B2B eContract Handling – A Survey of Projects, Papers and Standards

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Abstract

The rapid development of IT gives rise to changes in many industries and different spheres of life. It simplifies and speeds up processes and data processing. As a result, it changes the processes and the data involved in them. The area of commerce and contracting in particular undergoes similar changes. The new developments aim at speeding up, facilitating and globalizing the process of contracting. This inevitably leads to new contracting processes and changes the standard approach for contracting. This report presents a survey of the research, development, and standardization efforts in the area of business-to-business e-contracting. The report is divided into three parts. The first part presents a multi-dimensional contracting framework. The second part reviews current standardization processes and developments in the e-commerce field. The third part provides summaries and comments on a selected set of papers on e-contracting. Depending on their goals, focus and content, the papers are categorized in accordance with the contract cycle phases described in one of the dimensions of the contracting framework. Where appropriate, the content of the papers is related to the dimensions of the contracting framework. This report further provides an acronym list of the most common abbreviations in e-commerce terminology.

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1. Introduction

The goal of this report is to present an overview of the state of the art of electronic contracting in the business-to-business area. It presents some aspects of the electronic contracting, the standardization efforts as well as a selection of publications on this topic. This report is intended for a broad audience, presenting the content in a way accessible for both people from the Information Technology field and from the Business field.
This section introduces first the concept of electronic contracts. Next, the structure of this report is presented.

1.1 Electronic contracts in B2B scenarios

Since long, business organizations have been interacting in business-to-business (B2B) scenarios to reach their goals. The nature of the interaction varies to a high degree: organizations exchange information or products, they perform processes on each other's behalf, they engage in long-term relationships, etc. Traditionally, the interaction has mainly been based on manual processes. The advent of information and communication technology, however, has changed the nature of interaction. The proper use of digital means allows organizations to increase both the effectiveness and efficiency of their interaction and consequently improve their business goals.
Mostly, the interaction between organizations has to be formalized to make clear to all parties which rights and obligations exist in the collaboration supported by the interaction. Formalization usually takes the form of a contract that specifies the parties engaging in the collaboration, the goods, services or funds exchanged between parties, and details about the way this exchange takes place. Contracts can have different forms, ranging from simple contracts used to buy a product to complex contracts defining a complex interaction between parties. Until now, most contracts have had a 'paper appearance' and have been handled mainly manually.
The use of electronic contracts with automated support for their handling allows an increase of effectiveness and efficiency in contract processing. As contract handling is one of the elements in the interaction between organizations as outlined above, the use of electronic contracts can thus improve the overall interaction between organizations. Further, the use of electronic contracts can open new possibilities for interaction between parties that were not possible using manual processes and paper contracts. This is caused by several facts. Processing of electronic contracts can be much faster and cheaper than processing traditional contracts, allowing collaborations in which the use of paper contracts would be prohibitive. Processing of electronic contracts is also much less hindered by time and place constraints, thus supporting interactions between organizations that are far apart.
Electronic contract handling can thus change the way organizations interact in existing B2B scenarios and can be the basis for new interactions. This topic has consequently raised substantial interest in both the industrial and academic communities.

1.2 Structure of this report

The report consists of three parts:

1. A framework for e-contracting
2. Projects and standardization efforts on e-contracting
3. Papers on e-contracting

The first part provides a framework for electronic contracting. Several dimensions that are found important for e-contracting are investigated and briefly explained.
The second part is an overview of the current state in the process of standardization of e-commerce components and electronic contracting in particular. The goal of the overview is to present a short introduction to and to provide a classification of some of the current standardization efforts and the consortiums being leaders in these efforts.
The third part presents summaries of an extensive collection of research papers related to electronic contract handling. The papers are grouped according to their domain. A domain is considered to be a group of people (team) that work together on a given topic. Thus usually papers from one domain originate from one university or a research center. The papers from one domain are ordered according to the time of their publishing (the first discussed paper is the first one published in this domain). Thus, this part can be considered as the academic approach to research and development of electronic contract handling.
Note that this report does not claim completeness. Rather, it tries to give a representative overview of the field. This document does not cover most of the technical aspects implied in the projects.

2. Contract Framework

There are many aspects of electronic contracting. The purpose of the contract framework presented below is to provide a structured view of the contracts and the processes associated with them, by investigating six dimensions that are found fundamental for e-contracting (see Fig.1). Depending on their goals, the papers presented in Chapter 4 concentrate on some or on all of these dimensions.

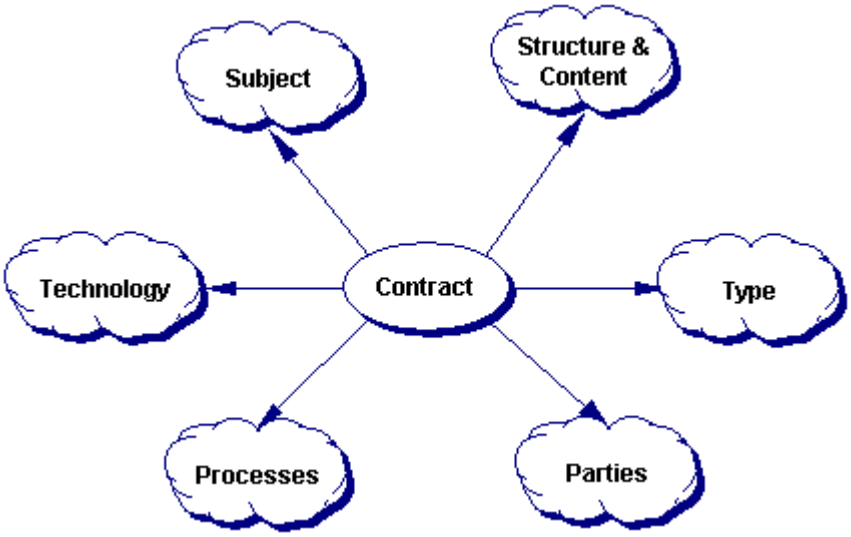


Figure 1: Contract framework

Each of these dimensions is briefly described below. Where appropriate references are listed to papers that explore some of the aspects of the dimension.

2.1 Contract subject

The contract subject is the core component of the contract. It is the starting point for finding possible partners. We distinguish between three types of contracts regarding the subject of agreement:

- Service contract - the subject of the offer is one or more services.
- Product contract - the subject of the offer is one or more products. Often in such offers a service is implicitly present e.g. a delivery service, insurance, etc. However, the offer's main subject is the product.
- Hybrid contract - the subject of the offer is a combination of a product and a service.

2.1.1 Products vs. Services contracts

The trade area has been an area of standardization efforts for years. This resulted in the UN Layout Key, accompanied by many standardized codes [22, 26, 33].
The results achieved so far are in the sphere of products (in this report the terms *products* and *goods* are used in one common meaning). Seven stages of a trade transaction of goods have been identified, from the contract negotiation stage to the final payment of the goods (see Fig.2). Additionally a Harmonized Commodity Description and Coding System for the coding of goods and commodities [27] was elaborated to facilitate the standardization processes and its transition to the electronic format.

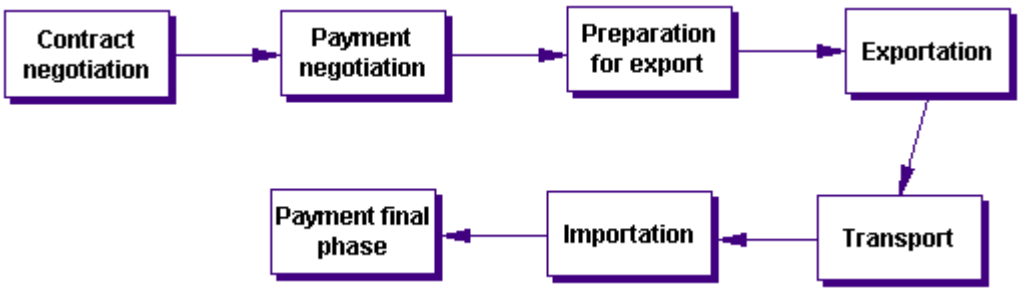


Figure 2: Stages of a trade transaction

All such attempts on the service area still are very incomplete and not standardized. One obvious reason for this is the large diversity of services and the inability to structure them as well as the processes accompanying them and their contracting.

2.2 Content and Structure

Considering their goals, e-contracts cannot be obtained by simply mapping paper contracts to e-contracts. Changes in the contract content and structure are needed. The next paragraphs investigate these two aspects in e-contracting.

2.2.1 Contract content

The contract content varies significantly from business-to-business (B2B) contracts to business-to-consumer (B2C) contracts. Usually the B2B contract content can be completely free, not subject to any rules unless it follows any standards or agreements (see 2.1.1). Its only purpose is to be used as a written proof of the expressed will of the parties. This free and unstructured form of the content of the B2B contracts is the major problem for the automated contract handling.
For this reason electronic contracts are usually extended with additional information that is not meant for human reading and carries some additional process information not

required by the legal issues involved in the contract. This additional information should help for the structuring of the contract content and for its easier machine processing.
Two possible solutions at this time exist. The electronic contract in some papers (e.g. [14,30]) is extended to Human readable form (natural language) plus additional Machine data (XML, other format, or XML convertible to other format). An alternative approach is the contract to be built only from machine-readable data and the natural language description to be missing or to be only optional [20].
Further on, a contract that is instantiated many times (e.g. between companies that have often trading relations) might have some fixed properties that are valid for every instance and some variable properties that are specified for every instance [20].

2.2.2 Structure

Creation of a standard contract structure has been the goal of many organizations and standardization efforts. This resulted in standardization of the product negotiation and contraction (see 2.1.1). XML seems to be the most common solution for e-contract and message structuring representation. The easy construction of XML documents and the simple processing and representation are very tempting for the developers. The common problem at this point is the lack of semantics in the XML document. A lot of standardization approaches on the use of XML as a contracting language are under development (see 3.2.3 Language specifications).
Several methods for structuring of the contract content and its reusability are discussed briefly in the next paragraphs.
Standard Contract Clauses (SCC). Usually contracts are built of many different clauses. SCC are those clauses that can be reused without changes for multiple contract instantiations.
Contract Templates (CT). CT are predefined contracts that can be used as a basis for the new contract instance. Contract Templates can define the contract structure, some standard contract objects (e.g. consumer's, provider's data, etc.) or clauses, the whole contract with some empty fields, etc. An important difference from SFC is that contract templates serve as a basis for further elaboration. They are not considered as the final result of the contracting process and can be restructured and renegotiated.
Standard Form Contracts (SFC). SFC are contracts that do not change (i.e. they are fixed) for every new instantiation**.** Such contracts are set by one party and are offered to the other party on an all-or-nothing basis. They are not subject to negotiation. SFC can be considered as fixed CT.
Partially Filled Contracts (PFC). PFC serve as templates with some of its data being preliminary filled (see [20]).

2.3 Type of Agreement

This dimension investigates the external conditions that influence the contractual process and the goals that are pursued when establishing a contract. These two factors affect the relations between the parties, the contracting process and hence the contract itself.

2.3.1 Open/Closed Relationships

Trading relationships can be either open or closed. Once established, closed relationships are usually easier to maintain and improve. EDI is just an example of how such closed relationships can be conducted. However, the modern business is global and companies are looking for new business relationships all the time. These relationships are usually expected to be very dynamic and quickly evolving. Thus the open relationships are now the challenge for ICT. A comparison of the two types by some of their features is given in table 1.

	OPEN	CLOSED
Level of Trust	**Low**	**High**
Number of Transactions	**Low**	**High**
Duration of Relationship	**Short**	**Long**
Level of Interdependence	**Low**	**High**
Level of Coordination	**Low**	**High**

Table 1: Open vs Closed relationships

The goal of most projects nowadays is to overcome the problems that result from the indicators stated above – low level of trust, low duration of relationship, etc. Electronic contracting must allow contracts between parties with no prior relationships to be established [28].

2.3.2 Umbrella Contracts

In some business relations a special type of contract is needed i.e. an **Umbrella Contract.** The Umbrella Contract is the main document, which contains terms, conditions, policies, etc. and is used as a general specification for future specific contract relations and contract instances. Each future contract instance must implement the umbrella contract terms and can add some additional, specific to this contract instance. Apparently, an instance of an Umbrella Contract can be seen as a PFC (see 2.2.2 Structure). Such an instance contains the terms from the umbrella contract, and hence it has to some extent a predefined structure and a partially filled content. The rest of the contract content is specific for the contract instance.

2.3.3 Asynchronous/Synchronous Contracting (time dimension in e-contracting)

Synchronous contracting procedures require both parties to be available at one and the same time. Generally, e-contracting must be *Asynchronous* in time [30]. This is just due to the geographical distribution of the process and the involvement of more than one company. Companies from locations with considerable time differences cannot be active at the same time or can be both active for few hours. A system that anticipates

synchronous procedures will lose some of the possible contractors. On the other hand it will profit from the parties' preferences to negotiate within the first 15 min. after the product decision by the buyer [18]. A possible solution to achieve synchronous contracting procedures is in the case of the "Computer as a legal person" (see 2.4.2, Human Participation).

2.4 Contract Parties

In this dimension the contracting parties are described, as well as the possible other participants in the contracting process. The human involvement in this process is discussed. Further on, the number and the topology of the contracting parties are investigated.

2.4.1 Nature of parties

Party entity – A party is considered to be a side in a contracting relationship. In the B2B case this usually is a company. Sometimes, several companies might establish a virtual enterprise that participates in the trading process as one party. In fact, both contracting parties might be virtual companies established by several companies. A party can be a product/service consumer, or a product/service supplier.
Still, a party in the B2B contracting is represented by a person that carries out the contracting process (see 2.4.2 Human participation). For this reason, it is necessary to pay a special attention to the user considered as a single entity.

Users – it must be taken into consideration that in B2B relationships users are usually businessmen or company staff, responsible for these activities. This imposes some requirements on the contracting system like:

- Simple and user friendly interface - being professionals in the business sphere, the users are not experts in the emerging Information Technologies. Thus the user interface can be complicated regarding the business issues and should be simple regarding the involved information technologies.
- The philosophy of one-run system of the preparation and fulfillment of the contractual process - i.e. a system should be with reduced to its minimum number of iterations of processes like data filling, data retrieval, etc. Regarding the user domain, a very complex system, with a lot of iterations can hardly be a successful one in supporting trade transactions.
- Pro-active dialogue - users should be fascinated in all possible ways.
- Fast and efficient system - businessmen always claim to be short of time (see 2.3.3 Time dimension).

It is still an open issue when a given person from a company has the authority to establish a contract (this issue is valid not only for e-contracts, but also generally for contracts). A suggestion on this topic is revealed in [2].

Intermediaries – the schema of two or more parties that establish contractual relationships (see 2.4.3 Number and topology of parties) can be extended. Different types of Intermediaries can be a part of the contracting process. Examples of such Intermediaries are:

- Standardizing bodies, providing contract templates, standard contracts, standard clauses etc.
- ASP e.g. brokers/matchmakers.
- Financial Intermediary/Escrow Managers
- Repositories/Registries, serving different purposes (e.g. contract archives)
- Certification Authorities
- Translators

The participation of intermediaries might result in the following sample schema (see Fig. 3):

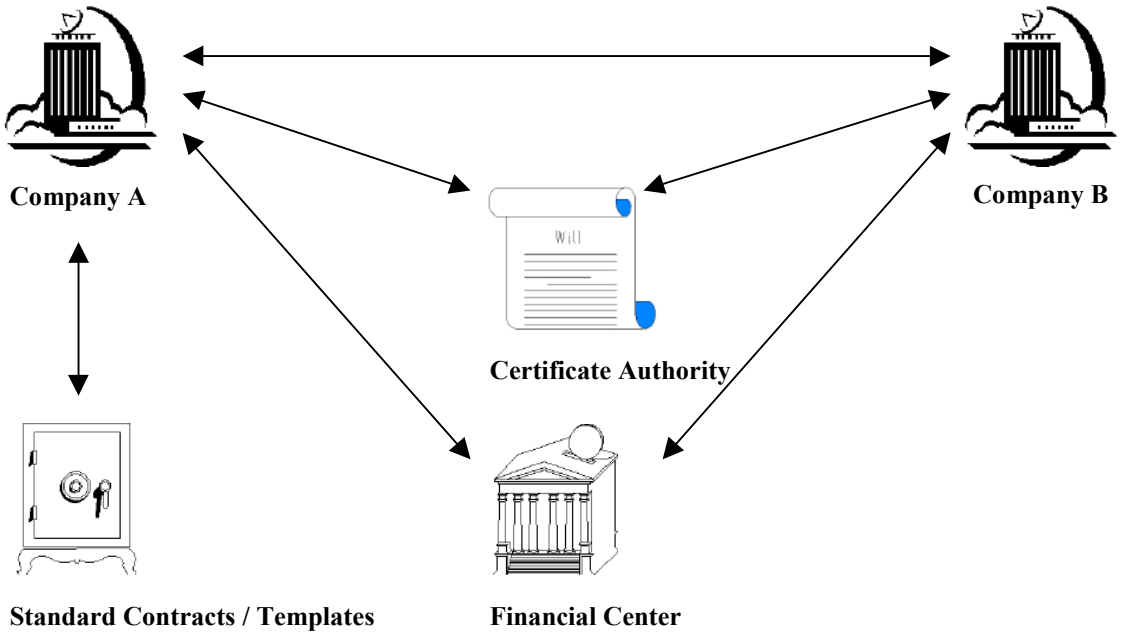


Figure 3: Intermediaries in contracting

Intermediaries are sometimes referred to as Third Parties. In this case the term "party" is not used in the sense of a contracting party.

