

E-contracting Challenges

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1. A short history of e-contracting

A decade ago, IT through its innovations in business process reengineering led the way in breaking down the inefficiencies within companies. Firms in the new millennium now face relentless pressure to perform better, faster, cheaper, while maintaining a high level of guaranteed results. Firms must thus focus on their core competencies and outsource all other activities. Working with a partner, however, requires breaking down the inefficiencies between organizations and coping with frequent change across the entire end-to-end value chain. In this new world of collaborative commerce and collaborative sourcing, a standard business process is simply inadequate. Using e-contracts to build new business relationships and to fulfill e-contracts through the Internet are important trends. E-contracting is however not a new concept. The history of e-contracting can be reviewed from legal and technology aspects.

Over the last twenty years or so, a growing body of research in artificial intelligence has focused on the representation of legislation and regulations (Sergor 1991). As specific regulations contracts are used to regulate the actions of two or multi-parties interactions. Gardner (1987) has developed contract formation rules. Her work concerns legislation about the nature of exchanges that lead to contractual relations. The ALDUS project and Legal Expert project investigated to draft the Sale Goods contract (ALDUS, 1992) and the United Nations Convention on contracts for the international sale of goods (Yoshino 1997, 1998), respectively. Detailed information on developing logic-based tools for the analysis and representation of legal contracts can be found from (Daskalopulu, 1997, 1999).

The law regards contracts as collections of obligations; research in this area includes automated inference methods, which are intended to facilitate application of the theory to the analysis of practical problems. The purpose of a legal e-contracting system is to clarify and expand an incomplete and imprecise statement of requirements into a precise formal specification.

In the early 1990's, the development of EDI (Electronic Data Interchange) was a significant movement for electronic commerce. EDI was considered as a term that refers solely to electronic transactions and contracts (Justice Canada, 1995). EDI requires an agreement between trading partners that not only dictates a standard data format for their computer-to-computer communications, but also governs all related legal issues of EDI usage. In 1987, the first set of EDI rules was named Uniform Rules of Conduct for Interchange of Trade Data by Teletransmission (UNCID, 1987). In 1990, the American Bar Association (ABA) published a Model Trading Partner

Agreement and Commentary together with an explanatory report (Winn, J.K. & Wright, B. 2001). In 2000 IBM submitted to OASIS (for standardization) the first example of an XML-based EDI TPA language which is called Trading Partner Agreement Markup Language (tpaML).

While the EDI standard introduced efficient communication channels between companies, its implementation was not widely accepted due to its high installation costs, lack of flexibility, and technological limitations (Raman, 1996). With the development of the Internet, electronic contracting began to be interpreted in broader terms. In this new view e-contracts are not only used as a legally binding agreement between a buyer and seller, but they can also be used across different workflow systems to cross different organizational business processes (Koetsier, Grefen, & Vonk, 1999) (Kafeza, Chiu and Kafeza, 2001) (Cheung, Chiu & Till, 2002) to integrate different web services (Cheung, Chiu & Till, 2003) (Chiu *et al*, 2002). E-contract(ing) has become synonymous for business integration over electronic networks.

2. Background

New technologies, Internet and other networks have changed business environments and provided the trading processes in e-business more efficiency. Legal regulations, such as the European directive for electronic signatures (EU Directive, 2000) and national e-commerce regulations have set up a framework for using electronic contracts in business. Concepts of e-contract under the network environment have definitely different characteristics than the concepts for traditional paper contracts. Whereas a paper-based contract document is a static view on the obligations, an e-contracting system could monitor the responsibilities of each contractual party and the performance of the obligations.

In a networked environment, the definition of the concept of e-contracts can be emphasized as “a contract is a guarantee” or “contracts build new business collaborations between contractual partners” (Xu, 2004). First, the contract provides a guarantee to all contractual partners according to the clauses of the signed contract and relevant laws. An agreement between consumers and retailers in B2C commerce is a typical example of “a contract is a guarantee”. The agreement provides protection to both consumers and retailers. Second, contractual partners build a business relationship using a contract such as an “arm’s length transaction”. Two (or multi-) parties, who used different workflows, can cooperate by using e-contracts to support business automation (Koetsier, Grefen & Vonk, 1999) (Kafeza, Chiu & Kafeza, 2001). Web service composition can also be implemented by using e-contracts. There also exist some e-contract applications that actually cover both sides’ concepts. For instance, Trading Partner Agreement (TPA) in ebXML provides a guaranteed business exchange with a certain quality. It also specifies a long-term business relationship/collaboration between partners to conduct the business. It is important to realize though that the concept of e-contract has only a partial overlap with the concept of a paper contract. Both have features that do not have their representation in the other one.

