A Survey of Electronic Contracting Related Developments[*]

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Abstract

We analyze the current state of electronic contracting systems. In the first part of the paper, we present a model based on a list of functions that an electronic contracting system should perform. We apply the model to discuss the current state of academic research and commercial software developments in the field of electronic contracting systems. We also point out directions for future research.

1.   General Introduction

In many cases businesses have the need to design customized contracts. Large multinationals always have a legal department that takes care of designing such customized contracts. Small and Medium sized Enterprises (SME), on the other hand, have to depend on banks and lawyers for legal assistance. However, drafting a complex contract with the help of a lawyer is often too expensive for an SME.

Global supply chains - outsourcing to foreign countries and engaging in international trade has become a competitive necessity for all companies. Additionally, the concept of dynamic networks - changing trading partners at short intervals for competitiveness is gaining importance in electronic business. This means an increased need for drafting and negotiating contracts.

In short, there is an increasing need for designing complex contracts for non-routine transactions or during the start of a new business relation in electronic commerce. Hence, an infrastructure that helps business executives to prepare their own contracts would be helpful. An Internet-based electronic contracting system could reduce the contracting related barriers in both domestic and international trade.

In this paper, we analyze the current state of developments in the field of electronic contracting. The three distinguished objectives of this paper are as follows.

The first objective is to present a model that consists of a set of features that an electronic contracting system needs to perform to facilitate contracting effectively.

The second objective is to analyze the academic research as well as commercial developments with our model of electronic contracting system. The state of development both in terms of commercial and academic research work are described using actual products and services as benchmark examples. The third objective is to provide directions for future research work.

The rest of the paper is divided into three sub-sections. The first section of the paper introduces the concept of electronic contracting, describes the need for electronic contracting, describes electronic contracting models, provides an overview of our model of electronic contracting system and finally elaborates on each of the functions that characterize the model. In the second section, commercial and research benchmark examples are provided to explain the current state of developments. Finally, recommendations are made for future research work in the third section.

1.1 Electronic Contracting System

Ronald Lee was one of the first to introduce Electronic Contracting as a concept over a decade ago. The language and formal procedures of contracting, employment of technology for further standardization of certain classes of contracts in order to reduce the transaction costs and time of contracting is referred to as 'electronic contracting' [12]. The first versions of the idea were based on Electronic Data Interchange (EDI) as a communication medium. Since then, electronic contracting has been evolving along with electronic communication.

1.2 Our Model of Electronic Contracting System

In the Electronic Markets Reference Model (EM-RM), Schmid and Lindemann [17] defined electronic contracting system as an integral component for electronically performing commerce activities. Lindemann and Runge in [14] elaborated on

electronic contracting system within the EM-RM framework. The following six contracting services namely were identified as within the contracting phase of the EM-RM framework.

1. *Validation Services* support the process of ensuring the validity of contracts.

2. *Negotiation services* provide an environment for the contract negotiation process.

3. *Monitoring Services* observes the actions of contracting parties and indicates the non-performance of contracted obligations.

4. *Enforcement Services* takes the necessary action in case of non-performance of contracting obligations

5. *Arbitration Services* assist in solving the disputes that arise during the formation and execution of a contract

6. *Repository Services* provides information that helps in the formation of contracts and in checking the validity of contracts.

Our model is a further elaboration of certain aspects of the electronic contracting services from the EM-RM [15]. On the one hand our model has a more restricted focus, because we do not discuss the monitoring, enforcement and arbitration services in this paper. On the other hand, our model is a further development of their model, because we give an in-depth analysis of the validation, negotiation and repository services, and we add two additional layers compared with the EM-RM, namely the Legal Infrastructure and Negotiation Infrastructure layer.
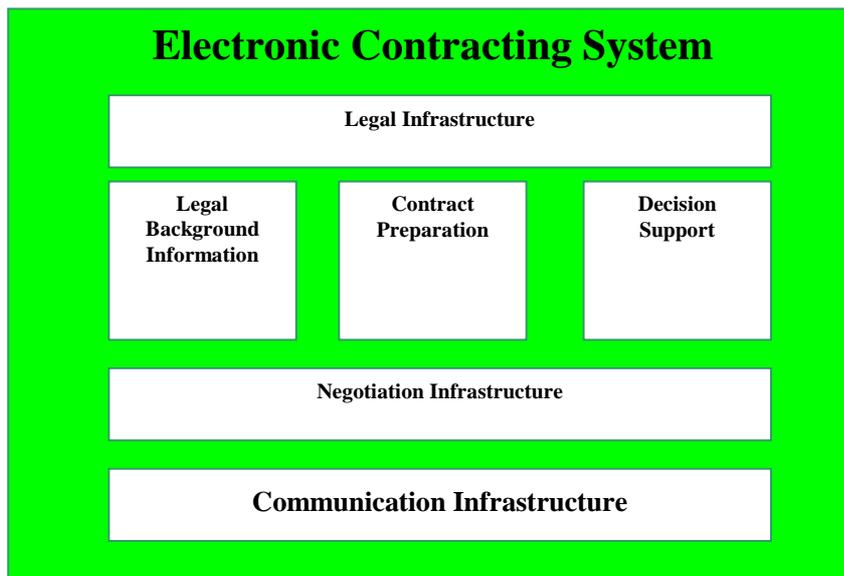

