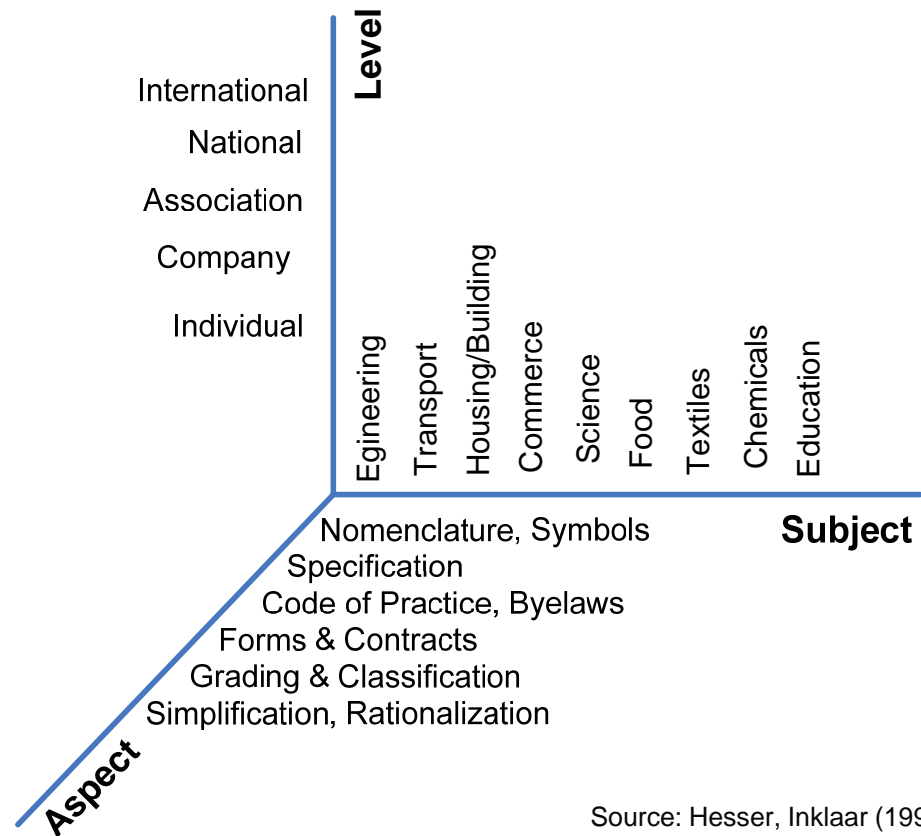
- Different scopes possible:
 - Measure
 - Service
 - Compatibility
 - Processes
 - Behavior
 - Communication
 - ...



- Here: Communication Standards in IOS

Standardization space (Verman 1973)

1. Role of Standards
2. IOS-Standards
3. Excursus
4. EAI



Source: Hesser, Inklaar (1997), p. 34.

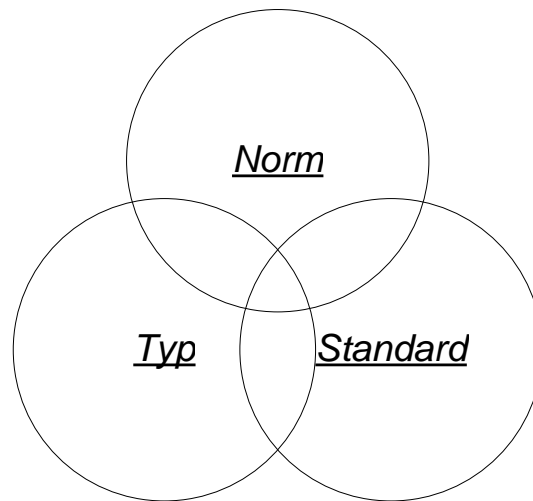
Definition of “Standard“

- “Standards sind [...] das Ergebnis kollektiver Prozesse der Vereinheitlichung und repräsentieren jeweils die von einer bestimmten Personenzahl für eine gewisse Zeit akzeptierte Auswahl einer Variante aus einem Pool von Möglichkeiten.“
Borowicz (2001), S. 7.
- Es handelt sich bei der Normung und Standardisierung um Prozesse, in deren Verlauf *Spezifikationen* festgelegt werden, die bestimmte Merkmale und Charakteristika von Systemen, Produkten oder Produktteilen beschreiben bzw. definieren.

Kleinaltenkamp (1993), S. 19

Authorship of standards

- Three types of technical specification:



Norm: Specification by standardization bodies(DIN, CEN/CENELEC) or legislator.

Standard: Specification accepted by multiplicity or all market actors.

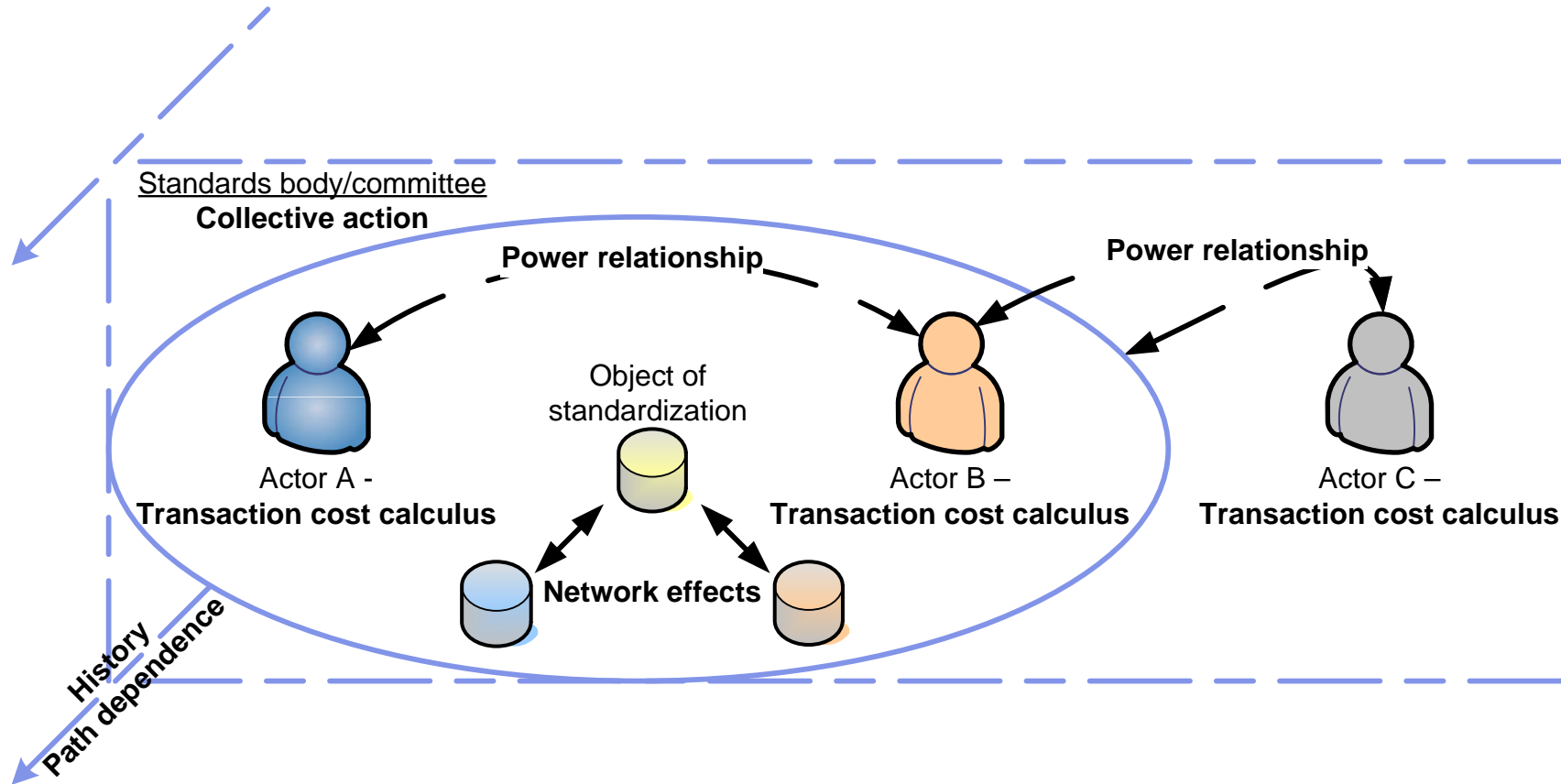
Typ: Specification accepted by (groups of/individual) firms or users.

Quelle: Vgl. Kleinaltenkamp (1993), S. 20.

- Classification by:
 - Degree of obligation for market actors
 - Mode of evolution

Theoretical lenses on standardization

1. Role of Standards
2. IOS-Standards
3. Excursus
4. EAI



Role of Standards in IOS

- To decrease communication costs
- Protection of investments due to versatile usability
- Standard protocols and software are more versatile applicable and cause lower costs of familiarisation
- No Costs of bilateral understandings
- Saving of time in communication and lesser media discontinuities
- Standardised open communication systems provide additional market transparency => more competition

Krcmar (1997), p. 317 .

