13.2 Information Management

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The information associated with running an architecture practice requires careful organization and a framework that offers consistency.

Businesses today are forced to deal in information. Far from being immune, architects must first address the administrative and organizational information associated with running any business, and then the typically more complex information associated with building projects. These sometimes disparate forms of information ultimately must be seen as one interrelated source of knowledge .

How well you manage the information that comes into, gets stored in, flows through, and is sent from your office can be a major factor in determining the success of your architecture firm. Information provides access to knowledge, and as the adage says, knowledge is power—or more pertinent to the architecture profession, successful management of knowledge is crucial to being competitive in practice today. At least it can be if the information needed to gain and benefit from knowledge is readily available.

THE INFORMATION EXPLOSION

Most offices are bombarded with information every day. Once computers and e-mail became ordinary tools, the printed materials that came through inboxes multiplied almost exponentially. Voice mail made available a more convenient means of communicating but left most businesspeople with one more type of information to retrieve, act on, or store. E-mail and the World Wide Web established wonderful new media for interaction but also created a multitude of additional information management challenges.

Architects now manage more information than ever in formats as dissimilar as paper, cassette tapes, photographs, film, and digital files. They manage information to evaluate their business opportunities and challenges. They also manage information to mitigate their risk and enhance their firm's profitability.

As daunting as it may seem, getting information routinely organized and integrated will increase productivity and eliminate time wasted on searching for letters, proposals, contracts, etc. This extra time can be used for pursuits that are more creative and possibly more lucrative.

Creating a Framework

Getting your firm's information into an organized system requires a framework that addresses the various forms of information used in an architect's office, from paper to digital. Just like a building, an information management system needs a structure that will firmly support a collection of various components.

Generators and formats. Information takes many forms in an architecture office. Each form—printed, electronic, or audiovisual—is associated with its own physical storage requirements. Within each form are crossover, individual, or complementary components. There is reference literature (such as standard details or product information) that could be managed in vertical files, on CD-ROMS, or both; general and project cost data and financial databases; personnel files and payroll data; legal documents (including insurance agreements and contracts); construction documents (not limited to drawings, specifications, and details); correspondence (notes, letters, transmittals, and letters); and forms and logs.

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Users. Traditionally, architecture firms create, organize, and use a variety of information. For example, architects use information to design a building. Specifiers use information to select materials and products. The marketing department use information to promote the firm and prepare proposals. Principals use information to make strategic business decisions and lead their employees. Those who prepare legal documents use information to protect the firm from undue risk or represent it when something goes wrong. One problem with this system of organization is that information used by more than one department is often duplicated or, worse, exists in different versions.

Organizational framework. Some architects may feel that computers will solve all their information management problems. And it is true that computers can be powerful tools in keeping track of a flow of information. But computer technology alone will not create a structure for organization. Someone first must think about an overall framework and structure—and then design it.

When you start to manage a firm's data, identify a hierarchy for this information and then set up an indexing system that corresponds to the hierarchy. Everything must be consistently organized.

The information to be managed, regardless of its format or media, must be filed somewhere, and each department within a firm might have its own idea of where that should be. But a system that varies by department makes sharing information more difficult. It will benefit the whole staff to have ready access to the knowledge represented by the information stored in the firm, regardless of which department is the caretaker of the information.

There are numerous organizational techniques to manage information, and new ones regularly appear. It is important that firms begin to use databases to link contacts, accounting, and marketing files, as well as to link CAD, project status, and history files with construction administration files. Web sites, extranets, and internal, firm-wide intranets are all being considered for information management.

Security. Some firms will deal with data or information that requires restricted access. It is easy to give out security passwords on a computerized database to keep the unauthorized out of the files. For a paper system, a different approach such as locking file drawers or signing out files might be considered.

Instituting a security system does not always mean keeping people out of the information. In some instances security could involve a system of checks and balances, so that no information inadvertently leaves the firm without approval by the managers.

> **Organizing, filing, and storing printed materials and associated collateral media such as photography should be the first step in developing an automated information system for the architecture office.**

PROCESSING AND USING INFORMATION: THE FUNCTIONAL ELEMENTS

Most of the information in an architecture office can be categorized as either project-related or "everything else." Project-related information can be anything that was created, received, or stored for a specific project. Rather than being a catchall, "everything else" is really information that relates to running your business—marketing materials, financial data, personnel records, professional publications, and so on—and will be called business information. The tools and techniques used to manage all of this information can be manual, automated, or a hybrid of the two, but all of this information must ultimately be considered part of the firm-wide knowledge base. But all of it must be categorized and stored accordingly.

Project Information

Before anything can be done with project-related information, some issues must be considered:

- How frequently will this information be used?
- How will it be viewed or accessed?
- Is it a legal document, or could it have legal implications sometime in the future?
- Is it confidential, and will it require security measures for access?
- Is it reproducible and can it be backed up?
- Can the original be recovered if disaster strikes?
- How and where will it be stored?

Once these questions have been considered, an information management system can be put in place.

Project files. It is common practice for architecture firms to have separate files for every project. Effective project filing systems can be easily understood and used by project personnel and everyone in the firm. Set up one system for all projects, and do not allow exceptions. That way vacations, travel, or attrition will not impact anyone's ability to locate and use a project's files.

