STAYING ABREAST OF PROFESSIONAL DEVELOPMENTS
'The A & E Profession in Transition'

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ABSTRACT

The architecture and engineering profession is facing a whirlwind of change and it is a challenge for faculty members to keep abreast of these developments. According to the National University Continuing Education Association, even slower paced technical fields are reinventing themselves at least once a decade. What is the best way for faculty to monitor and adjust to these changes? By gaining some industrial/professional experience through an association with a professional office, for a summer or on a part-time basis. The benefits are numerous when an educator reconnects with their ever changing technical profession.

Some of the more recent changes have included:

- We are deeply into the electronic-information era. New styles of education are possible and probably required.
- The appearance and organization of professional offices has been affected, as the changes being wrought by the computer move at blinding speed.
- Student portfolios and educational outcome results have changed. Firm hiring practices and recruitment strategies are much more aggressive.
- Firms have expanded the services they provide, and rely more on these expanded services.
- The success of a firm is not solely based on technical skills. Firms are better strategic planners and managers attempting to improve their current and future positions.

Architectural and engineering design is an enterprise aimed at the future, but how can educators prepare students if they do not understand present practice? Faculty cannot afford to prepare students for an industry that no longer exists. This can be avoided by blending hands-on professional experience with our academic advancements. Furthermore, studies have shown that work experience positively affects faculty attitudes toward teaching and research. Since efforts to improve engineering education cannot be addressed solely through academic means, added professional experience is an important factor in the growth of a faculty member. Many professions require continuing education credits to maintain licensing or other certificates; it is only logical that educators should require the reciprocal of themselves.

INTRODUCTION

The half-life of an engineer's technical skills - how long it takes for half of everything an engineer knows about his or her field to become obsolete - is strikingly short. According to the National University Continuing Education Association, for mechanical engineers it is 7.5 years;

for electrical engineers it is 5 years; for software engineers, a mere 2.5 years.[1] Keeping in mind the pace of change and growth since these estimates were developed almost 10 years ago, these half-life figures are undoubtedly even shorter today. So as technological changes gain momentum, architectural and engineering professionals must be prepared to treat their careers as dynamic entities that need continuous upkeep and upgrading.[2] How then can faculty, who are not being educated by professional experience or trained by their company, hope to stay abreast of current developments? Just as professionals must stop thinking of education as what they did in college many years ago, educators must stop thinking of industrial experience as what they did with a company many years ago. Everyone must start seeing both academic education and employment experience as a project of life-long learning.

According to many, the cornerstone of building a strong education curriculum is balancing practical experience based knowledge with academic inquiry.[3] Then why is not the same required of the faculty, that is, a blending of industrial experience with academic knowledge, thereby fusing practical applications with theory. This would strengthen the ties, and redefine the boundaries between education and practice in the preparation of professionals. A more professionally involved faculty would also improve the interaction between industry and academia, and improve a relationship that is at times lacking in trust and respect.

Architectural and engineering educators have a vital interest in enhancing their industrial experience, it would enrich the schools, support experience and sustain learning. Those educators teaching professional courses should not only have currency in their fields but should also be properly credentialed.

Experience in the field would provide faculty with first-hand exposure to and knowledge about advanced and creative uses of technology, current trends and cycles that affect the industry, and prevailing professional developments.

ADVANCED AND CREATIVE USES OF TECHNOLOGY

THE NEW PROFESSIONAL OFFICE LAYOUT: CHANGED BY THE COMPUTER

In an effort to amplify communication, many offices, some as early as 1989, discarded all drafting tables. The new office design has PCs at every station that are linked to all the other staff stations, the library, the conference rooms, and project teams' tables with a data network, telephone and modem. The network supports electronic mail and the Internet, and the telephone system supports voice mail. Discarding all drafting tables also meant re-inventing many the traditional mechanical skills of drawing with pencil and paper. The new artist's palette includes CADD, rendering tools, pixel editing, desktop publishing and black-and-white and color output devices.