2.4.2 Human participation

The participation of a human being in the contractual process is widely discussed. The most advanced systems aim to make the whole process automated and minimize the human participation as much as possible. However, software agents still cannot sign legal contracts. And something that should not be neglected is the users' preference to

negotiate by themselves at this stage of technology development [18]. Several approaches are possible according to [24]:

Computer as a legal person - the computer can act as a human during the contractual process. This implies that all his acts are legally binding the party, represented by this automating process.

Computer as a machine

- the agreement is computer generated but the human is still involved and has at least to sign the contract
- human participation is involved on every stage of the contracting process
- the computer is a passive implement of the trader.

2.4.3 Number and topology of parties

A classification of the possible contracting situations follows. A less detailed classification of business scenarios is described in [41].

Standard (one-to-one) contracting – two parties establish a contract:

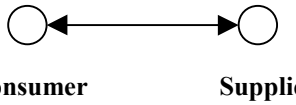


Figure 4: One-to-one contracting

The standard contract relations between two parties may undergo some variations:

Chain contracting/multiparty contracting – some contracts involve participation of several independent parties:

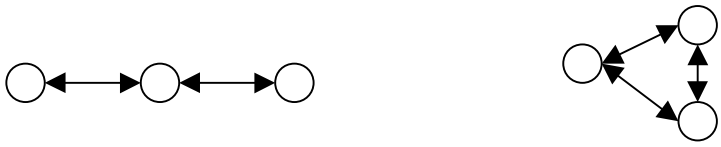


Figure 5: Chain contracting/multiparty contracting

Chain contracts involve more than two parties. A contract between two companies initiates the existence of sub-contracts in a chain-driven way. One of the parties requests a product or a service. Another party serves the request. In order to fulfill the contract, the

supplier establishes a contract with another, i.e. a third company (e.g. negotiates products for the manufacturing process). The existence of the primary contractual relationship is strongly dependent on the existence of the auxiliary contract. The auxiliary contract exists only if the primary one has been established. Due to these dependencies chain contracts are a special composition of the one-to-one contracts and can be treated as a separate class of contracts. An example of this contract situation is provided in [11] as a specification of a multiparty contract.
Multiparty contracts are similar to chain contracts. The difference is that there are relations between all the parties. An example of multiparty contracting is provided in [11].

One-to-many contracting – In the one-to-many case only one company is involved in several contractual processes, related explicitly or implicitly among each other (see Fig.6). All contracts serve one goal of the initiating company. In the general situation there is no major contract. The other participating companies view the process as a one-to-one situation.

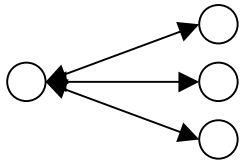


Figure 6: One-to-many contracting

Compound topologies
The listed topologies can be grouped and connected in different ways producing complex contract situations, e.g.:

> **Complex chain contracting –** this situation is a composition of chain contracting and one-to-many contracting (see Fig.7). In order to fulfill the request the serving company might need to conclude several parallel contracts.

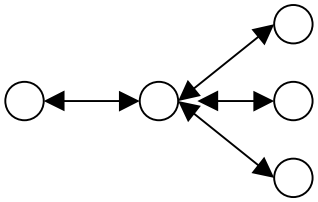


Figure 7: Complex chain contracting

Complex multiparty contracting – this situation is a composition of multiparty contracting and one-to-many contracting (see Fig. 8). An example of this scenario is provided in [30]. A more complex situation from the insurance domain is depicted in [20] (the same case description can be found in [43] as well).

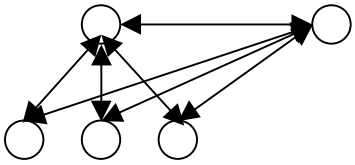


Figure 8: General contracting

2.5 Processes

The decomposition of the contracting process into phases and further on into underlying processes that build up these phases is an important step in the effort for contract automation. These processes need to be specified and structured, in order to be handled by the information technologies. The current efforts aim at identifying and modeling of the business processes and the exchanged messages during these processes.

2.5.1 Trading Phases

Most projects concentrate on different phases of the contracting process. An attempt to specify the trading phases in the trading relationship, based on [1,3,12] and extending these results (see Fig. 9) follows. The phases in this scheme can be considered as separate ones. The process can end at any of the phases before the contract is signed. However, based on the EM-RM [17] (see 4.2.3), each contract system should support the whole contracting process. A system that supports the whole contracting process will be able to use the data from the previous phases and the processes that were executed. A close interaction between the services supporting the separate phases is required [16,17].
Each of the papers described in this document has been classified according to the trading phases it has concentrated on.

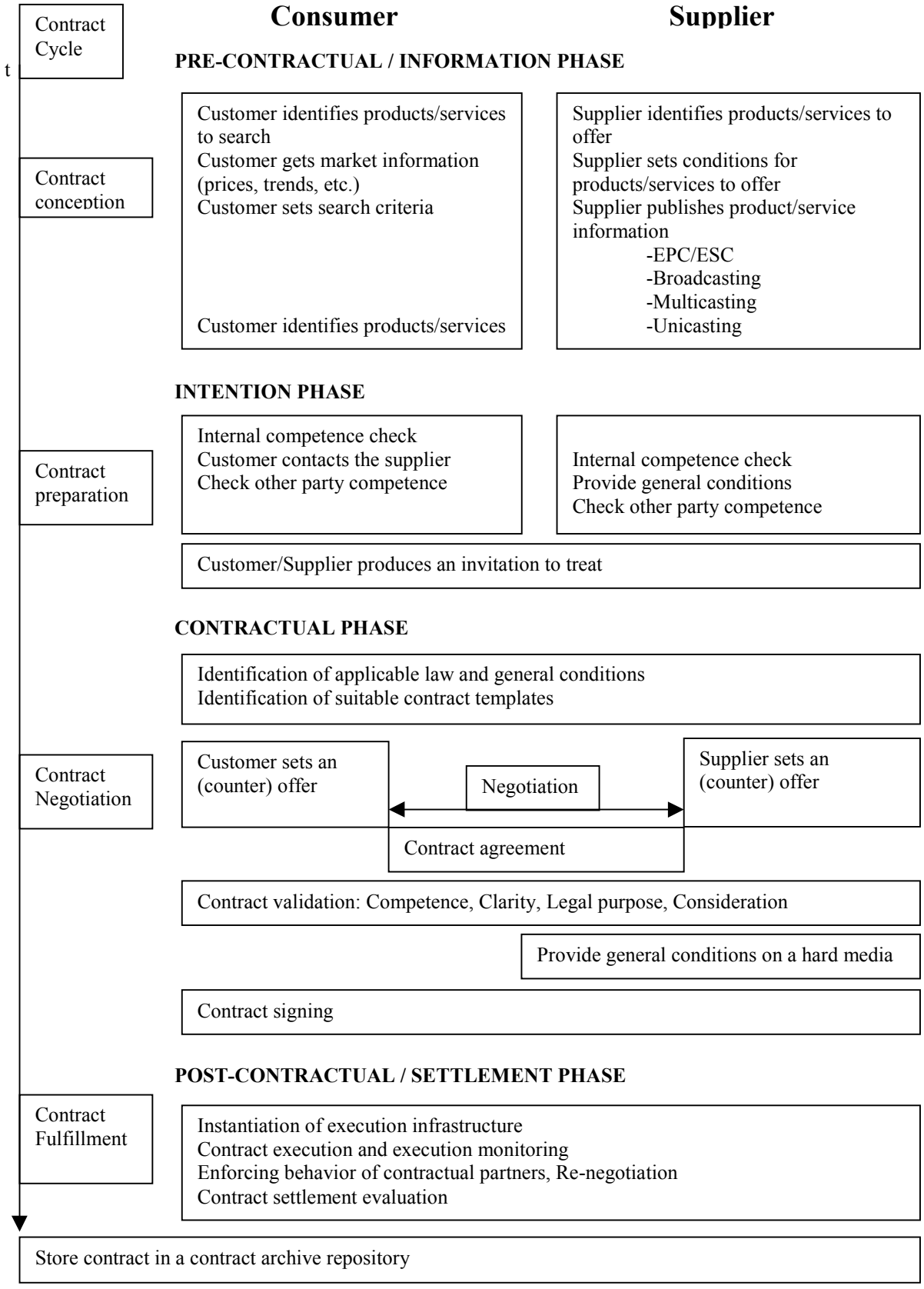


Figure 9: Contract cycle phases

2.5.2 Phases' sub-Processes

Each of the above phases can be inspected deeper. An example is the Delivery Cycle processes (see Fig. 10). An element of the Contract Fulfillment phase is "Contract execution and execution monitoring". The Delivery cycle process is one of the possible sub-processes that might comprise this element.

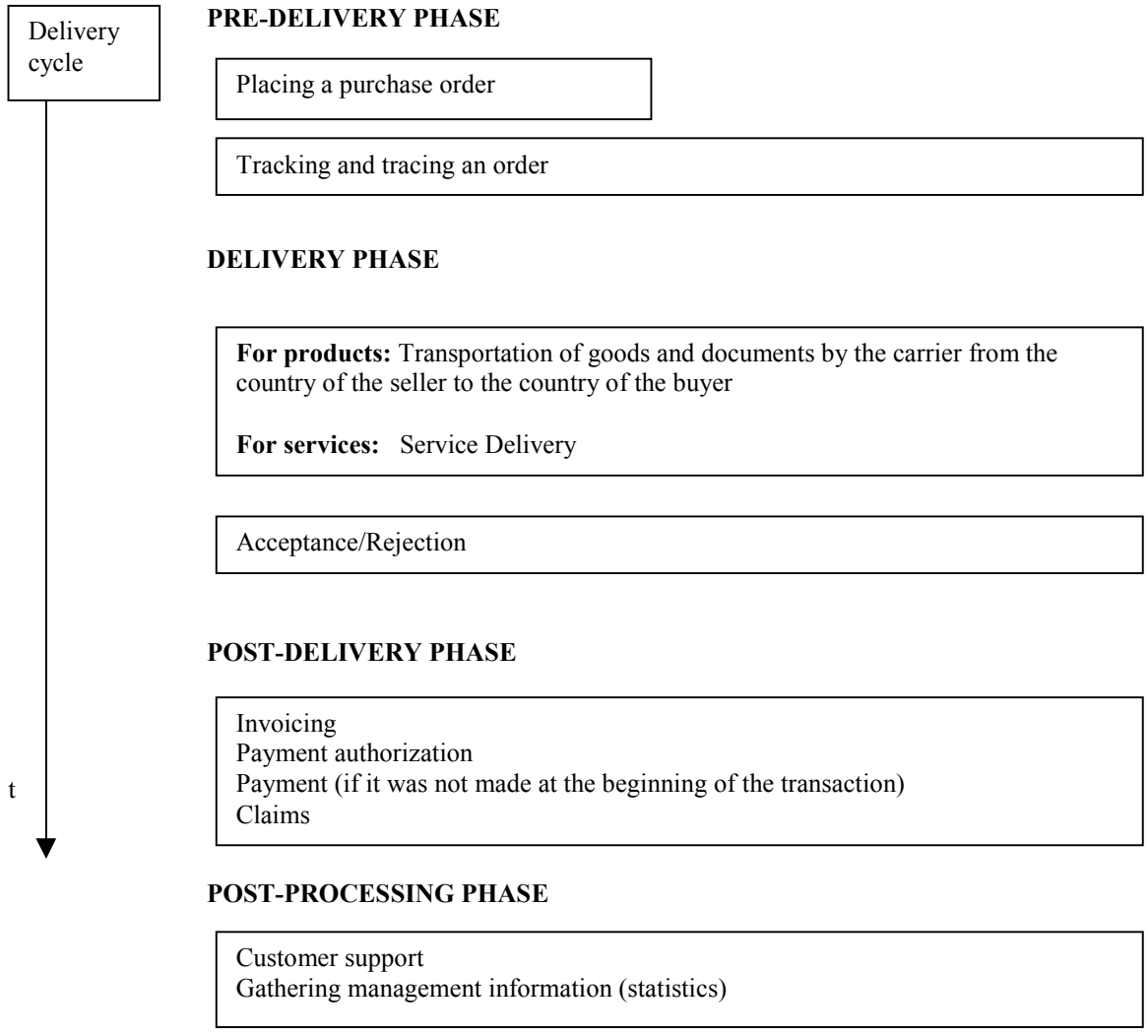


Figure 10: Delivery cycle phases

2.6 Technology support for contracting

Technology support for contract handling processes can be divided into two categories: general infrastructure support for these processes and dedicated support for the 'intelligent' process of negotiating and making contracts. Both categories are briefly discussed below.

2.6.1 Infrastructure support for e-contract handling

In discussing infrastructure support for e-contract handling, two aspects can be distinguished:

- **Data support aspect.** Clearly, electronic contracts and all information items related to them have to be stored in a proper way. Hence, data management technology is a key IT element in e-contract support. Data management technology can take the form of traditional relational database management systems or can be more advanced to cater for the semi-structured nature of contract data.

- **Process support aspect.** As discussed in this report, e-contract handling implies complex processes to be executed. Automated process support is therefore an important aspect in the advanced e-contract support. This support can be embedded in process handling systems, or can be treated in a more explicit manner in dedicated process support systems. In the latter approach, workflow management systems can come into play.

2.6.2 Automated support for contract making

The attempt to automate the process of negotiation and subsequent contract making has lead to two possible approaches:

- **Agent approach** – it is characterized by the use of agents in one or other form. Some systems use mobile agents, intelligent agents, etc. Agents can do a lot of "dirty" work thus saving time and other resources to the client (e.g. searching other markets, negotiating, etc.). The problems that emerge here are of two aspects. If the agents are not on the server this usually requires some preliminary work on the client side. This is strongly discarded by the users nowadays. Additionally, at this time it is not possible to teach the agents to negotiate in all contractual situations and on all aspects of contracting, as the people do now. This might lead in the future to a change of the style of negotiation.

- **Expert system approach** – this approach is considered as ineffective since did not achieve any significant results until now.

3. Standards

The goal of all current e-commerce developments is to automate the process of trading by means of Information Technology. A company should be able to establish trading relationships with any other company. Thus either all companies must be using one common trading system or standards must be established that will allow different systems to interoperate. It is not still clear yet whether one e-commerce system will prevail and will become dominant, though many attempts are made nowadays. However, if no one of them becomes dominant, without a common standard the interoperability between the separate systems seems to be hardly obtainable.
In this chapter the standardization processes and activities in the e-commerce area are described. In the first part of the chapter some general observations on the e-commerce standardization processes and their specificity are made. The second part lists some of the current, popular e-commerce standardization activities.

3.1 Standardization processes

There are several general profits (valid for the whole IT industry) from applying standards [25]: reduced uncertainty, reduced consumer lock-in, competition in the market versus competition for the market (i.e. companies are not making efforts for establishing new markets but for service development and improvement in one common market), etc. Currently, there are many initiatives that aim to set standards at different levels of the trading process (the so-called standard wars). In the standardization processes, different strategies are exercised. We can see large companies establishing consortia aiming to strengthen their positions on the market. IBM and Microsoft have joined their efforts proposing the UDDI (see 3.2.4), implementing the strategic rule "before engage in a standard battle form an alliance with your would-be rival"[25]. Many other initiatives are currently going on, hoping to set standards for some or for all trading aspects; hoping to gain advantage in the future developments and to retain limited control over this technology even when it becomes an open standard.

3.1.1 Formal standard setting

The UN Economic Commission has already provided several standards for contracting. This is an example of the so-called "formal standard setting". The common complaints about the formal standard setting process are that it is too slow, too political, does not use the best technology, etc. In the case of commerce, complaints are almost identical. However, as trading is considered as a very sensitive and easily disrupted sphere, this is the only one successful attempt till now. This approach has already some serious results e.g.:

- The UN/EDIFACT – an international standard, supported by trading companies in many countries. Several exchange messages were developed, most focused on transportation and finance. The first approved universal message was the invoice [33].

- UN LK– United Nations Layout Key [26] – a recommendation that establishes the document layout and the location of coded data entries of documents used in the international trade.

3.1.2 Business standardization approach

Usually the business standardization approach is reacting to the market demands and is concentrated on the market aspects and issues. The research done is oriented towards fast implementation and user accessibility. This inevitably leads to some lagging behind the future issues. Once adopted, such a standard usually shows some outdated features at the very moment of adoption.
Due to the global aspect of commerce, the private business companies and consortiums can issue proposals to state and international organizations. These proposals must be approved by several institutions (local and international).

3.1.3 Global standardization

Much of the investments in trade facilitation are done at the international level. By starting such investments globally, trade facilitation has the greatest impact but takes longer time to achieve. The return of the efforts, on the other hand, is received at national and company levels when the measures are implemented.
While usually such global standards are endangered if there is no long lasting sponsor, in this particular case the UN/CEFACT (United Nations Centre for Trade Facilitation and Electronic Business) can stand behind these standards and provide the necessary popularity, lawfulness and stability - factors that influence standardizing processes. UN/CEFACT, recommended by the TMWG (Techniques & Methodologies Working Group) can issue a successful standardization process in the e-commerce field. This standard might be based on one of the consortium initiatives. In fact UN/CEFACT might be the centralized and stable body that will establish, support and develop such a standard. UN/CEFACT has been monitoring Internet technology developments and in particular the evolution of XML. In order to put this in the context with other developments in electronic business, the UN/CEFACT Steering Group (CSG) requested the TMWG to review the XML development [32]. The TMWG recommended XML as an opportunity to electronic commerce. According to the TMWG, mature XML supported by appropriate standardization and development tools has an important place in electronic commerce. Business forms are closely related to and can result into contracts. UN/CEFACT believes that the starting point for consistency of commercial business forms on the web should be the use of the UN Layout Key. UN/CEFACT expects to be actively involved in the efforts of creating a single, global XML repository.
There is a vast amount of knowledgeable resources within UN/CEFACT that could be used. An attempt in this direction is the ebXML initiative described in the next chapter (see 3.2.4).