Critical project information. Many firms compile the key information needed to keep a project running smoothly from the kickoff. Much of this information will be located in a project file that is accessible to all participants. This information can include:

- A project directory that consolidates names of all team members, their phone and fax numbers, e-mail addresses, and mailing addresses
- Construction budget requirements and project agreements
- Information about site conditions, specific regulations, or anything else that could affect design
- Project schedule
- An index of project files, locations, and access guidelines

Sometimes internal project budgets are included for more effective time management. Then as work progresses, technical information can be added to verify construction systems, materials, and product decisions.

Business Information

In addition to specific project files, an architecture firm has need of organizing its other business information. This is information that pertains to running an architecture business and includes leases, payroll, general product literature, accounting files, marketing information, a photography library, and many other categories. While much of this information is very important, it has less risk associated with it than project information.

For uniformity throughout the firm, business information can be categorized by subjects similar to project information whenever possible. For example, the accounting department will have its own project files, but much of what it does needs to be categorized another way.

The accounting department, a bookkeeper, or even one of the principals maintains project files that contain copies of the project authorization, signed agreements, invoices, and other papers related to the financial aspects of a project. These are not the same technical files used by the project personnel. Whenever any changes are made to the contract, such as increases in project scope or authorizations for additional services, it is important that the accounting department receives a copy of the contract amendments. This can prevent accounting and billing errors. But the accounting department or principal will also need to keep track of leases on office space, equipment rental, company-wide cash flow projections, and possibly even budgets for training and professional development. A separate system and hierarchy could be created by department for the firm's business information.

With its own information management structure for proposals, client follow-up, and publicity, a marketing department will readily manage its tasks. It can manage its own knowledge and databases more effectively this way.

However it is created, an organizational structure for business information will benefit from many of the same principles used to organize project information.

DEVELOPING YOUR OWN SYSTEM

Most firms will want to develop their own system of organization. However, there are some lessons learned by others in the industry that can save the new firm some time and trouble. Architects who have set up information systems for their own firms suggest that creation of a standardized filing system is a good place to start the information management process. Computer files are generally located in a hierarchy of folders or directories, and this approach can be successfully used for paper files as well.
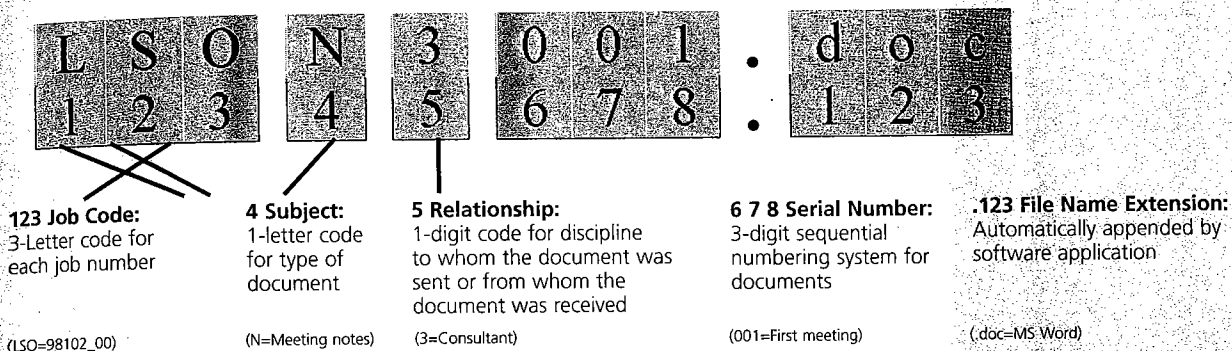
The purpose of this file naming convention is to provide design teams with a model for organizing project files, both electronic and paper. Maintaining project files is the responsibility of the project team, and this system can make that task much easier to accomplish.

Electronic File Names
(Non-drawing file names shortform)
The Standard DOS 8.3 ("eight-dot-three") structure can be used, as a minimum, with all positions filled in. An extended format is optional. This diagram shows an example for each postion.
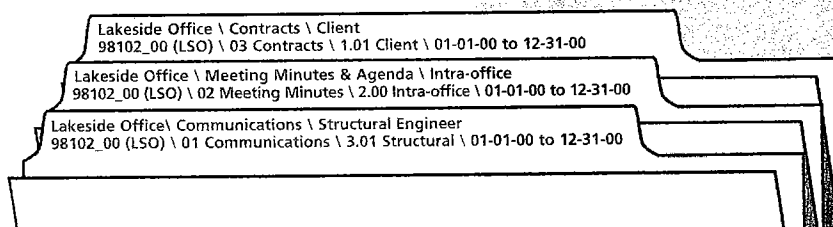
```
L S O   N   3   0 0 1 . d o c
1 2 3   4   5   6 7 8 . 1 2 3
```

123 Job Code:	**4 Subject:**	**5 Relationship:**	**6 7 8 Serial Number:**	**.123 File Name Extension:**
3-Letter code for each job number	1-letter code for type of document	1-digit code for discipline to whom the document was sent or from whom the document was received	3-digit sequential numbering system for documents	Automatically appended by software application
(LSO=98102_00)	(N=Meeting notes)	(3=Consultant)	(001=First meeting)	(.doc=MS Word)

Directory Structure for Electronic Files
(Non-drawing files as they would appear in Windows NT Explorer)

- 98102_00
  - 02 Meeting minutes/agenda
    - 3.01 Structural
      - LSONS001.doc
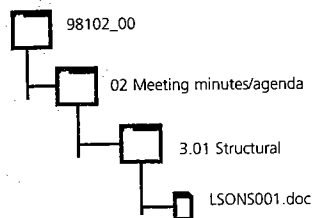
Paper File Folder Labels
The paper file labels can be organized with the following information: job name, subject, relationship (first line) and job number (3-letter job code), subject number and name, relationship number and name, dates of contents (second line).