- => Standards as an instrument for efficient coordination between actors, firms

Types of communication

1. Role of Standards

2. IOS-Standards

3. Excursus

4. EAI

From	To	
	Human	Computer/ Application
Human	E-Mail (File Transfer)	Interactive applications, On-line systems (CRS, electronic trading systems) E-Forms
Computer/ Application	Computer based control systems Automated E-Mail	EDI File Transfer

Why do we focus on EDI?

- EDI has been the dominant technological platform of IOSs.
- EDI encompasses most of the aspects that are relevant to IOS:
 - strategic (competitive advantage based on advanced ICT),
 - organisational (inter- and intraorganisational redesign) and
 - technical questions
 - standardisation issues

The EDI vision ...

- Global,
- Intersectoral,
i.e. encompassing the private and the public sector,
- Standardised

business communication among applications.

EDI application scenario

- ... automated exchange of standardised and structured business documents (messages for business transactions)
- extension of the notion of office automation across the boundaries of firms
- process integration for automatic order management, delivery or inventory management
- ideally with little or no human intervention: interpersonal communication is not envisioned
- applications in marketing (multi-media presentation) etc. are typically not part of EDI

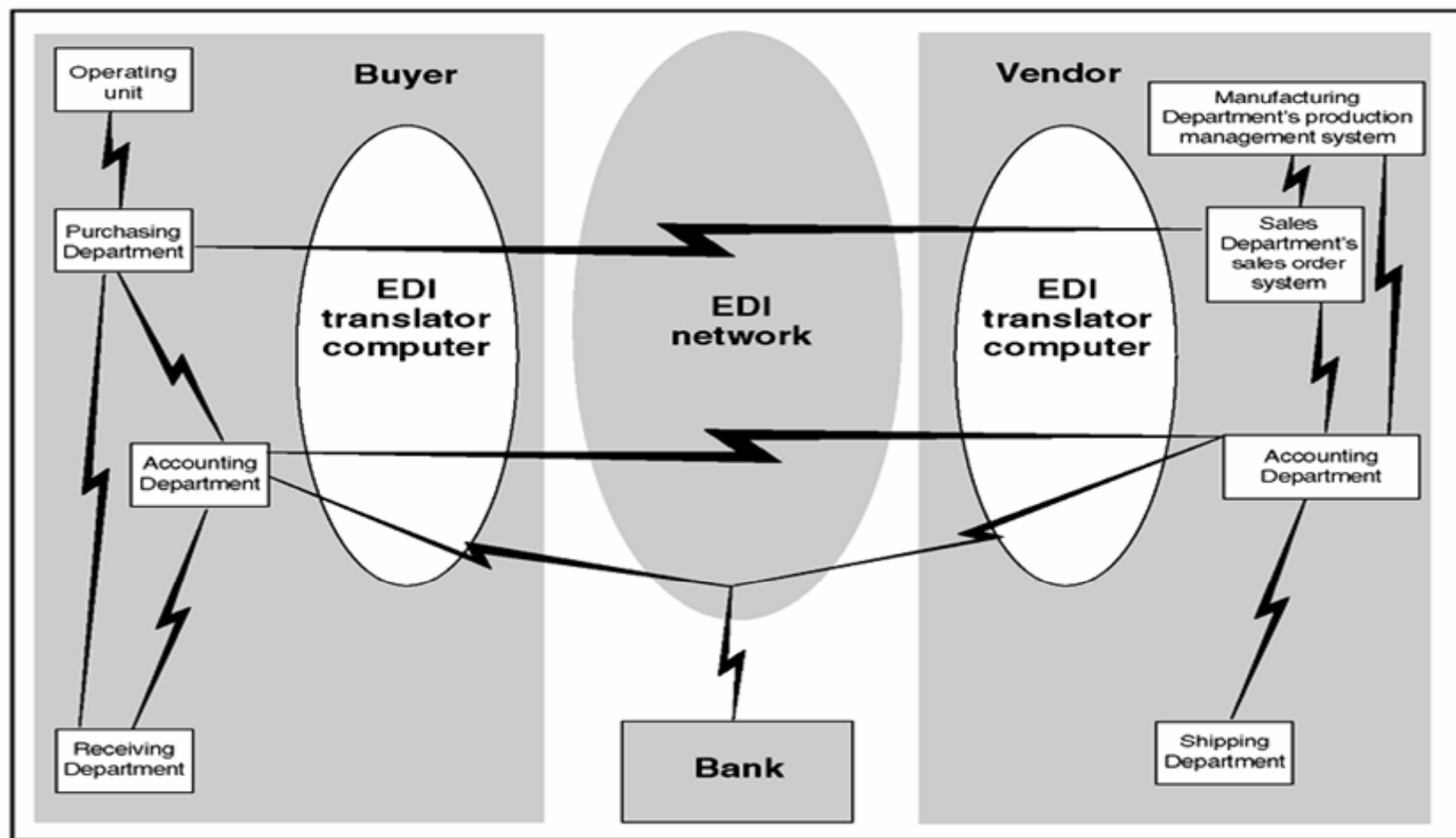
1. Role of Standards

2. IOS-Standards

3. Excursus

4. EAI

Information Flows in the EDI Purchasing Process



EDI ... a definition

<i>inter-organizational</i>	data exchange among legally independent companies, in particular trading partners and service providers
<i>electronic exchange of</i>	based on electronic communication media.
<i>standardized business documents</i>	focused on structured business messages, e.g. orders, invoices, payment orders etc. based on a standardized syntax and semantics
<i>among applications</i>	exchanged data will be automatically interpreted by applications.

Early EDI movers ...

- Airlines
- International banks
- Credit card organisations

➤ What do they have in common?

- international industry organisations (IATA) and communication networks (SWIFT, SITA),
- global businesses,
- high volume standardised transactions,
- information and communication as core business

Semiotic layers of EDI

Semiotic layer	Relevance for EDI
Syntax	message structure, e.g. type and sequence of fields in UN/EDIFACT
Semantics	contents of the fields, e.g. keys, identifiers etc.
Pragmatics	action - response patterns, e.g. business scenarios

EDI messages: different standards

Process	VDA	Odette	EDIFACT	ANSI X12
Inquiry, request for quotes	4909	ENQIRY	QUOTES	840
Offer	4910	OFFERR	QUOTES	843
Order	4925	ORDERR	ORDERS	850
Order response	-	REPORD	ORDRSP	855
Order change	4925	ORDCHG	ORDCHG	860
CAD/CAM data	4951	ENGDAT	CONDRA	841
JIT delivery	4915	CALOFF/CALDEL	DELJIT	862
Credit advise	4908	SEBINV	CREADV	?
KANBAN	-	KANBAN	DELJIT	862
Inventory report	4913 VA 35	STOACT	INVRPT	?
Delivery instruction	4905	DELINS	DELFOR	830
Dispatch advise	4913	AVIEXP	DESADV	856
pickup-sheets	-	CALDEL/CALOFF	DELJIT	862
Price list/ catalog	4911	PRILST	PRICAT	832
Invoice	4906	INVOIC	INVOIC	810
Remission advice	4907	REMADV	REMADV	820

