New Paradigms for Design Professionals – New Issues for Construction Lawyers

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Introduction
When Technologies Converge, Paradigms Shift

New technologies are redefining the construction industry, creating new paradigms for supply, construction and design. This process is organic, evolving non-linearly as new technologies, infrastructure and business forces combine in unanticipated and synergistic ways. While the endpoint of this process cannot be predicted, one can predict that every participant in the construction process will be affected. Project delivery, contracting, and legal relationships will change, as will the roles of construction participants. What it means to be an architect, contractor, supplier, or owner will change. And this redefinition is occurring more swiftly than our laws are able to react.

This paper explores how current construction roles will be affected by the changes sweeping through the construction industry, focusing primarily on where and how project design occurs. As construction lawyers, we must understand how these changes will affect our clients and consider how these changes will stretch – and sometimes rend – the current legal fabric.

A Brief Historical Diversion –
Technology as the Driver of Change

Technology convergence is a powerful driver of change. In recent years, our society has been profoundly affected by the growth of electronic and Internet based transactions. But the current explosion of Internet based activity did not occur in response to a comprehensive and detailed

business plan. It occurred because key technologies developed, interacted, and transformed each other without the benefit (or burden) of centralized planning.

In the beginning, there was ARPANet, a Department of Defense initiative to link key defense and research establishments. It was relatively slow and cumbersome, but it allowed many different types of computers to "talk" through a common language, or protocol (TCP/IP). Within the academic framework, ARPANet accomplished its stated purpose. But the complexity of ARPANet, with its multiple tools and arcane languages placed, its power beyond the average user's reach. Then several things happened.

In 1981, designers at Xerox's Palo Alto Research Center developed the first graphical user interface ("GUI"), inspiring the Apple Macintosh and the later Microsoft Windows. These GUIs replaced intimidating command-line systems with intuitive point and click interfaces. In 1989, a physicist at CERN (The European Particle Physics Laboratory) developed Hypertext Transfer Protocol ("HTTP") and Hypertext Markup Language ("HTML") as common languages for Internet communication. Using the first browser, NCSA Mosaic, computer users could traverse the Internet by pointing and clicking at "pages" written in HTML. The World Wide Web was born.

The final key technology was speed. Quantum leaps in transfer speed ("bandwidth") and exponential increases in processing speed unleashed the power stored in Internet protocols and GUIs, transforming the Web into an evolving, social, political, and economic forum. Suddenly, everything was different, and a new paradigm was born.

Technologies to Change Construction Have Arrived

Construction is on the brink of revolutionary change driven by new technologies. As with the World Wide Web, the new technologies are combining to create new paradigms that are qualitatively different from currently existing construction processes. And just as the Web developed in ways unanticipated, we can plan on the construction process changing in ways we cannot currently predict. But as discussed later, we can see new issues peeking over this technological horizon.

As our clients explore these new paradigms, they will seek our advice. But advice cannot be given in a vacuum. We need to have a basic understanding of the technologies that are driving change. These include sophisticated communication protocols, increased speed (bandwidth), collaboration tools, digital signatures, and object-oriented design.

SOPHISTICATED COMMUNICATION PROTOCOLS

HTTP and HTML allow differing computers running differing software to communicate over the Web. Without them, the Web would not exist. But they have limitations based on their initial intended use. Software and network designers are developing second generation protocols that are more flexible and powerful (such as eXtensible Mark-up Language "XTML") and industry specific protocols such as aecXML[1] designed specifically for the construction industry. Using these protocols, CADD and project management software will be able to share complex construction data simply and accurately.[2]

BANDWIDTH

It used to be that you could never be too thin or too rich. In the Internet world, you can never have too many stock options or too much bandwidth. Bandwidth refers to a data connection's "throughput"capacity, or in other words, the amount of data per second that can be sent through a

[1] For additional information on aecXML, see, www.aecxml.org.

[2] "CADD" is the acronym for Computer Aided Design and Drafting.

given communications circuit. Without high-speed connections, it is impossible to transfer enough data to run a collaborative construction process.