Figure 1: *Model of Electronic Contracting System*

The model that we propose for describing an electronic contracting system has three horizontal layers and three vertical categories (Fig.1.0). The vertical categories are i) Legal Information ii) Contract Preparation tools and iii) Decision Support. Each category has a set of functions, which is described below. Though the vertical categories are listed one after another, they do not necessarily describe a unidirectional flow of a process. Instead the back and forth process of preparing versions of contracts from electronic versions of state, national and international laws with the help of decision support tools that assist by providing scenario analysis is described.

Compared to the generic EM-RM framework, we propose two infrastructural additions in our model. At the infrastructure level, a Legal Infrastructure layer for governing the electronic market transactions and a Negotiation Infrastructure layer on top of the Communication Infrastructure layer in EM-RM are added. Firstly, we added a Legal Infrastructure layer because one needs specific legal functions to deal with electronic documents, for example electronic title registry, which will be described in the Bolero case. Secondly, we added a Negotiation Infrastructure layer, because in many complex negotiations (e.g. in international trade) there are strict rules and procedures about how to conduct negotiations, or how to exchange trade documents. The negotiation infrastructure should provide a library of trade procedures that can be used to structure the communication. Also the negotiation infrastructure should provide a library with negotiation strategies that could be used for conducting the negotiation.

1.3.1   Horizontal Layer: Legal Infrastructure

The legal infrastructure that we are proposing governs the whole process of negotiation and addresses concerns over the legality of transactions performed over the Internet. A number of countries are in the process of developing legal frameworks that govern online transactions. Complementing these developments, private organizations such as Bolero.net [2] have created their own rulebook, which applies to the transactions that are communicated over their secured closed network.

1.3.2   Vertical Category One: Legal Background Information

Legal information that helps in the formation of contracts is listed under this category. There are two methods by which the information can be accessed.

Legal Information web sites - Electronic versions of some national or international laws can be accessed via the Internet either for a subscription fee or for free. Most of the subscription based web sites provide more than just electronic versions of laws and regulations. For instance, they provide a forum for debating various laws, recommendations made by renowned legal professionals for future amendment of laws and its associated arguments. While forming contracts, these web sites can be used as a reference tool. An example is DC-Professional ICC [4].

Contract templates – Contracts terms and conditions that accompany frequently used trade documents such as purchase order are made in the form of a contract template. They can be used either as they are or after customization. With advancements in the usage of XML to machine process a contract, business executives might be able to prepare valid customized contracts from standard contract templates. Lawyers, often, use standard and stored customized versions of contract templates to make their jobs easier.

1.3.3   Vertical Category Two: Contract Preparation

In case of negotiations, where two or more parties are involved, different versions of a contract are prepared before a final agreement is made. The tools that facilitate in preparing the different versions of contracts are described.

Contract drafting - User-friendly tools that help in drafting of contracts are typically a part of Electronic Contracting Systems. The information that is required for the contract is collected from the user using a simple set of questions, which is formatted by the program into a standard contract. With this tool, contract clauses from sources such as standardized templates and other internet based information sites can be put together in a single format using simple word-processing functions. Generally, the program allows for the format of the contract to be validated but not the content of each section of the contract. Internet based contract drafting programs are available. (E.g.) Dicarta [3] and MEMO [5].

Version management - The process of negotiation usually involves more than one version of a contract being prepared. Usually, a contracting party prepares a version of the contract that best suits his or her interest and forwards it to the other parties. Then, the other party/ies indicate the issues, which they would like to negotiate. Subsequently, the disputed issues are negotiated, one by one or as a set, until an agreement is reached. In the process, different versions of the contract are prepared and stored which are often referred to during the negotiation process. Version management tools help in maintaining the different versions of the contract to which the contracting parties can refer.