Agenda Part B

A. Role of standards in IOS

B. Standards used in IOS

1. Classification and types of standards

2. Examples of eBusiness standards

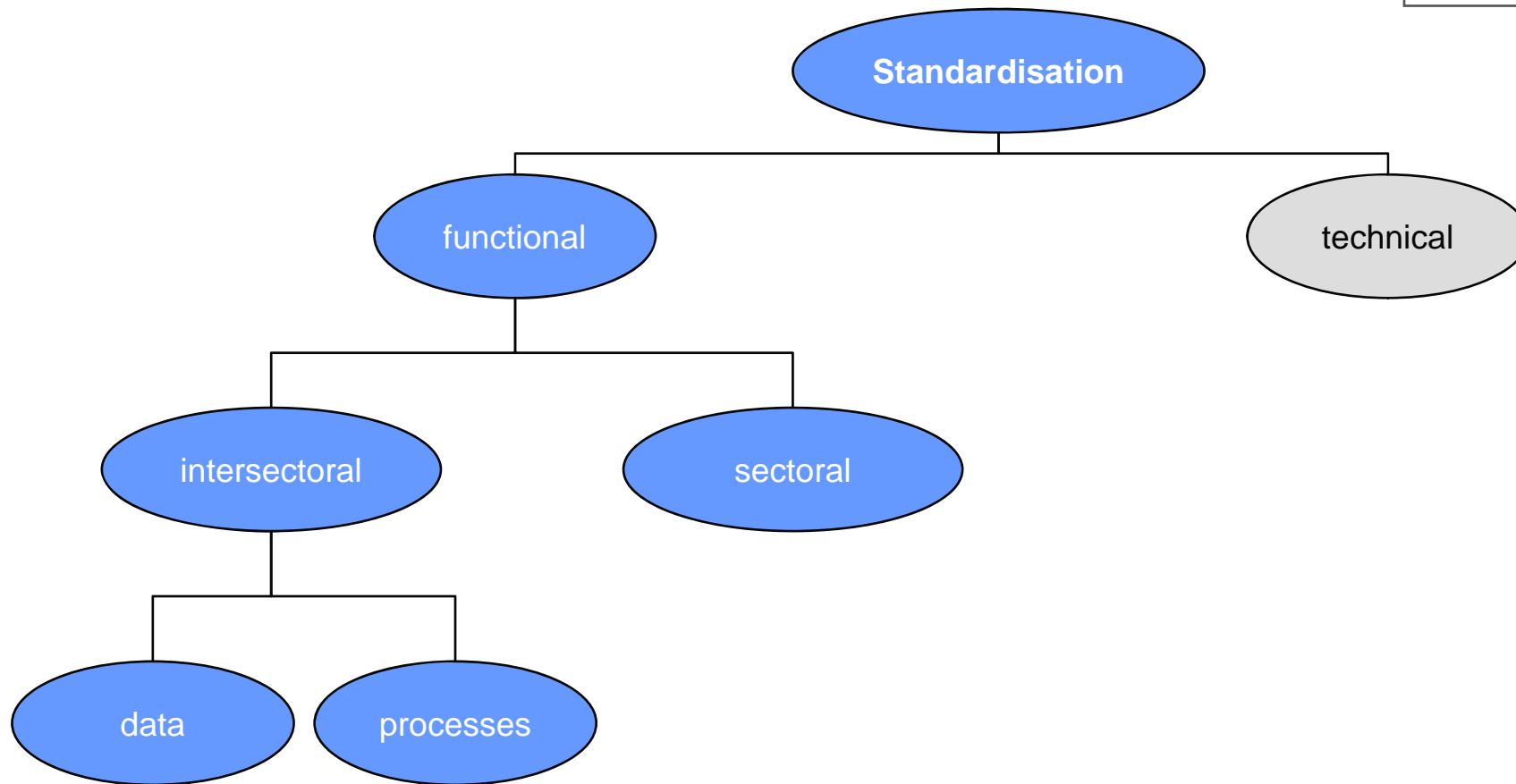
3. Empirical usage of standards

C. Excursus: The Irish case

D. Enterprise Application Integration (EAI)

Systematisation of E-Business Standards

1. Role of Standards
2. IOS-Standards
3. Excursus
4. EAI



Source: Berlecon Research 2003, p. 32

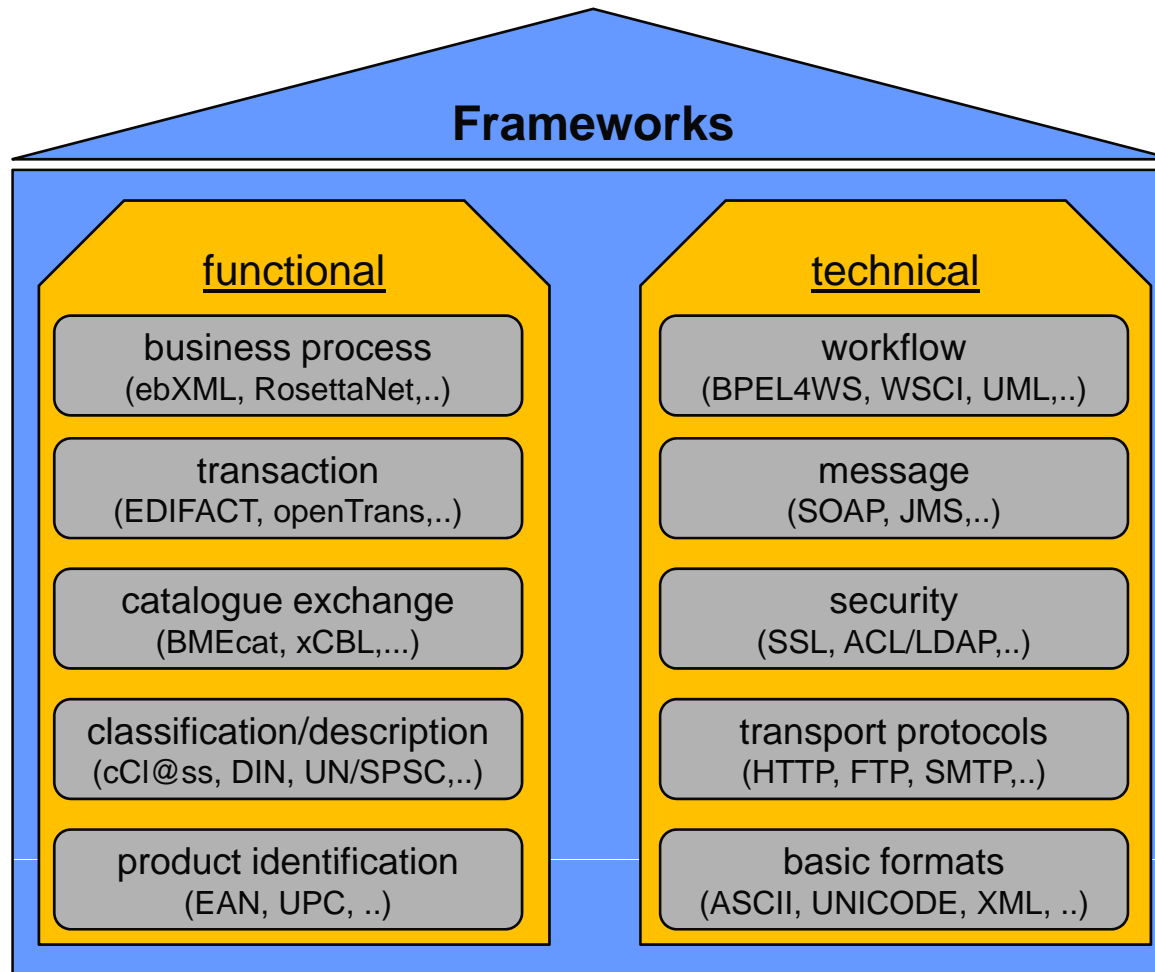
1. Role of Standards
2. IOS-Standards
3. Excursus
4. EAI

Scope of functional standards

- Product identification
- Product classification and description
- Catalogue exchange format
- Transactions
- Business processes

Standard-Stack of functional/technical standards

1. Role of Standards
2. IOS-Standards
3. Excursus
4. EAI



Source: Berlecon Research 2003, p. 34

Product identification: EAN-UPC



1. Role of Standards
2. IOS-Standards
3. Excursus
4. EAI

- Aim: globally unique identification of companies(ILN) and products(EAN) and logistic units (NVE)
- Universal Product Code (UPC)
 - Administered and assigned by UCC (since 2002, member of GS1)
 - Predominant identification standard in the USA
- European Article Number (EAN) provides a framework for product classification and bar coding
 - Administered and assigned by GS1-Organisation
 - Identifies companies and products
 - predominant outside USA

Product classification/description: eCI@ss, UN/SPSC

1. Role of Standards
2. IOS-Standards
3. Excursus
4. EAI

- Aim: classification of products and services by uniform criteria and characteristics
 - Hierarchical order of products:
 - Aggregation of products (e.g. for catalogue exchange)
 - Faster search for products and more convenient navigation in catalogues
 - Search for products by their characteristics
- Problem:
 - Different actors classify identical products in different classes
 - Free text or standardised characteristics (e.g. colour: blue, steel-blue, 0-0-100)

Product classification/description: UN/SPSC



1. Role of Standards
2. IOS-Standards
3. Excursus
4. EAI

- UN/SPSC = United Nations Standard Products and Services Code
 - Sector independent
 - International standard
 - 5 hierarchy levels:
 - Segment (44 Office Equipment, Accessories and Supplies)
 - Family (12 Office supplies)
 - Class (19 Ink and lead refills)
 - Commodity (03 Pen refills)
 - Business Function (optional, indicates business relationship to supplier)

- „Pen refills“ = UNSPSC classification 44-12-19-03

Product classification/description: eCl@ss



1. Role of Standards
2. IOS-Standards
3. Excursus
4. EAI

- provided by eCl@ss e.V.
 - Sector independent
 - International (although predominantly in german-speaking area)
 - Available in 8 languages
 - 4 hierarchy levels
 - Segment (24 Office products, facilities and technics, paperie)
 - Main group (24 Writing instrument, eraser, correction pen)
 - Group (08 Rollerball- gel roller supplies)
 - Commodity class (01 Ball pen refill)
 - Standard set of properties (17 properties listed)
 - Synonyms (5 keywords)

- „Ball pen refill“ = eCl@ss 24-24-08-01

Catalogue exchange format: BMEcat



1. Role of Standards
2. IOS-Standards
3. Excursus
4. EAI

- BMEcat was published the first time at the end of 1999
- eBusiness Standardisation Committee and Bundesverband Materialwirtschaft, Einkauf und Logistik e. V. (BME) published the XML-based catalogue exchange format in cooperation with the Fraunhofer IAO and the University of Essen
- User driven development
- Most widespread exchange standard for **electronic product catalogs** in German-speaking countries
- Structured **representation of (multi-media) product data**, e.g. basic data, packaging data, price data, multi-media additional data, article structure data, catalogue structure data

Catalogue exchange format: Commerce XML (cXML)



1. Role of Standards
2. IOS-Standards
3. Excursus
4. EAI

cXML is

- a **proprietary specification** copyrighted by Ariba Inc., first published in 1999, however, more than 40 companies have contributed to the specification looking to reduce the costs of B2B electronic commerce,
- a **set of document type definitions** (DTD) for the XML specification,
- a **meta language** that defines necessary information about a product,
- used to standardise the **exchange of catalog content** and to define request/response processes for secure electronic transactions over the Internet,
- addressing **processes** such as purchase orders, change orders, acknowledgments, status updates, ship notifications and payment transactions.