Communication speed is measured in baud, or bits per second. Under standard ASCII conventions, it takes 8 data bits (a byte) to represent a single character. ASCII data puts moderate demands on communication speed. But data in a collaborative setting includes graphical information, program files, CADD data, database information, audio and video streams, and other dense data sources. And, we now demand that this information be available "real-time". Dense data sources and real-time communication put extreme demands on data transmission speeds.

Fortunately, T-3, T-1, fractional T, Digital Subscriber Lines (DSL), cable modems, and ISDN allow transmission at speeds hundreds of times greater than was available with early modems. The cost of these connections has decreased significantly. These high speed connections transform the theoretical promise of collaboration into a practical tool.

COLLABORATION TOOLS

Recent issues of Engineering News-Record are crammed with advertisements for products that will allow construction participants to collaborate electronically.[3] Some of these products address individual problems, such as organizing subcontractor bid-day quotes. Others have broader scope, unifying communication and supporting a full range of project management tasks.[4] Almost all of these products are Web based.

Electronic collaboration tools have common elements. They organize communication between participants, track document flow, and store key documents. They have common "interchange space," such as bulletin boards, threaded messaging, and notification systems. They also have document control databases, allowing the participants to post documents to the website for review, comment, or issuance. Project schedules may be integrated with the website, or created externally, and then distributed and reviewed over the website. Access is layered. Participants are granted access rights that limit their ability to view, create and modify documents. Individual products build on this core functionality to provide a proprietary aspect to the collaborative construction environment.

DIGITAL SIGNATURES

Future project sites will not be paperless, but they will have less paper. Electronic documents are superseding paper as the primary documentation for key agreements and events. Paper is a secondary recording media.[5] Agreements are confirmed by e-mail or stored in databases, such as Prolog or Expedition. But there has been a significant legal impediment to using these as binding documents – lack of a legally recognized signature.

With the *Electronic Records and Signatures in Global and National Commerce Act*, effective October 1, 2000, Congress made electronic documents and signatures legally binding. "... [A] signature, contract, or other record relating to such transaction may not be denied legal effect, validity, or enforceability solely because it is in electronic form..."[6] This legislation supersedes state legislation, unless the state enactments meet specific criteria. As a practical matter, electronic documents and signatures are now the law of the land.

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[3] The 25 September 2000 issue of ENGINEERING NEWS RECORD reviewed 17 Web based project managers.

[4] For example, Primavera, a leading provider of scheduling and project management software, advertises its "Explorer 8.0 with Web Acess" for comprehensive Web-based project management and information dissemination tasks. See www.primavera.com/products/exp_web.html.

[5] Paper will always have an important role in construction. It is hard to visualize a project foreman laying out a structure without reference to full scale plans and details.

[6] 15 U.S.C., Sec. 7001(a)(1).

Digital signatures are simple and inexpensive. A leading provider, Verisign, sells individual certificates for $19.95,[7] and the registration process takes about 5 minutes. Once a digital signature is obtained, it can be used for signing documents and for encrypting documents sent to other persons.

Digital signatures will enable electronic procurement to move ahead rapidly. Bids will be received, verified, and accepted electronically. Project websites will be used to negotiate, document, and execute change orders. Periodic pay requests can also be reviewed and signed by appropriate parties without any need for paper copies. Indeed, almost any contract or agreement can now be consummated electronically. But, this efficiency may come at a cost: will the speed of Internet transactions lead personnel to issue binding agreements that have not been carefully considered?[8]

OBJECT-ORIENTED DESIGN

CADD programs significantly improve the drafting process. Drawings can be segregated into logical layers, information in related drawings can be easily reused, and modifications can be made without extensive rework. Information in the CADD database can often be used to generate statistical data about a design, such as square footage and material quantities. These are important advances, but at their heart, current CADD systems are merely faster and more efficient means to execute traditional design tasks.

Object-oriented design is qualitatively different. In object-oriented design, the designer selects "objects" and arranges them to create a structure or system. Each object is an individual piece of computer programming code that models the engineering characteristics of a physical object, such as a wall or window. An object-oriented design is dynamic. "Intelligent" objects can send messages to other objects telling them to adjust themselves to conform to the sending object, changes in design, or even local building code requirements.