3.2 Standards Activities Classification

The classification that is provided below covers only a small set of the current activities. New initiatives and consortiums emerge and new standards are proposed. The goal of this chapter is to describe some of the current popular activities. The classification is not very precise, due to the fact that some initiatives governed by a consortium pretend to provide simultaneously an architecture, a language, a protocol, etc. In these cases only the consortiums are described, which can be used as a starting point for further investigations of their projects and developments. Another issue that makes this classification problematic is the vague definitions of the goals of the initiatives that mix up terms like architecture/framework and language/protocol.

3.2.1 Consortiums and Organizations

A list of some of the major consortiums and organizations in the area of e-commerce standardization and innovative solutions follows. This list depicts the organizations that stand behind some of the most popular initiatives and activities in this filled.

- **UN/CEFACT** is the United Nations body, which mandate covers worldwide policy and technical development in the area of trade facilitation and electronic business. Headquartered in Geneva, it has developed and promoted many solutions for the facilitation of global business processes including UN/EDIFACT, the international EDI standard. It strongly supports the development and implementation of open interoperable, global standards and specifications for electronic business.
  URL: www.unece.org/cefact

- **OASIS** is a non-profit, international consortium dedicated solely to product-independent data and content interchange. Focusing on product interoperability, OASIS embraces the complete spectrum of structured information standards including XML, SGML and CGM (standardizing the exchange of graphical information).
  URL: www.oasis-open.org
  URL: www.xml.org

- **RosettaNet** is a self-funded, non-profit organization. It is a consortium of major Information Technology, Electronic Components and Semiconductor Manufacturing companies working to create and implement industry-wide, open e-business process standards. These standards form a common e-business language, aligning processes between supply chain partners on a global basis. The intention is to agree on a common format, which would lead to the easier introduction of online ordering.
  URL: http://www.rosettanet.org

- **CommerceNet**. CommerceNet is a global non-profit organization that has been evolving to meet the needs of companies doing electronic commerce since 1994. This community of influential e-commerce decision-makers is over 600 members strong, with a focus on business-to-business e-commerce worldwide. The consortium runs many pilot programs to address technology issues with the aim of fostering development and acceptance of e-commerce. In an attempt to overcome potential problems of interoperability between different e-commerce implementations the Consortium has developed an object-oriented framework called eCo System.
  URL: CommerceNet http://www.commerce.net

- **The Mobey Forum** is a financial industry-driven forum, whose mission is to encourage the use of mobile technology in financial services. The formation of the Mobey Forum was publicly announced by the world-leading financial institutions and mobile equipment manufacturers on May 10, 2000.
  URL: http://www.mobeyforum.org

- **Digital Commerce Center** provides forums for business leaders, entrepreneurs, academics, technologists and media experts to understand and communicate critical issues in e-commerce. Digital Commerce Center contains research and resources in the areas of electronic commerce, Internet advertising, digital asset management, media convergence, organizational knowledge, small business advice, corporate education, and business financing.
  URL: http://www.ec2.edu/dccenter (EC2 is a business incubator and media research center focusing on the advancement of digital technologies)

- **Accredited Standards Committee (ASC) X12.** In 1979, the American National Standards Institute (ANSI) assigned ASC X12 to develop uniform standards for inter-industry electronic interchange of business transactions - electronic data interchange (EDI). Since then ASC X12 develops, maintains, interprets, publishes and promotes the proper use of American National and UN/EDIFACT International Electronic Data Interchange Standards.
  URL: http://www.x12.org

- **The Data Interchange Standards Association (DISA)** is a non-profit corporation that serves as the secretariat for ASC X12. It offers a variety of initiatives and extensive educational programs in e-commerce. In the international arena, DISA and ASC X12 serve as the entry point for the United States into the United Nations/Electronic Data Interchange for Administration, Commerce and Transport (UN/EDIFACT) process.
  URL: DISA http://www.disa.org

- **The XML/EDI Group.** This open and voluntary group was set up in July 1997. The group aims to establish standards for commercial electronic data

interchange that are open and accessible to all, and that delivers a broad spectrum of capabilities suitable to meet the business needs.
URL: http://www.xmledi-group.org

- **The Financial Services Technology Consortium (FSTC)** is a non-profit organization whose goal is to enhance the competitiveness of the United States financial services industry. Members of the consortium include banks, financial service providers, research laboratories, universities, technology companies, and government agencies. There are several current and under formation projects.
  URL: http://www.fstc.org

- **IETF - The Internet Engineering Task Force** is a self-organized group of people who make technical and other contributions to the engineering and evolution of the Internet and its technologies. Its mission includes identifying, and proposing solutions, pressing operational and technical problems in the Internet; specifying the development or usage of protocols and the near-term architecture; making recommendations to the Internet Engineering Steering Group (IESG) regarding the standardization of protocols and protocol usage in the Internet. The IETF is not a traditional standards organization, although many specifications that become standards are produced.
  URL: http://www.ietf.org

- **Open Buying on the Internet (OBI) Consortium** is a non-profit organization dedicated to developing open standards for business-to-business e-commerce. The OBI Consortium is an independent organization managed by CommerceNet. The OBI standard's goal is to identify specific steps in the existing purchasing process, and provides standard communication elements. Steps already addressed by OBI standards are order request, purchase order, purchase order acknowledgment, order status. Work in progress is invoice, payments and services.
  URL: OBI Consortium http://www.openbuy.org

3.2.2 Protocols

A list of suggested protocol standards in the e-commerce area follows. The significance of a single protocol standard to e-contracting is not very high due to the fact that e-contracting standardization needs more than a single protocol definition [45].

- **Internet Open Trading Protocol (IOTP).** The Internet Open Trading Protocol is an interoperable framework for Internet commerce. It is optimized for open relationships. It can encapsulate and support payment systems such as SET, Mondex, secure channel card payment, GeldKarte, etc. IOTP handles cases where merchant roles as the shopping site, the payment handler, the

deliverer of goods or services, and the provider of customer support are performed by different Internet sites.
URL: http://www.otp.org
Contract significance: Medium

- **Financial Products Markup Language (FpML).** FpML is a protocol that aims to enable e-commerce activities in the field of financial derivatives. It will allow for the electronic integration of a range of services, from electronic trading and confirmations to portfolio specification for risk analysis. FpML is based on XML. JP Morgan, PricewaterhouseCoopers and 28 other companies participate in the development and support of the FpML.
  URL: http://www.fpml.org
  Contract significance: Low

- **The Joint Electronic Payment Initiative (JEPI).** The project is run by CommerceNet and the W3C. It aims to develop a negotiation protocol where a customer's online wallet "negotiates" an acceptable payment mechanism with the merchant terminal.
  URL: CommerceNet http://www.commerce.net
  URL: JEPI white paper http://www.w3.org/pub/WWW/Payments/white-paper.html
  Contract significance: Low

- **Information and Content Exchange (ICE) Protocol.** ICE, using XML, facilitates the controlled exchange and management of electronic assets between networked partners and affiliates. Applications based on ICE allow companies to easily construct syndicated publishing networks, web superstores, and online reseller channels by establishing website-to-website information networks. The following companies have working examples and implementations of ICE: Vignette Syndication Server, Kinecta Interact, Microsoft BizTalk, Xenosys JICE, Macromedia Aria/LikeMinds, Intershop Enfinity, Quark avenue.quark, ArcadiaOne eSyndication.
  URL: http://www.w3.org/TR/NOTE-ice
  URL: ICE http://www.icestandard.org
  Contract significance: Low

- **Simple Object Access Protocol (SOAP).** SOAP is a protocol for exchange of structured and typed information in a decentralized, distributed environment. SOAP is an XML-based protocol. SOAP can potentially be used in combination with a variety of other protocols. Microsoft, IBM and Lotus participate in the development of this initiative.
  URL http://www.w3.org/TR/SOAP
  Contract significance: High

3.2.3 Language specifications

A list of language specifications follows. The variety of language specifications is very high. The reason for this is that it is usually the first step towards providing a protocol and architecture that will support it.

- **E-commerce Modeling Language (ECML).** GlobeID, an e-commerce vendor, claims to have performed the "world's first secure Internet purchases using the Electronic Commerce Modeling Language (ECML) standard". The ECML format announced in early June 1999 by a consortium of technology companies, including AOL, IBM, Microsoft, Compaq, CyberCash, along with Visa, MasterCard and American Express, should enable "real-time Internet transaction applications". ECML is essentially a set of XML tags that merchants will be asked to use on their merchant servers to make form completion easier. This approach should ensure interoperability with other modules in the e-commerce chain, enabling the automation of information exchange between customer and merchant.
  URL: http://www.globeid.com
  Contract significance: Low

- **Trading Partner Agreement Markup Language (tpaML).** IBM has submitted a specification for defining and implementing electronic contracts to OASIS. Based on XML, the tpaML enables companies to automate business-to-business (B2B) transactions, by defining how trading partners interact. The foundation of tpaML is the Trading Partner Agreement (TPA). A TPA is an electronic contract that uses XML to set the general contract terms and conditions, participant roles, communication and security protocols, and business processes (see [42]).
  URL: http://www.ibm.com/software/developer/library/tpaml.html
  Contract significance: High

- **xCBL.** The Commerce One **XML Common Business Library** is a set of XML building blocks and a document framework that allows the creation of XML documents for electronic commerce. The intention is that people can use not only the predefined business documents but can also build their own documents out of the component library. The goal is to be achieved interoperability between applications, thus allowing businesses everywhere to easily exchange documents. xCBL is released in three different schema languages: Microsoft's XML Data Reduced (XDR); the World Wide Web Consortium's (W3C) XML Schema Definition Language (XSDL); Commerce One's Schema for Object-oriented XML (SOX). According to the press release, the specification has been endorsed by Microsoft's BizTalk initiative, OASIS, the UN/CEFACT Techniques and Methodologies Working Group, and CommerceNet and its eCo Framework Project and Working Group.
  URL: http://www.commerceone.com, http://www.xcbl.org
  Contract significance: High

- **eBIS-XML.** The UK's Business Application Software Developers' Association **(BASDA)** is running its eBIS-XML initiative. BASDA eBIS-XML standard pretends to be the world's first many-to-many e-commerce standard, which allows orders and invoices to be exchanged directly between different accounting applications. If the receiving company is not using a BASDA eBIS-XML enabled application, the message can be simply treated like an ordinary e-mail. According to BASDA, it is also working with a number of UK Government departments in the UK GovTalk initiative helping to define XML interfaces for the electronic submission of personal tax forms.
  URL: http://www.basda.org, http://www.ebis-xml.org
  Contract significance: Low

3.2.4 Frameworks

A list of proposed e-commerce frameworks follows. They contain elements like modelling methods, supporting tools, standards, software and system architectures etc. They should be all regarded of high importance to the e-contracting, because an e-commerce framework includes contracting as one of its major modules.

- **ebXML**. The United Nations body for Trade Facilitation and Electronic Business (UN/CEFACT) and the Organization for the Advancement of Structured Information Standards (OASIS), have joined forces to initiate a worldwide project to standardize XML business specifications. UN/CEFACT and OASIS have established the Electronic Business XML initiative to develop a technical framework that will enable XML to be utilized in a consistent manner for the exchange of all electronic business data. Industry groups currently working on XML specifications have been invited to participate in the 18-month project. A primary objective of ebXML is to lower the barrier of entry to electronic business in order to facilitate trade, particularly with respect to small- and medium-sized enterprises (SMEs) and developing nations. The first ebXML Initiative Technical Specifications has been released for public comment. The ebXML Requirements Specification defines specific technical infrastructure requirements.
  URL: ebXML http://www.ebxml.org
  URL: UN/CEFACT http://www.uncefact.org
  URL: OASIS http://www.oasis-open.org
  Contract significance: High

- **BizTalk.** Microsoft has released the BizTalk Framework. BizTalk is an industry initiative started by Microsoft and supported by a wide range of organizations, from technology vendors like SAP, CommerceOne, and Ariba to technology users like BASDA. It includes a design framework for implementing an XML schema and a set of XML tags used in messages sent between applications. It assumes that applications are distinct entities, and

application integration takes place using a loosely coupled approach to pass messages. The two applications simply need to be able to format, transmit, receive and process a standardized XML message. Through the BizTalk web site one can locate, manage, learn, share information about and publish XML, XSL and information models and business processes supported by applications that support the BizTalk Framework.
URL: http://www.biztalk.org
Contract significance: High

- **The UDDI (Universal Description, Discovery and Integration)** initiative aims at enabling businesses to discover each other, and define how they interact over the internet and share information in a global registry architecture. UDDI aims as well to enable businesses to invoke services over the Internet, providing additional value to their preferred customers. Expanding offerings, extending market reach, increasing access to current customers are some of the immediate benefits expected from UDDI. The UDDI project takes advantage of W3C and Internet Engineering Task Force (IETF) standards and the early versions of SOAP. Ariba, IBM, and Microsoft work together on this initiative. It is planned in time, the UDDI project to turn into a standards organization.
  URL: http://www-3.ibm.com/services/uddi/faq.html, http://www.uddi.org
  Contract significance: High

- **eCo Framework** is a CommerceNet project that focuses on the integration of three e-commerce services. These services are: an integration of multiple database types with multiple data constructs and data libraries; trusted open registries; and agent-mediated buying. The intent is that these core services will provide interoperability between many commerce services and will serve as a foundation to operate web based trading communities.
  URL: http://eco.commerce.net
  Contract significance: Medium

4. Papers[1]

This chapter presents abstracts of an extensive collection of papers that use electronic contracts. The papers are grouped in domains. Each sub-chapter presents the papers published from one domain. The following domains are investigated: Qeensland University, University of St. Gallen, Twente University, IBM Research Division - T.J. Watson Research Center, Erasmus University, University of Hamburg & University of Évora, University of California, University of Toronto, Washington University, Emporia State University, University of Texas.

4.1 Qeensland University

The following papers from this domain are discussed:

- Electronic Commerce on the Internet: What is Still Missing?
- Inter-enterprise Contract Architecture for Open Distributed Systems: Security Requirements
- Business Contracts for B2B

4.1.1 Electronic commerce on the Internet: What is still missing? [1]

By Zoran Milosevic, Andy Bond
Focus: Contractual Phase

This is the first of a series of three papers. In this paper as well as in [3] (see 4.1.3) are presented results, which are used in the work of other domains as well [9,13]. This paper contains ideas that undergo some development in [3] and for this reason some more details will be revealed there.

The paper starts with the identification of the term "contract domain". Legislative bodies are valid in a certain region. They place restrictions on the contracts that are to be made in their boundaries. These boundaries define the contract domain. The domain can be defined on a regional basis, on an industry specific field of trade, etc.

Further on, the authors suggest a contract template, which can be used as a base for the contractual procedure. It should contain the roles of the parties, the period of the contract, the nature of consideration (the obligations of each party to give something to each other), the obligations associated with each role and the domain of the contract. In this way, the Contract Template contains semantics about the business contract. Different semantics can represent different scenarios. It is noted that certain relations between contracts can be observed.

[1] A text extracted from the papers is used sometimes for the description of the projects. Figures used as illustrations to the projects are also published in these papers.

The contract validity is established through the identification of some mandatory elements. Usually they include an agreement part, considerations and competence (ensuring that parties entering into the contract are lawfully capable of agreeing to contracts). Finally the legal purpose of the contract must be established. Contract validation is not needed at each contractual procedure. Once a contract is validated it can be stored in a notary.

Contract monitoring is the process of observing the activities of the company and tracking these activities not to violate the contract. Monitoring can be performed by the parties or by a third party acting on behalf of one or all the parties. This process can be performed continuously during the contract execution or can occur from time to time.
In case that one of the parties breaks the contract conditions, contract enforcement can take place. It can be achieved in several ways:

- Requiring future contract conformance
- Requiring corrective processes
- Demanding compensations
- Terminating the contract

Based on this observations the authors propose a schema for the contract cycle (see Fig.11).

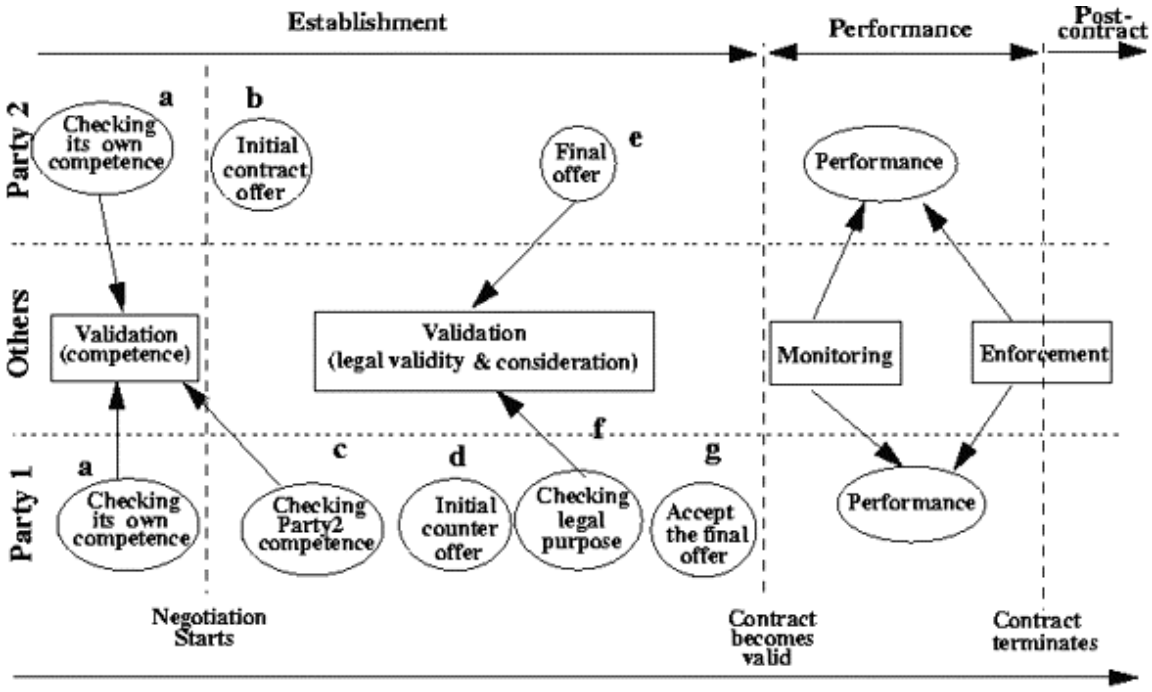


Figure 11: Contract cycle [1]

The "Information phase" described in 2.5 is missing in this scheme. Before the "Negotiation phase" is the "Check own competence" phase, the existence of which resembles the real world scenarios. The process of establishing its own and the other

company competency is omitted in the work of other domains. The schema assumes in an implicit way the participation of third parties (mentioned as “Others”).