Catalogue exchange format: XML Common Business Library (xCBL)

xCBL
4.0

1. Role of Standards
2. IOS-Standards
3. Excursus
4. EAI

- xCBL 4.0 was published in March 2003
- Result of collaboration between Commerce One and XML standards bodies, e-commerce enterprises, and hardware and software vendors, as well as analysis of existing e-commerce standards including Electronic Data Interchange (EDI), RosettaNet, and Open Buying on the Internet (OBI)
- Set of XML building blocks and a document framework that allows the **creation of XML documents for e-commerce**
- Available in various formats: as a set of SOX schemas, as W3C XSDL schemas, in XML DTD form, and as a set of XDR schemas
- **Support documents and transactions for global e-commerce** including multi-company supply chain automation, direct and indirect procurement, planning, auctions, and invoicing and payment in an international multi-currency environment.

1. Role of Standards
2. IOS-Standards
3. Exkursus
4. EAI

Transaction: EDI (UN/EDIFACT, EANCOM)

... standardised syntax rules for EDI messages designed by national and international *message development groups* (UN/JEDI, ISO, ETSI, CEN, DIN)

first published in 1987

E	lectronic
D	ata
I	nterchange
F	or
A	dministration (accounting, customs, pension, health care, social security, jurisprudence, job application, statistics)
C	ommerce (construction, finance, insurance, production and logistics, tourism, transaction) and
T	ransport (general transport, container movement, dangerous goods movement, forwarding)

Transaction: EDI (UN/EDIFACT, EANCOM)

1. Role of Standards
2. IOS-Standards
3. Excursus
4. EAI

... a framework for a universal and global business language.

1. Role of Standards
2. IOS-Standards
3. Excursus
4. EAI

Transaction: EDIFACT messages

REQOTE	request for quote
QUOTES	quotation
PRICAT	price/sales catalogue
ORDERS	purchase order
ORDRSP	order response
DESADV	dispatch advice
INVOIC	invoice
PAYORD	payment order
DEBADV	debit advice
CREADV	credit advice

- ~200 different message types => EDIFACT-Subsets (EANCOM, ODETTE, ...)

Transaction: EDI (UN/EDIFACT, EANCOM)

1. Role of Standards
2. IOS-Standards
3. Exkursus
4. EAI

Fahrradhandel Pedal, Wagingerstr. 5, 81549 München

Huber GmbH
Obstgasse 2
81549 München

München, 02.08.99

Rechnung: 9908001 Ihre Bestellung Nr. O0010001 vom 15.07.99

Pos	Artikel	Beschreibung	Anzahl	Einzelpreis	Gesamt
1	4711.001	Fahrrad, Damen-	1	750,00	750,00
2	4711.002	Luftpumpe, Stand-	1	19,90	19,90
3	4711.003	Ersatzventil	3	2,50	7,50

					Gesamtsumme netto 777,40
					Umsatzsteuer 16% 124,38
					=====
					zu zahlender Betrag 901,78

Alle Beträge verstehen sich in DEM

Transaction: EDI (UN/EDIFACT, EANCOM)

1. Role of Standards
2. IOS-Standards
3. Excursus
4. EAI

```
UNA:+,? 'UNB+UNOA:2+FHPEDEL+HUBERGMBH+990802:1557+
9908021557'UNH+INVOIC0001+INVOIC:D:93A:UN'BGM+380+
9908001+9'DTM+3:19990802:102'RFF+ON:00010001'DTM+4
:19999715:102'NAD+SE++Fahrradhandel Pedal++Wagingerstr.
5+München++81549'NAD+BY++Huber GmbH++Obstgas se 2+
München++81549'LIN+1++4711.001'IMD+F++::Fahr rad, Damen
'QTY+47:1:PCE'MOA+66:750'PRI+AAA:750'LIN +2++4711.002'IMD+
F++::Luftpumpe, Stand-'QTY+47:1: PCE'MOA+66:19,9'PRI+AAA:19,9,
LIN+3++4711.003'IMD+F ++::Ersatzventil'QTY+47:3:PCE'MOA+66:7,5,
PRI+AAA: 2,5'UNS+S'MOA+79:777,4'MOA+124:124,38'MOA+128:901,
78'TAX+7+VAT+++::16+S'UNT+28+INVOIC0001'UNZ+1+990 8021557'
```

Transaction: EDI (UN/EDIFACT, EANCOM)

1. Motivation
2. Classification
3. IOS-Standards
4. EAI

- Standardisation of the message syntax, i.e.
 - distinction between syntax and semantics
product identification (e.g. EAN) and company identification (X.500) are not part of EDIFACT
 - distinction between message and communication (e.g. TCP/IP, SMTP, X.400, FTAM)

1. Role of Standards
2. IOS-Standards
3. Excursus
4. EAI

Transaction: WebEDI

- Web interface for EDI(form)
- Companies offer business partner to enter data via a web portal
- Pros:
 - Low investments necessary for business partner (pc, browser, internet connection)
 - No EDI-knowledge necessary for business partner
- Cons:
 - Manual data entry
 - Lesser integration of systems
- => solution for small and medium-sized enterprises (SMEs)

Transaction: XML (openTrans, RosettaNet, OAGIS)

1. Role of Standards
2. IOS-Standards
3. Excursus
4. EAI

- Consortium of more than 400 Electronic Components (EC), Information Technology (IT), Semiconductor Manufacturing (SM) and Solution Provider (SP) companies founded in June 1998
- Creating, implementing and promoting open e-business standards that form a common e-business language, aligning processes between trading partners on a global basis
- RosettaNet standards encompassing data dictionaries, implementation framework, and XML-based business message schemas and process specifications
- RosettaNet Implementation Framework: exchange protocols for quick and efficient implementation of RosettaNet standards
- RosettaNet Partner Interface Processes: system-to-system XML-based dialogs that define business processes between trading partners, applying to the following core processes: Administration; Partner, Product and Service Review; Product Introduction; Order Management; Inventory Management; Marketing Information Management; Service and Support; and Manufacturing
- <http://www.rosettanel.org>



1. Role of Standards
2. IOS-Standards
3. Excursus
4. EAI

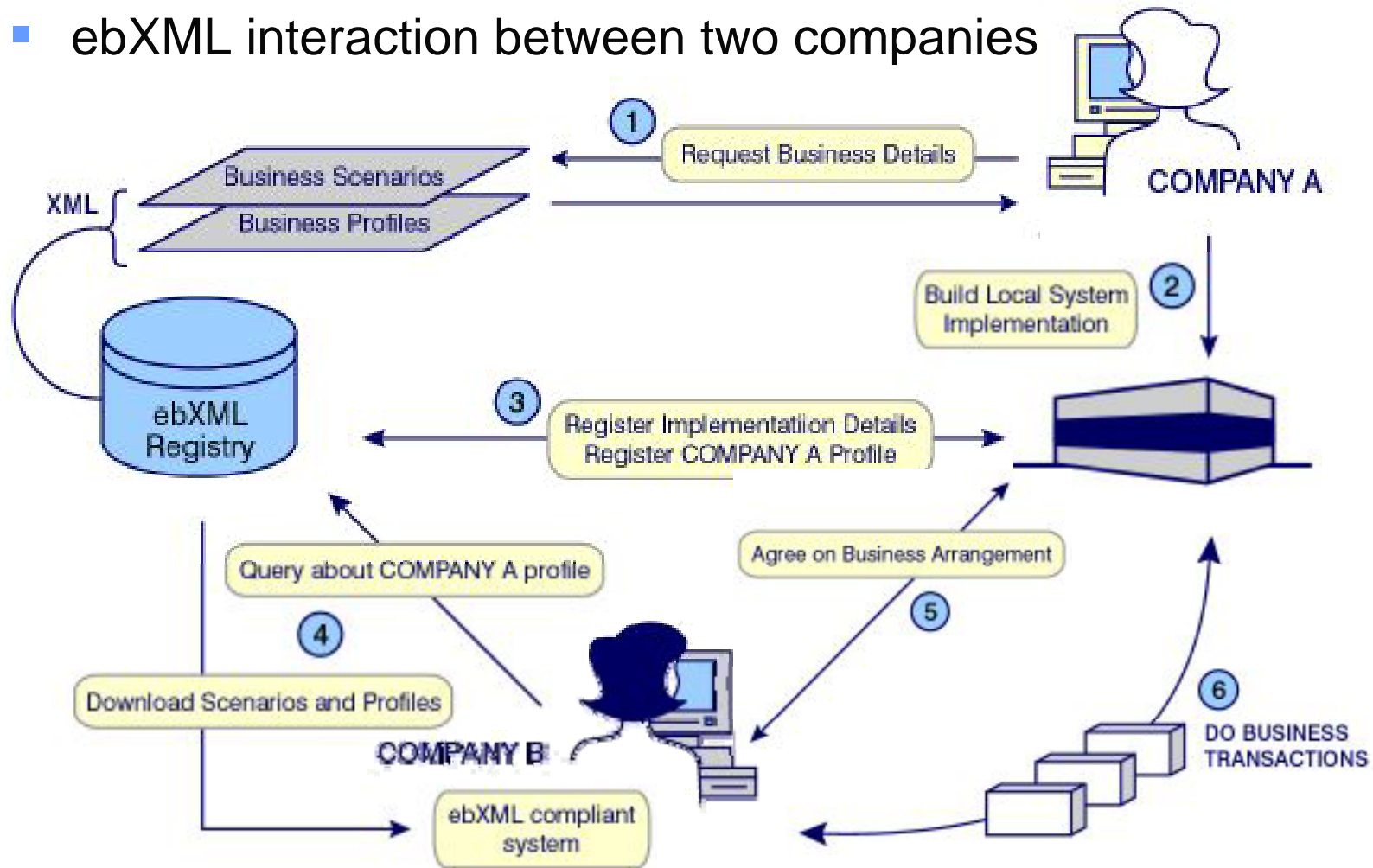
- ebXML sponsored by UN/CEFACT and OASIS, is a modular suite of specifications that enables enterprises of any size and in any geographical location to conduct business over the Internet
- ebXML framework will become an international standard, most likely under the auspices of UN/CEFACT
- Supporting messages and services among businesses as well as between businesses and consumers
- Offering businesses of all sizes a common message structure and syntax for exchanging business data over data networks like the Internet using XML
- ISO approves OASIS e-business standards in March 2004
- <http://www.ebxml.org/>