Lakeside Office \ Contracts \ Client
98102_00 (LSO) \ 03 Contracts \ 1.01 Client \ 01-01-00 to 12-31-00

Lakeside Office \ Meeting Minutes & Agenda \ Intra-office
98102_00 (LSO) \ 02 Meeting Minutes \ 2.00 Intra-office \ 01-01-00 to 12-31-00

Lakeside Office\ Communications \ Structural Engineer
98102_00 (LSO) \ 01 Communications \ 3.01 Structural \ 01-01-00 to 12-31-00

Naming Files

Naming files—whether they are paper or electronic—is where the information management process actually begins. Give files names that anticipate how someone will search for the information contained in them. Anticipating what will be needed, by whom, and in what form, is not always easy, but it is worth the extra time to start thinking about information retrieval before files are established. Once you can pinpoint what might be needed, start naming files with major headings—categories that are easily recognized, such as "correspondence with contractor" or "correspondence with engineers." Because architecture firms are project-focused, a file-naming system is typically centered around project data, even in nonproject or business areas of the firm.

Having unnecessary files can be a mistake—it is much easier to check through twenty-five pieces of paper in one file than to have to look through five pieces of paper in each of five different files. This also holds for clicking through computer folders and subfolders. Whenever possible, put information into the largest general category first. When the major categories get too full, it is time to start subcategories. One exception—there will be some information that is so important that it should always be filed separately. A signed contract is one such example.

As you name files, you will want to adhere to the hierarchy you first established when you thought about the structure of organizing your project information. The project designation is the top level, which is broken up into subjects. From there, if the volume of information warrants, subjects can be subdivided by relationships. All of this can be further subcategorized by project phase.

Keeping a standard vocabulary across projects will facilitate your information management. For example, you could always have the following as project subjects: contracts, meeting minutes, correspondence, budgets, and schedules. In addition, you will likely want to have a subject for specifications and one for drawings.

Depending on the size of the project, large subject categories may be all that you

The codes shown here represent one way of identifying project numbers, file subjects, and relationships. The detailed breakdown of subjects can be used in place of the serial number (see diagram) when naming drawing files. Architecture firms may want to tweak the structure shown here to accommodate their own idiosyncrasies.

Project Number, Name, and Phase

PM Programming/master planning	DD Design development	CA Bidding/construction
SD Schematic design	CD Construction documents	PO Postoccupancy

Subject (document type letters)

01 **Communications: (L)** Letter, **(E)** E-mail, **(M)** Memorandum, **(T)** Transmittals, **(F)** Fax Transmittal, **(P)** Phone Record
02 **Meeting minutes/agenda: (N)** Meeting Notes, **(A)** Agenda
03 **Contracts: (C)** Agreement, Notice to Proceed, Contract, RFP
04 **Reports: (R)** Surveys, Staffing, Programming, Phase Reports **(S)** Schedule, **(W)** Workplans, Cost Estimates
05 **Graphics/photos: (G)** Prints and Negatives, Optical and Magnetic Media
06 **Specifications:** (organized per CSI division and section number)
07 **2D Drawings:** (organized per AIA standards for sheet numbers and CAD layers)
08 **3D Drawings/reference details:** (organized per UniFormat standards)
09 **Accounting: (X)** timesheets, invoices, budget status reports
10 **Construction administration:** (organized per CSI division and section number)

Relationship (discipline code numbers)

1.00	**Client contacts**	3.19	Code/ADA	4.13	Special construction
1.01	Client	3.20	Energy	4.14	Conveying systems
1.02	Client's representative	3.21	Model	4.15	Mechanical subcontractor
1.03	Client's architect	3.22	Renderings	4.16	Electrical subcontractor
1.04	Client's marketing	3.23	Plan check	**5.00**	**Agencies**
1.05	Client's construction manager	3.24	Graphics/art	5.01	Code/zoning analysis
1.06	Tenant/user	3.25	Security	5.02	City/county
1.07	User representative	3.26	Audiovisual	5.03	State
1.08	Building owner	3.27	Interiors	5.04	Federal
2.00	**Intra-office records**	3.28	Purchasing/furniture	5.05	Community/special interest group
2.01	Architects	3.29	Waterproofing/roofing	5.06	Gas and electric utility
2.02	Interiors	3.30	Waterproofing	5.07	Telephone utility
2.03	Graphics	3.31	Equipment	5.08	Cable TV
2.04	Industrial design	3.32	Associate architect	5.09	U.S. Postal Service
2.05	Planning	3.33	Radiation	5.10	Water
3.00	**Consultants**	3.34	Telecommunications	5.11	Sewer and storm drainage
3.01	Structural	3.35	Partnering	5.12	Refuse disposal
3.02	Mechanical/plumbing	3.36	Value engineering	5.13	Fire department
3.03	Electrical	3.37	Pneumatic tubes	5.14	Health department
3.04	Plumbing	3.38	Miscellaneous consultants	5.15	Outside plan review
3.05	Civil	**4.00**	**Contractors/vendors**	**6.00**	**Professional services**
3.06	Survey	4.00	General contractor	6.01	Attorney/legal
3.07	Landscaping	4.01	Testing/inspection	6.02	Insurance
3.08	Specifications	4.02	Sitework	6.03	Reprographics
3.09	Geotechnical	4.03	Concrete	6.04	Real estate agents
3.10	Acoustical	4.04	Masonry	6.05	Property managers
3.11	Environmental	4.05	Metals	6.06	Bankers
3.12	Cost estimating	4.06	Wood/plastics/casework	6.07	Doctors
3.13	Health care	4.07	Thermal/moisture protection	6.08	Couriers
3.14	Food service/laundry	4.08	Doors/windows/glass/hardware		
3.15	Fire protection	4.09	Finishes		
3.16	Elevator	4.10	Specialties		
3.17	Lighting	4.11	Equipment subcontractor		
3.18	Traffic	4.12	Furnishings subcontractor		