The described phases result in several roles and components that form the contractual architecture (see Fig.12).

The rules and policies specific for a given contract domain are stored in a Legal Rules Repository. A separate repository for the templates is described as well. In the repository will be stored contract element types as well as different types of contracts. It should provide also operations for the manipulation of contract templates.
The Contract Validator (CV) performs the contract validity checking procedures. The Contract Negotiator (CN) component supports the contract negotiation. Contract negotiation starts from a contract template that is further on refined by the parties (by selection of contract subtypes and actualization of contract element types) to a mutually agreed contract. The Contract Legality (CL) object is responsible for the checking of the legal purpose of the contract. The Contract Monitoring (CM) object is used for the support of the contract monitoring. The CM has three major roles: to monitor the party activities, to record and measure actions and performance, to deal with non-performance parties. In case of improper behavior the CM informs the Contract Enforcer (CE) component. The contract enforcement can be done in three ways: pro-actively – through constraints provided in the contract; reactively – via auxiliary components; post-contractually – by constraining future activities of that company in this domain. The Contract Arbitrator (CA) has the role to evaluate the parties’ behavior and to act as a trusted third party.

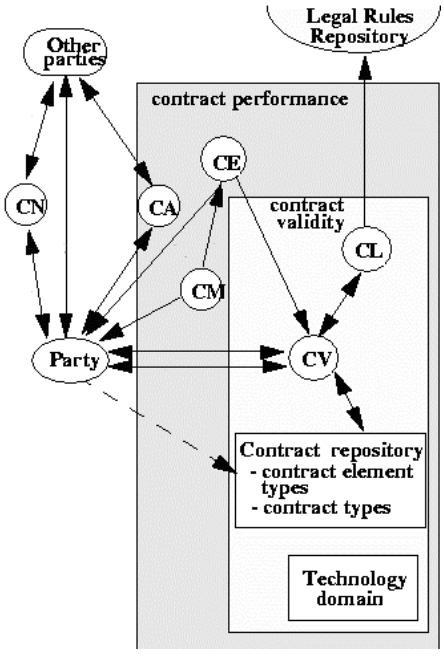


Figure 12: Contract architecture [1]

4.1.2 Inter-enterprise contract architecture for open distributed systems: security requirements [2]

By Z.Milosevic, D.Arnold, L.O'Connor
Focus: Competence (element of Intention and Contractual Phases)

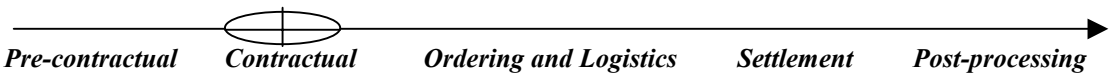
This paper focuses mainly on the security requirements when building an open distributed system for contracts. Special attention is paid to the competence element. This is essentially the problem of determining if a given person has the authority to establish a contract. The proposal is to base competence on a notion of roles, which reflect the structure of a company, e.g. CEO, presidents, managers, and administrators. As is common practice, a person can proceed with a request if the permission is obtained from some collections of the superiors such as 3 managers or 2 state managers, or simply the permission of the CEO. Digital signatures and roles are used to implement competence that can be verified by people within a company and by those negotiating with the company.

4.1.3 Business Contracts for B2B [3]

By Andrew Goodchild, Charles Herring, Zoran Milosevic
Focus: Contractual Phase

This paper aims at the specification and implementation of business contracts needed for Business-to-Business (B2B) EC. The focus of this paper is on the contractual phase.

B2B Phases according to the authors:



Mandatory contract elements according to the authors:
Similar to [1], each valid business contract must contain four elements i.e. agreement, consideration, capacity, legal purpose. These elements result in clauses that cover items like Parties, Definition and interpretation of terms, Jurisdiction, etc. (see Fig.13). Thus they form a contract. In the appendix of [3] an example of such a contract is listed.

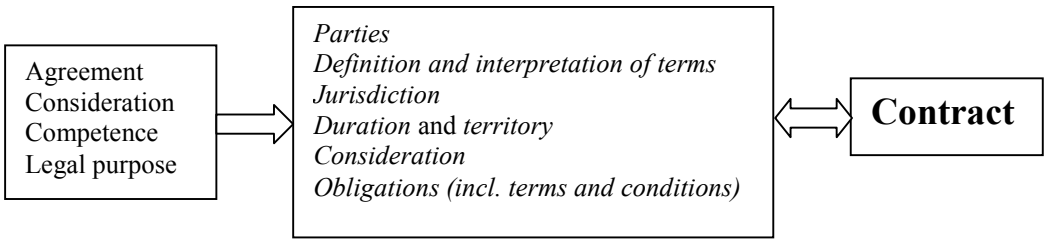


Figure 13: Contract structure and content [3]

The authors propose several ideas about contract templates, broadening the vision about contract templates described in [1]. A standard contract is taken to become the base for the final contract. It can be provided by one of the parties (e.g. the seller), a third party or a commercial organization that will be providing general–purpose contracts for different business scenarios. Some contracts can include standard contract clauses outlined by universities or government institutions (e.g. INCOTERMS provided by UN/CEFACT, [35]).
Similar to [1] six basic roles, needed to support typical operations associated with contract establishment, monitoring and enforcement are identified. The Contract Repository (CR) is needed to store standard form contracts and standard contract clauses. In this paper it unifies the Legal Rules Repository and the Template Repository from [1]. The Notary is used to store signed instances of standard form contracts, which can be used later as evidence of agreement in contract monitoring and enforcement activities (a limited role of the CA from [1]). The Contract Monitor (CM) and the Contract Validator (CV) serve the same role as in [1]. The Contract Enforcer (CE), upon being signaled by the CM, performs enforcing actions such as sending a message to various parties informing them of the violation and possibly preventing further access to the system by non-conforming parties. The Contract Negotiator (CN) is an optional role that can be used to mediate the negotiation of contracts in the contractual phase.
Based on this analysis the authors define a contract model (see Fig.14).

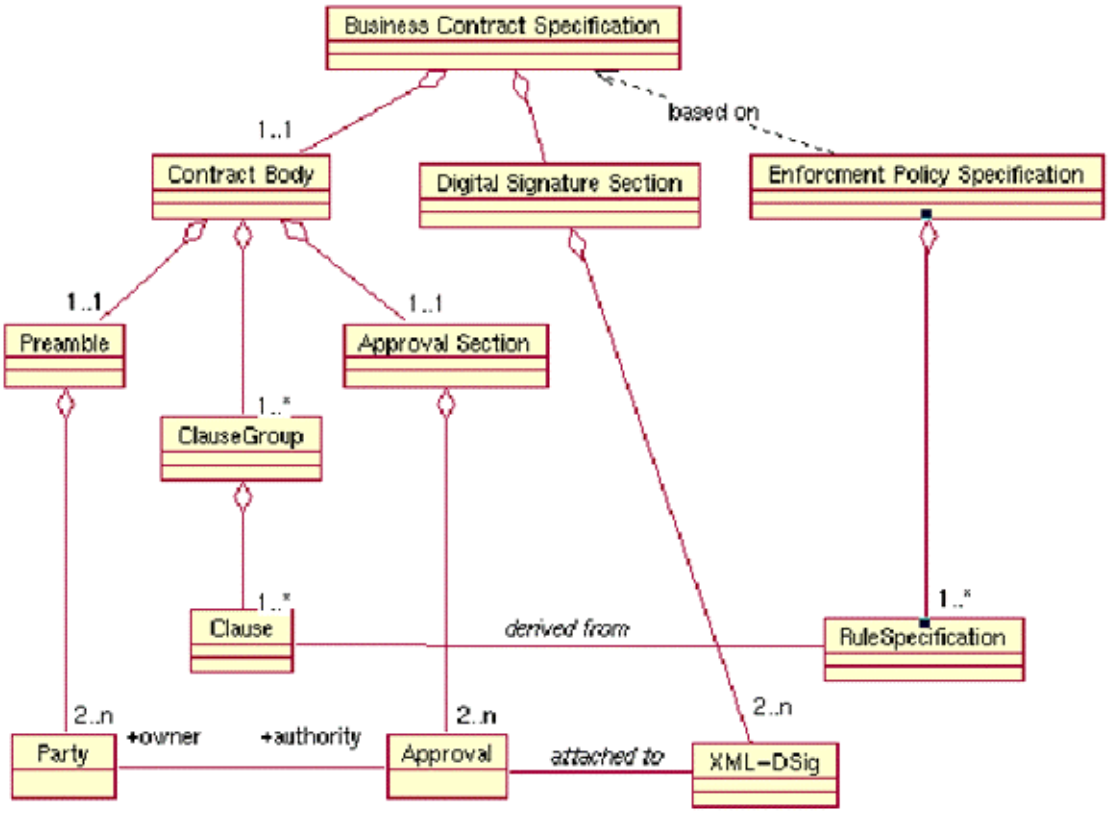


Figure 14: Contract model [3]

The contract model elements are:

- A preamble, that outlines the parties involved in the contract and the nature of the consideration.
- A clause element, which is a list of contract clauses, clustered in logical groups.
- An approval section that enumerates who from each party approved the contract.
- A digital signature section, with digital signatures from the appropriate parties listed in the approval section.
- A section containing a list of policy specifications stating contract enforcement rules according to the agreed contract clauses.

The preamble is equivalent to the Product description block and the Agents block in the SeCo container, proposed in [12]. The approval section isolated as a separate element, results from the problems depicted in [2]. The digital signature section is equivalent to the signature block in [12].
The authors use an extended CBL (see 3.2.3) contract concept that includes the additional elements from the contract model. Contractual terms and conditions are modeled as policies. This is influenced by the Event-Condition-Action (ECA) paradigm from active databases and the ODP language. Policies are embedded in the XML structure.

4.1.4 Conclusion

The work presented above covers several years of research and focuses mainly on the contractual phase and the processes that take place in this phase. Some security issues are revealed as well.
In the three papers, the contract is built of four elements -Agreement, Consideration, Capacity, Legal purpose. These elements take the form of clauses that cover standard contract data.
The competence element is essentially the problem of determining if a given person has the authority to establish a contract. The proposal is to base competence on a notion of roles, which reflect the structure of a company. A person can proceed with a request if the permission is obtained from some collections of the superiors. Digital signatures and roles are used to implement competency that can be verified by people within a company and by those negotiating with the company.
Finally, it can be concluded that the three papers have a progressive element through the years. The idea of contract templates grows to standardization. The different roles in the process (modules) remain stable and are a part of all papers. The papers do not concentrate on the contract negotiation.

4.2 University of St. Gallen

Two stages of the work in this domain can be observed. The work presented under the title **Stage 1** dates since 1997-1998. **Stage 2** comprises the period 1999-2000. This separation is made due to the significant changes in the research results and the new tendencies that can be noticed. The domain members also change (papers' authors), which leads to new concepts and visions on the field researched.

The following papers from this domain are discussed:

Stage 1
- Permanent IT-support in Electronic Commerce Transactions
- Non-Repudiation within the Electronic Contracting Phase of Electronic Commerce Transactions
- Elements of a Reference Model for Electronic Markets
- Mediating Electronic Product Catalogs
- The Need for Supporting Electronic Commerce with Electronic Contracting
- Electronic Contracting within the Reference Model for Electronic Markets

Stage 2
- The Management of Business Transactions through Electronic Contracts
- Legal Aspects of Electronic Contracts
- Supporting Market Transaction through XML Contracting Containers

University of St. Gallen, Stage 1

4.2.1 Permanent IT-support in Electronic Commerce Transactions [16]

By Markus Lindemann, Alexander Runge
Focus: Contract cycle

This is a short article that pays attention to the processes that have to be supported during EC transactions. Three phases for an ECT (Electronic Commerce Transaction) are identified i.e. information, agreement and settlement phase. The intention phase described in 2.5 is missing. The other phases can be mapped to the pre-contractual, contractual and post-contractual phase described in 2.5.
The paper briefly describes a Model for Permanent IT-Support in ECT. The main point is that a permanent IT-support is only realizable, if all services interact. By permanent IT-support is meant continuos and time-independent Information Technology support throughout all phases of an ECT. The suggested model consists of a business layer, a services layer and a technical layer. This model will be developed significantly in [17,19,29] and further on elaborated in [12,13,14] and will be described in the overviews of [17] and [14] in more detail.

4.2.2 Non-Repudiation within the Electronic Contracting Phase of Electronic Commerce Transactions [15]

By Markus Lindemann, Alexander Runge
Focus: Contract cycle

This paper is a broader version of [16]. The focus of this work is put on the negotiation process, the ways of exchanging information, ways of ordering, and of settling upon agreed contracts. The idea of Permanent and Continuous IT-support [16] is developed.

The same three layers from [16] of an EC platform are outlined i.e. a business layer, a services layer, and a technical layer (see Fig.15).

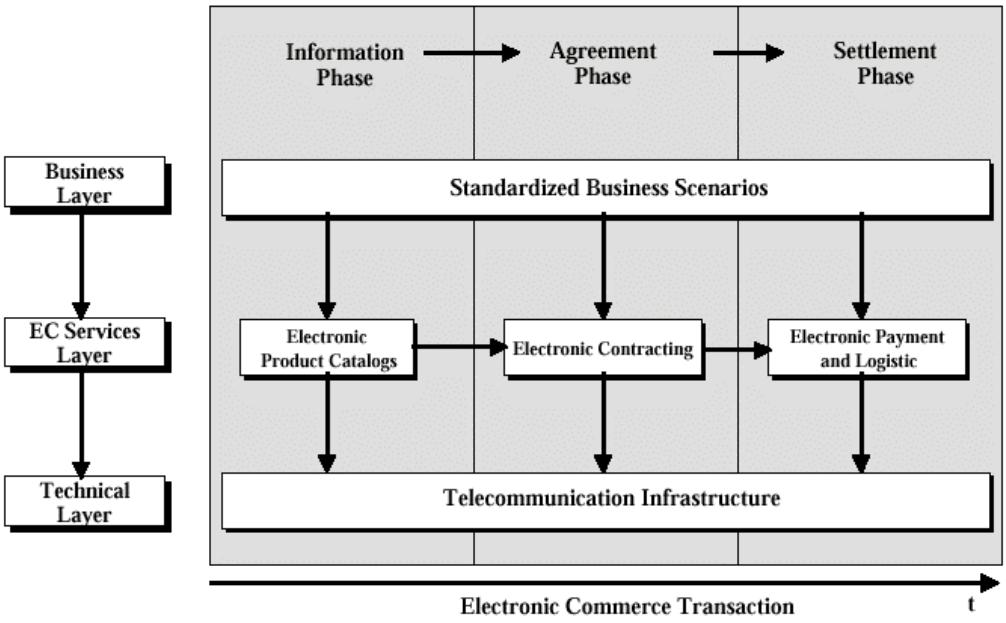


Figure 15: Model for permanent IT support [15]

The three levels are vaguely described and evolve considerably in the succeeding papers [17,19,29]. This model is explained in detail in the overview of [17].
The same three phases in ECT [16] are outlined i.e. information, agreement, and settlement phase.

The problems in EC are found mainly in the legal issues and lack of trust. For this reason, trust centers are described - institutional instruments to support confidentiality and non-repudiation. The paper describes the services and tasks that must be performed by the trust centers. The idea of Trust Centers is gaining popularity nowadays and is considered by many researchers and developers as one of the most probable solutions for the legal issue problems and the lack of trust in the parties - [28].

According to the paper there are three possible approaches for the initialization of business relations:
Customized Trading Partner Agreements - the negotiation and exchange of necessary modalities with an extra legal agreement. This negotiation and exchange happens before the actual exchange of business data and is known as „trading partner agreement". Obviously this might be a solution only for large companies or in specific business situations, as it implies high entrance costs.
Guideline Approach via Legislation - an alternative to the customized trading partner agreement. Legislation defines standardized terms of trade, which must be respected in almost all business relations (see 3.1).
Open-EDI and Standardized Business Scenarios - allow and simplify open, not initially negotiated business relations. They are defined in Open-EDI [34,39].

The first step here is the definition of a common grammar, in order to describe later defined business scenarios. This common grammar has to be formal, graphically representable and a computer should be able to interpret it. The second step is the definition and description of the actual business scenario by means of an agreed common grammar.
This approach is an attempt to find a more flexible solution for companies that find the Guideline Approach too restrictive and not suitable for market-specific business processes. Both, SME and big companies are supposed to profit from this approach. However, these business scenarios are fixed and cannot meet the needs of a particular business situation.
In order to illustrate this approach and its advantages the authors use the example of the electronic contract. The paper introduces a non-repudiation business scenario based on several basic roles: a supplier, a customer, a Mediating Electronic Product Catalog MEPC service and a Trusted Third Party service (see Fig. 16). This construction is a combination of the MEPC (see [19]) and the Trusted Third Party architecture. By involving Trusted Third Parties in this business scenario, legal requirements for non-repudiation, confidentiality, and provability of electronic documents and contracts are supported.