1.3.4   Vertical Category Three: Decision Support

This category covers functions that provide intelligent support to users while drafting contracts. The decision support tools should be made available through out the process of contracting to provide the maximum support to users for taking final decisions.

What if analysis – In order to assist those without legal expertise, an electronic contracting system should provide assistance in interpreting legal language. The users can make use of this function to probe the system about the meaning of legal clauses as well as describe a scenario to the system and seek advice about the liabilities, protection and risks. In order to perform such a function, the system should i) be able to interpret the meaning of legal clauses ii) have an interface

through which users can use to query the system by describing various scenarios in a simple manner iii) interpret the user input and relate the information to the applicable set of legal clauses and inform the user about the various contractual options that he or she has for the situation described.

Negotiation strategies – Usually, during negotiations, offers and counter-offers are made by the negotiating parties before reaching a final settlement. Using a wrong strategy for negotiation might result in prolonged negotiation and undesirable results. A decision support system based on concepts from game theory that can assist negotiating parties in determining the strategies would be a useful tool for contracting.

1.3.5 Horizontal Layer Two: Negotiation Infrastructure

The lists of functions that are performed throughout the process of negotiation fall under this category. This category would fall between services and transaction view in the EM-RM model. We have identified three functions under this category. We foresee the need to inform the contracting party about the rules that govern a negotiation, to carry out the act of negotiation and to have some automated reasoning through out the process.

Shared workspace - It is an Internet based, authentication requiring workspace that facilitates contract exchange and messaging between the contracting parties. The shared workspace, an integral part of an electronic contracting system, comes into play when a party has identified his or her counterpart for doing business. The contract template repository is accessible from the shared workspace. While establishing a business relation, the party has the option of choosing one of the contract templates available in the repository and submit it via the shared workspace, probing the counterpart's interest.

Negotiation protocols - Before embarking on the process of negotiation, firstly, the contracting parties have to agree upon on the rules that govern the process of negotiation. For instance, in the case of Amazon.com type of vendors where the price of the goods and the conditions that come along with it are non-negotiable. The buyer has the option of buying the good by either agreeing to the listed price and contract clauses or decide otherwise. In the case of contract negotiation, the parties might have to agree upon the list of actions and the order in which they will perform. There are numerous protocols with varying levels of complications to one or more of which the parties may have to agree upon before embarking on the process of negotiation. In our opinion, the electronic contracting tool should provide an easy method for choosing the protocol that is best suited to the type of negotiation that the parties perform. Ideally, the system should guide the process of negotiation and take appropriate actions when there are discrepancies in compliance with the protocol.

Messaging: Messaging is an essential feature of electronic contracting systems. There are many new XML based electronic message standards emerging. Most message standards have a data perspective on electronic communication. The

proponents of these message standards see communication as the exchange of data between back-office systems. Many criticisms have been lodged against this view on communication.

An alternative view on communication is offered by a linguistic theory, called Speech Act Theory (SAT)[19]. The core idea of SAT is that communication amounts to performing actions. The proponents of a linguistic view on communication claim that even though SAT is based on human communication it can help the design of electronic message standards. SAT has shown that a limited set of illocutionary forces is sufficient to express the majority of what we want to communicate. Thus SAT can help to minimize that number of messages that a message standard has to define. In addition, the formal Speech Act Theory can help to define the exact meaning of the messages.

1.3.6   Horizontal Layer Three: Communication Infrastructure

An electronic contracting system should be able to authenticate a user and provide a secured platform for negotiating. Especially, when one system is used to facilitate numerous negotiations simultaneously, (e.g. market places) it is important that negotiations between two parties are confidential. A reliable monitoring message bank is a requirement for filing the communicated messages. This retrievable data would serve as legal evidence in case of legal disputes between contracting parties, if they arise.

2.1   Analysis of Current Developments

While the previous section mapped the constituents and described the functions that an electronic contracting system should perform, this section using commercial and research initiatives as examples explains the current state of development under each of the listed categories. The model that was presented in the previous section is used to structure the description.

2.2   Horizontal Layer One: Legal Infrastructure

Many governments are developing legal infrastructures for monitoring and governing the transactions that are conducted over the Internet. As a make shift plan, commercial initiatives such as Bolero are providing an opportunity for their customers to make use of the legal infrastructure that they have developed and even make it mandatory that the customers sign to abide by the rules while hiring these services.