Traditional Vector Graphics

Comparing a simple design task in traditional and object-oriented systems demonstrates the difference between traditional and object-oriented design. In traditional design, a designer represents a window by drawing lines, manually or with a CADD program. The designer adds to the structure by drawing additional lines, representing a door, a window and light switch near the door frame. If the wall is resized, or if the door is moved, the designer must reconfirm the appropriate location of ancillary features, such as the light switch, and must move the lines or redraw the represented item.

"Intelligent" Objects

In an object-oriented design, the designer selects a wall object and places it in the design. Doors, windows, light switches, and other objects are placed on the wall. If a change needs to be made in a fully object-oriented design, the door would "know" that it needs to have a light switch close by and, if moved, would "tell" the light switch to follow it. The wall would "know" its acoustic and thermal characteristics, and would communicate with the window to assure that proper thermal characteristics were maintained. When an object was modified, it would communicate with all of the related objects, and they would respond to the change.

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[7] http://www.verisign.com.

[8] Technology does not *require* sloppiness, but it does set the stage for sloppiness to occur. By accelerating the pace of communication, technology creates opportunities to "shoot first, ask later." The informality of e-mail tends to invite responding without performing all of the necessary research. In addition, the communication – once transmitted in the standard project or business form – looks complete and official. Glossy formatting can displace critical thought. These deficiencies can occur in a low-tech environment, and can be avoided in a high-tech environment. But we see them occur more often in high-tech communications than in traditional low-tech paper documents.

As object-oriented design advances, increasingly complex and sophisticated objects will be developed. One can imagine pumps communicating with piping to determine pipe sizing to accommodate pump performance and pipes communicating with bracing to assure code required seismic support. The designers will be freed from checking the small but critical details. The objects will do that themselves.

Interoperability

An object-oriented design's success depends on the accuracy with which physical objects are modeled. Objects will be created by a combination of standards committees, material and equipment vendors, designers and software vendors. This process is already underway under the auspices of the International Alliance on Interoperability ("IAI").[9] Its members are the leaders of the construction industry and include key designers, contractors, and owners as well as vendors and software design firms. IAI has issued an interoperability standard and has recently published a new draft standard for comment. One major CADD package, ArchiCad, is built around the object paradigm. Others, such as AutoCad, are incorporating object features in their existing software and participating in the development of interoperability standards.[10]

Virtual Structures

Object-oriented design is also related to simulation technologies. By using intelligent objects, designers can experiment with structural relationships in three dimensions. As they vary elements of the design, other elements adjust. Thus, the virtual structure can be used for program development, to document design intent, and may even be the design itself.

Design by Object Definition

As object-oriented design becomes more widespread, much of what we now view as "design" will reside in the definition of the objects themselves. The properties of objects, the messages they send to other objects and their ability to receive and react to messages will determine how various detailing and conflict issues get resolved. Software programmers or other non-design professionals will often set these properties. The shift of "design" from the licensed professional to these new, unlicensed "designers" raises thorny problems, as discussed in the following section.

New Issues for Construction Lawyers

NEW LEGAL ISSUES

The construction process, and particularly the design process, is undergoing profound change. The participants are taking on new and different roles and will undoubtedly be accepting new responsibilities. But the legal issues related to these changes are largely being ignored. There are no efforts, for example, to prepare contract documents that reflect the parties' responsibilities in a collaborative, electronic based environment. There are no efforts to amend professional registration requirements to accommodate the design participation of object designers. Few construction documents discuss the responsibilities for coordinating and maintaining Web-based documentation, and none adjust the parties' risk allocation to reflect these new realities. Some construction documents are beginning to address the transfer of electronic files, but few adequately deal with the problems created by three dimensional data, object-oriented design, or Internet collaboration.

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[9] For information on the International Alliance on Interoperability, see http://www.iaiweb.lbl.gov.