Business process: ebXML



1. Role of Standards
2. IOS-Standards
3. Excursus
4. EAI

■ ebXML interaction between two companies



Source: ebxml.org

Overview

1. Role of Standards
2. IOS-Standards
3. Excursus
4. EAI

Name	Identification	Classification	Catalogue data	Transactions	Processes
BMEcat					
DATANORM, ELDANORM					
EAN-UCC					
ebXML					
EDIFACT, EANCOM					
ETIM					
eClass					
openTRANS					
proficlass					
RosettaNet					
UBL					
UN/SPSC					
X12					
xCBL					

Source: Berlecon Research 2003

Empirical usage of standards

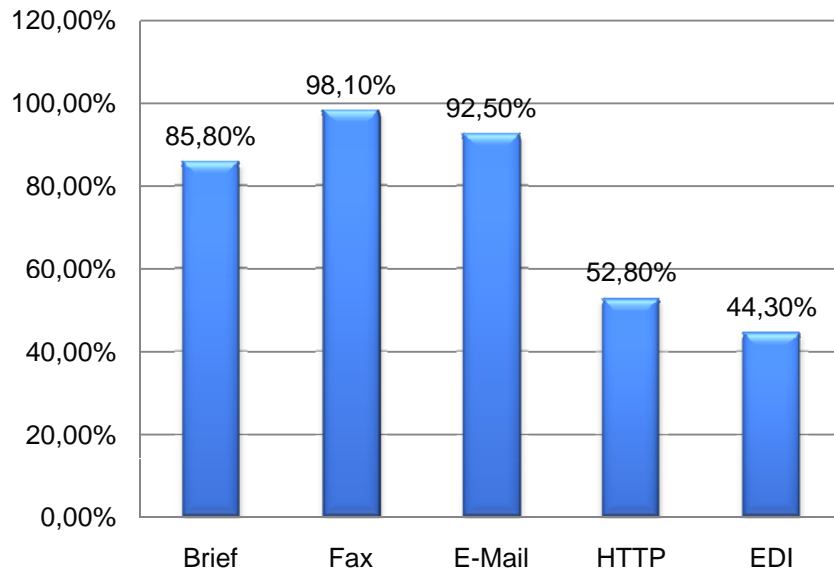
1. Role of Standards
2. IOS-Standards
3. Excursus
4. EAI

- Survey: eBusiness-standards in the German sector of electronics (Otto, B. (2002))
- Conducted in 2001
- 70 industrial companies, 36 wholesaler

