

LEGAL RISK ANALYSIS, MODELING AND PROGRAMMING FOR E-COMMERCE IN CONSTRUCTION

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ABSTRACT

This paper presents an aspect of the ongoing research at the University of Michigan aiming to analyze the status of e-commerce in the construction industry. It identifies impediments and challenges, and research solutions for the identified challenges. The focus is on risk management and legal challenges for e-commerce in construction. Very little, if any, research exists on this area in construction literature. The premise of the argument is that **studying the legal aspects and challenges for e-commerce in construction are an essential element to having a strong e-commerce infrastructure**. This paper introduces the concept of legal modeling and programming for e-commerce in the construction industry. To present the argument for legal programming, the paper starts by outlining the taxonomy of construction e-commerce risks and introducing the legal risks of doing business through e-commerce in construction. It then looks to the future and considers how to incorporate legal criteria in e-construction applications, design and programming.

KEY WORDS

E-commerce; legal modeling; legal programming; construction industry; construction management; business process modeling; software modeling; information technology (IT) in construction.

INTRODUCTION

The hype for e-commerce in the construction industry is now over. With industry players already embracing the change, many are now shifting their focus towards the impact, or no-impact, that e-commerce has left in their businesses. E-commerce applications in the construction industry are poised for restructuring. Industry players have recognized that e-commerce will re-intermediate the existing market relations, disrupting some and driving new efficiencies in many. The efforts in the next era should focus on those restructuring efforts.

Despite predictions about the success of e-commerce in construction and how it could change the construction industry (Anumba and Ruikar 2002; Berning 2000, Merrill Lynch 2000), the industry is still struggling with e-commerce applications. Indeed, the adoption of the construction industry to e-commerce applications and IT in general has been sluggish; however, steady (Berning 2000). The industry should now be concerned with

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the readiness for the next phase of e-commerce implementation; a phase that will involve much more players than the innovators and early adopters.

The question of how much value e-commerce can add to construction operations has been studied in numerous occasions (Mohamed and Stewart 2003; Johnson and Clayton 1998; Stewart and Mohamed 2004; Love et al. 2004). The need for legally binding e-contracts in construction applications have been noted (Nitithamyong and Skibniewski 2004). More importantly, the link between the existence of quality legal rules for regulating e-commerce and the amount of e-commerce revenue has been established. It has been shown that quality legal rules and enforcement are “significantly and positively” associated with e-commerce revenues (Millard 2000). It is also documented that, if and when, a legally binding e-collaboration and e-commerce system is established in construction projects, the utilization of such a system increases noticeably (Pena-Mora and Choudary 2001). Therefore, the analysis of e-construction legal risks, coupled with, incorporating the legal dimension in programming e-commerce tools, may, radically improve the utilization of e-commerce in construction and significantly improve the trust and confidence of the industry in e-commerce. This analysis, however, has been overlooked.

RESEARCH BACKGROUND

This paper presents an aspect of the ongoing research at the University of Michigan aiming to analyze the status of e-commerce in the construction industry. It identifies impediments and challenges, and research solutions for the identified challenges. The research efforts started with a survey and interviews conducted in 2000/2001 with the industry practitioners to establish a benchmark for e-commerce implementation and to gain insight on the problems faced by the early adopters. Another survey is currently being conducted to take another snap-shot four years after the first survey to compare the results and analyze the trends. From the results of the first survey, the preliminary results of the second survey, and a comprehensive literature review and analysis, a framework was identified for analyzing and managing e-commerce barriers and challenges in the construction industry. The research grouped the challenges under four focus areas: technological, risk management, information liquidity, and managerial and organizational.

The focus of this paper is on the risk management and legal challenges for e-commerce in construction. In a litigious environment such as the construction industry, risk management practices are of paramount importance. Surprisingly, the practical issues relating to risk management and legal challenges to e-construction have been widely neglected. Very little, if any, research exists on this area in construction literature. The argument is that studying the legal aspects and challenges for e-commerce in construction is an essential element to having a strong e-commerce infrastructure. This paper introduces the concept of legal modeling and programming for e-commerce in the construction industry. To present the argument for legal programming, the paper starts by outlining the taxonomy of construction e-commerce risks and introducing the legal risks of doing business through e-commerce in construction. It then looks to the future and considers how to incorporate legal criteria in e-construction applications, design and programming.