Someone who has not been in an architectural and engineering firm for 10 years would not recognize the place. There would be a PC at every station and all would be networked together for ease of information exchange

THE ELECTRONIC-INFORMATION ERA: COMPUTERS IN PRACTICE

According to Dennis Neely, vice president of Industry Marketing for Softdesk ASG, we are now deeply into the electronic-information era. Unlike other transformations in the field (professionalization at the end of the 19th century, or the increased specialization of practice after W.W.II, or even the Industrial Revolution of the mid 1800s), the changes being wrought by electronic information are moving at blinding speed. Practitioners must embrace these tools, or others will be doing their jobs - by the year 2000.[4] The long-heralded electronic-information revolution actually began in 1985 when inexpensive software and hardware became sophisticated enough for architects, engineers, contractors, and owners. You no longer need to know how to draft to make perfectly drawn drawings. Today's software can assist you in making renderings, calculating duct sizes, drawing framing plans, calculating building assembly and energy use. Clearly talent and knowledge are necessary to make good designs and to create proper documents. However, software developers are embedding more data and more evaluation criteria and design methodology within their application programs,. Drawings are "smarter", capable of changing data associated within them as they are changed. Drawings are now able to generate schedules, soon they will be "writing" specifications. A CADD based structural analysis program evaluates a selected area to be spanned then develops a material schedule, chooses details and draws the framing diagram. CADD generated presentations also allow clients and consultants to share more thoroughly in the design process.

If the changes that have occurred during this decade are dramatic, the next decade of architectural and engineering practice will be mind boggling. Those close to it will be better able to discuss it and prepare for its future.

CADD: IMPROVES EFFICIENCY AND COORDINATION

A typical office has strong computer capabilities incorporating multiple systems, networking and file translating and transferring. They rely heavily on computers to improve efficiency, communication and coordination on their projects. They use AutoCAD as their primary drawing system, for both two-dimensional and three-dimensional applications. One of the most important features is AutoCAD's interrelationship with database software, which allows it to both count and manipulate objects. Many use multi-XREF schemes that allow for architects and engineers to view each other's drawings simultaneously. As drawings are revised or altered, the updated drawings are immediately available to the other disciplines working on the project. The integration of CADD capabilities with other software, including spread sheets, databases and word processing packages continues to expand. Many firms belong to file transfer networks, an inexpensive and effective national network that allows them to send drawings, or any type of data electronically instead of via express delivery. Architectural and engineering firms are committed to computer technology to improve not only efficiency and coordination ability, but also communication.

Unless one has had first-hand workplace experience with CADD it is difficult to realize how effective it is as a tool for design, documentation and delivery.

PROFESSIONAL COLLABORATION BY WIRE: ACCELERATES THE DESIGN PROCESS

Architects and engineers are increasing their use of modern electronic communications, particularly the Internet, to collaborate. This has allowed the design process to be accelerated as

design professionals can exchange documents more quickly, or work on the same document at the same time. More documents get exchanged when you use CADD and collaborate over a network, particularly in the early stages of the project, when the design is modified more often. The Internet helped popularize this way of working, as most of the newer tools are Internet-based.

Students appear to accept, understand, and be excited about the fact that computer networks, particularly the Internet, have made it easier, faster, and more cost-effective for architects, engineers, other design professionals, and clients to work together even when they are apart.

MANAGING THE PROJECT TEAM: WEB HELPS INFORMATION FLOW

A Web page was the answer for an architectural firm when they were trying to get the firm's project information flow under control. After faxing and overnight deliveries to the tune of tens of thousands of dollars a year, they were looking for a way to distribute project information that was significantly less expensive. Working with an Internet service provider, they developed a low tech Web page. The Web page contained enough information for the consultants to find out what was going on with the project, without having to send out faxes every time they wanted to do something. Team members can look at announcements, the meeting schedule, the project schedule, the current phase work plan, the overall project calendar, a list of drawings, an electronic file repository of drawings, all meeting minutes, the project directory, and a message center.

This is one of many innovative uses of computer systems and new technologies in architectural and engineering firms that improve management and communication.

LICENSING AND REGISTRATION: EXAMS GO COMPUTERIZED

In January 1997, National Council of Architectural Registration Boards, which administers the architectural registration exam, launched its computerized registration exam to mixed reviews. But in any case, the way exams are given to professionals in many disciplines will never be the same.

As the format of licensing and registration exams change, it is critical that faculty understand the challenges that this creates for young professionals.