[10] There is a strong precedent for the eventual adoption of object-oriented approaches – design of computer software. During the 1980s, the traditional linear programming languages were largely displaced by object-oriented languages. These offered designers the ability to construct programs from building blocks and to achieve a greater level of abstraction. C++, an object-oriented language derived from the popular C language, is currently the "norm" for microcomputer application development.

Economic Pressure to Adopt Technology

Because they offer opportunities to provide better quality designs more quickly and less expensively, the construction industry is eagerly embracing these new technologies. Some of the advantages are obvious. Collaboration with contractors and vendors should yield lower costs and more competitive bids. Electronic design documents are also valuable to project operation and maintainance. These and others factors will impel adoption of some, or all, of the new technologies. The pressure to move to a new paradigm is irresistible.

Construction lawyers will be swept up in this change. Our clients will pose questions that do not have clear or established answers. We will be tempted to ignore the problem, or counsel clients to use existing approaches until the issues are addressed and resolved. But this does not serve the client's interests, nor will such "wait and see" advice be heeded. Legal conservatism is no match for market pressure.

As construction lawyers, we need to examine the ramifications of the changing paradigms and begin to chart a rational course through the new environment. Identifying the key issues is the first step in this process, and in the paragraphs below, we will look at some of these questions.

WHAT IS THE DESIGN?

The new design processes will be fluid and collaborative. Elements of the design, such as object properties, will be created by vendors or software manufacturers – not licensed design professionals. The design may be self-modifying, and to that extent, partially self-designed. The design deliverable may be a computer model or simulation, not paper drawings, and may be distributed between computer systems operated by different participants. The complete design may exist in a space defined by the connections of the Internet, not plotting paper's narrow confines. Design will be flexible, but elusive.

Despite technological advances in design processes, the parties will still need a clear definition of the project design. Contractors need to know what they are bidding on. They need the ability to compare revised design elements to earlier versions to determine if there are changes in scope. Owners need to determine whether they have received a project that complies with the design. Designers need assurance that their services are complete and, if problems later occur, that their designs can be compared against the constructed condition. Building officials and inspectors must be able to compare physical construction to an objective design standard and they need a definite "something" to review, not a moving target.

The design fluidity allowed by new technologies competes with the precision required for contract enforcement. Contract definitions of design should address the following issues:

- The contracts between the parties should define the design deliverables in content, time, and type of electronic media used;
- The contract documents should determine whether incorporated submittals, such as objects provided by vendors, are part of the designer's deliverables and which party takes responsibility for incorporation and coordination;
- Once a design definition is adopted, it will be important for the parties, and particularly the designer, to adhere to the definition during project development;[11]
- The design should be preserved in "snapshots" at major design milestones. In some cases, this may be accomplished by printing and saving these milestone documents. But

[11] We have all experienced clients who will execute contract documents with detailed provisions governing change, notice, and dispute resolution, and then ignore these provisions during performance, or create entirely new mechanisms that deviate significantly from the systems provided in the contract. In this fashion, we must expect deviation from whatever prospective systems we and our clients develop. Technology may change, but people don't.

in a multi-dimensional electronic design maintained in a diffused Internet relationship, the total design package may not be encompassed by printed documents. It may be possible, however, to temporarily freeze this digital design world and save it, complete with linked documents and locations, on semi-permanent media, such as CD-ROM disks; and,

- The design definition must consider the needs of inspectors and building officials to have a stable document to review or to compare against the actual construction.

WHO IS THE DESIGNER?

Not only is the concept of "the design" becoming less clear; the identity of the "designer" is becoming equally vague.

In the grand sense, we will always know who the designer is. The prime design professional will maintain responsiblity for general layout of design elements, systems design, flow through the structure, and building aesthetics. But most disputes regarding design deficiencies have little to do with these aspects of design.[12] Most design disputes arise from deficiencies in details, inadequate coordination, deviations in submittals, excessive changes, and failure of a design to meet budgetary or functional program requirements.