TAXONOMY OF CONSTRUCTION E-COMMERCE RISKS

The wide implementation of e-commerce in the construction industry will change the traditional risks that the industry is familiar with. Enterprises engaged in online trading will incur additional risks to the risks of doing business offline (Pacini et al. 2002). E-commerce risks in construction can be classified according to how it may affect the current traditional risks in the industry. E-commerce will yield additional risks, increasing the significance of existing traditional risks, or eliminate traditional risks all together. Risks, as it relates to e-commerce in construction, can be grouped as follows:

1. *Exclusive e-commerce risks.* These are risks that are particular to the use of e-commerce business process in construction. Only those who will use e-commerce will be faced with the burden of managing these additional risks. Issues relating to intelligent agents trading are representative of this category.
2. *Mixed e-commerce/non e-commerce risks.* These are risks that currently exist in the traditional business process, where the use of e-commerce will increase their likelihood of occurrence and/or their potential impact to the construction industry. Jurisdiction risks, for instance, exist in a traditional environment but they may become exacerbated in an e-commerce environment.
3. *Exclusive non e-commerce risks.* These are risks that existed in the traditional business process but will cease to exist with the wide implementation of e-commerce in the construction industry. Legal issues relating to "Mail box rule", or "battle of the forms" are some of the risks that may be eliminated through proper use of e-commerce tools.

Unfortunately, risks are inevitable and will exist on a continuum; on one end are the risks that only exist in a pure e-commerce environment and on the other end are risks that exist on a pure non e-commerce/traditional business process environment.

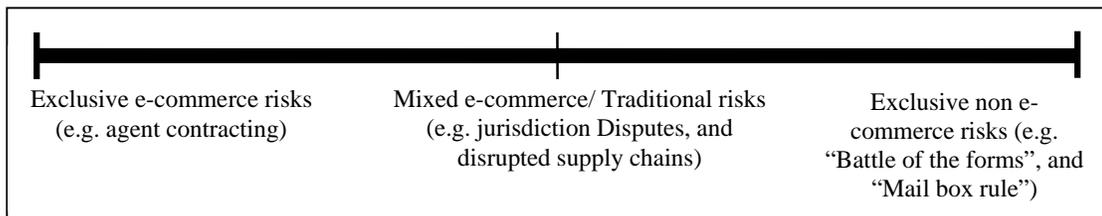


Figure 1: E-commerce Risk Continuum

E-commerce risks can also be classified according to the nature of the risk. The major classifications are legal, operational, and insurance risks.

CONSTRUCTION E-COMMERCE LEGAL RISKS

Although the legal risks of conducting a business online have been well covered in the literature, they have not been studied in relation to construction e-commerce. These risks pose important problems to legislators that need quick and effective solutions. The difference between the rate of e-commerce development to that of the legal framework regulating it is substantial. The development of the Uniform Electronic Transaction Act, and its adoption by California (September 16, 1999), New York (September 28, 1999) (Thelen Reid & Priest LLP 1999a) and other States afterwards have been great strides in developing that legal infrastructure. Many perils exist, however. Legal e-commerce risks

include those relating to: agency, jurisdiction, contract formation, validity and errors, authentication, attribution, non-repudiation, and privacy (Pacini et al. 2002).

AGENCY

Software agents present the biggest challenge to the current legal system. Legal risks posed by software agents are perhaps the only set of risks that are truly exclusive to the e-commerce environment. What distinguishes software agents from other software is its degree of autonomy. Agents control their decision; they learn and act upon their perception of their environment to maximize the goals of its user or programmer (Ren and Anumba 2004; Dzung and Lin 2004; Lee 2004). Software agents are computer programs that possess a learning capability and can take decisions on behalf of their users and programmers (Ren and Anumba 2004; Dzung and Lin 2004). Software agents act on behalf of their owners to promote the owners' desires, unlike support software that supports the owner in making a decision but leaves the decision for the owner to make (Ren and Anumba 2004; Schoop et al. 2003). To understand what software agents are, consider the following hypothetical case:

Prelude: Supplier 1 (S1) is responding to an online invitation to bid from the General Contractor (GC) to supply material for a construction project. The General Contractor is considering two other short-listed suppliers: Supplier 2 (S2), and Supplier 3 (S3). Negotiation is done in a pure e-commerce setting with each party being represented by a negotiation agent: GC representing the General Contractor, S1, S2, and S3 for Supplier 1, Supplier 2, and Supplier 3, respectively. Each party feeds their negotiation agent with their payoff settings. Payoff settings may include items such as price, delivery dates, warranty terms, payment terms, and other special terms.