CURRENT TRENDS AND CYCLES

MARKET TRENDS: INSTITUTIONAL SECTOR HOTTEST MARKET

Though most sectors of the construction industry are performing well at present, architectural and engineering firms place the institutional sector at the top of the list. According to an AIA survey, when asked to list the hottest construction sectors currently, 43% of the firms listed institutional sector projects, led by education and healthcare.[5] Within recent years many firms have developed a more comprehensive practice. If involved in educational projects, their work might encompass all aspects of K-12 work for both public and independent schools. Projects might include individual elementary, middle, and high schools; child-care centers; district-wide and campus master planning; referendum and feasibility studies; and

comprehensive K-12 campuses which incorporate community centers, visual and performing arts, fitness, science, and wellness facilities.

Architects and engineers must also keep pace with the changing nature of their markets, in this case teaching and education. Not only are theories of learning and instruction evolving, but also the political climate affecting schools, school design, and school construction as never before. Active learning, multiuse facilities, community participation and environments to facilitate learning are all part of the discussion. Special aspects of different student user groups are of greater importance than ever before.

Faculty that are intimately involved in actual school projects can bring real world discussions, issues, projects, clients and professionals into play in the classroom or studio. Reading a book about current trends or projecting from dated experiences is helpful but is in no way comparable to having fresh real world experiences with a demanding building type. Students of faculty with current experience have a tremendous advantage over those without. Prevalent experience is also a source of antidotes and stories which can give them some casual and refreshing insights into the profession.

CONSTRUCTION COSTS AND ACTIVITY: ON THE RISE

Construction costs rose approximately 4% between mid-1996 and mid-1997, according to the Turner Construction Company index of nonresidential construction costs.[6] This is the highest annual increase this decade. Those who work in industry are more concerned with the even greater cost increases in areas where the construction market is particularly active. Nonresidential construction costs that were at $100/SF in 1992 are at $116/SF in 1997. Speculation has it that 1998 will usher in a period of slightly slower growth for nonresidential construction activity with strong office and institutional market sectors.[7] However, architecture and engineering firm activity can be characterized as strong and getting stronger, and most firms are highly optimistic about the prospects for 1998.

Real world concerns regarding construction costs and activity and their cyclical nature, should be shared with the students at every opportunity.

EMPLOYMENT OPPORTUNITIES IT'S A SELLERS MARKET

With workloads strong at present, many architectural and engineering firms are planning to increase their professional staffing. Large firms are more likely to be contemplating growth than small firms. The construction sector has also shared in these employment gains. Young architects and engineers are moving easily into entry-level jobs. More seasoned professionals with two to five years of experience are in greater demand.[8] At every level, architects and engineers in search of opportunity are blessed with positive choices rather than the mere survival options of just a few years ago. Many firms are more focused in their search for people with excellent client relationships and good communication skills, and are taking more care with the interviewing process.

Faculty with first hand knowledge of these trends can advise their students of how to search for a career opportunity as opposed to just looking for a job. They can help their students through the interviewing process by enlightening them on issues such as how much responsibility

to ask for or expect, or what to look for in the intern development experience. Professors who work in an office regularly also have a clearer idea of the salaries and/or benefit issues the students may ultimately have to deal with.

PORTFOLIOS IN ACTION: THE WORKPLACE VS. THE CLASSROOM

Keeping a portfolio of one's work is not a new idea - architects, artists, and writers have been doing it for centuries. More recently, though, educators in a variety of fields, including many engineering disciplines are using the portfolio as a way to collect and evaluate student work.[9] Supporters of portfolio assessment contend that portfolios show evidence of skills that exams and standardized tests, or even papers or projects evaluated separately, cannot. At some institutions this portfolio of work is used not only as an assessment tool but also as a marketing device for job searches and a reference aid for students to use in future courses or on the job.[10] It is important to maintain good records and good documentation and keeping a portfolio will help students develop organizational skills that will assist them on the job. Furthermore, as recent students start new design projects in industry, they can, and often do, refer back to their early work in their portfolios.

Seeing student and young professional portfolios in an interview setting at the office provides professors who work in industry with exposure to a wider array of portfolios. This allows them to be better critics and advisors to their own students, and have a better understanding of the portfolios' long-term usefulness to professionals. The knowledge the professor gains outside the classroom will result in the students developing better portfolios.