Detailed Breakdown of Subjects

01 Communications

1.00 Client contacts	3.00 Consultants	5.00 Agencies
2.00 Intra-office records	4.00 Contractors/vendors	6.00 Professional services

02 Meeting minutes/agenda

03 Contracts/legal records

04 Reports/cost estimates

05 Graphics/photos/marketing materials

06 Specifications (per CSI division and section number)

01 General requirements	05 Metals	09 Finishes	13 Special construction
02 Site construction	06 Wood and plastics	10 Specialties	14 Conveying systems
03 Concrete	07 Thermal and moisture protection	11 Equipment	15 Mechanical
04 Masonry	08 Doors and windows	12 Furnishings	16 Electrical

07 2D Drawings (per AIA standards)

A0.1 General (index, symbols, abbreviations, notes, code analysis plan references)
A1.1 Demolition, site plan, temporary work
A2.1 Plans, room finish schedule, door schedule, wall types schedule, floor-ceiling assemblies, key drawings
A3.1 Sections, exterior elevations
A4.1 Detailed floor plans

A5.1 Interior elevations
A6.1 Reflected ceiling plans
A7.1 Vertical circulation, stairs (elevators, escalators)
A8.1 Exterior details

A9.1 Interior details

08 3D Drawings/reference details (per UniFormat Standards)

A	**Substructure**	**D**	**Services**	**G**	**Building sitework**
A10	Foundations	D10	Conveying	G10	Site preparation
A20	Basement construction	D20	Plumbing	G20	Site improvements
B	**Shell**	D30	Heating, ventilating, and air conditioning (HVAC)	G30	Site civil/mechanical utilities
B10	Superstructure	D40	Fire protection	G40	Site electrical utilities
B20	Exterior enclosure	D50	Electrical	G90	Other site construction
B30	Roofing	**E**	**Equipment and furnishings**	**Z**	**General**
C	**Interiors**	E10	Equipment	Z10	General requirements
C10	Interior construction	E20	Furnishings	Z20	Contingencies
C20	Stairs	**F**	**Special construction and demolition**		
C30	Interior finishes	F10	Special construction		
F20	Selective demolition				

09 Accounting records

10 Construction administration records (per CSI division and section number)

00100	**Bidding/negotiations**	00300	**Log files**	01300	**Submittals**
00105	Bid questions	00310	Transmittal log	01305	Construction schedule
00115	Approvals	00320	Request for information log	01310	Schedule of values
00120	Addenda	00330	Submittal log	01315	Submittal schedule
00125	Amendments	00340	Correspondence log	01320	Shop drawings
00130	Preconstruction negotiation	00350	Contract modification log	01325	Production data
00135	Proposed work	00360	Memoranda log	01330	Samples
00140	Value engineering	00370	Revision log	01400	**Quality control/testing**
00145	GMP and cost negotiation	00380	Field sketch log	01700	**Project closeout/record documents**
00200	**Contract/payment file**	00320	Request for information log	01705	Architect's punch lists
00205	Notice to proceed	00400	**Supplementary bid information**	01707	Contractor's punch list
00215	Change orders (CO)	00500	**Contractor coordination**	01710	Substantial completion
00220	Change proposals (CP)	00600	**Bonds and insurance**	01720	Warranties and bonds
00225	Construction change directives (CCD)	00700	**Owner coordination**	01730	Final acceptance
00230	Cost requests (CR)	00800	**Agency coordination**	01740	Contract document archiving
00235	Architect's supplemental instruction (ASI)	00900	**Document modifications**	01706	Consultant's punch list
00240	Construction change request (CCR)	01000	**Summary of work**	01708	Design-build punch list
00245	Owner/contractor contract	01200	**Project administration**	01715	Operations and maintenance manuals
				01725	Record documents
				01735	Extra maintenance materials
				01900	**Colors and materials**

Courtesy Patrick Mays, AIA

need. But project size will influence filing and file naming decisions. For small projects, one lump category for correspondence with the contractor, for example, should suffice. However, for large, complex projects, you might need to further divide that file to include subfolder files—perhaps correspondence from the contractor or requests for information in one folder, correspondence to the contractor in another. Although this discussion does not center on computer files, when you set up your paper file-naming system, keep it as simple as possible and devise a system that can closely correspond to computer file names (which most firms in practice today do have in place).