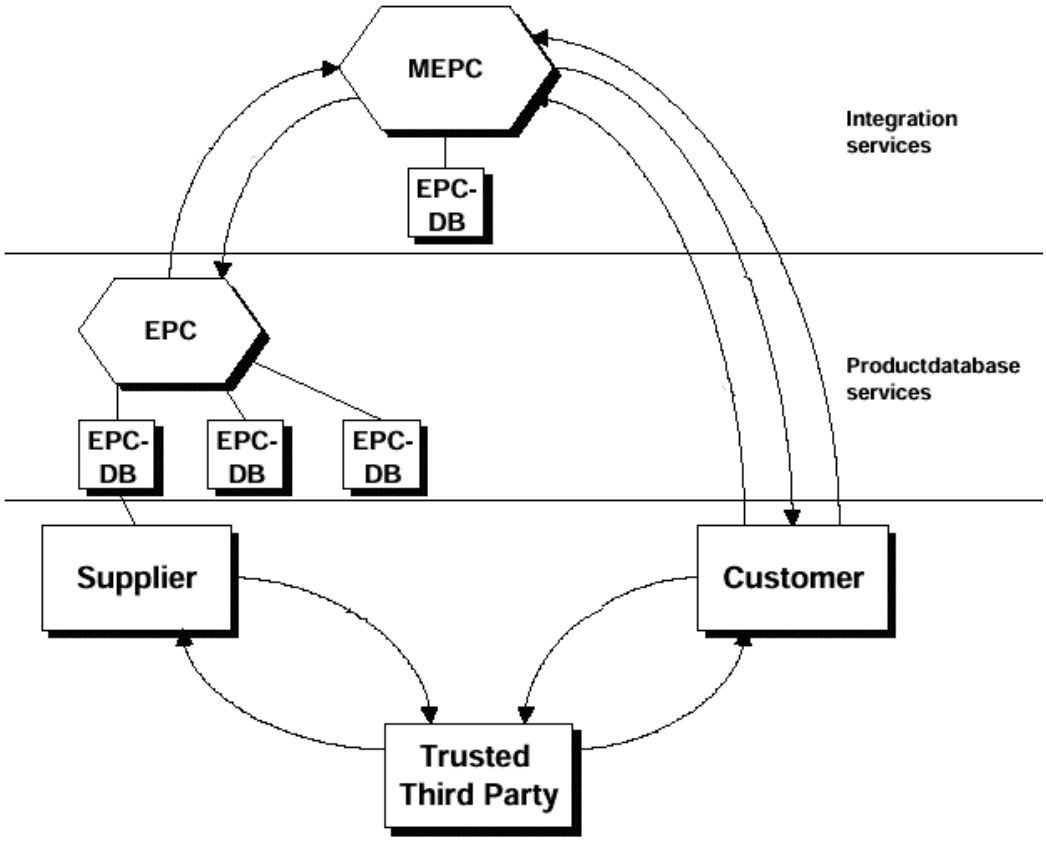


Figure 16: Contract business scenario [15]

4.2.3 Elements of a Reference Model for Electronic Markets [17]

By Beat F. Schmid, Markus A. Lindemann
Focus: Contract cycle

In this paper, a reference model for electronic markets is discussed. The phases of the market transaction still remain the same i.e. information, agreement, and settlement phase.
The paper starts with a short introduction to the Electronic Market concept. In a simplified manner, the EM concept and the roles in it are described (see Fig. 17).
The customer („Demand“) is looking for offers in a specific field. Electronic market services provide help for the selection and the evaluation of offers, which are of high interest. The supplier („Supply“) is advertising offers. Service providers („Services“, „Logistics“, „Finance“) supplement the offered goods and services of an EM or provide some special services. Depending on the phase of a market transaction, different service providers have to be integrated (trusted third parties, certification authorities, parties involved in the delivery and payment of the ordered goods, etc.). The Operator runs the EM.

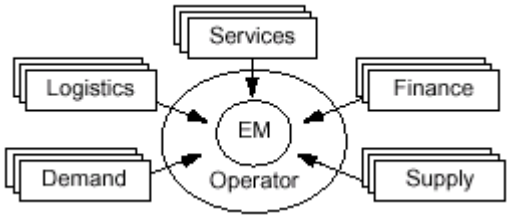


Figure 17: EM concept [17]

The proposed Electronic Market Reference Model (EM-RM) consists of two dimensions (see Fig. 18). The horizontal dimension contains the three phases of a market transaction whereas the vertical dimension is built of four views. The four views can be grouped into two main blocks of which the upper two views (Business and Transaction View) focus on o*rganizational aspects,* whilst the lower two views (Services and Infrastructure View) depict *technological aspects*.

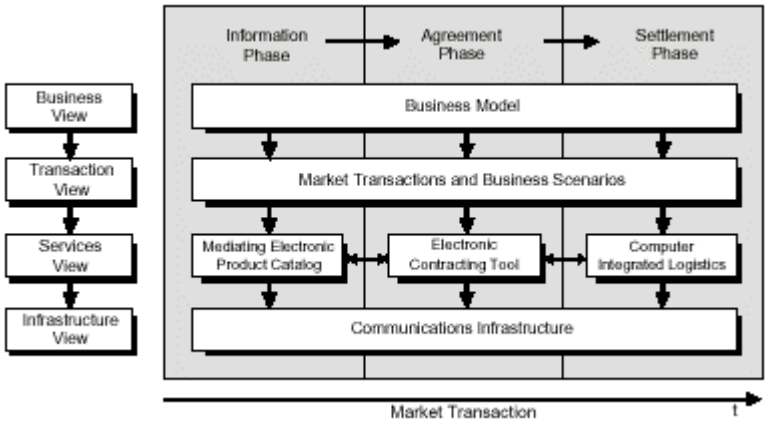


Figure 18: Electronic Market Reference Model [17]

This EM-RM is used in the next papers as well [18,29] but as it does not undergo any serious development, its detail view and its elements will be discussed in the next paragraphs.

The main modeling concepts within the **Business View** are business models. The business model is the basis for a particular EM. It involves the general outlining of the purpose for the EM in order to position the EM and to obtain potential participants for this EM. Four fundamental business models for operators of an EM are identified i.e. an autonomous operator, participants in the EM as an operator (a company founded by participants in the EM serves as an operator), service provider as an operator and supplier as an operator.

The goal within the **Transaction View** is an alignment of the way of doing business. Within each phase of a market transaction several *business processes* can occur. Identified business processes can be formalized and harmonized by standardized and open business scenarios (see 4.2.2, [15]). A ***business scenario*** according to the Open-EDI approach is a formal specification (i.e. by using formal description techniques) of a class of business transactions having the same business goal [39]. In the business scenario, the participants as well as the information objects to be exchanged are to be specified. An "information object" is a formal description of the semantic content of the information to be exchanged. A "role" is a description of the behavior of an organization or institution within a scenario. In this paper Document Petri Nets (an extension of classical Petri Nets) are suggested for process modeling. The business scenarios describe the manner of steering the way of doing business without specifying the steering components. Therefore, another sub-layer within the Transaction View, that serves the steering components or *atomic transactions*, is required. Business scenarios use one or more of these atomic transactions. The atomic transactions have to be identified and described according to the business scenarios. The offered services of atomic transactions are realized by using the underlying services of the **Services View**. An example of business scenarios for electronic contracting, regarding this RM is provided in [29].

The services from the **Services View** support the different phases in the market transaction. As services often need and use information that resulted from services previously executed, they should provide suitable interfaces in order to interoperate. This is a sequel of the idea for permanent IT support in ECT, described in [15, 16]. For the information phase, the authors describe the EPC (Electronic Product Catalogues) and more specifically the MEPC (this idea is promoted separately in [19]), which should facilitate the exchange of information during the initial market phase. For the agreement phase is suggested an e-contracting tool. This service should include special tools for the contracting process including the negotiation process in particular. The services in the settlement phase should facilitate the booking, payment and delivery of ordered goods and services. As an example, a *computer integrated logistics* service is used that allows suppliers at their location to exchange merchandise for money and similarly purchasers can exchange money for merchandise.

The **Infrastructure View** provides a common information and communication infrastructure for the implementation of the market services.
It must be noted that the model of an EM from [15,16] evolves significantly. A new layer in the proposed model is included i.e. the Transaction view. This layer plays an important role as a mediator between the defined business models and the services that must be present during the different market phases.

4.2.4 Mediating Electronic Product Catalogs [19]

By David-Michael Lincke and Beat Schmid
Focus: Contract conception

The paper presents the idea of the Mediating Electronic Product Catalogs element of [15]. They are used to integrate several separate EPCs or other MEPCs into a federated system. This integration will result into a transparent search over several EPCs in a distributed environment; support for multilingual query resolution and national differences (e.g. conversion of measurements, sizes, or currencies); inference mechanisms for the evaluation of integrated information; interfaces to additional market services (such as payment or logistics services). This integration should be achieved by means of a common language for the specification of product information.
MEPC can be applied in one or in a combination of the three business models:

- Horizontal – several catalogs covering various product families are integrated.
- Vertical – catalogs covering homogenous products are integrated.
- Cross - integration of vertical and horizontal models.

4.2.5 The Need for Supporting Electronic Commerce with electronic contracting[18]

By Alexander Runge
Focus: Contract cycle

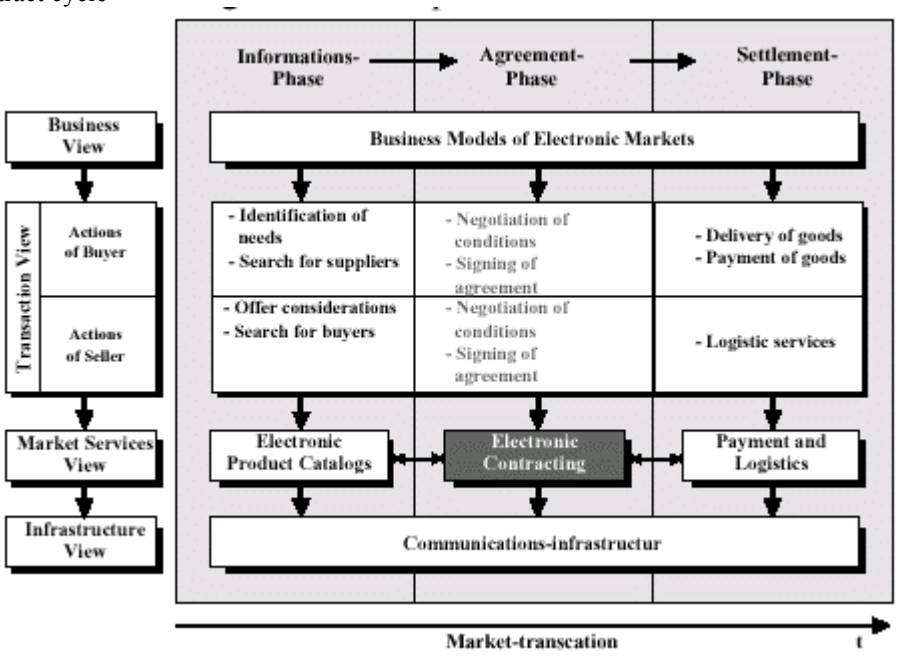


Figure 19: Electronic Market Reference Model [18]

This paper is a short overview that uses again the EM-RM. It is targeted to a broader audience. However, the EM-RM diagram (see Fig.19) is the most detailed one in the series of papers [15,17]. The Transaction View is divided into two views, separating in this way the actions of the seller and the actions of the buyer in the business scenarios. This view is a simplified version of the contract cycle described in 2.5. There are still some missing components (e.g. the intention phase) in order to make this model complete. More exhaustive text description of the electronic contracting in the transaction view is provided in [29].
Several surveys are listed in this paper, in order to illustrate the user requirements. Users regard e-contracting as very important. No clear distinction can be made on the conditions that a user would like to negotiate. 49.70 % of users stated that they would like to negotiate within the first 15 min. after the product decision by the buyer. More than half of all users (65.52 %) would like to negotiate themselves. Negotiations by computers on behalf of users are welcome by 17.93 %, negotiations through trustworthy third persons are welcome by 13.10 %, and auctions are welcome by 3.45 % of all users.
However, these web surveys that were made in 1998 or even earlier cannot pretend to be relevant any more in this quickly evolving area with a strong pressure not only on companies and technologies but on user behavior as well.

4.2.6 Electronic Contracting within the Reference Model for Electronic Markets [29]

By Markus A. Lindemann, Alexander Runge
Focus: Contract cycle, contractual phase

This paper states, that electronic contracting may only be supported by IT, if designed and used with a common framework, like the EM-RM described in the previous papers. It starts with an analysis of the existing approaches.
Auctioning Systems are very popular. Weaknesses: Despite the very broad range of products and sites, electronic auctions only match demand and supply via the criteria price. Other criteria such as delivery conditions or payment conditions are not taken into consideration. These conditions are announced within the product description and/or auction announcement. Potential buyers, who think of participating at the auction, must accept these predefined conditions. Furthermore, auctions do not pay any respect to potential cross-relationships between several products or between products and services, which are combined in bundles.
Agent Systems. Learning software agents are used in order to negotiate on behalf of users. The backing idea for the use of learning software agents in electronic negotiations is the fact that it is nearly impossible to program a computer to negotiate the same way humans negotiate. Agents are capable of searching for offers and of negotiating on behalf of users. However, agents are not capable of signing reliably on behalf of the user. Signing contracts electronically is a major part in electronic contracting. One approach to solve this problem is by separating the negotiation process from the signing process.
Decision and Negotiation Support Systems. Negotiation Support Systems (NSS) are designed to foster negotiators to come to an agreement. Problems occur from the lack of studies of NSS within the realm of EC. Studies and works are mostly done within organizational decisions and negotiations.

The authors describe the process of construction of EM and the problems that occur. Some special attention is paid to the Electronic Contracting in the Transaction View. Several definitions of electronic contracting are given. Proposed are two classes of business scenarios. The first class of business scenarios involves *electronic contract or agreement negotiatio*n. These scenarios observe the situation of negotiation or bargaining and the interactive exchange of messages between buyers and sellers. The second class of business scenarios deals with the *electronic signing of contracts or agreements* that have previously been negotiated and/or exchanged.
Finally some ideas about an electronic contracting service are provided. The parallel process of negotiation with several parties is proposed. The possibility to switch between negotiation strategies should be taken into consideration. Another remark to be mentioned is that the parties may like to change the negotiation mechanism i.e. to switch to a face to face negotiation in case that software "agents" are unsuccessful in this (see 2.4.2 Human participation).

4.2.7 Conclusion on Stage 1

One of the achievements in this group is the formulation and specification of the EM-RM. The three EC phases that are identified i.e. Information, Agreement, Settlement, remain stable in all papers. The proposed EM-RM evolves in the series of papers. At this stage almost no attention is paid to the information technologies that should be involved in the construction of an EM. The next stage concentrates on the elaboration of the EC phases and on the documents that accompany it and more specifically, on the process of electronic contracting. This leads to some changes in the proposed Reference Model as well. Some technological solutions are also provided but they will not be discussed, as this is not the goal of this document.

University of St. Gallen, Stage 2

4.2.8 The Management of Business Transactions through Electronic Contracts [13]

By Alexander Runge, Bernd Schopp, Katarina Stanoevska-Slabeva
Focus: Contract cycle

This paper provides a solution for a management of business transactions, considering contracts as the key information object of all legally relevant actions in a business transaction. A contracting framework is presented. The paper gives an overview of the services and roles that have to be fulfilled in a business transaction to manage the flow of information across all phases of the Customer Buying Cycle (CBC) (called Contract Cycle in 2.5.1).
The authors use the media concept defined as an entity of a platform that facilitates the representation, processing and communication of information and an organized community of agents. The media concept consists of three components:

- A ***Logic*** component to represent and formalize information and to process information. This allows the agents to comprehend the medium (e.g. its structure)

and to act in this medium. The logic component relates the information in the medium and the real world information. This component provides the required integration of all components into an entity.

- A ***Community of Agent*s**, processing information and using the medium as a common information and communication space. Agents are meant in a general sense, not specifically as software agents.
- ***Channel*s**, to carry information and to relate agents by facilitating communication over time and space barriers.

An instance of the media concept is the business media. Business media is defined as an information space, which provides services necessary for generation and exchange of goods and values among the members of a business community.
The Business media framework (BMF) that is proposed is shown on Fig. 20.

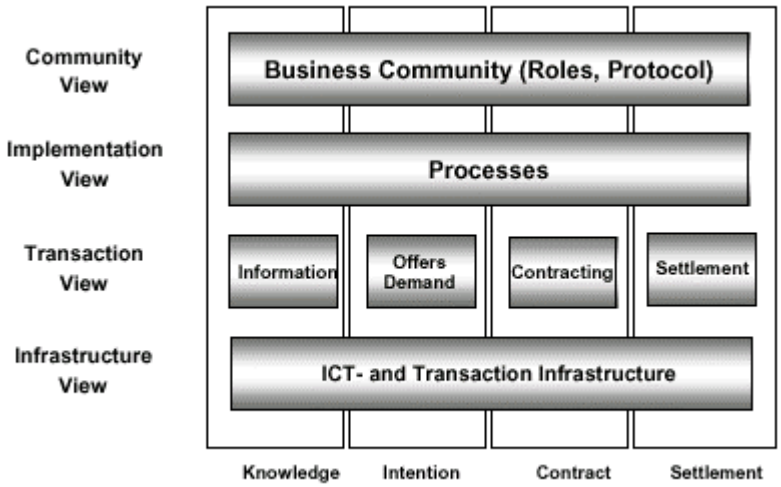


Figure 20: Business Media Framework [13]

Four layers are identified in the BMF:
***Community Vie*w**. The interested business community is described and structured on this layer.
***Implementation Vie*w.** On this layer the roles, protocols and processes that have been identified in the Community View. These are based on the underlying generic services of the Transaction View.
***Transaction Vie*w.** This layer contains the generic market services (i.e. services, which can be used for any marketplace and are necessary to complete a Customer Buying Cycle) that can be seen as independent from the upper layers.
***Infrastructure Vie*w**. This layer contains communication, transaction, and transportation infrastructure resp. interfaces with this infrastructure.
The vertical ax of the BMF guarantees the vertical integration of the four views and their proper interaction during the different business transaction phases. The horizontal ax guarantees the integration of all phases of a business transaction in the time dimension.