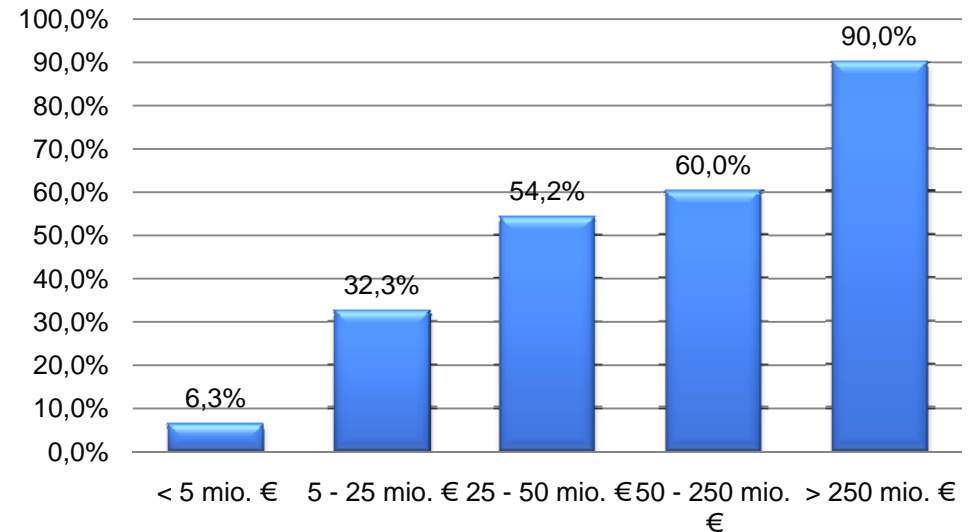
Survey: Data Exchange

1. Role of Standards
2. IOS-Standards
3. Excursus
4. EAI

Transmission medium for data exchange



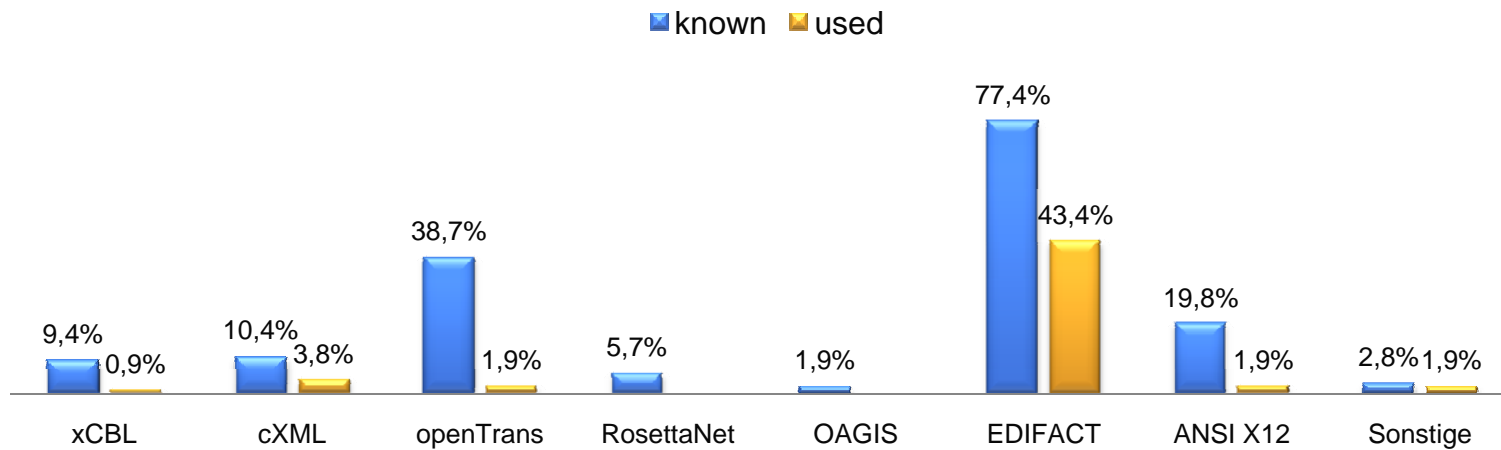
Usage of EDI and turnover



Survey: Transaction Standards

1. Role of Standards
2. IOS-Standards
3. Excursus
4. EAI

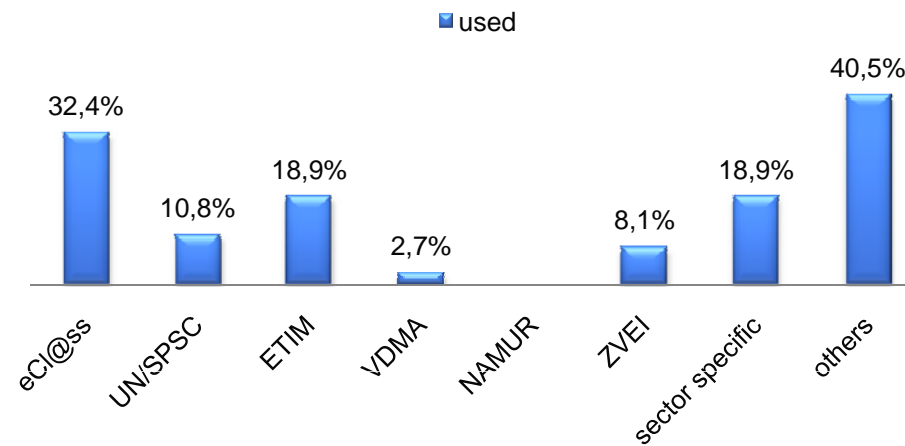
Transaction Standards



Survey: Product Classification Standards

1. Role of Standards
2. IOS-Standards
3. Excursus
4. EAI

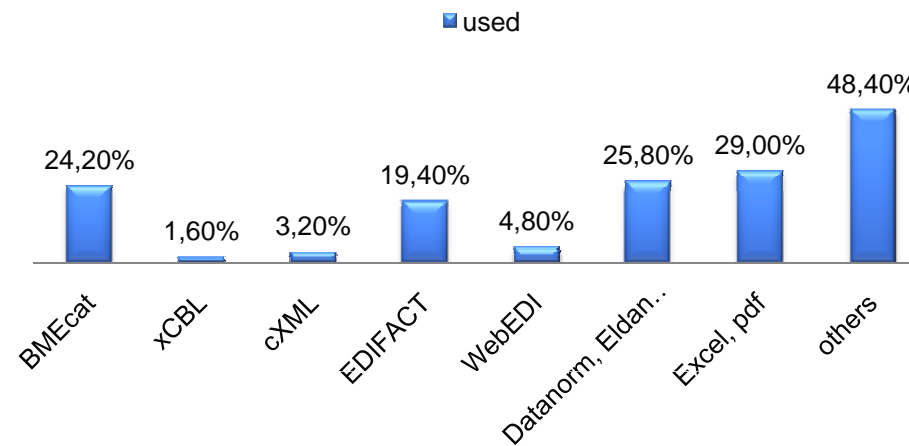
product classification



Survey: Catalogue Exchange Format

1. Role of Standards
2. IOS-Standards
3. Excursus
4. EAI

Catalogue Exchange Format



Agenda Part C

A. Role of standards in IOS

B. Standards used in IOS

C. Excursus: The Irish case

1. Pharmaceutical industry in Ireland

2. Standardization

3. IOS

D. Enterprise Application Integration (EAI)

Excursus: The Irish pharmaceutical retail industry

1. Motivation
2. Classification
3. IOS-Standards
4. EAI

- Open „irish_case.ppt“

Agenda Part D

A. Role of standards in IOS

B. Standards used in IOS

C. Excursus: The Irish case

D. Enterprise Application Integration (EAI)

1. Business Drivers

2. Types of Integration

3. Technology

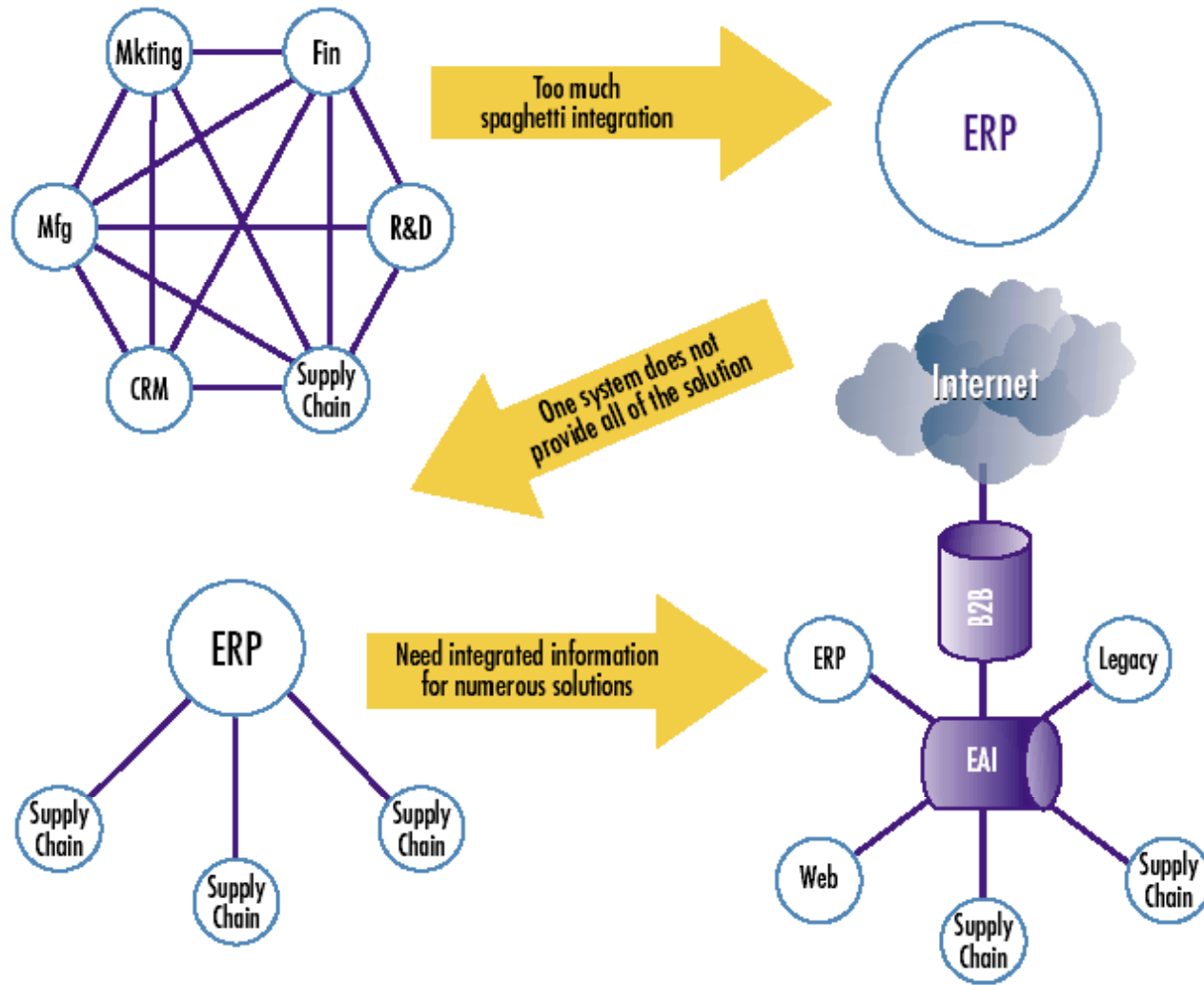
1. Role of Standards
2. IOS-Standards
3. Excursus
4. EAI

What is EAI?

- Enterprise Application Integration (EAI)
 - Is not a technological product but concept for a comprehensive application integration on an intra- and inter-organisational level.
 - Is the creation of business solutions by combining application using common middleware.
 - Consists of:
 - Methods
 - Standards and technologies
 - Architecture concepts
- Middleware
 - Is application-independent software that provides services that mediate between applications

Business Drivers

- 1. Role of Standards
- 2. IOS-Standards
- 3. Excursus
- 4. EAI



The way to EAI

1. Role of Standards
2. IOS-Standards
3. Excursus
4. EAI

1. Departmental applications

- Lead to “spaghetti integration”

2. ERP systems

- Claimed to be a one-system-fits-all solution
- But ERP systems do not have all the functionalities needed to support the business processes
- ERP has to be integrated with legacy or new systems

3. Middleware/ EAI

- Providing an infrastructure to connect and interface information between an organisation’s internal applications
- Need for B2B connectivity: integrating applications and business processes with business partners

1. Role of Standards
2. IOS-Standards
3. Excursus
4. EAI

Business drivers

- Enabling of critical new solutions
 - Improving customer relationships
 - Improving Supply-Chain relationships
 - Improving internal processes
 - Reducing Time to Market
 - Saving development costs
 - Preserve value of existing legacy applications
- => Ultimate EAI scenario: One common virtual system

Federated Information Systems

1. Role of Standards
2. IOS-Standards
3. Excursus
4. EAI

- Term „federation“ comes out of politics (FRG, USA, UNO)
- Characteristics of a federation are:
 - Degree of remaining autonomy
 - Heterogeneity of participants
- IS exhibit these characteristics as well:
 - Autonomy regarding:
 - Design (e.g. data model)
 - Communication (component may enter/leave federation at will, may choose communication partner independently)
 - Execution (e.g. independent scheduling of incoming queries)