Having different names for printed and electronic files that contain the same or similar materials will defeat your information management organizational structure. Your naming conventions, and the index to track them, must reflect the limitations of a computer operating system for file names. Most—such as Windows or Macintosh—permit long names, but anything on DOS restricts names to eight characters, plus the three-letter extension.

A sample system for naming paper and electronic files is described below. This system is a refinement of one introduced by Patrick C. Mays, AIA, in *Construction Administration: An Architect's Guide to Surviving Information Overload* (1997).

This filing system has two basic parts: file names and a directory structure. The system maintains consistency between paper and electronic file naming.

The electronic file names have three critical pieces of information. The beginning of the name indicates the project by either a project number or a shortened three-letter job code. The second part of the name indicates what kind of subject matter the file represents, such as a letter, meeting notes, or a contract. The third part of the file name indicates a relationship, such as to whom the document was sent or from whom it was received. For some documents, such as meeting minutes, serial numbers are used to indicate that the notes are from meeting number 1, meeting number 2, etc. Other documents may not require serial numbers. For items such as transmittals, letters, and contracts, more spaces can be used in the file name to describe the relationship code in more detail. For example, the number "1" could indicate client information, and the number "3" consultant information. In designating a specific consultant discipline, "3-03" could indicate an electrical consultant.

The electronic directory structure also has three basic parts, in this case three hierarchical levels. The uppermost level refers to the project number and might include the project name and the phase of work. For example, "98102 Lakeside Office–Design Phase" might be the name given to the directory containing all information for that project. The second level of the directory could include 10 separate categories of subject matter such as communications, meeting notes, contracts, etc. The third directory level would depend on the subject matter. For example, communication and meeting notes might be organized by relationships, such as meetings with consultants, meetings with clients, or letters from city agencies. Items such as specifications could be organized by CSI division and section numbers. Reference details might be organized by UniFormat classification standards since they represent physical components and elements of a building.

It can be a good idea to close project files at the end of the design phase of a project and start a new set of files for the construction administration phase. For example,"98102 Lakeside Office–Design Phase" might become "98102 Lakeside Office–Construction Phase." This makes it clear that communication and meeting notes from this phase of work are focused on construction issues.

Because many special forms are used in the course of construction, it is advisable to organize construction administration records around CSI division and section numbers used in the project specifications. For example, division 1 section 300 describes methods for submitting shop drawings and samples so a corresponding file can be set up to include information about products as they are received from subcontractors.

Whatever naming conventions you choose, make sure they are understood by everyone in the firm. It can be a good idea to hold a staff briefing on file naming, storage, and retrieval. With some of the sophisticated software programs being issued, this training could be a necessity.

In some instances, the order of information can be alphabetical, but project information is successfully stored and easily retrieved when it is chronological. Filed in sequence by date, this information can be useful in determining whether or not an architect was diligent about informing other team members of problems in a timely manner.

Guidelines for Managing Documents

Project information should be documented as fully as possible. Everything from approved drawings to notes of conversations can be important information needed for project management, for financial decisions, or to resolve liability issues.

Project sequence documentation. Information is reused at various stages of a project. During the project's life, information from programming will be needed in schematic design; construction drawings might be used for presentations, or even for marketing efforts.

Design compensation is often tied to completion of specific project milestones. You should get, and keep, proof of delivery of schematic design studies, design development documents, and construction documents. However, delivery does not mean that the owner has accepted what was delivered. Normal owner-architect agreements require the architect to get the owner's approval at the end of each phase. This can be as simple as a signature or initials on the review set of documents. If the approval is given in conversation, the architect would be wise to follow up with a confirmation letter to the owner stating that oral approval was received.

The extent of written confirmations can vary a bit depending on specific project requirements and the practices of individual firms. Just remember: Written records of understanding are often the easiest means of avoiding later misunderstandings or litigation.

Construction documents. You must verify that an owner has reviewed and approved all construction documents. The first step is to deliver duplicate copies of drawings and specifications to the owner for review and comment. There is a legal difference between delivery and acceptance, so the architect should get written approval if the owner provides it orally.

In a formalized approach to providing architectural services, such as when the client is a public agency, the building committee usually approves drawings and specifications in a resolution. It should order the issuance of invitations for proposals or competitive bids for construction. But usually the process is much less formal—the client requests bids or proposals, therefore showing it is satisfied with what the architect has delivered. A contract construction award is considered evidence of the client's approval of construction documents.

Some documentation specifics. Transmittal forms serve as cover letters for work materials sent somewhere. Items such as drawings and product sample boards are cumbersome to store close to a working space. So the transmittal cover becomes the record on file, and thus is most useful when it contains pertinent data such as dates.

Letters are written, so even if a letter is sent electronically, it can be printed and filed. This also applies to faxes or any other correspondence received electronically. Include any attachments in the file. It could be helpful to know who was on a distribution list of something received or sent in the past.

Phone calls, e-mail, and hallway conversations with clients might be information you need to record. A written telephone—or conversation—log, dated and in chronological order, that summarizes the conversation and any decisions would be useful. It can serve both as a to-do list and a record of what transpired. E-mail in particular has become so widespread, and in many cases has replaced other forms of traditional correspondence, that a methodical and organized way of receiving, storing, and archiving project e-mail is critical. Using tools built into some of the commercially available e-mail software packages can be an excellent way to begin this organizational process.