Agent Negotiation: The process of negotiation between agents is initiated by GC. GC receives an offer from S1, S2, and S3 concurrently and evaluates them. GC will then start a negotiation algorithm with the three supplier agents that will try to maximize the value for GC. On the other hand, S1, S2, and S3 will engage in the same negotiation process with GC, each with the goal of maximizing their own benefit. Neither party knows the value curve of any of the others. A critical distinction between software agents and standard software is that agents can learn during this process. More importantly, agents make decisions on behalf of their users without delegating the decision back to them. GC, based on the negotiation with S1, S2, and S3, will analyze bids, negotiate favorable terms, and finalize the transaction with the winning supplier: in this example assume S1.

Variation: In this example, user of agent GC initiated the negotiation. In other examples, GC can automatically initiate the negotiation and make decisions on behalf of its user. Consider that agent GC is linked to an Enterprise Resource Planning (ERP) system. Agent GC will automatically sense that the level of inventory of a certain material is below what is needed to finish the schedule on time. Agent GC will automatically initiate a bid by sending an invitation to bid. Agent GC will search for suppliers selling the required material and will evaluate their reputation, proximity to the project location, history of dealings with GC, material availability, etc. Agent GC will then select S1, S2, and S3 based on this search and send them an invitation to bid. The rest of the example will follow until agent GC automatically contracts with agent S1.

Agents with the ability to initiate actions on behalf of their users are called Initiator Agents; they only mediate an agreement and make decisions on behalf of their users, but only when a request to make a decision is initiated by the user called Mediator Agents

(Bain and Subirana 2003b). This distinction is important from a legal perspective. Initiator agents have a higher degree of autonomy; thus posing more challenges to the legal system.

Software intelligent agents exist (Ren and Anumba 2004; Dzung and Lin 2004; Bain and Subirana 2003b; Liang and Huang 2000). It is outside the scope of this paper to review the current agents used in construction. It is important to point out, however, that several software agents are developed, or are currently being developed, that target the construction industry. (Ren and Anumba 2004; Dzung and Lin 2004; Anumba et al. 2003; Tah 2004) Many Intelligent agents target other industries that can easily be tailored to fit construction (Karageorgos et al. 2003). The hypothesized example is not far from being a reality. C-Negotiators are an example of software agents specifically designed and programmed for online e-commerce in construction. C-negotiators are an autonomous software agent that can evaluate and negotiate bids automatically with other e-commerce bidding software agents, or another version of the same agent utilized by different user (Dzung and Lin 2004). Multi-Agent System (MAS) target the construction industry. Construction is a well suited industry for MAS application because of its fragmentation. MAS applications in construction focus on the negotiation and design coordination (Ren and Anumba 2004).

Intelligent agents can help solve some of the legal issues that e-commerce raises. Time-bound negotiation agents, for example, can control option contracts (Lee et al. 2000). Intelligent agents, however, can pose serious legal challenges to the current legal system and the application of e-commerce in the construction industry. Agent e-commerce, presents multiple legal risks to the construction industry; some are particular to these types of transactions while others are similar to the risks associated with e-commerce contracting. Common Risks in e-commerce contracting, such as jurisdiction, contract formation, and errors are discussed below. This section will focus only on the risks that are particular to intelligent agent e-commerce.