In a collaborative setting, the design details that create disputes may well be provided by subcontractors or vendors through submittals or object specifications. To this extent, they, too, become the "designer." The distribution and "hiding" of the design process raises several significant questions:

- If an object-oriented design system is used, does the software, which can communicate between objects and cause them to adjust their properties, become a "designer" as well?
- Do the standards committees that develop interoperability protocols and object specifications become project "designers?"
- What are the responsibilities of these secondary "designers?"
- To what extent can the design professional rely upon the products of these "designers?"
- If these "designers" have responsibility, do they have insurance for design risks?

In the immediate future, owners and building officials will look to the architect and engineers of record as the project's designers. But, in a practical sense, these parties cannot check and be responsible for all of the work of the many "designers" distributed throughout a collaborative design process. Just as tomorrow's designs will be distributed, so should design responsibility. Contract documents need to be developed to achieve this result.

COORDINATION AND INTERFERENCE

Tomorrow's distributed designs will require coordination. But by whom? Software itself will accomplish some of the coordination. CADD programs with intelligent objects could seek out interferences and adjust the design to accommodate problems encountered. Intelligent objects can validate the acceptability of interactions with other objects. But no one with extensive experience in complex computer systems would trust these mechanisms to completely coordinate the design or to ferret out all interferences. As an anonymous wag noted, "To err is human, it takes a computer to really screw-up."

Computer coordination will likely reduce interferences, but it will also create "spell check blindness." When typewriters ruled the earth, we carefully checked letters for the typing errors we knew must exist. In the word processing age, we are still responsible for reviewing letters closely,

[12] In over 20 years of representing designers, the author has only once defended a designer sued because the design was "ugly."

but because we know the letter was spell checked, we lazily review for content, not spelling. Words are now perfectly spelled, but still misused. Computerized coordination will reduce the level of "spell check" errors, but will not catch the design equivalent of "their" or "there." And designers relying on electronic coordinations may overlook these errors.

TRANSLATION ERRORS

The new protocols, such as aecXML and the standards issued by the International Alliance for Interoperability, allow direct interchange of design elements and related information. In theory, this eliminates the need for translation. But in practice, information generated by different programs will always be utilized or translated with some differences. These translations will result in a level of misinterpretation and error.[13] Who will be responsible for checking converted documents for accuracy and functionality? How should contract documents allocate this risk?

STANDARD OF CARE

In "What is the Design?" on page 6, we noted that the definition of "design" was becoming looser and less identifiable. In "Who is the Designer?" on page 7, we discussed the diffusion of design among a variety of parties. But even if we can identify the design and the designer, will we know whether the designer in a complex, distributed system has met the standard of care?

Consider the following two problems.

Standards Without Consensus

First, because the standard of care is based on what other prudent designers would do, it assumes that other designers engage in the activity being questioned. If practice standards are evolving quickly, there may not be any consensus approach to the activity. In addition, the methods for accomplishing design may differ based upon the collaborative system or software used. Because some of the products have been developed by, and are only used by, a single firm, the designer's approach may not be comparable to the approach used by other designers using other systems.

Computer Code that Designers Neither Create Nor Understand

Second, can a designer rely on systems or software he or she does not understand and has never checked? When structural engineering programs first appeared, lawyers cross-examined engineers on their understanding of the program code, how its algorithms analyzed design conditions, and if the engineer validated the results by independent calculation. Critics argued that without a detailed understanding of the program's operation, engineers could not rely on the results. Now, most engineers never see the program code, and would not understand it if they did. Nor do engineers attempt to validate a program's results. Engineers rely on software companies to prepare adequate software, and rely on the program's "general acceptance" by the engineering profession. But if a program contains a flaw, does an engineer violate the standard of care by using it? How obvious does the problem need to be before the designer is responsible for the deficiency? Can the designer disclaim responsibility for software deficiencies that affect the adequacy of his or her design?

GAP BETWEEN SOFTWARE WARRANTIES AND DESIGN STANDARDS

Almost every software installation program requires the user to acknowledge the limited warranty provided with the software. These warranties generally provide that the supplier has no responsibility for any damage beyond replacing the media on which the program is published. There is no recourse for buggy software's sting.