Minutes of meetings require accurate recording, as important decisions are made at most project meetings. According to Mays and Novitski in *Construction Administration: An Architect's Guide to Surviving Information Overload,* if some key information is recorded in the minutes, they will become an index of their own to other construction records. Mays and Novitski recommend assigning a code number to problems discussed at a meeting and eventually solved. The code provides a link to other records—shop drawings or change orders, for example—so that if a problem appears again during construction or after completion, it will be easy to locate through references in the minutes. "If it is ever an issue for discussion, it will appear on successive sets of minutes until it is resolved," they write. "So, by thumbing through pages of minutes, you can easily see what the issues were and how long they were on the table. By using their code numbers and the dates of the minutes that refer to them, you can locate the appropriate logs, correspondence files, submittals, and field reports to trace a complete history of the problem."

Drawings, materials samples, and other reference materials that do not conveniently fit in filing cabinets need to be kept in ready access for ongoing projects. Once a project is completed, these files can be moved to a back room or a storage area away from the office.

Backups

Information stored on computers should be backed up regularly. Backups are data copied to a storage device that will protect files from accidental damage. Many computer systems can be programmed to backup automatically. Backups can be made on diskettes (for small amounts of information), tapes, CD-ROMs, or some other electronic format (and these are evolving, so it pays to keep current with what the market offers).

In order to recover data and files in the event disaster strikes, plans should be made for everyone in the firm to follow. Having a company-wide backup procedure is the first step to disaster recovery, but the next step, and one that is just as critical, is using it. Someone in the firm needs to decide whether data will be backed up monthly, weekly, or daily.

Whatever the media you select for your firm's backup, update it on a rotating basis. Do your first backup on one set of backup media, the next on a second set, the third on the first backup media set, the fourth backup on the second backup media set, and so on. This way, if something happens to corrupt your backup files, you have the generation of information saved immediately before. Then you have only one period—a day, if that is your backup period—of data to re-create.

Regardless of the backup schema, it is wise to keep backup copies at a site removed from the physical location of the office. Storage in a nearby fireproof bank vault is a great option. There are also service companies that will pick up backup media from your location and store them at secure facilities. If your location is prone to natural disasters, consider storing some copies of backup media in another geographic location.

Avoid Duplicating Information

Worried about missing information that could be important at some point, people

often want to cross-reference the information. It is possible to place copies of the same item in more than one file; however, to avoid excessive duplication, a cross-reference to another source can be included in the file.

Indexing is the underlying structure for an information managementsystem. In a paper system, the index is in a printed format. But much of the architect's business information is created by computer, including letters, spreadsheets, drawings, and proposals. A digital index such as a computer directory of folders can be used to maintain this information.

Filing systems are less effective when the same type of information can be filed under different names. When several people have access to the same files, it is inevitable that similar materials will be filed under different names, and this is particularly true for library files or archives. To avoid this, keep the index of project and business information updated, and make sure everyone who will be using the information has a copy.

MAINTAINING, UPDATING, AND MANAGING INFORMATION SYSTEMS

Information systems should be kept current and up-to-date. When it is a computer-based system, there are some issues to consider when evaluating an upgrade. First, will the software used to generate information for projects this year be usable on the next generation of hardware? If not, will you maintain some old hardware until you no longer need to hold on to project data? Will you be sharing information with other offices, or will you maintain it internally? As architects use their knowledge of buildings, design, and construction to perform more services than ever before, the information they manage might change. Will the information management framework you have created accommodate these new services?

After years of storing information on finances or proposals, the architecture firm may have a collection of information it can use to increase its knowledge. One way to use it is to create databases on the computer. Knowledge databases that link such items as contacts, accounting, CAD, project histories and status, digital images, marketing materials, and construction administration are clearly the direction in which most firms seem to be moving. A firm can electronically capture key business indicators, standardize data formats to compile information from multiple sources, and enhance data analysis and presentations through its knowledge database.

In *The AEC Technology Survival Guide*, Kristine K. Fallon, FAIA, says design firms can use their information systems to achieve an advantage if they look at the integrated information. She points to four databases:

- The *human resources database* catalogs skills, qualifications, licenses, salaries, and experience.
- The *performance database* compiles raw data from financial and project management into a single source to track profitability and consistency.
- The *technical database* contains everything the firm knows about the art and science of putting buildings together.
- The *contact database* lists clients, peers, press, consultants, contractors, and strategic partners.

Update and clean out the firm's files on a regular basis. In *Taming the Paper Tiger at Work*, Barbara Hemphill tells us to ask ourselves, "What is the worst that will happen if I don't have this piece of information?" She wants us to cull our files and get rid of what we don't need, and to do it now.

Unlike project files, it is much easier to guess which of the firm's business files might be needed at some future date for legal reasons. You will need to keep anything that has tax implications, and old proposals with the firm's accomplishments and statistics could be useful later. But the materials in many business files have no use after a while. An expired lease could probably be discarded, as could rejection letters

from projects the firm bid on. It is also a good idea to clear unwanted files from your hard drive periodically.