Under electronic communications, e-contracting processes have their unique characteristics. The result of e-contracting, the contract, is a semi-structured document, which stored in any format, e.g. MS Word, PDF, or XML etc. Most e-contracts contain semi-structured information, such as XML-based words, sentences,

clauses or meta-information. Furthermore, some e-contracts have the legal status of digital documents. Depending on whether networks are used during the e-contract establishment stage, e-contracts can be created online (i.e. through networks), or electronically without networks. The collaboration in the contract formation phase can be asynchronous (e.g. by email) or synchronous (e.g. online collaboration). Moreover, the e-contracting process can be finished on a shared platform (e.g. e-marketplace) or be interconnected between contractual partners. The ownership of the contracting platform can thus be with a third party (ASP) or with the contractual partners. The e-contract can be fulfilled online (e.g. digital goods, services) or offline (e.g. physical goods). As e-contracts serve different purposes, different opportunities will bring extra values during the e-contracting stages. For example, in the contract execution/performance stage, extra monitoring information can be provided by different messages over networks. This is a significant difference with traditional contracting.

In short, e-contracting can protect contractual partners in electronic environments, reduce time-to-contract and reduce process costs. It can also provide new opportunities on contract management, contract content re-use and contract monitoring. Benefits of e-contracting are listed

- Avoiding errors
- Re-using content after closing
- Reducing time-to-contract
- Providing machine-processible document
- Minimizing risks in a contractual agreement for ad-hoc business relationships over public networks (such as Internet)
- Reducing contract management costs

3. E-contracting

Although there exist different descriptions for the e-contracting process (Milosevic and Bond,1995) (Goodchild, Herring & Milosevic, 2000), the general e-contracting process includes two stages: contract establishment (contract formation) and contract enactment (contract performance or contract fulfillment) (Xu, 2004) (Angelov, 2005). E-contracting activities such as identifying, checking and validating of contractual parties, negotiation and validation contract, are included in the stage of contract establishment. The contract enactment is further separated into two phases: performance and post-contractual activities. Monitoring of contract performance and compensation activities belongs to the contract performance phase while contract enforcement may be involved in both the contract performance and post-contractual activities.

The research area of electronic contracting focuses on negotiation of the terms and conditions of the contract and the monitoring of contract performance (Lee, 1998). Contract negotiation is described as the process in which contracting parties come to a mutual agreement on the contract content. Contract negotiation can be performed with or without the help of a third party. There are three critical aspects for the negotiation of a contract (Burgwinkel, 2002). First, the subject of the contract needs to be defined exactly. Second, the legal validity is formulated. Third, the price and conditions of each clause need to be negotiated in relation to the quality of deliverables and the quality of services and in relation to the legal terms.

Contract monitoring is the process of observing the activities performed by the parties for the purpose of pro-active imminent contract violations or detecting contract violations. To prevent undue costs it is important for the contractual parties to monitor the performance of the other collaborating parties, especially if the transactions are business critical. The monitoring of contract performance can be split into two parts divided by the occurrence of an anomalous action (Xu & Jeusfeld, 2003) (Xu, 2004). The part preceding the occurrence of anomalous actions is called the proactive monitoring of contract performance. The part following it is called the reactive monitoring of contract performance. In the pro-active monitoring stage, anomalous actions can be avoided and anticipated before contract violation occurrence. For example by warning about impending deadline violations. In the reactive monitoring stage, anomalous actions can be detected, the partners who are responsible for the violations need to be identified, the relevant partner needs to be compensated, and unsolvable disputes can be stored for future, human-involved, resolution.