Federated Information Systems

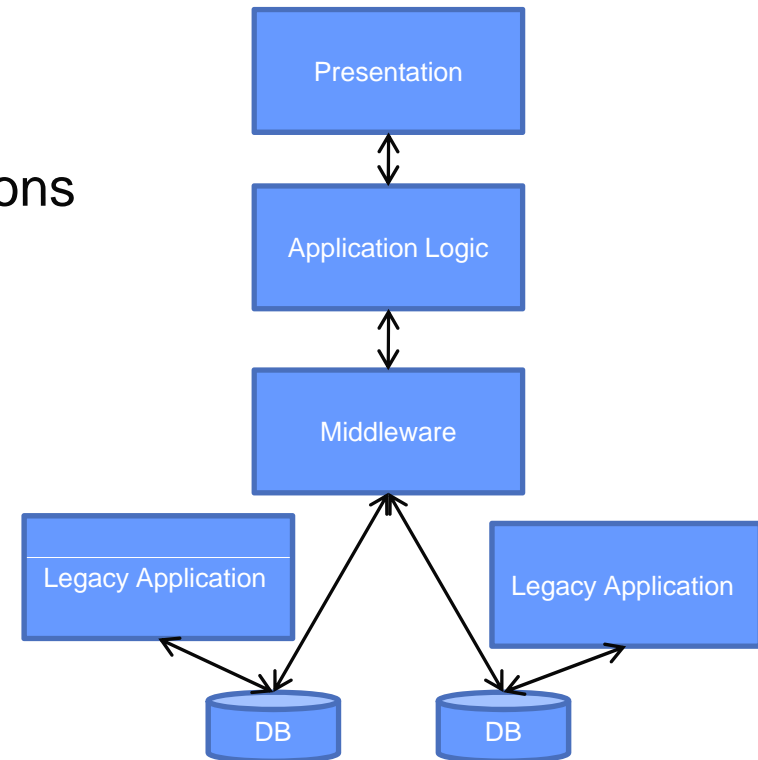
1. Motivation
2. Classification
3. IOS-Standards
4. EAI

- IS exhibit these characteristics as well:
 - Autonomy
 - Heterogeneity
 - Technical (technical infrastructures(DBMS, OS, Network, Hardware))
 - Syntactic (Data modelling, languages, data types, identifier)
 - Semantic (same concepts – different significance)
 - Organisational (spatial, responsibility)
 - Distribution
 - Physical distribution of data sources

Data Integration

1. Role of Standards
2. IOS-Standards
3. Excursus
4. EAI

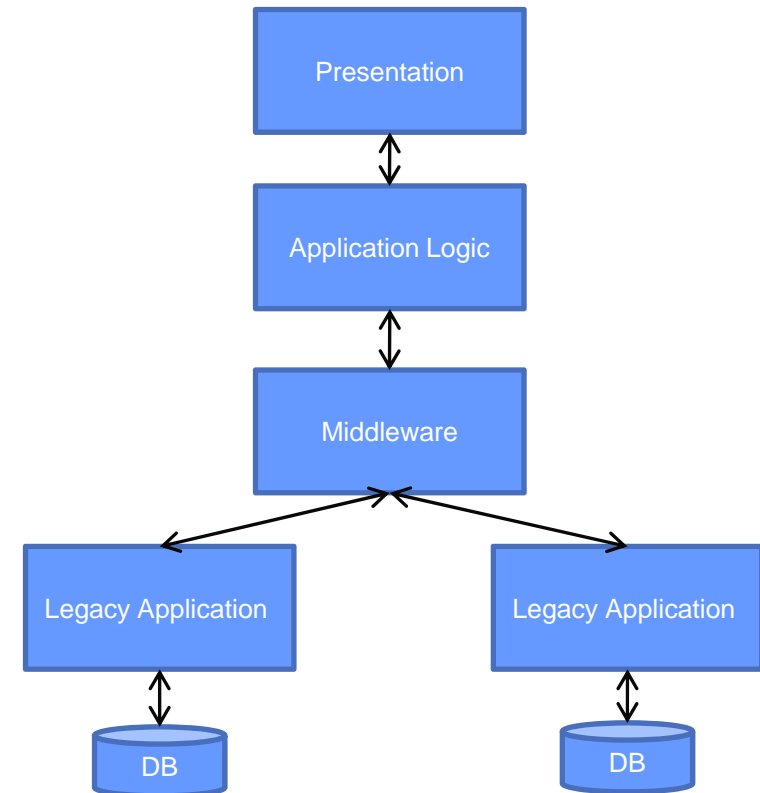
- Pros:
 - Easy to implement
 - Easy to integrate other applications
- Cons:
 - Semantic problems
 - No usage of business logic
 - Difficult modification of data structures



Application/Functional Integration

1. Role of Standards
2. IOS-Standards
3. Excursus
4. EAI

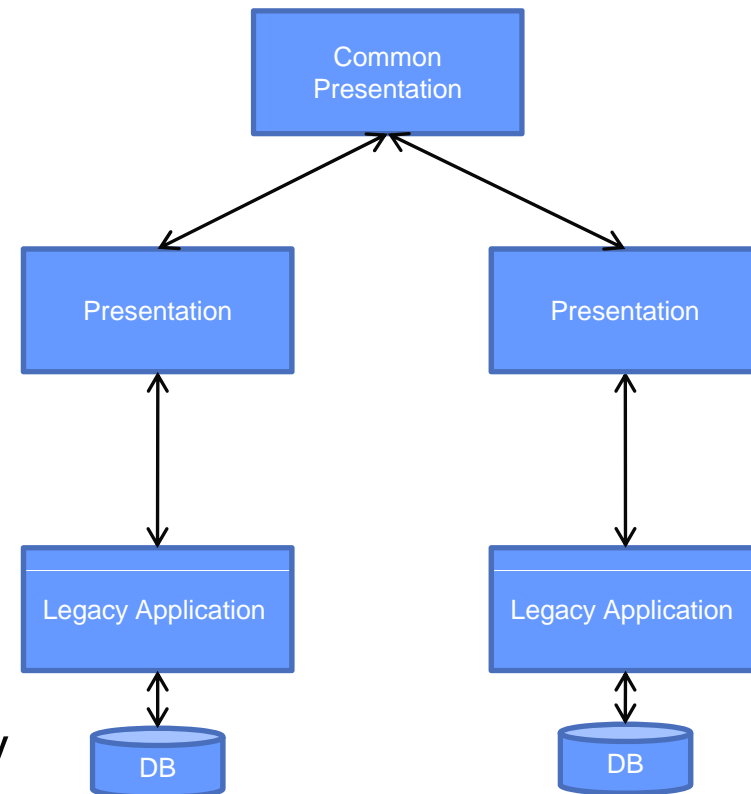
- Pros:
 - Semantically richest integration
 - Not only data, also business logic
 - Usage of existing integrity and plausibility checks
- Cons:
 - Complex implementation
 - Lack of interfaces requires adaptation or implementation of wrappers
 - Difficult to realize if needed interfaces do not exist or are not well documented



Presentation Integration

1. Role of Standards
2. IOS-Standards
3. Excursus
4. EAI

- Pros:
 - Easy and fast to realize
 - Applicable if no API or source code available
 - Sometimes only alternative
- Cons:
 - No integration of underlying data and functions
 - Bad performance and scalability
 - Low flexibility and reuse



Integration Technologies

1. Role of Standards
2. IOS-Standards
3. Excursus
4. EAI

- Communication models:
 - Synchronous (Web Services)
 - Asynchronous (MOM)
- Methods of integration
 - Function oriented (RPC)
 - Object oriented (RMI, EJB, CORBA, MOM)
 - Service oriented (MOM, Web Services)

Service oriented Architecture (SOA)

1. Role of Standards
2. IOS-Standards
3. Excursus
4. EAI

- No specific technology, but integration concept
- Modular services, defined by interface
- Orchestration of elementary services to complex ones
- Asynchronous and logical decoupled communication of services