At the heart of Bolero is a unique legal infrastructure, the Bolero rulebook. It binds users to a common set of rights and obligations in the electronic (paperless) world. It operates in harmony with national legal systems and international conventions. The Bolero Rulebook is the result of one of the world's largest legal feasibility studies conducted by leading legal practitioners in world trade law. The rulebook

designed by Bolero can be compared to that of a private contract. It does not overrule any of the commercial agreements that are present in a contract. Instead, by signing the rulebook, a user is made responsible for the contents of the electronic documents sent through Bolero workspace. The rulebook balances inadequate legal support that has been stalling electronic transfer of documents. Quay notes, an interface designed by a venture between Allagraf [7] (expert in PKI applications) and Bolero, extends the advantages that Bolero offers to wider applications in an "easy-to-use" manner.

2.3   Vertical Category One: Legal Background Information

Electronic versions of some state, national and International laws are available over the Internet. Based on the Internet, commercial initiatives such as DC-Professional (ICC), which is explained in detail below, are focussing on specific set of laws and regulations. They also provide related value added services. Another set of function that falls under this category is standardized templates for contract formation. Quite a few programs are available with contract template functions. Following the explanation of DC-Professional - an Internet based commercial web site, MEMO - a European funded research project is explained below

Legal information web sites: Targeting legal professionals, *DC-Professional (ICC)* provides extensive and up-to-date documentary credit information over the Internet. It is associated with the International Chamber of Commerce (ICC). Paid subscription is required in order to access the service. Rule books and published and unpublished opinions are available in a retrievable electronic format. Finally, a workspace is provided for the members to exchange information and opinions.

Contract Templates: Templates in *MEMO - MEdiating and MOnitoring electronic commerce* electronic contracting system are similar to that of those in Microsoft PowerPoint. Electronic versions of standardized contracts are made using this 12-point structure as standardized contract templates. Customized contracts can be designed by modifying certain clauses of the template. In other words, specific clauses of the standardized contract can be modified and the modified template as a whole can be saved as a customized contract. XML language is used to tag the legal clauses with which the templates are formed. This means that the resulting template is not simply a text but has semi-formal properties.

2.4   Vertical Category Two: Contract Preparation

Internet-based contract preparation tools are well developed at this stage. Dicarta - a commercial electronic contracting system that provides contracting related solutions to Ariba marketplaces have a well-developed contract preparation tools - contract drafting and version management. MEMO, an EU funded research initiative, has well-developed tools but the interface is not as sophisticated as that of Dicarta. A secure environment is provided by Allagrafs' ACL web-based application for

facilitating the formation of contracts based on International Chamber of Commerce (ICC) Model International Sale Contract.

Contract Drafting: MasterDraft is a document assembly software developed by First Draft Legal Systems Inc. MasterDraft enables the corporate user to generate sophisticated contract documents using simple description-boxes, menus, templates and context-sensitive help. MasterDraft allows the corporate law department to convert the company's contracts into easy-to-use checkboxes, worksheets, clause libraries & pick-menus for rapid intelligent assembly of documents. Provato [8], a company aiming to reduce the inefficiency associated with contract management, provides solutions for managing the drafted contracts/e-agreements.

Version Management: This function is very similar to that of version management in data processing programs. *Dicarta* has a sophisticated version management tool, which is accessible from the shared workspace of its electronic contracting system. The contracting parties have the option of highlighting the legal clauses using a shade to which they disagree. Then, the list is negotiated. Different versions of the contracts that represents the negotiation at various stages is maintained which allows the contracting parties to refer back to the process of negotiation.

2.5   Vertical Category Three: Decision Support

This part of the electronic contracting system is being researched and commercial initiatives are yet to use the full potential of this category of functions. The research hurdles however are many as identified in the paper [9]. Objectively providing decision support to all contracting parties is a complex process. In our opinion, the potential for research work in this area is high and it would take a reasonable period of time before commercial products for decision support are available.

What if analysis: INCAS [18], a research initiative, is a legal expert system that uses defeasibility (an action in which the rule is overruled by another rule or fact) reasoning capability of prolog programming language for modeling the reasoning about the Incoterms. It uses on-line explanations about the use of Incoterms in trade contracts. Incoterms stipulate which party (buyer or seller) is responsible for arranging and paying transport of the goods, and arranging the documents necessary for this transport (e.g. quality certificates etc.).

Negotiation strategies: The concept, which is still in its stages of infancy, has been used to make programs that interpret the domain of Australian family law and assist spouses in negotiating a settlement after divorce. The developers of the programs, Family_negotiator, Split_up, Adjust Winner and DEUS, have experimented using Artificial Intelligence systems to incorporate decision making features into the NSS in order to automate the process of negotiation [9]. Inadequate advancements in the concept can be noticed when the program attempts to assist in complex negotiation problems.