Contract enforcement is the process of persuading the noncompliant party to perform corrective actions. Contract enforcement can be performed in three ways: pro-actively (through constraints provided in the contract), reactively (via auxiliary corrective measures aiming at minimizing the deviations from the contract), and post-contractually (by constraining future activities of that company in this domain) (Angelov, 2005).

In order to format and fulfill contract electronically, e-contracts have to be managed. There are different views to look at contract management. From a contract platform view, contract management includes

- a single repository for all contracts, related documents and information to users.
- searching, reporting and reusing capabilities to access all information in contracts and attachments,
- capabilities partners to track and monitor key performance indicators (KPIs) and performance over the contract execution and use this information to target improvement actions and to determine preferred status, rankings, etc.
- maintenance of different versions of contracts, automatically reconcile changes to terms and clause language, and compare different versions.
- clause and template library to capture standard and alternate clauses along with guidelines
- alerts and reminders to inform contract partners of any upcoming dates, events and milestones.

From one contractual party point of view, both its supplier and customer contracts need be managed. Moreover, the interrelation between these internal and external obligations, rights and penalties must be synchronized.

4. Multi-party contract case and issues

We provide a multi-party contract case to explain the existing issues in multi-party contract execution. The case outlines the manner in which a car damage claim is handled by a car insurance company. The contract parties work together to provide a service level which facilitates efficient claim settlement. The parties involved are a call centre, a day to day handling company, a group of garages and an association of assessors. The call centre is responsible for registering the insurant information,

suggesting an appropriate garage (most time a close by garage is assigned) and notifying the insurance company about the insurant's claim. The day to day handling company coordinates and manages the operation on a day to day level on behalf of the insurance company. A group of garages to assess car damages and to repair damaged cars for an insurant, who has bought car insurance from the car insurance company. The assessors conduct the physical inspections of damaged vehicles and agree upon repair figures with the garages.

The general process of the car insurance case is as follows (Figure 1): the insurant phones the call centre using a toll-free phone number to give notification of a new claim. The call centre will register the information, suggest an appropriate garage, and notify the car insurance company, which will check whether the policy is valid and covers this claim. After the car insurance company receives this claim, the car insurance company sends the claim details to the day to day handling company. The car insurance company will send a letter to the insurant to ask for a completed claim form. The day to day handling company will agree upon repair costs if an assessor is not required for small damages; otherwise, an assessor will be assigned. The assessor will check the damaged vehicle and agree upon repair costs with the garage. After receiving an agreement for repairing the car from the day to day handling company, the garage will then commence repairs. After finishing repairs, the garage will issue an invoice to the day to day handling company, which will check the invoice against the original estimate. The day to day handling company returns all invoices to the car insurance company. After the car insurance company also receives the completed claim form from the insurant, the payment is processed. In the whole process, if the claim is found invalid, all contractual parties will be contacted and the process will be stopped.