On a conceptual level, the basic challenge about intelligent agents relates to their legal personality; do intelligent agents have a separate legal personality from their owner? Could the Agency Law be applied towards intelligent agents' actions? Can intelligent agents enter into an enforceable contract? Would they be liable for mistakes? How would risk be distributed amongst contracting agents in case of an error? Intelligent software agents' capacity to take actions on behalf of their user is part of their programming and learning. Do they have the same capacity from a legal point of view? The fact that agents have the programmed-in capability of taking decisions (on behalf of the owner) that may offer better judgment than that of the actual owner, does not necessitate that the law will acknowledge this as contractual consent (Bain and Subirana 2003c). The answers to those questions are not readily available in Agency Law. The basic premise of Agency Law is that the principal and agent are two separate individuals (Bain and Subirana 2003c; Bain and Subirana 2003a).

JURISDICTION

Jurisdiction is a legal term describing which law is in effect at a given period of time and which court's decisions will be legally binding. Jurisdiction issues arise when parties dispute a contract and try to decide which court has jurisdiction over it. The problem is exacerbated by the fact that in an e-commerce contract, the question of where the contract was formed becomes daunting. The outcome of the dispute can differ materially if judged under a different set of rules, regulations and laws (Rowe 1998).

The global reach of the Internet adds yet another layer of complexity: determining jurisdiction over contracts with international elements. The key issue of jurisdiction can be simply explained by comparing the spatial distinction of the legal world to the borderless nature of the Internet. The Internet empowers people to engage in e-commerce activities regardless of geographical boundaries. In contrast, most of the laws governing contractual relationships, specifically those relating to Construction Law, are limited in one way or another to a certain geographical boundary.

One risk arising from the issue of jurisdiction is unanticipated foreign lawsuits. Foreign can be a different state or country. Although the laws regulating e-commerce vary, the general opinion of the courts imply that companies engaged in its activities or online advertising, may have to defend lawsuits in different jurisdictions if those activities violate the local laws (Thelen Reid & Priest LLP 1997). This may very well affect construction companies participating in e-commerce activities over the Internet especially in areas like intellectual property rights and distribution rights. Companies with local or regional trademarks may find themselves infringing upon others' trademarks when they advertise their products online. Advertising products on the Internet or engaging in e-commerce over the Internet makes the product accessible globally and is not limited geographically as trademarks are (Thelen Reid & Priest LLP 1999b). Similarly, there is a distinction between local and regional distribution rights and distribution over the Internet through e-commerce activities. Distribution of construction material or products may have only local or regional distribution rights. Would e-commerce activity constitute a breach if the distribution rights of both the seller and the buyer are within the geographical boundaries? How about if the seller is within the geographical boundaries of the distribution rights and the buyer is outside?

Jurisdiction risks can also appear in a different form; a company can fail to protect its legal rights due to lack of familiarity with foreign jurisdiction procedures or, in a case of a dispute, where the parties disputing cannot agree on which court has jurisdiction. This is illustrated in the following example.

Consider the case of an Architect, working out of California, employing an Engineering Consulting firm, working out of New York, for the design of a specialty component of a project in Michigan. The Architect and Consulting firm engage in an e-contract and they never physically meet; collaboration and submission of work is completed online. During construction it was discovered that the Consulting firm's design was faulty and did not meet the Michigan code. The Architect deducts the value of the change from the firm's pay, the firm is opposed to this and stops working; a dispute arises. The question is: which state law has jurisdiction over this dispute? The issue of jurisdiction in this example may be even more challenging if the error was discovered after construction was complete and the different States involved have differing statute of limitations. Enabled by online project collaboration systems, and e-commerce tools, the probability of occurrence of this risk is on the rise.

Some of the jurisdiction risks can be avoided by adding choice of law, choice of forum, or arbitration clauses (Thelen Reid & Priest LLP 1999b). Many risks, however, still exist even when such clauses are made as part of the agreement. It is also important to note that not all contract provisions are enforced by courts (Gallagher 2000). E-commerce solutions could be programmed to include those provisions and intelligent agents could be made available to distinguish those provisions that are enforceable from those that are not.