The BMF is strongly influenced by the EM-RM discussed in Stage 1 of this domain's research work. However, some new concepts and approaches appear in this framework. They are further on elaborated in [14]. The most important change in the Customer Buying Cycle is the inclusion of a new phase – the Intention phase. The different phases are not described in this paper but it can be concluded from Fig. 20 that this is the process of initiating contacts between the buyer and the seller. The Information phase is renamed to Knowledge phase but there is no change in its meaning. Regarding the vertical dimension only the Infrastructure View keeps both its name and meaning from the EM-RM. The Business View is called Community View but its meaning still remains the same. The Transaction View is transformed into Implementation View. This layer has the same mediating function between the community and the transaction view but there are no details about the way in which the processes are described and identified. The idea of using Open-EDI and standardized business scenarios is abandoned. The Service View is renamed into Transaction View but still performs the same function.

The transaction view contains several services: contracting services - based on [1,3], some other market services like EPC (MEPC), Logistics services – that use parts of the contract information as the specification for the processes they provide, and Payment services. These service follow the tendencies outlined in Stage 1. It is not necessary for them to be single entities - they can be a part of one single entity that has control over the flow of information in all market phases. The only requirement is that the communication between the modules should be standardized in order to achieve an open, integrated market transaction.
The authors have used the defined BMF with the roles defined in [1,3] in order to build a Contracting Framework for the contracting services (see Fig. 21). This framework is a combination of the two models.

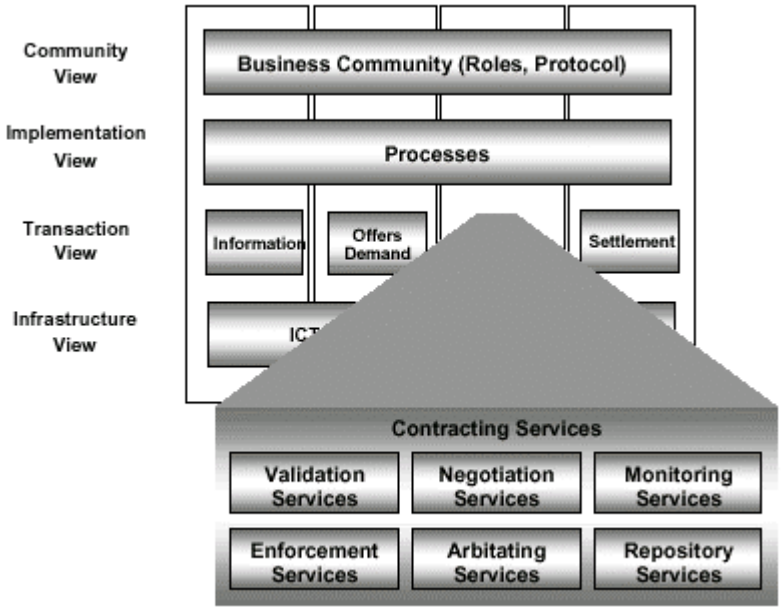


Figure 21: Contracting Framework for the contracting services [13]

Further on, a Contracting Container architecture is proposed. More details on the container and its structure are provided in the overviews of [12] and [14].
An idea abandoned in the next papers is the idea of Recursive Contracting Relations. In order to handle the cases when subcontracts or contracts are derived from the main contract (see 2.4.3 Number and topology of parties), the authors suggest using unique container identification numbers. Hence a contract net can be established that covers the entire transaction and allows an analysis of interdependent contracting and negotiation aspects. In this case several contract containers will exist.

4.2.9 Legal Aspects of Electronic Contracts [12]

By Michael Gisler, Katarina Stanoevska-Slabeva, Markus Greunz
Focus: Contract cycle

This paper investigates the technological aspect as well as the legal aspect of Electronic Contracts. It focuses on contracts that involve two parties (see 2.4.3 Number and topology of parties, Standard situation). The two roles in a contract are:

- An *offeror* - the person who makes an offer.
- An *offeree* - the person who receives an offer.

Declaratory acts

Besides the declaratory act of an offer the invitation to treat is presented. The difference to an offer is that the originator of an invitation to treat is not bound to his declaratory act. He can revoke it at any time. Figure 22 shows the possible cases resulting from different declaratory acts.

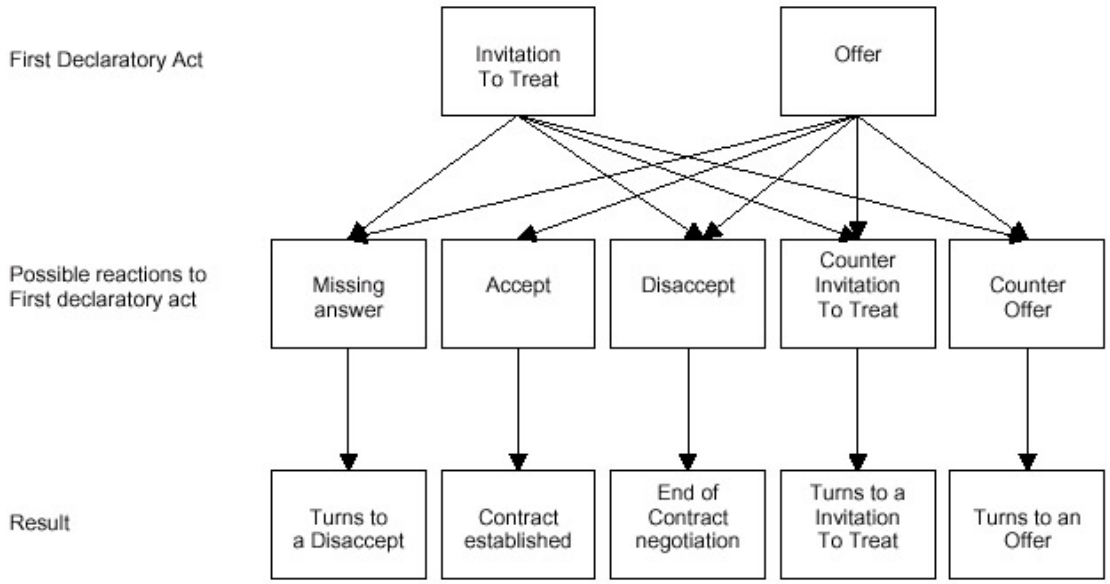


Figure 22: Reactions of declaratory acts [12]

Business Phases of a Contracting Process
The paper distinguishes four phases in an electronic market transaction from the business aspect i.e. Information, Intention, Agreement and Settlement. Each step creates several documents, which describe the status quo of the process at a point of time. An Electronic Contract is one of these documents.

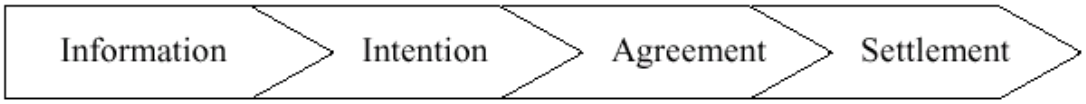


Figure 23: Business Phases of a Contracting Process [12]

In case the negotiations are successful, the Agreement phase results in a contract between the partners. These four phases are basically the same as the market phases used in the BMF [13]. Only the terminology is changed – the Knowledge phase is called Information and the Contract phase is renamed to Agreement. This terminology of phases is the same as the one used in the papers presented in 4.2 Stage 1, extended with the Intention phase.

Legal Phases of a Contracting Process
According to the authors, there are four legal phases of the contracting process i.e. Contract Conception, Contract Preparation, Contract Negotiation and Contract Fulfillment (see Fig. 24).

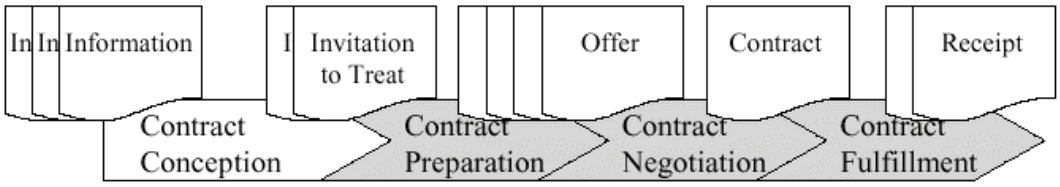


Figure 24: Legal Phases of a Contracting Process [12]

Each legal phase corresponds to a business one:

- Information Phase → Contract Conception
- Intention Phase → Contract Preparation
- Agreement Phase → Contract Negotiation
- Settlement Phase → Contract Fulfillment

The will of the contract parties might change at any phase. The need of a mechanism that freezes the will of a contract party at a certain point of time is observed. A written complement, called a document is used when such a need is observed. The document is suitable to generate proofs to be used in front of a court. This document can be a contract as well as any other preliminary document that freezes the will of the parties (e.g. an offer).

The "Contract Conception" phase does not produce any documents with legal consequences. At the beginning of the "Contract Preparation" phase a document "Invitation to treat" is created. This does not legally bind the originator. The "Contract Negotiation" starts with an offer. This is the first legally binding document in the whole process. The offeror is allowed to assume that the offeree did not accept the offer when he does not react in a reasonable length of time. When negotiation is needed a counter offer is generated. The last declaration of will turns to a contract, when one party accepts the offer or the counter offer of the other party. The resulting document from the "Contract fulfillment" is usually a receipt. This is the last document produced during the process. It is also suggested that for e-contracts a receipt for the vendor should be created. This receipt will confirm that the vendor has fulfilled his obligations in the contract. The reason for this suggestion is the uniqueness of the process and its new features, not typical for the standard contract procedures. For each obligation that arises out of the contract there must be a receipt after the fulfillment of this obligation. This should increase the level of trust between the contracting parties.

Electronic Contracts

To support electronic transactions in a way similar to conventional transactions, electronic contracts are required. To serve this purpose the authors introduce a "**Secure Contract Container**". The software architecture for the SeCo Container is described in details in 4.2.10.

Next, the document structure of the SeCo Container is described (see Fig.25).

The basic function of the electronic contract is to store information about accepted liabilities in a legally binding manner.

A SeCo container comprises two parts: a contract section and an administrative section. The contract section is separated into a content section and a signature block. The *content section* contains all data that is relevant for the contract and that the contracting parties have to agree on. It includes:

- The product or service descriptions with agreed upon quality or specifications of all products and services the customer intends to purchase.
- The identification and address data of the contracting parties (mandatory), as well as other involved market agents such as an arbitrator, a recipient other than the customer, or a notary (optional). This sub-section is referred to as "Agents" (see Fig. 25).
- The legal terms of the contract as well as the arbitration code.
- The delivery and payment conditions together with the communication protocols applied in the integration of payment and logistics services (i.e. SET).

The contract content section in the SeCo Container serves the same purpose as the Concept Model in the CrossFlow contract model [20].

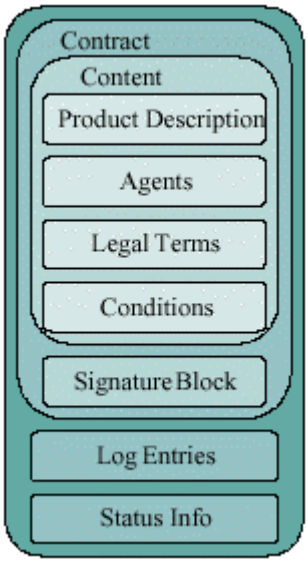


Figure 25: Structure of the SeCo Container [12]

The *signature block* holds the digital signatures signing the content section. Furthermore, the signature block contains the corresponding X509 certificates that hold the public keys of the signers (X509 is a standard for digital certificates). The *log section* logs the events that occur during the contracting process, as well as any relevant information that arises during the fulfillment of the contract. The *status section* holds information about the current state of the SeCo Container. It can be used as a quick reference for queries for the status of a contract. A container can hold more than one contract section, resulting from the process of negotiation, but at any given time, there is only one valid contract section The most recent contract section represents the current state of the contracting process. This allows tracking of the historical evolution of the contract.

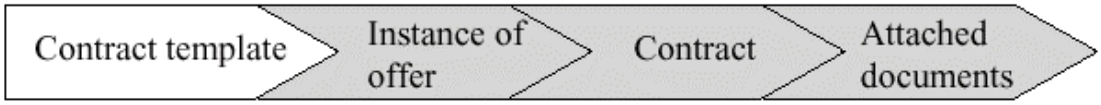


Figure 26: Contracting process [12]

Figure 26 shows the contracting process, based on the SeCo Container structure.
An instance of the offer document (e.g. resulting from a contract template) is created. It contains only one signature of the offeree. A deadline for the validity of the offer is set. The offerer can accept the offer with a second signature and in that case the offer is transformed into a contract. He can issue a counter-offer as well. In that case the first version is kept for archiving reasons and a new offer document is created containing the altered proposal. That step can be repeated until a valid contract is established. Finally the whole package of related legal documents is archived as an entity.

4.2.10 Supporting Market Transaction through XML Contracting Containers [14]

By Markus Greunz, Bernd Schopp, Katarina Stanoevska-Slabeva
Focus: Contract cycle

This paper uses the Business Media Framework [13] to describe again the same contracting framework and architecture for a container for secure electronic contracts.
The SeCo Container Architecture (described for the first time in [13]) reflects the software architecture of the SeCo container. It is build of logic, information, and communication layer (see Fig. 27). Explanations of this architecture follow.

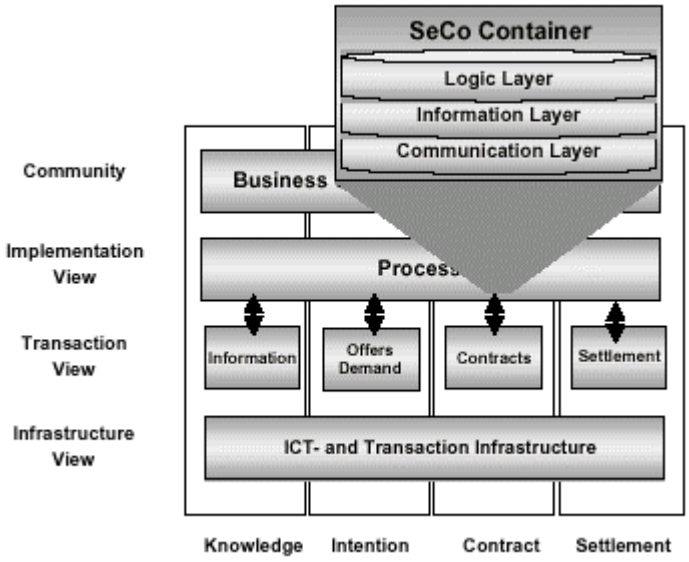


Figure 27: SeCo Container Architecture [14]

On the **Logic Layer**, the logic of the business transaction is designed, managed, and performed. The logic layer can manage the monitoring of the contracting process through checking critical dates and values, and through performing actions like reminding of the outstanding signing of the contract or the non-performance of the delivery. The logic layer has a secure access to the information structured on the information layer.
The **Information Layer** provides data storage and contains the contract information. The data of the information layer contains a structured and an unstructured part. In the structured part all the information that is subject to further processing in the contracting or settlement phase is stored. The structured part is divided into four blocks:
(1) *Who* Block - the involved parties are described.
(2) *What* Block - product or service object of the contract (imported from the product catalog).
(3) *Condition* Block - the settlement conditions of the transactions i.e. the enactment clauses.
(4) *Legal* Block – the legal circumstances, under which the parties came to a mutual agreement.
In the unstructured part of the information layer, documents that are collected throughout a market transaction could be added. In order to have a document history it is proposed to generate a new document for each step of the contracting process. This new document

inherits certain attributes either from the container settings or from already existing documents.
The **Communication Layer** includes all protocols necessary for the communication with the generic market services and the contracting parties. It includes the communication security for the message passing.

SeCo Container document structure
The SeCo Container can be seen as an information object that contains all information that is important to describe the workflow logic necessary for the contract fulfillment, all data describing the terms that have been agreed upon between the contracting parties as well as all information about the needed communication protocols. In order to make this data accessible to the various services within the contracting phase as well as in other phases of a market transaction, it is necessary to structure it in a way that allows to codify the semantics of the data in the same document. The SeCo Container document structure proposed in [12] serves this necessity.

4.2.11 Conclusion on Stage 2
The dominant idea in all these papers is the SeCo container. This concept was developed in a project at the University of St. Galen and the University of Zurich, called SeCo – Secure Electronic Contracts.
In [12], the processes and documents produced during the contractual phase are listed in an exhaustive manner. In fact the phases described in [12] seem to encompass all the partial solutions listed in the other papers that are discussed in this overview document. The Knowledge phase turns into an Information phase and the Contracting services resp. into an Agreement phase.
In [13], the contracting are introduced services as well as the contracting container architecture. In [12] the SeCo Container structure is described. Finally, the ideas from both papers are combined in [14].