Project files require a longer holding time. In some states a statute of limitations will set the period for retention of project documents by the risk-averting firm. Other states have no statute of limitation. But as active projects age, they can be moved to the back of your files.

Information management should be a viable system. Once set up, a framework for managing an architecture firm's flow of information should be rigorous enough to maintain a logical structure. Yet it must also be flexible to accommodate changes in construction practices, architecture services, and rapid advances in technology.

ARCHIVING INFORMATION

Completion of a building is often a cause for celebration. Then the firm almost immediately turns its attention to the next project. But the hurrah when the building is finished is not the end of the project. All the project transactions—the information that moved between team members, drawings, details, contracts, change orders, new product information, and the like—need to be evaluated and a decision made on what to keep.

Archives

Archiving is a system of storage that collects information that is complete. All projects should be placed in archives when they are completed.

Bulky items such as drawings will probably be sent to archives long before normal paper files or electronic files. But eventually, after a project has been closed out for a while, decisions need to be made about what information to keep and where to keep it.

The same project/subject/relationship/phase approach used to manage the project while it was ongoing can be retained for archiving purposes. However, some information might be separated out because it will be used more frequently. It is common for architecture firms to reuse details, so project details files may be more readily accessible.

Generally, all duplicate files on a single subject—say, from both accounting and design—will be consolidated into one file for the project subject. That means all the correspondence will be in one place, as will all the drawings, all the specifications, and so on. Paper is separate from disks, which are separate from photographs. Different media formats have different life spans.

When storing electronic files, storage of software can also be quite important. CAD drawings, word processing documents, and financial spreadsheets stored on archival disks will need to be stored along with the corresponding applications (if they have been updated or replaced) in order to retrieve the information. Many files can be saved in a universal Web-ready format such as HyperText Markup Language, which is the language of the Internet. Only a Web browser is required to review the archived data.

Digital information created within your information framework is easy to copy and backup. Writeable CDs and Zip drives make it easy to store (and retrieve) large amounts of information in very little space. Magnetic tapes can also be used, but their life expectancy is only about five years. CAD drawings can be filed on electronic media, and drawings that occur only on paper can be scanned and filed electronically as well. Ideally, archived data will be the final and complete documentation.

Documents to Keep

Good documentation throughout the life of a project helps to keep it on schedule. It also serves as a risk management strategy—if you keep records of all transactions, you will have documentation of the job you have done, as requested by the client, with input from appropriate consultants, and in cooperation with a contractor and/or subcontractors.

Keep all important project records. Written documentation will serve as proof of your firm's position in the event of any disputes. Written means printed, in the form of notes, letters, photographs, photocopies, faxes, printed e-mail, or printouts of computer files that are stamped with a date. The acceptability of electronic files in a court of law is not

always guaranteed. The records you choose to maintain can be subpoenaed in a lawsuit, so take care and review everything with a wary eye.

Project records that architects would be wise to keep are consolidated into three categories: transactions between the architect and owner, transactions between the architect and the whole team (including consultants), and transactions between the architect and the contractor.

Owner-architect records. Typical owner records to keep include:

- Contracts and letters of understanding
- Information provided by the owner, including confirming memos prepared by the architect if the information was verbal
- Presentation and submittal information and data
- Approval letters or meeting minutes that document approvals
- Logs that record when contract documents were sent and returned
- Submittal and acceptance records of insurance (for owner and contractor)
- Reports of on-site observations
- Owner representatives' reports or directives
- Certificate of substantial completion
- Final certificate for final payment
- Architecture production budget, schedule, time, and expense records for each phase of design and construction
- Final construction and final project costs

Team records. Maintaining files of interactions between team members can be a benefit if questions of responsibility and knowledge come into play. Documentation to include here consists of:

- Minutes of any meetings or conferences, even notes following informal meetings
- Memos of telephone conversations
- Logs and/or transmittals showing delivery dates for drawings, specifications, responses to requests for information, and similar items
- Records of approval of drawings, with specifications, by the appropriate reviewing organization
- Progress photographs
- Final construction cost

Architect-contractor records. These records are in addition to those you retain concerning transactions with the whole team.

- Bids from all contractors, not just the winning bidder (include subcontractor bids)
- Submittal records
- Action taken regarding progress schedules, testing, or special inspections
- Review and approval of shop drawings, including product data and materials samples
- Applications and certifications for contractor payments
- Responses to requests for information
- Records of change orders, directives, or other instructions
- Reports of on-site observations

Toss It?

Management is always a series of tradeoffs, and decisions on archiving are no different from other management decisions. In balancing liability concerns with the cost-effectiveness of storage, architects have to decide which materials and documents to hold in archives when a project is completed. The guiding principle is to keep a project file for as long as you are at risk of being called into court to defend your services. Some jurisdictions do not have statutes of limitations for improvements to real property, so that might mean it is necessary to keep those files forever.

When you must manage the storage space you have and feel compelled to discard

files, consider that more than 80 percent of claims against designers are initiated before the fifth anniversary of a project's completion. Personal injuries that occur ten years or more after project completion are usually caused by inadequate maintenance and not by a design defect. If you are sued and have the records to show in court, you may have a better chance of defending yourself with success. No matter how old, files from any project that suffered from conflicts among the parties or problems during design and construction should be saved. Similarly, priority should be given to saving files for projects where new building products or systems were used, or where established products and systems were used in a new way.