CONTRACT FORMATION, VALIDITY, AND ERRORS

“The law of contracts is, broadly speaking, the law of voluntary obligations; that is, the law of obligations that arise because of an express or implied commitment—in particular, a promise” (Fuller and Eisenberg 2001). According to the Restatement, First, of Contracts “A promise may be defined as an expression of an intention to act (or refrain from acting) in a specific way, so made as to justify the person to whom the expression is addressed in understanding that a commitment has been made to that person.” In commercial context the promises are often exchanged in the form of an offer and an acceptance of the offer. The offer and acceptance coupled with a valid consideration and mutual assent would, subject to certain limitations, constitute a valid contract.

For example, in the context of construction contracting the contracting relationship is first initiated by the owner issuing a Request for Proposal (RFP). The RFP is not an offer from the owner to general contractors; the RFP is advertising for general contractors to submit proposals for consideration. The general contractors will study the project based on the RFP information and will submit priced proposals with certain terms and conditions to the owner. The priced proposals act as an offer to enter into an agreement on definite terms and price. Upon selection of the lowest responsible bidder, the owner will notify the successful contractor of its acceptance. This notification will constitute the legal acceptance of the contractor’s offer. Provided there is mutual assent and valid consideration the owner and contractor will have entered a legal contract.

In e-commerce transactions, however, it may not be easy to distinguish the offer maker from the offer taker. This is very critical because a contract is not valid until an offer is accepted and the acceptance is communicated to the offer maker. A recent legal case in the UK is a good example of this issue. An e-merchant posted a £3.99 price tag for a TV on their web page instead of £399.00 because of a computer error. In excess of 20,000 TV were sold for £3.99 before the error was realized. The e-merchant closed the site and a dispute between it and the buyers is yet to be settled. The buyers want to claim the product they bought and the seller is not willing to entertain buyers’ requests. The key issue is whether the web page posting of the TV was an offer from the e-merchant that was accepted by the buyers and is thus legally binding, or the web page posting was an invitation to treat or a mere advertising that did not constitute an offer. If the later is true, then the buyers were the ones who submitted an offer for £3.99; where the seller retains his right to reject the offer and not enter into an agreement (Pacini et al. 2002; Gallagher 2000).

AUTHENTICATION, ATTRIBUTION, AND NON-REPUDIATION

Risks related to electronic authentication, attribution and message integrity are of particular importance to the construction industry. The drive to authenticate e-commerce buyers and sellers and attribute contracting actions to the proper buyer or seller is in direct conflict with privacy laws (Smith and Clarke 2000). Attributing an electronic message for an offer or acceptance of an e-contract to the person who purports to send it is yet another risk (Pacini et al. 2002). The Uniform Electronic Transaction Act (UETA) addresses this risk from a legal perspective by requiring certain authentication levels to ensure proper authentication and attribution, and protecting e-commerce participants from the actions of hackers (Pacini et al. 2002; Thelen Reid & Priest LLP 1999a; Belgum 1999; Moreau 1999). It is outside the scope of this paper to discuss the types of non-cryptographic and cryptographic signatures (Hernando 2003) suitable for e-commerce

transactions. It is important, however, from a legal programming and user perspectives to incorporate this requirement and comply with it when engaging in e-commerce transactions.

PRIVACY

The collection of information and data about people is a characteristic of e-commerce transactions. E-commerce marketplaces and portals derive value from data mining activities (Millard 2000; Crichard 2003). Construction companies engaged in e-commerce will have to manage multiple risks relating to privacy; some relate to personal privacy concerns about their own firms, and others relate to concerns about infringement.

Construction companies wanting to engage in e-commerce transactions have to give away some information about the company for the purposes of authentication, and attribution; the question is how much information? Online portals and marketplaces collect more information than is needed for legally authenticating an e-contracting party (Smith and Clarke 2000). They collect information through user registration forms, cookies, or tracking companies “bidding behavior.” Who owns this information? This data mining operation presents a potential risk for construction companies engaging in e-commerce.

For risks relating to infringement, consider the case of a contractor engaging in e-procurement activities. The contractor keeps information about potential suppliers on the company IT system. They legitimately use this information to select appropriate bidders. To aid future estimating operations, the contractor records all historical bids on all suppliers who previously electronically bid project on its e-procurement system. The historical database includes supplier information, historical bid prices, financial performance collected from pre-qualification forms, safety performance, comments about the supplier performance on previous projects, amongst other information. As a result of a security breach, or a virus, the contractor realizes that the information ended up with a third party –other than the contractor and suppliers. The contractor’s liability is surmountable.