4.3 Twente University

4.3.1 Contracts for Cross-Organizational Workflow Management [20]
By Marjanca Koetsier, Paul Grefen, Jochem Vonk
Focus: Contract Model, Trading phases

This paper is a result from the CrossFlow ESPRIT project [21]. The CrossFlow project aims at developing concepts and information technology for advanced workflow support in virtual organizations that are dynamically formed by contract based service trading. Contracts are used in CrossFlow for flexible service outsourcing, in which a service provider organization performs a service on behalf of a service consumer organization. Contracts are the basis for finding suitable partners, establishing business relationships, connecting WFMSs of different kinds, controlling outsourced workflows, and sharing abstractions of workflow specifications between partners. CrossFlow contracts define all data, process elements and enactment conditions relevant to the co-operation through the

outsourced workflow process on an abstract level. As such, contracts are not used only for defining a business relationship, but are also used operationally in the various phases of the lifecycle of the relationship.
The establishment of virtual enterprises through the making of contracts is discussed in [36]. Contracts are established automatically by CrossFlow Contract Manager modules without human interaction. Negotiation of contracts is not required in the context of the project and thus not covered by the approach. This is possible because the approach is based on Standard Form Contracts that describe standardized services in the context of specific markets. Notwithstanding their extended functionality as indicated above, contracts are considered legally binding documents.

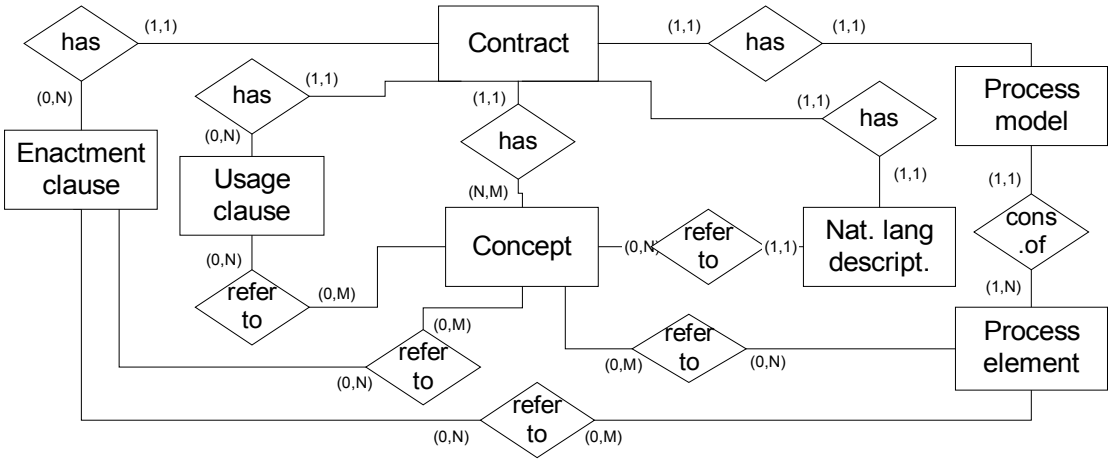


Figure 28: CrossFlow Contract Model [20]

The data structure of the CrossFlow contract model consists of five main parts (see also Fig. 28):

1. The *Concept Model* establishes the terminology for the contract. The concepts of the contract are defined as a list of parameters that can have complex structures. The parameters are defined with their name, type and description. The concept model consists of three parts. *General parameters* describe attributes that are applicable to contracts in general. This part standardizes contracts by ensuring that parameters used in any service always have the same name and structure, like CONSUMER, PROVIDER, and SERVICENAME. Having this part makes it easier to search for a contract on generally accepted terms. *Service specific parameters* apply to specific service types. Parameters like DELIVERY ADDRESS, PACKAGEWEIGHT, etc. are only applicable to transport services. The consumer should specify the values of these parameters in the contract, so the provider process can read them from the contract and start the workflow instance. *Process variables* are dynamic parameters used for exchanging information during the service execution.
2. The *Workflow Definition* is an abstract process definition of the service covered by the contract. This process definition is shared between the partners in a business relationship. Each of them maps it to its internal process definition. The workflow definition may be extended with a *Data Flow Definition* to cater for workflow environments that address data flow explicitly.

3. The *Enactment Clauses* define additional enactment requirements on top of basic workflow processing defined in the workflow definition. Enactment clauses can be related to enactment performance monitoring, cross-organizational process control, advanced transaction management, automatic remuneration, etc.
4. The *Usage Clauses* define how contracts are used for service outsourcing. These definitions are related to the concept of Partially Filled Contracts as explained below.
5. The *Natural Language Description* is a piece of text that is not meant for electronic interpretation, but for human reading. This text can be used to describe the service in an understandable way and to refer to the legal context of the transaction.

To enable the use of umbrella contracts, the CrossFlow approach has defined the concept of Partially Filled Contracts (PFCs). PFCs are contract templates of which the service-specific fields are partially filled by a service consumer. On the basis of the PFC, a business agreement is reached between service provider and consumer for the enactment of multiple services. Each service is specified by completing the PFC to a complete filled contract. A life cycle model has been defined relating various kinds of templates, PFCs and actual contracts.

4.4 IBM Research Division, T.J. Watson Research Center

4.4.1 The Coyote Project: Framework for Multi-party E-Commerce [30]

By Asit Dan, Daniel Dias, Thao Nguyen, Marty Sachs, Hidayatullah Shaikh, Richard King and Sastry Duri
Focus: Contractual phase

This paper describes the COYOTE (Cover YOurself Transaction Environment) project. The project considers contracts as multi-party ones (see 2.4.3 Number and topology of parties). The paper uses as an example a complex, mixed B2B and B2C case. The example illustrates the situation of a customer who purchases full fare on an Airline company thus receiving a discount at a specific Hotel and Car rental company (see Fig.29). This situation involves close relations between the companies for this B2C case. Thus the contract covers not only the B2C case but supports the interactions between the companies as well.

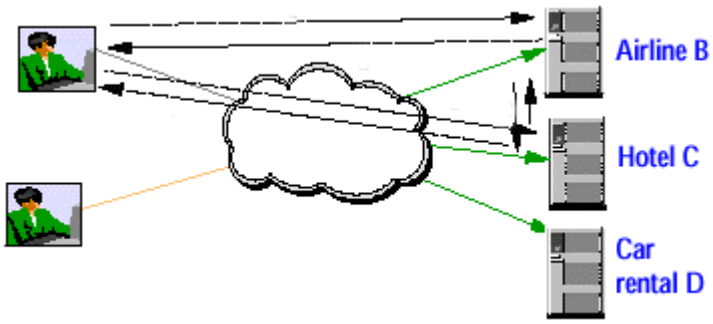


Figure 29: Multi-party ECT [30]

This multi-party model reveals new aspects of electronic contracting. The participation of several companies and clients involves different views of the business transaction, which should exist and be supported for all participants. The great variability in the parties' response time and the different internal business processes create a need for asynchronous and event-driven processing (see 2.3.3 Time dimension).
Hence the process of electronic trade is described as a distributed, long running application, spanning multiple autonomous business organizations. The goal of the COYOTE approach is to provide an application development and execution environment for such an application. The approach makes a clear separation of internal and external business processes within an organization. The rules of external interaction and externally visible states are defined as a service contract. A service contract acts both as a guideline for interaction across businesses and also as an enforcement mechanism for guaranteeing proper interaction. It is a high-level description of the interaction between two or more contracting parties.
The contract contains two kinds of information. The first is a machine-readable description of the computer-to-computer interactions between the parties that supports the overall application. It concerns those aspects of the application that each party must agree with and which are enforceable by the Coyote system. The second is the usual human-readable legal language that is part of any business-to-business contract and includes those aspects of the agreement, which must be enforced by person to person contact. Thus the two parts are complementary (see 2.2.1 Contract content). The project is concerned with the machine-readable section. The contract is written in XML. After reaching an agreement by all parties, the XML contract can then be turned into a code. This code is called a service-contract object (SCO) and resides at each of the parties. It provides interfaces to the application programs of the parties. Each party communicates via the SCO of the other party.
The service contract defines the properties of each party to the contract that must be made visible to the other parties to the contract. These properties include:
Identification: The identification section assigns a name to the contract and provides the names of each of the parties to the contract.
Overall properties: The overall properties are attributes of the contract that apply to the contract as a whole and all instantiations of it.
Communication: These properties provide the information necessary for each party to communicate with all the others.
Security/Authentication: The following levels of security are provided: non-repudiation, authentication, encryption, and none.
Role: The contract can be formulated in terms of generic roles.
Actions: An action is a specific request which a party, acting as a client, can issue to a party acting as a server. In the example above (see Fig.29), possible actions could be "reserve a hotel", "purchase", etc.
Constraints and sequencing rules: Constraints are various conditions, which must be satisfied for individual actions. For example, the action "reserve a hotel" might be accompanied by a rule stating the latest time to cancel the reservation. Sequencing rules state the allowed order of actions at a given party. For example, a "cancel reservation" action cannot be invoked until the "reserve a hotel" action has been invoked.

State transition logic: When an action is performed, the state associated with the action (and hence the state of the contract) changes. The contract defines additional changes of variables and parameters, which take place following the completion or failure of an action.
Compensation rules: These properties state any conditions relating to the cancellation of previously invoked actions.
Error handling: These properties contain error conditions and methods to be called when they occur.
Legal aspects: These properties contain conditions, which are typically defined in a legal contract such as handling of disputes and other exceptional conditions.
These properties provide the structure of the service contract. This structure is comparable with the structure of the SeCo Container [12]. For example the legal terms in the SeCo Container are identical to the Legal aspects; the agents to the Identity, etc. Specific property for this project is Error handling. The approach in this project is process oriented and the contracts must support the different processes that result from the activities of the companies. Thus the additional properties that are needed are state transition logic, actions and error handling. An analogue of the compensation rules can be found in the CrossFlow project, which also follows the same approach [20].

The rest of this paper describes the technical solution within the Coyote approach.

Due to the diversity in the business processes, the many possible actions and responses from the parties in a business transaction, this paper considers the use of Petri Net like definitions of the business processes as inappropriate. This statement opposes to [17] and [4], where Petri Nets are used for process modeling.

4.5 Erasmus University, Rotterdam

4.5.1 Towards Open Electronic Contracting [4]

By Ronald M. Lee
Focus: Contract cycle

The paper presents a design and pilot implementation of a system, supporting electronic contracting, called InterProcs. A key deliverable of this project is a model expert system for producing trade scenarios customized to a particular situation, yet making use of stored knowledge and experience on their design and legal controls. This is a generalization of the Open-EDI approach used in [17], where only standard trade scenarios are used. The project aims to provide an artificially intelligent framework for constructing trade scenarios. For this reason, the authors aim to not only understand the sequencing of document flows, but to understand why these documents are sent, and what is the purpose of these documents, i.e. their legal effects. The formal representation of the trade scenarios should be:

- Procedurally representable.
- Computable thus allowing fully automated computer-to-computer transactions.
- Customizable – parties should be able to customize the generic trade scenarios for their specific needs.

- Expressing not only document flows but the legal effects as well.
- With familiar end-user interface for the contracting parties as well as for possible third parties (see 2.4.1 Nature of parties).
- Reusable – the composition of trade scenarios should make use of reusable constituent parts.

The technology approach in this project is based on artificial intelligence (AI) techniques. Like other expert systems, this should involve an inference engine and a knowledge base. However, unlike other expert systems, which usually only provide advice, this project also involves a transaction system, which is able to execute the trade scenarios automatically.

A key objective for the design of trade scenarios is the inclusion of appropriate documentary controls, e.g. protecting against fraud, accident or misinterpretation, and providing appropriate evidence of the contract status, should the contract come into dispute and go to court. These controls may be either detective, recognizing when something has gone wrong, or preventative, in avoiding the error in the first place. Two additional open challenges are listed:

> *revisability* - while a given contract is being 'executed', it should be capable of revision (due to possible constraints previously set in the contract clauses).
> *evolvablility* - the knowledge base of trade scenarios should be able to evolve, based on learning and experience from past modeling.

The contracting process in this paper is divided into three main phases: shopping, negotiation and performance. Though the terminology is different the three phases can be easily mapped to information, agreement, settlement i.e. the phases discussed in the Stage1 of the St. Galen domain research work (see 4.2).

A basic issue for this project is how electronic trade scenarios should be represented from the modeler's perspective, and from a computation perspective. In this paper Document Petri Nets (DPN's) are considered again (see [17]) to be the most appropriate representation for capturing the temporal/dynamic aspects of electronic trade scenarios, offering both a graphical representation and a formal basis for the verification of various properties.

In order to make the scenarios adaptable, scenario components are broken down into reusable component parts, which can be flexibly reassembled to meet the needs of a wide variety of situations. The contract reusability is an issue in many approaches e.g. [1,3,20]. As discussed in Chapter 2 (see 2.2.1 Contract content), the standard solution is to use Contract Templates, SCF/SCC, etc. The idea to identify reusable components in contracts is appealing but, as it can be observed from this survey, still has no serious achievements. The reason for this is the huge diversity in the contracts and their clauses. Some preliminary work on this topic has been done at Twente University as well.

4.6 University of Hamburg & University of Évora

The following papers from this domain are discussed:

- Electronic Contract Negotiation as an Application Niche for Mobile Agents
- Electronic Contracting with COSMOS — How to Establish, Negotiate and Execute Electronic Contracts on the Internet

4.6.1 Electronic Contract Negotiation as an Application Niche for Mobile Agents [11]

Frank Griffel, M. Tuan Tu, Malte Münke, Michael Merz, Winfried Lamersdorf University of Hamburg
Miguel Mira da Silva University of Évora
Focus: Contractual phase, Contract cycle

This paper is an example for mobile applications. The example chosen is Electronic Contract Negotiation. The paper deals mainly with the technology of mobile agents – its problems and unsolved issues. An overview of the state of the art is provided plus requirements when such agents should be used. Some of the factors that influence this are the agent size, communication and bandwidth costs, number of hosts involved in the process, etc. The paper uses a multi-party contract (see 2.4.3) as an example from real life business relationships. A South American company offers coffee to a German importer, requesting TV sets. A French exporter delivers TV sets to the coffee supplier and the German company pays to the French one a certain amount of money.
According to the authors, an application field of mobile agents could be the negotiation of contracts among business transaction participants. The business transaction scenario is briefly explained (see Fig. 30).

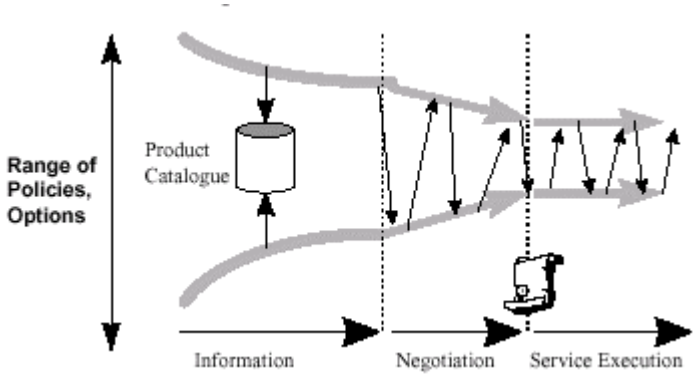


Figure 30: Phases in a business transaction [11]

The paper was published in 1997. As it has been observed the papers from this period [15,17,18] depict three business transaction phases. In this paper they are called information, negotiation, service execution but can be mapped one to one to the phases described in [15,17,18].

The contract represents a data object that is accessed by the negotiating partners. During the negotiation phase, the contract data object circulates among the participants. Thus contracts are considered as mobile objects. When the party receives the contract it can start changing or inserting clauses. According to the authors the contract clauses should contain the price of an offered service, description of the order of service exchanges, and definition of the support services in the contract.
The process of "owning" a contract and sending it explicitly to the partner is considered as an advantage to the mobile agent technology against other technologies like web technologies, Remote Procedure Call, etc. Mobile agents can be used not only for the negotiation process but for searching for offers in on-line markets as well. Hence the automation of the process covers the information phase as well as the negotiation phase.
Services that support negotiation are called support services. They are classified by the functions they supply. They can be notaries, complementary functions such as quality assertion services, protocol validation services. Payment service is also considered by the authors as a support service. It is observed that many more support services may emerge and they will not be covered at design time by electronic market system architecture. Therefore, a flexible naming schema and access method are required that allow for the registration of newly introduced support service classes at run-time. The paper however, does not provide a solution how to define the interface to each service so that an application that was not designed to use it can make use of it when it is available.
Because the investigated example is of a multi-party contract, a problem occurs when the contract must be split into separate parts for the three contracting groups (French and Coffee company, French and German company, German and Coffee company) and must be edited separately by them. The authors propose two possible solutions to this problem. The first option is each party to be allowed to edit only its own part in one common contract. The second option is to perform a unification of the separate contract parts.
Another possible case is the German company to try to establish a separate contract with the French company, hiding the existence of the coffee provider, and profiting more from the deal. This change in the party behavior leads to a change in the contractual process and the contractual topology, turning it into a chain contracting (see 2.4.3).
A prototype of a mobile agent system based on Java has been devised in the scope the OSM (Open Service Model) project [37], funded by the EU ACTS Program.