PREVAILING PROFESSIONAL DEVELOPMENTS

PROFESSIONAL SERVICES: EXPANDED AND ALTERED

Architectural and engineering firms are as busy as they have been in over a decade. Many firms, however, are busy doing different things than they were a decade or two ago. In 1990 almost 80% of firm billings were generated by construction-related design services: architectural design, engineering, interiors, landscape, and urban design services.[11] Billings have undergone a radical change in the 1990s. Design services accounted for 60% of billing last year, with planning and predesign, construction, postconstruction, and other related activity increasing substantially during this period.[12] For architecture and engineering firms, a more diversified portfolio has reduced the firms' exposure when one sector of the economy hits hard times. Some firms are pushing out the envelope of architectural and engineering services even more, or abandoning such services altogether. The expanded services might include computer imaging for the film or CD-ROM industries, facility management, real estate development studies, asset management, RFP management or quality improvement programming. This all has provided opportunities to take the architect's and engineer's problem solving methodology into other realms of the building industry.

More commonly, even the most traditional architectural and engineering firms are providing a scope of services which include: planning (master planning, urban planning, design guidelines, land use and zoning analyses, site selection studies, and feasibility studies), architecture (architectural design, historic preservation, equipment planning, facilities analysis,

code compliance, specifications, and construction observation), engineering (structural, mechanical, electrical, plumbing, fire protection, and value engineering), interiors (alternative location analyses, facilities programming, space planning, interior design, furniture and fixture selection, equipment selection, graphic design, signage design, and ADA access audit services). The change in services is also a new element of contracts. New documents reflecting these trends were released by the AIA in October 1997.

A faculty member with recent experience in industry could accurately share this expanded services picture with the students. Student who were less interested in the traditional architectural and engineering services and considering changing their major could stay in the program and focus on the fringes of their professional training. A better understanding of the options, and there are many, will certainly benefit all the students and reduce some pre-employment stress levels.

DESIGN-BUILD: AN OPPORTUNITIES FOR ARCHITECTS AND ENGINEERS

Design-build is a newly popular method of building delivery where an owner hires one firm to both design and build the project. Until recently, architects and engineers have been somewhat hostile to the design-build concept, classifying it as another encroachment on their status and services since they are usually subcontractors of the design-builder or construction manager. However, design-build has been an opportunity for some architects and engineers to seize the initiative by agreeing not only to design but also to construct the project. Architect and engineer led design-build or construction management is well suited to smaller projects and especially historic preservation and renovations.

With a current understanding of design-build opportunities this material can be discussed optimistically.

VALUE ENGINEERING: NO LONGER JUST AN OPTION

Originally developed in the 1950s, value engineering has become a fact of life in the US construction industry during the cost-conscious 1990s.[13] It is prevalent in major government projects, for which value engineering is now required, and in complex industrial, institutional, and transportation facilities, for which it is almost routine. Value engineering is a structured method of analyzing and fine-tuning a project to satisfy the owner's functional and aesthetic requirements at the lowest cost. If approached optimistically a true value engineering effort results in a project with the greatest possible long-term value, while considering life cycle costs and the integrity of the building program and design intent.

In the past, value engineering decisions appeared to be strictly aimed at slashing costs, were not sensitive to design, or were started after the design was finished or when the bids came in too high. The process was frowned upon and had limited usefulness. Now however, value engineering is becoming more common during schematic design, when conceptual changes can be made easily and the owner can alter initial assumptions. First hand experience with a successful value engineering effort allows professors to present this information without bias.

"GREEN" BUILDING DESIGN: NOW A REALITY

Green building assessment programs are becoming more common. These building labeling programs are useful because they define exactly what a "green" building is. They encourage good environmental design practices by identifying improvements that will earn credits based on criteria such as energy efficiency, indoor air quality, ozone depletion, water conservation and recycling. The best environmental assessment programs are in the UK, Canada and Hong Kong,[14] but the US is not far behind. Clients and professionals move the program forward as changes in environmental thinking require more efficient use of our resources.

Professors with first hand knowledge of these advances are better prepared to incorporate them into their curriculum and share information with students.

PROJECT TEAMS: MORE DYNAMIC AND COMPLEX

Offices doing larger, more complex projects tend to split the architect's role into three parts: a project manager who guides the project's team and their progress, a project designer who does the creative part, and the technical specialist or job captain who guides the material and construction methods. The dynamics of this shared responsibility for a project can cause some clashes over who talks directly with who, clients and consultants alike. In the 1970s clients were becoming more concerned with who the manager on their project was; in the 1980s clients raised more interest in who was designing their project. Today's reality is that complex projects require organizational, technical, and managerial disciplines that frequently consume more time and skill than creativity.[15] This more complex structure can be confusing for young professionals, especially since the draftsperson has disappeared and has been replaced by educated and licensed architects and engineers who are expected to contribute to the project from the very beginning.