What files are best to keep? Obviously your contract and final drawings and specifications should be retained, along with a chronological file of progress reports and correspondence. Maintain these items at least until the statute of limitations period passes. After that, and as time continues to pass, more files can be eliminated.

When deciding whether to hold on to or toss files, consider the longevity of each item. Not all media are permanent. For example, thermal faxes and diazo prints are two items that will need photocopies. If you are the source of a document, keep it. It is not safe to assume that the client has kept a copy. Include documents within your records whenever possible—a change order could be filed with project agreements, for example.

Do not throw away information that affected design or construction decisions. Notes about a client decision to change the design from the architect's original proposal should be retained. So should client or consultant changes to design details. Hold on to anything that shows your work was performed in accordance with the appropriate standard of care.

Archiving computer or electronic files requires special care. Specific procedures might include archiving a current version of the software with data files, placing backup copies in separate locations, concern for magnetic interference, and a time limit on how long drawing files will be saved. In some instances, thought might be given to retaining the hardware that can use the software that has been retained.

There are no easy answers to the question of what to retain. As you go through your files, cull smartly, and keep risk management in mind.

DESIGN IS A BUSINESS OF INFORMATION

Processing and organizing information within an architecture firm has become a large task and continues to expand in its complexity and demands. This is a task that could require the efforts of a single devoted individual or even a whole department. But whether it is one person's job or everyone's, information management must be formally addressed by architects. If business opportunities are to be pursued successfully and risk avoided, staff members need ready access to the information that helps them do their job.

A potential now exists for firms to expand their range of services if they can effectively manage information. Much of the information and data that are managed electronically by an architecture firm can be captured and offered as part of a facilities management service to clients. As architects hold more completed project CAD files and databases, they will have the opportunity to keep that information organized for their clients and manipulate it or update it as additional services for their clients. The information explosion is not likely to lessen anytime in the foreseeable future. As a result, how well a firm manages its data will be directly related to its success.

For More Information

For a further look at organizing project information, see Patrick C. Mays, AIA, and B.J. Novitski, AIA, *Construction Administration: An Architect's Guide to Surviving Information Overload* (1997). Kristine K. Fallon, FAIA, has also written a guide for managing project information with technology, *The AEC Technology Survival Guide* (1997).

13.3 Using the Internet in Practice

Paul Doherty, AIA, with Michael Tardif, Assoc. AIA

With so much media hype centered on the Internet, it's little wonder some architects are confused about how this powerful information and communications tool can make their jobs easier. What is clear is that the Internet offers both quick, easy access to information and a reliable communications network.

To survive in the current economic climate, architects must be prepared for constant change and ready to respond to it. One powerful tool that can help architecture firms keep up with change is the Internet. Constantly evolving, yet easily adapted and molded to fit your needs, the Internet is a perfect vehicle for the Information Age. It is a part of the information revolution that can benefit all businesses.

The initial design for the Internet was developed by a small firm with a specialty in architectural acoustics. According to the book *Where Wizards Stay Up Late: The Origins of the Internet,* by Katie Hanford and Matthew Lyon, engineers Bolt Baranek and Newman (BBN), of Cambridge, Massachusetts, beat out some of the biggest conglomerates of the 1960s for the project. Research scientists were asked to conceptualize a means of connecting government computers so that military personnel, federal employees, and contractors could quickly communicate information regardless of their location or time zone. A child of the Cold War, the Internet was conceived to be invulnerable to nuclear attack: If one area of the Internet is destroyed, the system reroutes information to another area that is still working.

Few people called themselves computer scientists in the 1960s, but those involved in a wide range of research activities were bent on developing a means to connect distant computers and allow them to communicate with one another. Some of these scientists were involved in acoustics research. BBN employed a few of the nation's foremost acoustics scientists, who were known to the Advanced Research Projects Agency (ARPA). BBN was awarded the contract to design and construct ARPANET, which later evolved into the Internet. BBN eventually wound up designing, building, expanding, and maintaining ARPANET for several years.

Today the Internet has a life of its own. With more than 100 million users online and millions of new ones connecting every month, it is no longer the domain of a technical elite. Thanks to its rapidly expanding collection of information resources and increasing ease of use, the Internet has become a central part of daily life. People form relationships, conduct business, and perform transactions using a communications medium in which traditional boundaries and concepts of communication are transcended.

Architects must develop the requisite skills and learn how to harness the Internet for business and design purposes. Those who neglect to master information technology (IT) will be at a severe competitive disadvantage in the twenty-first century. The challenge is not just for individuals but for the entire profession—those who do not understand and master the Internet will lose out to those who do.

Positioning your firm in the Information Age means looking beyond the technology of the day. As a first step, firm owners and managers must analyze their firms' business and design processes, both internal and external, and then make strategic decisions regarding the deployment of information technology for the next one, three, and five years. Many firms have created marketing "portfolio" Web sites and use e-mail for correspondence. Perhaps your firm manages internal communication through an intranet. You may even be using the collaborative environment of an extranet to facilitate project management. Whatever you choose, your business needs and functions should drive your technology decisions, not the other way around. A firm can organize its Internet technology strategy

> **"Being a sole practitioner, I depend on an online forum of people who exchange problems and solutions over the Internet, and a monthly newsletter of shared tips."**
> *Peter Wronsky, AIA*

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