Another variation to the same risk relates to using online marketplaces. An owner or a contractor places a Request for Proposal on one of the online marketplaces owned by a third party. Suppliers bid on the project after entering information about their respective companies’. The third party, owner and operator or the marketplace, have a security breach in which other people had access to stored information about this project mistakenly. Though common sense indicates that the third party should be liable, the contractor or owner may realize that they signed a “click-through” agreement that limits the third party’s liability to such instances; a bad situation to be in.

LEGAL MODELING AND PROGRAMMING

Business process modeling is a comprehensive approach to presenting activities that have to occur within an organization for a certain outcome to materialize (Aguilar-Saven 2004). It is out of the scope of this paper to discuss business process models in detail, however, a select few are mentioned for demonstration.

The simplest form of a business process modeling technique is using a Flow Chart. Other more advanced techniques include: Data Flow Diagrams, Role Activity Diagrams, Role Interaction Diagrams, Gantt Charts, Integrated Definition for Function Modeling, Colored Petri-net, and Object Oriented Models (Aguilar-Saven 2004). Additionally, there

are many generic modeling methodologies such as the different types of simulation methodologies that exist today (Aguilar-Saven 2004).

Modeling technique development parallels the development of business processes. The more complex the business process becomes, the higher the need for a newer modeling technique that can capture the new complex aspects (Aguilar-Saven 2004). Six quoted phases, from Aguilar-Saven (2004), have been identified for this development:

1. the functional hierarchy,
2. the functional hierarchy with function oriented automation,
3. the functional hierarchy with shared database on mainframes,
4. the process oriented enterprise,
5. the supply chain oriented enterprise, and
6. the web-enabled agile enterprise

The authors argue that the six phases of development demonstrate a trend towards moving from an internal focus (modeling techniques used to model the internal dependencies between activities within the enterprise) to an external focus (modeling techniques used to model the relationships between multiple enterprises). For example, supply chain oriented enterprise modeling (phase #5) focuses on a company's supply chain network which is more influenced by external forces, as opposed to, the process oriented enterprise (phase#4). Similarly, the web-enabled enterprise model (phase #6) has a more external focus than the supply chain oriented enterprise model (phase #5). This is influenced by the capability of the Internet and other communication tools to restructure the external relationships between enterprises; making the legal component in modeling a business process more critical as the process modeled starts focusing even more on external business processes. Legal rules and regulations play a more important role in governing the relationship between different enterprises as opposed to the internal process within. Furthermore, e-commerce applications support electronic trade between two or more enterprises. It follows then that the development of these applications requires modeling the business process's interaction between multiple enterprises. Failing to include the legal dimension in this modeling exercise can jeopardize the outcome of the developed systems; it can lead to many additional risks as those outlined earlier.

The risk of entering into a void contract is not to be taken lightly. The benefits of e-commerce intelligent agents and e-commerce are tempting, however, construction contractors, suppliers and owners cannot afford such a risk. Arguably, the lack of consideration for the legal risks of e-commerce contracting is one of the barriers to its implementation in the construction industry. E-commerce models and tools in construction have gone through an evolutionary process where they gradually tailored their offerings to the construction business process. They have yet to incorporate the legal aspects that would enable the A/E/C industry to manage the legal risks posed by those new models. Legal modeling and programming is a crucial step towards this achievement. The construction industry needs to anticipate potential legal problems before they arise to minimize their significance.

Figure 2 is an example that demonstrates the importance of capturing the legal dimension in modeling a simplified version of online bidding. Legal modeling techniques can make it much easier to identify the legal difference between an "offer" and an "invitation to treat" and it can allow programmers of e-commerce applications to clearly distinguish between both. Similarly, modeling a business process with a legal modeling