4.6.2 Electronic Contracting with COSMOS — How to Establish, Negotiate and Execute Electronic Contracts on the Internet [10]

By F. Griffel, M. Boger, H. Weinreich, W. Lamersdorf M. Merz
Focus: Contract cycle

This paper presents the COSMOS project (Common Open Service Market for SMEs) [38]. The project aim is an Internet-based electronic contracting service that facilitates the business transaction process.
The same commercial transaction phases as in [11] are used i.e. information, negotiations and execution phase. The e-contracts are considered as a solution for reduction of the high transaction costs in the standard contractual process. Three groups of transaction costs are described - information costs, negotiation costs, execution costs. As can be noticed, these groups correspond to the trading phases used by the authors of this paper

and hence it can be concluded that the goal of the paper is to propose an approach to reduce the transaction costs in each of the transaction phases.
The COSMOS project aims at providing an infrastructure that allows the integration of all phases of e-contracting, based on object-oriented Internet technology. The project's goal is to establish a technology to create complex contracts in an easy way and to support their semi-automated filling in. Further on, COSMOS aims at supporting the negotiation and execution phases by letting the constructed contract actively influence the processing of itself. Due to the integrated, semi-automated construction of the contract, the COSMOS system should be able to consistently include execution definitions that can automatically drive the contract's fulfillment. This approach resembles the CrossFlow work [20], where the workflow definition and the enactment clauses in the contract have this function.
A list of contract variation points is proposed. It relates to some of the dimensions revealed in the framework proposed in part two of this document (see. 2.4 Contract Parties, Number and topology of parties, Human participation). However, this brief list is not very elaborate and the terminology that is involved is not very precise (e.g. the definitions of parties and roles is ambiguous):

- *Number of roles*: Usually two roles are defined. Some contracts may be closed between three parties who organize a circular transfer of goods.
- *Number of parties*: In simple cases contracts are closed between two parties, where each party plays a single role. In complex cases one role may be played by a set of parties.
- *Number of related contracts*. Often different types of contracts are related in a „transactional" way, such that either all of these contracts are signed or none of them is considered as legally correct (see 2.4.3 Chain contracting/Multiparty contracting).
- *Inter-contract dependencies*: The contract may be related to an already given one, e.g. framework contract, memos of understanding, regulations, etc. (see 2.3.2 Umbrella contract, 2.4.3 General contracting)
- *Human participants vs. Software Agents:* a company may be represented in the contractual process by a human participant or by a software agent. (see 2.4.2 Human participation)

An architecture of an EC system is proposed. It is composed of an online catalogue, brokers, contract negotiation support, signing support, and contract execution support. The project uses the *CORBA Business Objects Architecture* (BOA). Voyager, a Java-based ORB that provides mobility of objects and is compatible with CORBA, is chosen as implementation platform for COSMOS.

Further on, a Contract Object Model is described (see Fig. 31).

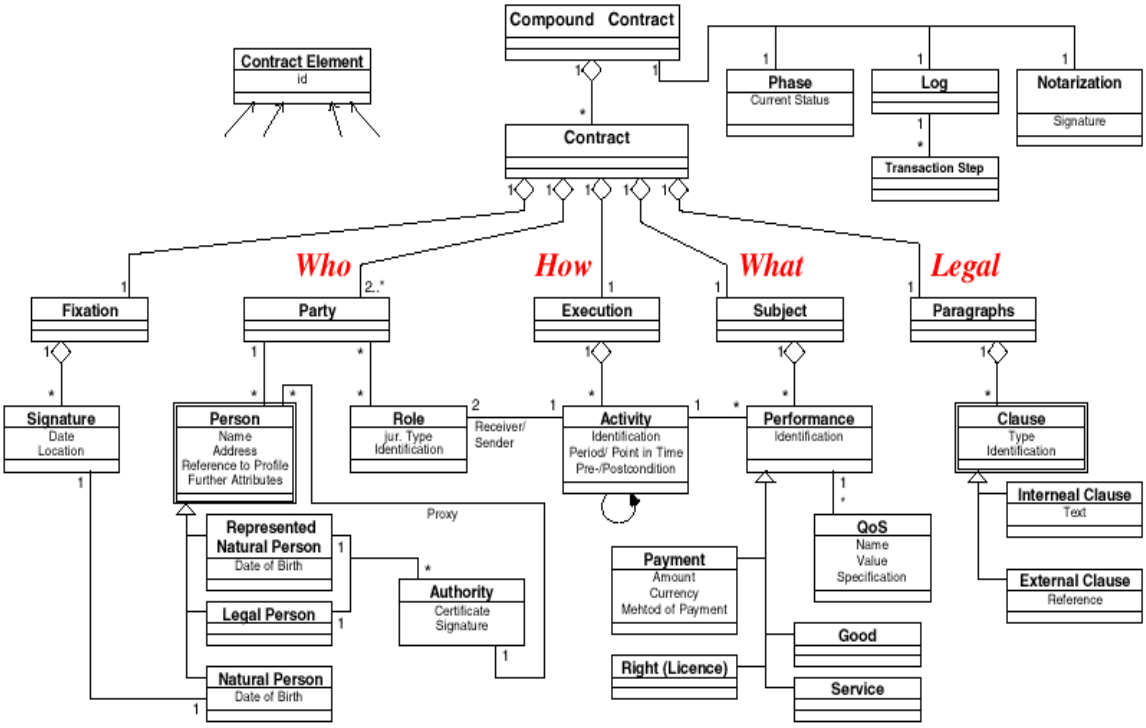


Figure 31: COSMOS contract model [10]

The contract model distinguishes several parts:
The *Who* part: Parties, Persons, and Signatures are related to the participants of the contract.
The *What* part is the subject of the contract. It covers all obligations of the involved parties. An important feature of the obligation is a list of QoS attributes.
The *How* part defines execution details for the obligations: when and which services to be delivered; what is the deadline; which clause will apply when a party does not observe its obligation. This part is used to derive a workflow that defines causal relationships, data transfers, delays and deadlines, and the final termination of the execution phase.
The *Legal clauses* form the fourth part of a contract.
It can be noticed that the Information layer from the contract architecture presented in [14] is almost identical to this model. The Who and the Legal parts are identical. The What part in this paper is extended, including the obligations of the parties (thus including part of the Condition block from [14]) and the QoS attributes. It is not very clear why the QoS attributes are not included in the How part. The How part covers the rest of the Condition block.

The contract passes through several steps:
A *contract template* is defined, which usually predefines the „How“ and the „Legal clauses“ parts. Additionally, roles are defined and for each obligation a requested set of conditions is defined. This leads to PFC (see 2.2.2 Structure). Still the template does not define exact obligations. The idea of using contract templates with some predefined fields

is presented in the CrossFlow project [20] as well. However, in CrossFlow project, PFCs aim contract reusability and facilitation of the contracting process, while in COSMOS project only the second goal is pursued. Regarding the contractual phases, this step should take place in the information phase.
By using a *broker*, the template will be completed if suitable providers can be retrieved from the catalogue. The broker's task is to assemble type-conforming offers, requests and contract templates and replace QoS specifications with the corresponding values offered. If the brokerage step leads to a completed contract that can be signed in principle, a contract proposal is given. Probably, this step can still be considered as part of the information phase.
During *negotiation*, contract proposals can be exchanged between the parties. Depending on the semantics of such a contract transfer, it may either be considered as a *proposal* (without legal binding) or as an *offer* (with legal binding if the other parties accept). If all parties accept, the contract is in an *agreed* state and ready for signing. It is not very clear how the semantic of the contract transfer should be defined and when it will be legally binding. Apparently, this step is part of the negotiation phase.
After all parties have signed the contract, the electronic contracting service certifies this. Afterwards, the contract is *executabl*e.

The information gathered within the contract during earlier phases directly allows deriving a workflow to execute a contract. Thus, a graphical representation of a workflow based on Petri-nets can be generated from the contract. The reason to use explicit representation is to allow manual editing by the user. Two ways are suggested for the utilization of the workflow representation. The CWE can be used only as a Petri-net interpreter that has adapters to different workflow environments. For companies not having established their own internal workflow system, COSMOS additionally includes a self-installing workflow environment.

According to this paper, the attempt to cover the full semantics of a contract by building a „contracting expert system" is considered as a dead end, since the expert system overhead i.e. the complexity of the system is expected to be too high.

4.7 University of California at Berkeley, USA

4.7.1 Services of a Broker in Electronic Commerce Transactions [23]

By Martin Bichler, Carrie Beam and Arie Segev
Focus: Pre-contractual phase, Contractual phase

This paper discusses the design and implementation of a CORBA-based electronic broker.
Nextn the difference between a broker and a matchmaker is described. The matchmaker is simply searching and performing matching of offers. The broker on the other hand provides services that may include searching for a suitable business partner (matchmaking), negotiating the terms of the deal, ensuring delivery of goods, etc. Thus

brokering is a process that extends matchmaking and participates in and facilitates the contractual and even the post-contractual phase of the business transaction.
The paper describes an electronic broker built on distributed object technology, which is part of the goals of a larger project called OFFER. The e-broker in OFFER assists the user in two main ways during a market transaction. It allows search in many, often unknown to the user, e-catalogues of suppliers. The only requirement is the e-catalogues to be registered in the broker. Further on, it provides auction mechanisms to support price negotiation between buyers and sellers.
A standard IDL interface is specified for the e-catalogues of a supplier and for the e-broker. Each supplier is responsible for implementing this interface.
The next quotation reveals some common problems of these applications, concerning negotiation:
"An e-broker provides a centralized market place, where many buyers and suppliers can meet. Hence, an e-broker is well situated for offering various kinds of negotiation mechanisms to buyers and sellers. Unfortunately, there do not exist solid bargaining algorithms. Bargaining strategies between a buyer and seller are extremely complex. They frequently evolve over time, and often require shrewd judgements about how much information to reveal, when to lie, how many issues to involve, and which sequence of counterproposals to use. It is a fuzzy science at best, and efforts to either program strategies into software agents or to have agents learn good strategies are not robust enough for commercial applications. Hence, automated negotiation is still in its infancy, in extremely controlled conditions at research laboratories."
The solution to this problem in this paper is in using an auction strategy. The software agents need only to know the auction rules and submit a bid. However, this is suitable only for price negotiation.

4.8 University of Toronto, Canada

4.8.1 A Business Contracting Model for TINA Architecture [9]

By Fawzi Daoud
Focus: Contractual phase

This paper describes a contracting architectural framework, which is related to the TINA (Telecommunication Information, Networking Architecture) architecture. The TINA system is a worldwide information networking system that is made up of a large number of interconnected computers [40].
This architecture includes the Meta-broker concept to the TINA business model. It is used to support the contracting requirements on top of the TINA business model. The Meta-broker concept is composed of a contract framework and of catalogue facilities. The Meta-broker ensures the correct negotiation protocols, validation, and enforcing the constraints and the contracts, and also interacting with the virtual catalogues.
The contract framework is built of four modules: *Validation, Negotiation, Monitoring,* and *Enforcement.* Though it is not stated in the paper, the proposed contract framework is equivalent to the contract architecture described in [1].

4.9 Washington University, USA

4.9.1 Contracting with Uncertain Level of Trust [7]

By Sviatoslav Brainov, Tuomas Sandholm
Focus: Pre-delivery, post-delivery phases

The paper investigates the impact of trust on the form and the terms of contracts. Need of trust in electronic commerce is usually explained by time asymmetry, lack of power, insecurity, or inability to conclude perfect contracts.
The paper focuses on the case where the level of trustworthiness of the buyer is uncertain. It is shown that if the seller's trust equals the buyer trustworthiness, then the social welfare, the amount of trade and the parties' utility functions are maximized. It is demonstrated that underestimating the buyer's trustworthiness tends to harm both parties. The role of advance payment contracts for improving trustworthiness is discussed. It is shown that in the case where the buyer is distrusted, advance payment contracts are efficient in terms of amount of trade and social welfare. It is proved that in this case both parties prefer an advance payment contract to a standard uncertain payment contract.

4.10 Emporia State University, Kansas, USA

4.10.1 Building the Virtual Organization with Electronic Communication [5]

By William S. Remingon, Ronald Pedigo, and Terry L. Fox
Focus: Party entity

The paper provides a very brief overview of virtual organizations, the way they are established and the goals that must be followed when establishing such relations. This paper considers only outsourcing as a basis for virtual organizations establishment. It tries to answer two questions: What should be outsourced to the partner and what left for the company? What are the guidelines for developing the contracts that link strategic partners?
This paper considers the strategic partnerships as a long-term relationship. The most important outcome of the contract negotiation is not the finished contract, but the deepened understanding of important issues that arise in working out the contract. Several principles that contribute to building a long-term relationship can be applied in developing contracts: Simplicity, Flexibility, Strategic Alignment (the parties should have coordinated strategies) and Shared Outcomes (The success / failure of the overall enterprise must be shared by all of the partners).
This approach of long-term relationships contradicts the expectations that electronic commerce relationships will be open and thus short-term ones. As it was outlined in the contractual framework (see 2.3 Type of agreement), the efforts are concentrated on the open relationships, which will allow a company to be flexible and free in doing business.
The last part of the article outlines the necessity of establishing a technological capability and compatibility for data sharing among the companies forming a virtual organization.

4.11 University of Texas at Austin, USA

4.11.1 Intermediation, Contracts and Micropayments in Electronic Commerce [6]

By Soon-Yong Choi, Dale O. Stahl, and Andrew B. Whinston
Focus: Contractual phase, post-delivery phase

This paper discusses the role of the trade intermediaries (e.g. retailers) in the electronic commerce. The need for a trade intermediary is often dismissed in the direct supplier to consumer electronic commerce transaction model (see 2.4.3 One-to-one contracting). For example, an e-commerce system has little need for distributional intermediaries.
The problem of electronic markets that is depicted in this paper is the uncertainty about product quality. One of the primary reasons why a market fails is the asymmetric information: what a seller knows is different from what a buyer knows. The authors suggest electronic commerce intermediaries to act as quality guarantors but without incurring high transaction costs. The paper answers to the problem how to keep the costs low for intermediaries when the quality cannot be observed as in the physical world. A possible solution is a just-in-time purchasing system. The key element of this system is the open-ended contract with suppliers whose deliveries are not inspected. The contract can be terminated if the intermediary encounters many instances of low quality. The reward for high quality is the continued business relationship with the manufacturer.
The rest of the paper discusses the role of micro-payments in the electronic commerce, which has mostly B2C issues.

5. Conclusion

This document provides a survey of contract-related standards, standard-issuing organizations and contract-oriented projects. The projects were selected after a thorough search in different libraries including digital ones (ACM, Business Media, etc.), as well as through some secondary, other means, like contacts established during the work on the CrossFlow project [20] and contacts established with the Bulgarian Industrial Association. Most of the examined papers are from the last two years, except [1], which was published in 1995 but sets important standards and influences that can be observed in other papers [3, 9,13,14].

There still are a number of open issues in the e-contracting process.
Apparently, the process of negotiation is the most complicated phase of the e-contractual process. It is still in the initial stage of development. Also it is still questionable whether users will agree negotiation in all business transactions to be done on their behalf.

Two other open issues can be observed: How to improve trustworthiness among the clients and how to make legally valid the procedure of e-contracting. One possible solution regarding the trustworthiness (and probably the real future solution) is the existence of intermediaries that will support the contracting processes. These intermediaries can support different phases of the contracting process or can facilitate only some of the processes in the phases. For example, the identity of the parties and their profile can be certified by electronic certification institutes, the payment process can be supported by a bank institution, the signed contracts can be stored in a third-party repository, etc. It is possible one trusted center to comprise and support all these processes.
Undefined legal conditions and the different legal systems of the countries seriously hinder the e-contract development and implementation. Legal problems require appropriate legislation to be adopted not only at a national level but globally, encompassing all countries and their local legislative systems.

Electronic contracting is an area that is currently under research and development. The goal that should be achieved one day is quite obvious: to establish a standard way for doing business by electronic means. Probably in the transitional period several solutions will be available that will compete for the leading position. Due to interoperability reasons it is probable only one solution to remain dominant or all solutions to interoperate.
Unfortunately, it is not always the best possible solution that is chosen in the business area. Usually, the one that already works and people have got used to, becomes popular and will commonly be used for a long period of time.

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Appendix A - Acronym List

A2A	Application to Application
AI	Artificial Intelligence
ANSI	American National Standards Institute
ASCX12	Accredited Standards Committee X12
ASP	Application Service Provider
B2B	Business to Business
B2C	Business to Consumer
BASDA	Business Application Software Developers' Association
BMF	Business Media Framework
C2C	Consumer to Consumer
CA	Certificate Authority
CBC	Customer Buying Cycle
CEO	Chief Executive Officer
CFO	Chief Financial Officer
CT	Contract Template
CTO	Chief Technology Officer
DISA	Data Interchange Standards Association
DPN	Document Petri Nets
DS	Digital Signature
EB	Electronic Business
EBXML	Electronic Business eXtensible Markup Language
EC	Electronic Commerce
ECML	Electronic Commerce Modeling Language
ECT	Electronic Commerce Transaction
EDI	Electronic Data Interchange
(UN/)EDIFACT	(United Nations/) Electronic Data Interchange for Administration, Commerce and Transport
EM-RM	Electronic Market Reference Model
EPC	Electronic Product Catalogue
ESC	Electronic Service Catalogue
FPML	Financial Products Markup Language
FSTC	Financial Services Technology Consortium
ICE	Information and Content Exchange Protocol
ICT	Information and Communication Technology
IETF	Internet Engineering Task Force
INCOTERMS	INternational COmmercial TERMS
IOTP	Internet Open Trading Protocol
IT	Information Technology
JEPI	Joint Electronic Payment Initiative
MEPC	Mediating Electronic Product Catalogues
NSS	Negotiation Support System
OASIS	Organization for the Advancement of Structured Information Standards
OBI	Open Buying on the Internet
Open-EDI	Open Electronic Data Interchange

P2P	Peer to Peer
PFC	Partially Filled Contract
QoS	Quality of Service
SCC	Standard Contract Clause
SFC	Standard Form Contract
SME	Small and Medium Enterprises
SOAP	Simple Object Access Protocol
TC	Trusted Center
TMWG	Techniques & Methodologies Working Group
TPA	Trading Partner Agreement
TPAML	Trading Partner Agreement Markup Language
TTP	Trusted Third Party
UDDI	Universal Description, Discovery and Integration
UN/CEFACT	United Nations Centre for Trade Facilitation and Electronic Business
UN EC	United Nations Economic Commission
UN LK	United Nations Layout Key
VE	Virtual Enterprise
VO	Virtual Organization
W3C	World Wide Web Consortium
WFMS	WorkFlow Management System
XCBL	XML Common Business Library
XML	eXtensible Markup Language