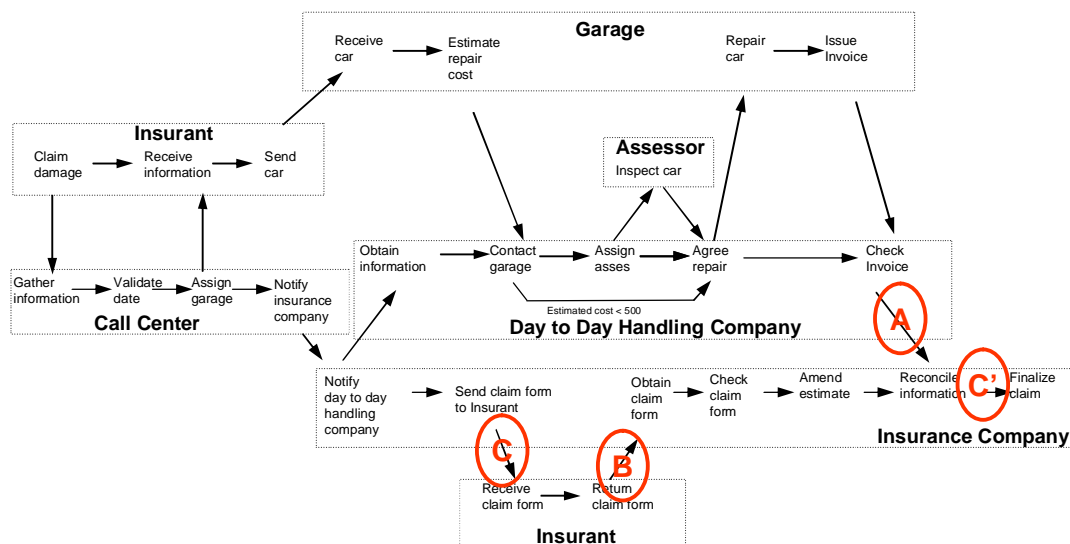


Figure 1 Process of car insurance case

There are many potential contract violations in this case, for example, after sending invoices to the day to day handling company; the garage does not get money back from the car insurance company. It could be caused by for example:

- the day to day handling company, because it does not forward the invoices to the car insurance company (Figure 1, with mark A);

- the insurant, because the insurant did not return the completed claim form to the car insurance company (Figure 1, with mark B);
- the car insurance company, because the car insurance company forgot to send the claim form to the insurant or simply because it did not pay the garage in time (Figure 1, with mark C and C’).

or any combination from above.

Contract specification:

A multi-party contract is specified as a set of actions, a set of commitments and a commitment graph of a contract.

An action is specified as

action = (name, sender, receiver, deadline),

For example, Action (A_agreeRepairCar,L,G”,3) describes agreement of the day to day handling company for the garage to repair the car and that the day to day handling company has 3 days to respond.

A commitment is specified as

commitment = (name, sender, receiver, n, {(a₁, u₁), (a₂, u₂), . . . , (a_n, u_n) : a_i ∈ A, u_i ∈ U}).

An example of a commitment, C_repairService is specified as

(C_repairService,G, P, {(A_sendCar, tr), (A_estimateRepairCost, fi), (A_agreeRepairCar, tr), (A_repairCar, fi)}).

the garage will offer the repair service to the insurant. After the insurant sends his/her car to the garage (action A_sendCar has a trigger attribute), the garage estimates the repair costs (action A_estimateRepairCost has a finish attribute). After the garage receives an agreement from the day to day about the repair costs (action A_agreeRepairCar has a trigger attribute), the garage repairs the car (action A_repairCar has a finish attribute).

Because of the space limitation, more detail of multi-party contract specification and formal reasoning can be found from (Xu, L. 2004) , (Xu, Jeusfeld & Grefen, 2005)

5. Future trends

Several hurdles from technological, business and legal aspects have to be overcome to establish e-contracting as a collaboration technology.

Multi-party e-contract vs. multiple bilateral e-contracts

Little research has been done on multi-party contracts. Almost all research on multi-party contracts tries to break down a multi-party contract into a number of bilateral contracts (Xu, Jeusfeld & Grefen, 2005). The semantics of a multi-party relationship are not always the same as multiple binary relationships. Only in some cases is it possible to see multi-party contracts as multiple binary contracts without losing valuable information. However, as more multi-party relations develop between companies, more contracts will be in force that would result in loss of information and increased complexity as relationships get hidden. The issues of how to represent or model multi-party e-contracts, how to identify the responsible partner(s) for a contract violation and how to provide extra services for multi-party contracting (e.g. pro-active monitoring functions) are critical in the area of e-contracting.

E-contracting challenges on modeling and representing contractual relationships

Existing contract models, such as the e-contracting logic model (Lee, 98), aim to improve both expressiveness and inferential capabilities of the contracts. The model proposed in (Weigand & Xu, 2001) focuses on task allocations and process coordinations. The pro-active monitoring contract model (Xu, 2003, 2004) and multi-party contract model (Xu, 2004b) provide contract model for different objects. These models are representing trading contracts.