As discussed earlier, designers may be liable for the results caused by deficient software, especially if the results appear unusual. Even if the designer can establish that it met the standard of care, it runs the risk of being dragged through expensive litigation. And the limited software warranty will

[13] A similar problem exists with current word processing software. Most programs contain conversion utilities that can "read" other data formats. But the quality of the conversions varies greatly, with some conversions yielding "crippled" documents. There are options for converting data through an open source standard, such as Rich Text Format (.rtf) but this can strip a document of some of its characteristics. Similar problems currently exist with CADD conversions and will undoubtedly plague us forever.

prevent transferring this risk to the software provider. Thus, there is a liability gap between the standards applicable to the designer and the standards applicable to the software provider. This gap creates a significant tension in the contracting process. The owner will want to close this gap by imposing liability on the design professional, who will want to disclaim this liability because it is a risk the design professional did not create and cannot control. Regardless of the risk allocation negotiated between the owner and the design professional, third parties will not be bound by an exculpatory clause.[14]

DOES SITE HOSTING EXPAND THE DESIGNER'S ROLE?

Many design firms advertise their ability to manage projects across the Internet. These systems include as many participants as possible to facilitate coordination and provide all parties with the documents and resources necessary for their tasks. Part of this process is a digital version of normal construction administration, but part goes beyond the services design professionals customarily perform. It is thus quite possible that interactions on the website will fall well outside the "normal" scope of a designer's work.

Hosting a broad-based website raises many issues not currently discussed in contract documents.

- If a designer hosts a broad based site, is it responsible for any economic damages caused by lost or corrupted data, down time, lost communications, or similar electronic catastrophes?
- If the website utilized custom or customized software, is the designer responsible for the adequacy of the program code?
- Should the design professional obtain confidential damage waivers from all users of the website?
- Are such losses covered under insurance normally maintained by design professionals?[15]
- If coordination occurs on a site hosted by the designer, is it responsible for coordination of parties other than its own subconsultants?
- Can the designer ignore coordination problems that would be apparent from a review of website communications, if the communications are available but not ordinarily read by the designer?
- Does the designer impliedly know everything that is posted to the website?
- If job site safety issues are discussed on a website, does the hosting party assume OSHA responsibilities as an employer on a multi-employer site?
- If fraudulent change orders on a public job are processed through a website, does the designer assume any responsibility for false claims?

Private Sites

One approach to website issues is to keep the site private (or have public information areas and private areas). Participants are authenticated (user name and password) and must execute an agreement allocating the rights and responsibilities of the parties. But if the designer's contract grants ownership of "documents" to a public agency, public access regulations may not permit closing of the site.

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[14] For this reason, design professionals should request two different contract protections: an allocation of risk between design professional and the owner, and a statement eliminating the checking task from the scope of work. As against a third party, a limited scope definition has a better chance of being enforced than a risk allocation provision the third party did not sign.

[15] Internet/multi-media insurance is available through Lloyds and others, but is not commonly within the scope of A/E liability or CGL coverage.

Copyright Concerns

Copyright violation is also a significant concern. We are currently witnessing battles between the music recording industry and Internet start-ups over facilitation of copyright violation. The music industry is arguing, with significant success, that it is illegal to facilitate copying and exchanging copyrighted music. If a website is used to transfer copyrighted designs, documents, software or other information, will the Web host be held responsible for copyright violations? Even publishing photographs or video without the authors' consent could subject the host to copyright damages.[16]

Harassment Liability

A similar problem is created by inappropriate communications. Sexist, racist or other derogatory remarks can create liability if the host does not take appropriate steps to eliminate this behavior.[17] If the harasser is technically savvy, this can require significant efforts by the site host.

Computer Viruses

Virus distribution is another hazard. Computer viruses can be very destructive, as demonstrated last year by the damage caused by the "I Love You" and "Joke" viruses. What responsibility does the site host have for viral infections transmitted through the site?[18]

WHO OWNS WEB SITES? DOES IT MATTER? WHAT ARE SITE OWNERS' RESPONSIBILITIES?