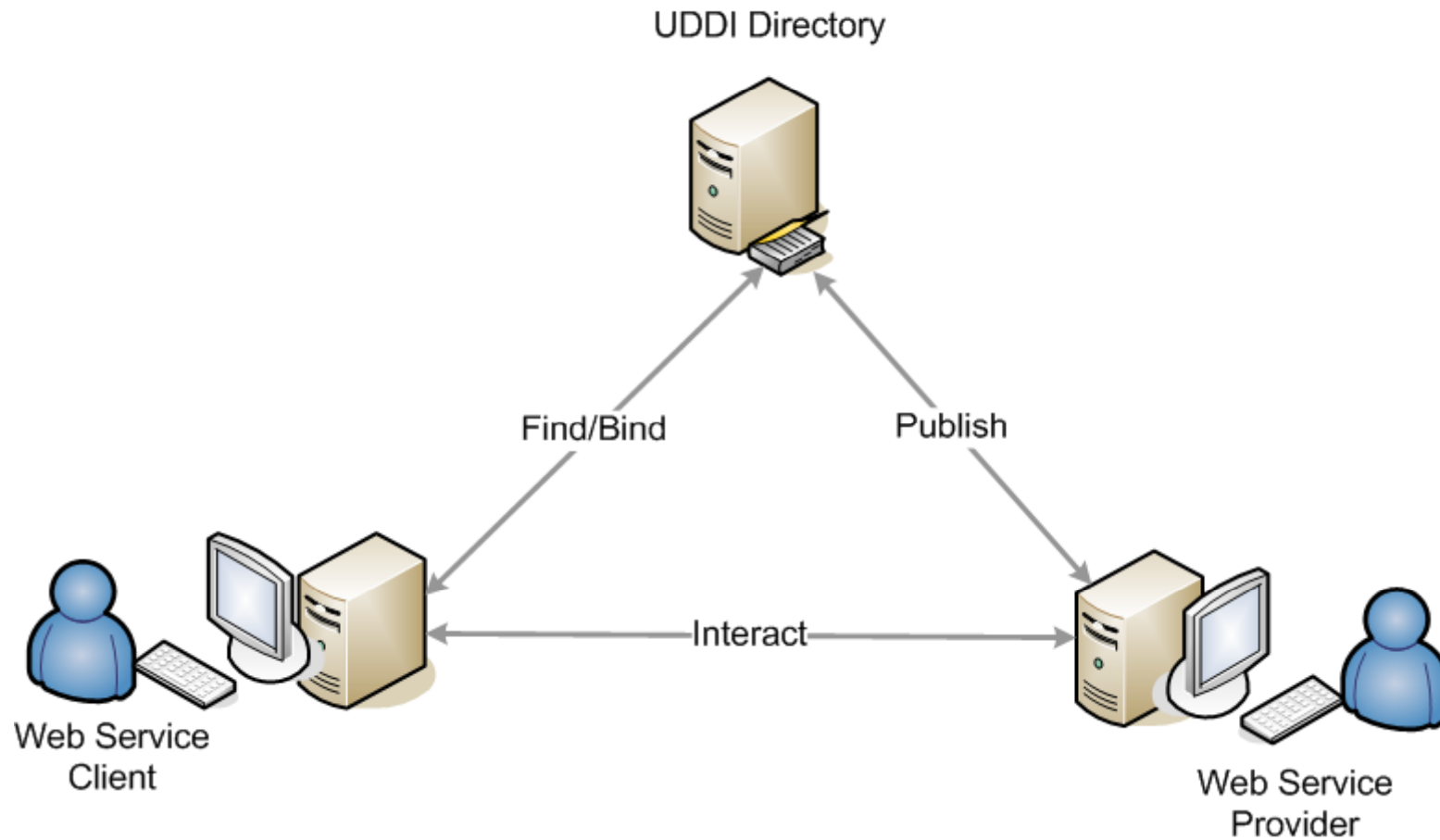
Web Services

1. Role of Standards
2. IOS-Standards
3. Excursus
4. EAI

- One possibility to instantiate SOA
- Loose coupling (between interface and service description)
- Reusable
- Set of standards (UDDI, WSDL, SOAP,...)
- Interaction with XML-messages
- Transaction protocol independent

Web Service Architecture

1. Role of Standards
2. IOS-Standards
3. Excursus
4. EAI



1. Role of Standards
2. IOS-Standards
3. Excursus
4. EAI

Web Services – SOAP - WSDL

- SOAP:
 - „Simple Object Access Protocol“
 - XML-document
 - Describes a method invocation
 - Transmitted over http, smtp, ftp

- WSDL:
 - „Web Service Description Language“
 - Describes a method invocation
 - Format of input and output data
 - Operations the service supports
 - Protocol the service communicates with

1. Role of Standards
2. IOS-Standards
3. Excursus
4. EAI

Web Services - UDDI

- „Universal Description, Discovery and Integration“
- Registry incorporating:
 - White Pages (information about an organization)
 - Green Pages (describing services offered by an organization)
 - Yellow Pages (categorizing organizations)
- Operations:
 - Save/find business
 - Save/find service
 - Save/find binding
 - Save/find tModel

- Benefits:
 - Programming language independent
 - Open standards
 - Addressing, configuration and integration at runtime
 - Supports synchronous and asynchronous communication
 - Loose application coupling
 - Independent application evolution
 - EAI-non-intrusive integration
 - „Component wars“ and „Languages wars“ do not affect interoperability
 - All vendors are pushing for web services
 - Some interoperability
 - Standardisation of integration technologies
 - Convenience APIs and tools

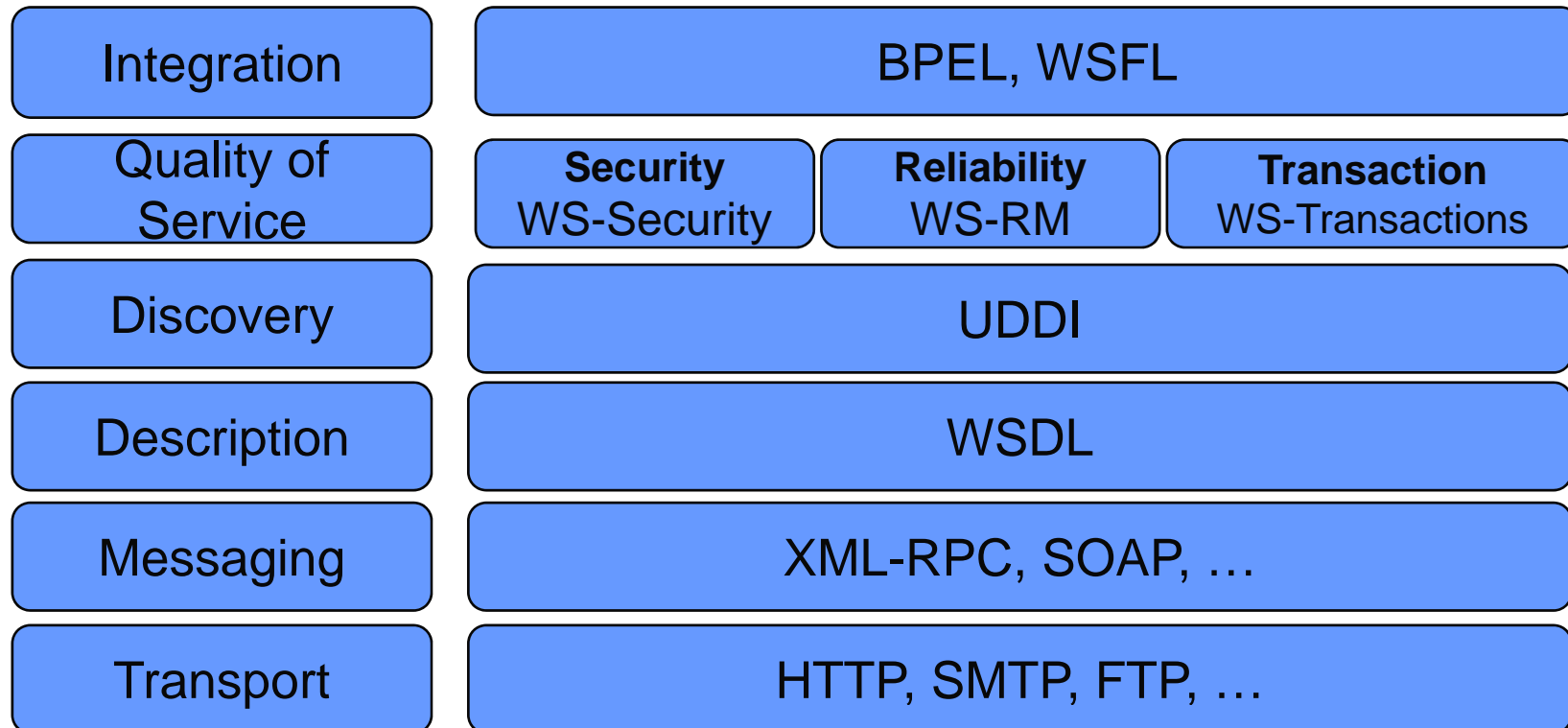
Web Services

1. Role of Standards
2. IOS-Standards
3. Excursus
4. EAI

- Problems:
 - Security
 - Transaction management (ACID)
 - Performance

Web Services – Protocol Stack

1. Role of Standards
2. IOS-Standards
3. Excursus
4. EAI



Business Process Execution Language (BPEL)

1. Role of Standards
2. IOS-Standards
3. Excursus
4. EAI

- Idea:
 - Usage of Web Services as interface to all functionality
 - Composition of WS to new business process WS
 - Easy language, easy adulteration
- =>BPEL (Business Process Execution Language)
 - Programming language
 - Invoking of other WS
 - Provides WS
 - Branching/loops
 - Error handling

Business Process Execution Language (BPEL)

1. Role of Standards
2. IOS-Standards
3. Excursus
4. EAI

- Orchestration



- BPEL Engine:
 - Responsible for execution
 - Handles access to other WS
 - Provides WS

- Hesser, Inklaar (1997) An Introduction to Standards and Standardization.
- Berlecon Research (2003) E-Business-Standards in Deutschland.
- Rahm, Vossen (2003) Web & Datenbanken
- Linthicum, D. S.: Enterprise Application Integration. Reading, Mass. (Addison Wesley) 1999.
- Pinkston, J.: The Ins and Outs of Integration, in: EAI Journal August 2001, pp. 48-52.

Contact

Stefan Schellhammer

stsc@wi.uni-muenster.de

0251 83-38 124

Raum 313

Universität Münster
Institut für Wirtschaftsinformatik

Lehrstuhl für Wirtschaftsinformatik und
Interorganisationssysteme (IOS)
Prof. Dr. Stefan Klein
Leonardo-Campus 3
D-48149 Münster

Tel.: +49 (251) 8338-110

Fax: +49 (251) 8338-119

<http://www.wi-ios.de>