A model for e-contracts needs to present an integrated view on both the regular contracts and the technical agreement to be able for e-contracts to be fulfilled over networks. XML-based e-contracts have been investigated by several research projects: SeCo (Greunz et al., 2002), COSMOS (Merz et al., 1999) and OCTANE (Kuhne, 2001) and eLEGAL (Carter et al., 2002). An XML-based electronic contracting editor is currently developed and can be deployed in different contract domains (Burgwinkel, 2002b). It enables all collaborating parties to create contracts from existing templates, to exchange and negotiate them, and finally, to sign them over Internet. The contract is a domain-specific XML document. The semantics of legal clauses can be expressed by using clause types and structuring rules for legal documents. The e-contracts can be signed electronically using XML signatures. Ponton X/E, a visual XML Editor, is developed by the German Ponton consulting company. The possibilities and limitations of XML-based e-contracting are discussed in (Burgwinkel, 2002b). Applying semantic web technology and business rules for e-contracting is studied in (Grosz, 2001).

There are some specific communities who publish standards and rules for the formation of contracts, such as the International Chamber of Commerce's model international sale contract (www.modelcontracts.com) and the Swiss IT association.

E-contracting challenges on negotiation

Electronic environments have a great impact on contract negotiation. The benefits of e-negotiation could reduce the need for face-to-face meetings and traveling, improve the quality of agreements and mutual satisfaction, and reduce the damage caused by lasting and unresolved disputes. Contracts can be negotiated by exchange of messages over networks or by using a negotiation platform. Studies on e-mail negotiation have shown that trading partners behave differently in electronic negotiation than they would in a face-to-face meeting (Shell, 2001). E-negotiation is a challenging task from the legal as well as from the business point of view. New laws and new legal frameworks for e-contracting such as building e-notaries are needed. User acceptance, security and confidentiality are also important challenges of e-negotiation.

E-contracting challenges on monitoring

A considerable amount of recent research and industrial application effort has concentrated on the provision of standards for automated establishment and subsequent implementation of electronic contracts. In general terms, an e-contract between multiple business partners contains some statements about their business relationship. In particular on their physical and informational interactions over networks. One purpose of such an e-contract is to distinguish expected and acceptable

behavior from behavior violating some clause in the multi-party contract. During the contract fulfillment, all necessary messages will be exchanged over networks. Those messages, events or actions of contractual partners can be used to provide extra information for (pro-active) monitoring services. Most of the current work focuses on the automation of contracting processes, rather than the development of services for contract fulfillment support, such as monitoring. Value-adding services, such as pro-active monitoring, detecting the party (or parties) responsible for a contract violation in multi-party contract performance, are the new opportunities as well as the key issues for realizing a trustworthy e-commerce environment.

E-contracting challenges on contract management

When a company is engaged in many contractual business relationships all using different e-commerce standards, management of the relations between the contractual parties and their e-commerce service providers becomes especially interesting. For each contractual party it is important to monitor the performance of their providers, especially if the transaction is business critical, such as a payment service with a guaranteed payment.

Besides, from one contractual party's perspective challenges for contract management are being able to achieve the maximum benefit of a contractual party, pre-calculating the cost of the contract violation and trying to reduce the potential costs.

Currently, some contract management applications are offered by Dicarta and Oracle

6. Conclusions

Electronic contract affects the traditional roles and attitudes of sales and purchasing departments and lawyers. Growing IT-support for contract management will provide assistance in handling the growing complexity of contractual relationships.

As an important component for trusted e-business in a global environment, e-contracting will help to reduce time-to contract, improve the collaboration between the trading partners and reduce minimize financial and legal risk. However, deployment of e-contracting has great challenges from the technical, business and legal view. To handle the complexity of the set-up and operation of contractual relations based on e-contracts, further research is needed.

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Terms and Definitions

Contract: A contract is a legally binding exchange of promises or agreement between parties that the law will enforce.

E-contract: An e-contract is a contractual agreement, represented as digital information and signed with digital signatures of the parties.

E-contracting: E-contracting is the processes of formatting and negotiating of contracts electronically, and also the monitoring the contract performance over networks.

E-negotiation: E-negotiation is negotiation over networks where interested parties resolve disputes, agree upon courses of action, bargain for individual or collective advantages, and/or attempt to craft outcomes which serve their mutual interests.

Business collaboration: Business collaboration involves at least two autonomous business parties, and is a set of activities or processes that lead to the accomplishment of an explicitly shared business goal by coordinated business parties.