Many offices have recently taken the time to develop meaningful and organized approaches to project management and coordination. They are designed to result in significant value added for the client and project. New hires need to be prepared for this. The "Work Plan" approach has enabled some firms to develop, along with the consultants and clients, a complete plan for the project that will serve as a living document, guiding everyone's effort from start to finish.

FUTURE PROFESSIONAL LEADERS: NEED TO BE STRATEGIC PLANNERS TOO

Principles of successful architectural and engineering firms assert that strategic planning is a tool that has helped them both secure commissions in new markets and manage their own offices more effectively. Strategic planning is the process of complete business tuning, aimed at moving the firm forward by projecting a desired future goal and creating strategies and structures for its achievement.[16] In short, strategic planning is a clear and precise method to visualize and define success and then to systematically remove obstacles to reaching that goal. This planning often consists of a simple four step process with appraisals, objectives, strategies and actions. Some other firms have gone through a Total Quality Management (TQM) program with the net result being an intense refocusing on improving the outcome of their work and strengthening their relationships with clients and consultants. TQM focuses its efforts on delivering products and services more efficiently, ideally with fewer errors. Other firms have pursued a Time, Cost and Value Management concept. Regardless of what it's called, the total team approach is an interactive process with the clients and consultants which centers on building consensus for

project goals and bringing issues to closure as early as possible. Architects and engineers must overcome a general lack of understanding of business strategy if they hope to gain the full confidence of corporate clients.

Future leaders in professional fields need to be more than just talented architects and engineers. They will need to be effective strategic planners, business strategists and team players. The sooner this is understood the better. Many feel that the educational program for architects and engineers simply does not provide either management skills nor the communications and synthesizing skills needed by today's working methods. If so, then students should look elsewhere for those skills, possibly to business courses.

CONCLUSION

In 1991 the National Research Council (NRC) had identified the lack of training and education in design as the principal cause of declining competitiveness of American industry.[17] In reviewing undergraduate engineering curricula, the NRC wrote: (University) curricula as a whole lacked the essential interdisciplinary character of modern design practice and did not teach the best practices currently in use in the most competitive companies.[18] Unfortunately, many who teach design have little experience (it is estimated that only about one-half of engineering faculty have had some work experience in industry) and are unaware of the most recent design techniques. Agreeing with the NRC's analysis, participants of the Engineering Coalition of Schools for Excellence in Education and Leadership (ECSEL) found that faculty without experience in industry typically are less prepared to teach design.[19]

Other studies have also shown that faculty with industrial experience spend a greater percentage of their time on teaching above and beyond their work assignments. Adding experience in industry as an important criterion in hiring new faculty may be fundamental to changing the existing culture and to placing greater emphasis on teaching.[20] Schools are being asked to enrich the education of students, and this can be done by increasing the numbers of faculty with relevant industrial experience. Integral to accomplishing our educational goals is having the participation of the practitioners in the educational process. It cannot hurt to have faculty with practitioner experience in the classroom on a daily basis.

Architectural and engineering education must reflect the conditions of practice. It must also be responsive to the needs of the profession, and at the same time push the profession forward. Meanwhile, tenure reviews are forcing faculty away from general practice and into narrowly focused specialties. Because of the difficult to control conditions of practice and time consuming demands of academia there is a decreased availability of quality part-time adjunct faculty. It is the schools that need to provide the direct linkage or 'window to the profession' and this falls upon the full-time faculty. However the schools may need to become more flexible with their faculty's schedules in order to make this happen.

Many professions require continuing education credits to maintain licensing or other certifications; it is only logical that educators should require the reciprocal of themselves. There is tremendous value in life-long learning that builds a relationship between education and

practice. The two should be integrated, continual, and less fragmented. In a rapidly changing world, can educational institutions bear the burden of leading the way by teaching all that there is to know alone? Probably not, nor should the active professions have to bear this burden. Industry will always depend on the educational institutions to provide a foundation of knowledge that cannot be attained in the workplace: the knowledge of history, theory, the path that has led the profession to where it is today. Schools can provide us an anchor against the wind, remind us of where our roots are, why we are architects and engineers, and what we do in the world. The obligation the school takes on is to prepare us to do it well, by staying abreast of current developments in industry and allowing these developments to influence what is taught and how it is taught.

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