The prior discussion concerning the expansion of the designer's work scope indicates that ownership and management of the website does affect the designer's liabilities. It also raises other issues.

A website may contain a vast amount of data, such as change order data, requests for information, meeting notes, project documents, plans, submittals, project photographs, schedules, calendars, and other project related information. Some of this information will be on the Web pages themselves, other information will "pour" to the website through portals, or be accessed through hypertext links. When counseling the host of a project website, you should consider the following issues.

- Who owns this data?
- Who controls access?
- Is security necessary?
- How is it implemented and controlled?
- When the project is complete, where does the data go?
- How will it be archived?
- Who is responsible for archiving the information?
- How do project participants gain access to the data when the website is inactive?
- How do you even save a website that imported information from multiple and distant servers?
- How do you rebuild a website to demonstrate its state at a given point in time?
- Is the website a public document?

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[16] Third-party liability for Internet copyright infringement is generally addressed by the Online Copyright Infringement Liability Limitation Act and other provisions of the Digital Millenium Copyright Act at 17 U.S.C. §§ 1201 *et seq*. For further discussion of these laws, see Melville B. Nimmer & David Nimmer, 3 NIMMER ON COPYRIGHT §§ 12A.01 *et seq*. (2001), and Ian C. Ballon, 1 E-COMMERCE AND INTERNET LAW, §§ 8.12 and 55.05 (2001).

[17] For a useful discussion of third-party liability for inappropriate website communications, see, generally, Ballon, 3 E-COMMERCE AND INTERNET LAW, Chapter. 55.

[18] For a useful discussion of third-party liability for transmission of viruses and other disabling programs via websites, see, generally, Ballon, 3 E-COMMERCE AND INTERNET LAW, Chapter. 44.

- Do public agency disclosure or public records act statutes apply to the website?
- By linking your data to the website, do you waive trade secret information?
- The business records exception to the hearsay rules requires that the party presenting evidence establish that it recorded the information in the ordinary course of business and maintained it with adequate safeguards to assure integrity. What steps does the website host have to assure that documents are properly signed, authenticated and maintained?
- If a party wants to use website hosted data, how does it show that it maintaned the information in the manner required to qualify for the business records exception? (Unless the party had actual control over the data, as opposed to mere access.)

DIFFUSION OF DESIGN

Design in a collaborative process will be distributed across a broad range of entities. Some will have significant design responsibilities. Others will only be involved in narrow issues. Some design will be hidden, such as design inherent in properties of objects created by CADD providers or standards committees. Questions will arise regarding design definition and the identification of the designer. The answer to these questions will depend on the specific question and the context in which it is asked.

Diffusion of design spreads responsibility to parties that may not be accountable, or who have limited accountability for their actions. If a window object miscommunicates with a wall object – neither of which were created by the designer of record – who is responsible? If the error is in the software description of the object, how would a designer even know a problem existed? In this example, it is not clear who bears responsibility for the deficiency. Even if responsibility can be traced, the culprit may be immunized by warranty disclaimers or privity defenses. At the very least, we can expect the designer and each supplier to argue that the error is the fault of another. When a problem occurs, finding the "designer" may be a difficult task.

LICENSING

This collaborative design paradigm does not fit into existing professional regulatory frameworks. Current regulations assume that licensed professionals will perform all design. But with increasing frequency, aspects of design are likely to be distributed to persons who may or may not hold professional licenses in the state where the project will be constructed. Is the creation of design objects the practice of architecture or engineering? Does it matter whether the design objects are generic or were created for a specific project?

If a portion of the design is embedded in material that others provide, does a design professional breach his or her registration statute by signing or sealing the documents? Statutes governing professional practice require performance of work under the design professional's "responsible charge" or "direct supervision." What does this mean in a collaborative, distributed design?

The regulation of professional practice must be adapted to include collaborative design processes and tools.

WHAT IS THE DESIGN DELIVERABLE?

In a traditional project, the design deliverables are plans and specifications printed on paper. Although there is pressure to change the deliverables to electronic documents, good practice suggests that paper still be used in electronic, collaborative projects. The electronic documents should be treated as drafts or copies provided as an accommodation.