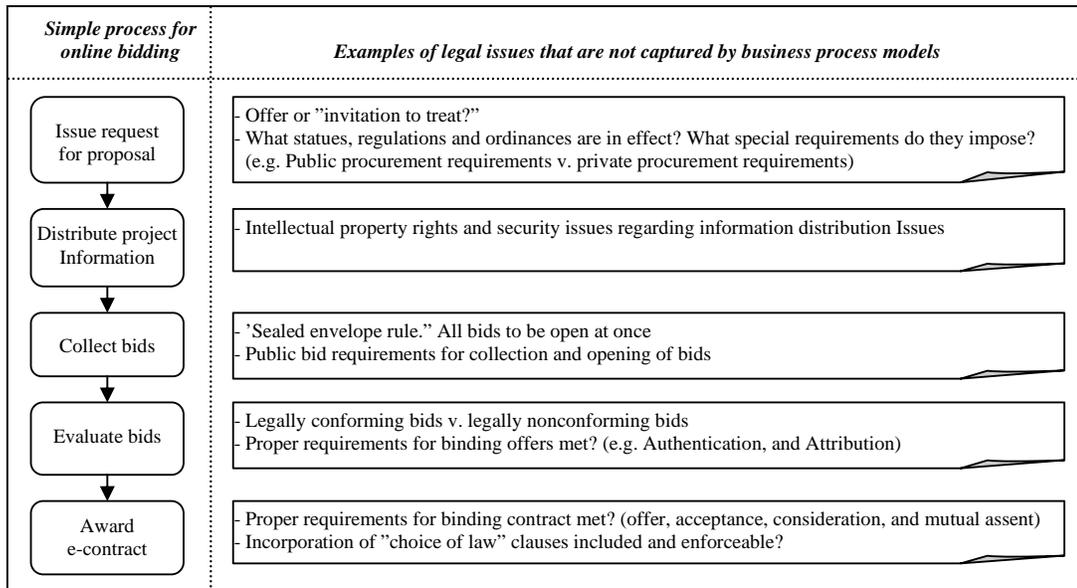


Figure 2: Legal Dimension of Business Process Modeling

technique will minimize the risk of jurisdiction issues by prompting the programmers to include "choice of law" clauses when and if needed.

CONTRIBUTIONS AND FUTURE RESEARCH

The e-commerce legal risks presented in this paper support the notion that construction companies engaged in e-commerce activities will have to manage additional risks attributable to the new business environment. This paper fills a gap in literature related to legal e-commerce risks in the construction industry seeing as how it has not been addressed in depth before. Providing more than an introduction of legal risks, it identifies challenges and presents innovative, proactive solutions. Legal modeling is presented as a proposed solution to allow software programmers, researchers and industry executives to incorporate the legal aspects of doing business in their analysis to business processes. The concept of legal modeling when implemented will result in developing e-commerce platforms that support construction business models. It will also increase the level of trust in e-commerce directly and indirectly; directly by calling for higher security requirements and encryption for legal authentication, and indirectly by resulting in enforceable e-contracts.

To-date, there is no legal modeling and programming language in existence, whether in the construction industry or other industries. Although the concept of legal programming is important for e-commerce across all industries, it is particularly important for the construction industry. The construction industry's requires a dynamic e-contract system to match its dynamic contracting requirements.

The argument in this paper for legal modeling and programming is the starting point for a new area in construction research; one that will bring the advances in construction research and the realities of construction business closer by incorporating the often forgotten legal requirements. The next step that is currently in progress at the University of Michigan is the development and testing of a legal business process modeling technique. The results of this research can be applied in numerous ways. The following are few examples:

1. Conceptual modeling of legal aspects of business process will facilitate the development of e-commerce platforms and software that supports the realities of construction contracting.
2. Legal modeling can provide construction researchers with a valuable tool for business process redesign to achieve more efficient processes that are realistic from a legal standpoint.
3. Legal modeling can be used to predict and settle construction claims.
4. Legal modeling can support research studying the effect of legal regulations on the efficiency of the construction environment and its financial impacts.
5. Legal modeling of construction delivery methods can lead to development of alternate or hybrid methods that are legally enforceable and provide better efficacy for certain project types.

ACKNOWLEDGMENTS

The presented work has been partially supported by the National Science Foundation (NSF) through grant CMS-0408538. The authors gratefully acknowledge NSF's support. Any opinions, findings, conclusions, and recommendations expressed in this paper are those of the authors and do not necessarily reflect the views of the NSF.

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