2.6   Horizontal Layer Two: Negotiation Infrastructure

The basic infrastructure for negotiating contracts exists. The concept of shared workspace is well developed and used in different context apart from contracting purposes. Supply point – an initiative that provides an Internet based environment in which consortiums for construction purposes are formed [6]. The workspace that they provide has advanced features and it well represents the state of development. In the context of electronic contracting, Dicarta has a sophisticated shared workspace that adequately meets the commercial requirements. MEMO, a research initiative also has a well-developed shared workspace.

With regards to negotiation protocols, a comprehensive multi-protocol electronic contracting system does not exist. For instance, MEMO and Dicarta provide an environment for designing legally valid contracts but do not allow for automated price negotiations such as auctions. Ariba [1] - an electronic market place provider, has well-developed price matching mechanisms uses the Dicarta program as a supportive infrastructure that allows for drafting of legal contracts.

Shared Workspace: The Shared Workspace, an integral part of MEMO ECS, comes into play when a party has identified his or her counterpart for doing business. In the case of MEMO, the shared workspace is hosted by the ABN – AMRO bank, which plays the role of a trusted third party. The users have the option of accessing contract templates and contract drafting tools from the shared workspace.

Negotiation Protocols: To connect buyers and suppliers, Ariba Network incorporates a number of Internet services including, catalog and content management, order transaction routing, and multi-protocol support for numerous standard ways of exchanging content and transaction information. InterProcs [13] – a modeling tool can be used to design negotiation protocols that can be downloaded from the Internet and executed by the trading parties. The parties can agree upon a protocol chosen from an online repository and use it as a regulating mechanism for negotiation.

Messaging: (FLBC): The user of the MEMO ECS can decide to use either messaging or the Shared Workspace for communicating with a trading partner. Because of the advantages of semantic-oriented over data based communication language the MEMO ECS messaging system uses FLBC [11]. As a part of the MEMO project, FLBC has been further developed and new layers, such as scenarios and transactions have been added to the FLBC specification.

2.7   Horizontal Layer Three: Communication Infrastructure

Bolero initiative [2], provides a secure, guaranteed service for the exchange of electronic trade documents, and is designed to ultimately become a globally accepted standard. While providing the Infrastructure for electronic communication, Bolero has proven methods that ensure authentication, integrity and non-repudiation of electronic messages. By playing the role of a middleman, Bolero controls the

exchange of messages between users. In the process, through message notifications and acknowledgements it ensures guaranteed message deliveries.

Core Messaging Platform: Also known as CMP, it is the hub of Bolero.net service. Authenticated and validated trade documents are sent through CMP. A minute discrepancy between the message sent and message received is identified, resulting in rejection of the document. By using XML coded messages in message headers, Interoperability between users is facilitated through CMP. During the exchange, messages are logged, which can be produced upon request for up to three years of time, in case of litigation.

3.   Conclusions

Table 1.0 gives comparison of the different electronic contracting services discussed in this paper. Many of the products that we described above are developed to perform one or two functions but not all the six, which in our opinion, is ideally required to form a contract electronically. Dicarta's contracting systems seems to be the most comprehensive of all the programs that are commercially available. The basic technology for decision support is still under development. Research projects such as INCAS and Split_up are examples of the current state of development in the field of Decision Support Systems (DSS). DSS related developments would improve the breadth and quality of services provided by an electronic contracting system considerably.

Functions	ME	DI	SP	DC	SU	BO	IN	AR	MD	IP
Legal Rule book						✔				
Legal Information Web Sites				✔						
Standard Contract Templates	✔								✔	
Contract Drafting	✔	✔							✔	
Version Management	✔	✔							✔	
What-if analysis							✔			
Negotiation strategies					✔					
Shared workspace	✔	✔	✔							
Negotiation protocols	✔							✔		✔
Messaging	✔	✔	✔			✔				
Secured Communication platform						✔				

ME = Mediating and Monitoring Electronic Commerce   BO = Bolero
DI = Dicarta   IN = INCAS
SP = Supply Point   AR = Ariba
DC = DC- Professional (ICC)   MD = Master Draft
SU = Split_Up   IP = InterProcs

Table 1: *Functions Comparison Table*

Products and services are available to perform one function such as Dc-Professional for legal information, Bolero for legal rulebook and secured communication and MEMO for contract templates. But an electronic contracting system that incorporates these independent initiatives to improve its comprehensiveness is still missing. Those providing an environment for businesses to meet and transact electronically (E.g. market makers, international trade portals) could benefit from electronic contracting systems. Dicarta providing contracting services to Ariba market place is a fine example of this trend.

Acknowledgements

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