Paper deliverables have several advantages. As discussed in " Document Archiving" on page 12, paper is a better archival medium. It is less easily modified and provides more reliable evidence of what was provided.

The printed plans and specifications are also the documents that will be reviewed for code compliance. The design deliverables should be in the same format. Although a three dimensional

model provides significant information about a design, it is still the plans that are signed, stamped and reviewed by the building official and the plans that are used by the construction crews to build the project.

But clients are demanding that the documents be delivered as electronic copies. The designer's contract should state that the paper copies are the official deliverable and that the electronic copies are provided as an accommodation, only. Even then, the designer should take steps to preserve the design as it existed when the documents were provided to the owner. This is most easily done by printing the documents that are provided on disk and burning CDs of the documents to preserve the exact information that is transferred. If the documents are being supplied to anyone besides the owner, such as a contractor, the designer should require the recipient to acknowledge, in writing, that the recipient is completely responsible for any errors, omissions, or inconsistencies in the documents and is responsible for verifying any information against the paper contract documents.[19]

MODIFICATIONS TO THE DESIGN

There are two different concerns with design modification. First, will the designer lose control over the design if the process is open to collaboration? Second, if documents are delivered digitally, can they be altered without the designer's consent? Both of these issues can be addressed through software, itself.

Project management sites have the ability to track versions of documents. CADD packages can do this as well. If the appropriate security provisions are implemented, the programs can determine who made a specific modification and can roll-back the documents to an earlier stage. Access to documents can be made "read only" to prohibit unauthorized editing of the document.

It is also possible to lock documents with digital signatures. A change to the document will invalidate the signature. A user can verify the signature and determine if the document has been changed. But the designer needs to understand and use these protections.

DOCUMENT ARCHIVING

Electronic data creates new preservation and storage problems.

Data Without Physical Existence

Paper files can store some information, such as drawings or specifications. But the new design and collaboration tools create dynamic models that may not "flatten" to paper without loss of content. Websites, themselves, do not easily store as paper files, since much of the content consists of links to other sites or portals into databases on servers located elsewhere. Preserving all of the information requires digital storage formats.

Media Obsolescence

Digital storage has significant limitations, and few good archival solutions presently exist. Magnetic media has a relatively short reliable life, and the best CD-ROMS are not expected to last beyond 100 years. Even if they did, how would we read them? Storage technologies change rapidly, and current standards are tomorrow's forgotten antiques. If you were given a punch card, a mag-card, or an 8" floppy, could you use it? Even if you could read it, could you find a program that could use and recognize the data? And if you did, would you have a computer and operating system that could run it? Given statutes of limitation and repose, it is quite possible for a lawsuit to occur after the storage media, programs, and data have *all* become obsolete.

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[19] This recommendation may seem severe (especially to vendors and contractors), since the purpose of obtaining electronic copies is to use them instead of making take-offs or layouts from the paper designs. But there is a reason. CADD documents for a major project are complex, consisting of many linked layers. Some layers may be "hidden" before printing the document. Incorrect use of the documents could actually lead a contractor or vendor astray. In addition, using the documents with different software, or even different versions of the same software, could produce different results. The designer cannot anticipate or be responsible for these problems.

SINGLE SOURCE PROCUREMENT

Collaborative processes create new opportunities for vendors to limit competition for a product. For example, if a vendor makes objects available for the designer's use, it will be tempting to use these predefined elements. But how will designers determine whether other vendors' products – also modeled by objects – are actually equivalent? And if a design is based on amicable cooperation between objects, who will assure that the adjusted design will work with the "or equal" product?

Conclusion

The Web enabled, object-oriented design process will soon be the standard of practice. As noted briefly in the discussion above, the standard contracts, the licensing regulations, and current practice are not synchronized with this trend. If construction lawyers want to assist their clients, they will need to understand the new technologies and develop solutions to the new problems they raise. Otherwise, construction lawyers will be like typewriters: kept around to fill out a few forms – but rarely used.