CYBERPOWER

LETTING GO OF PROFESSIONAL AUTHORITY

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Introduction

CyberPower exists as the most powerful political and technological force currently, and silently, working to alter the traditional practice of architecture, redirect the focus of architectural education, and challenge professional authority. *CyberPower* is that inherent capacity of information technology to capture professional knowledge and globally distribute such professional expertise in a format accessible to and useable by the paraprofessional and layman. The capacity of technology to embed knowledge is not new; it appears in a wide array of common consumer products from the point-and-shoot camera, the automobile automatic transmission, to the digital darkroom now appearing on home computer screens. This process is less about technological development than it is about "empowerment," the transfer of proprietary professional knowledge from an elite few to the many.

Architecture, like the professions of medicine and the law, is information rich and has protected itself from the assault of technology through licensing laws, political lobby, and public opinion campaigns. One of the most dramatic and recent battles to ward off the erosion of professional stature was conducted by the American Medical Association in response to the President Clinton's call for a national health care program. The architectural profession, however, is far more vulnerable than the medical profession due to comparatively weak legal protections and lack of broad public interest in architectural issues or concerns.

The architectural profession must reinvent itself, not to fight for professional status quo, but to find ways to fully participate as a partner with society to oversee this process of empowerment in a manner which seeks to preserve qualitative environmental design values. *Don't fight it, join the revolution.*

The process of the orderly transfer of professional authority, power, and the associated proprietary professional knowledge beyond the individual architect can occur in an orderly manner at several incremental stages. These begin at the enterprise (firm) level, evolve into the independent architectural service franchise model, and ultimately to the client as architectural information consumer utilizing prepackaged design software distributed on CD ROM or as JAVA applications. Within the framework of the empowerment issue, the structure of and vision of the enterprise must change. Adopting these new tools of practice requires a re-engineering of the design and practice process, which is essentially requires that architects focus on fundamental business, business process, design process, and people concerns, rather than strictly technology issues.

Equally important are the challenges to traditional architectural values and culture presented by information technologies and cyberspace networks. This author offers the position that the current culture of architectural education and practice in the United States, based largely on a European model of state regulation, historical precedent, and artisan-patron relationships will not survive the continuing process of empowerment of the consumer through technology.

Education

The educational system bears great responsibility, possibly unwittingly, along with professional organizations like the AIA, for introducing and sustaining models of practice. Students tend to pursue practice models to which they have been introduced in the university, while universities often tend to provide "preparation" for practice based on the most prevalent existing practice formats. These introverted and circular references have had the effect of isolating and insulating both the profession and university from the rapid changes in society and the economy. Universities need to recognize and acknowledge that the prevalent model of architectural "consultancy" practice has failed to provide adequate personal, professional, and financial rewards to the majority of students. Frankly, the professional operates on the "Hollywood" model: *you're either a star or waiting tables.*

The *power* of CyberPower requires new educational attitudes, content, and context as preparation for creating new models of architectural practice. The design studio especially needs transformation from a place of expert tutoring, from the place of individual artists and a focus on the single "project," to a "coaching" environment of broad access to learning, a place for capturing that learning, and distributing knowledge and experience to others. The architecture student must learn to value not his or her "project," but to value the capacity to provide other non-professionally educated persons the ability to qualitatively participate in environmental design issues among many future projects.

For example, *object-oriented technology* offers a readily available, simple, and timely methodology for constructing information decision systems. These systems (Cyberpower)

embed professional learning and knowledge in a format which makes that knowledge available to the layman to apply to a specific circumstance. A complete discussion of object-oriented concepts is not the focus of this paper. The author has used these principles in the design studio and related courses using Excel spreadsheets for building code analysis, structural system selection and member sizing, and passive environmental systems selection and design. Code analysis, a routine but time consuming activity, can be taken from hours to under ten minutes. Structural beam sizing requires only selecting, from a series of drop-down boxes, the building use (office, assembly hall, residence, etc.), the construction assembly (wood, steel, concrete), and input of member length ... Viola! ... the beam size appears ... and that didn't require knowledge of modulus of elasticity, moment of inertia, deflection criteria, or any other engineering terminology/concepts.

Likewise, students need to learn to design *design systems*, not individual projects. The development of the *Shell, Organ, Turtle,* and *Image* architectural object classifications offered as examples in this author's studio, serve as both a conceptual and an operational tool for empowerment and expanding the reach of the enterprise beyond a handful of employees and local markets. That future of the student and profession lies in increasingly sophisticated object-oriented technologies, data warehouse scale knowledge-bases, fuzzy logic systems, and neural networks.

Today

Architectural consultancy practice is primarily based on practice and associated design process models, an educational system bias, and professional values, which assume that each building project has unique design requirements and therefore requires an equally unique design response. The result is a profession treating each design project as a new beginning, engaging in and valuing handicraft work and production methods, and failing to expand the scale of the enterprise beyond a handful of employees and local markets.

These practice methods, when applied over broader context of construction activity, are so costly in relationship to the market value of the services offered, that most professionals operate at an economic survival level.

New Tools

Information technology, in the form of computer aided design, relational databases, and inference engines, will provide for some a platform for expanded professional and economic opportunity. Although a majority number of architectural firms have acquired computer aided design systems, that technology has been primarily directed at adding efficiency to traditional processes, usually in the form of construction document drawing production. Rote replication of manual processes provides relatively little net gain when measured against technology costs.

The new opportunities lie beyond the technology itself, in the critical examination of and re-engineering of the fundamental processes, services, and products associated with architectural practice in a manner supported by the new information technology tools. When we change the tools, we need to re-examine the work processes.

Vision

An examination of information systems and networks will quickly reveal that the interesting issues are not about CPU's and megabytes, but rather about people, information access, and empowerment. Before the work process can be restructured, a basic decision must be made as to who will have access, who will thereby be empowered. That decision will drive the entire re-engineering effort and set the foundation for building the enterprise's vision. At one end of the decision spectrum, information may be held within and proprietary to the enterprise, while at the other end, information may be readily available and usable by the larger body of society.

Current architectural practice lies at the proprietary side of the decision set, since any professional practice, whether medical, legal, or architectural, by the very nature of the concept of professional activity and service, must protect and limit access to that information which makes that very practice possible. Professional registration, and the legal control of professional titles and the marketing of specific services are fundamentally devices for limiting access to and/or the usage of information.

By contrast, the history of and evolution of technology, within a framework of competitive capitalism, is a history of the empowerment of the masses. Technology captures professional and scientific knowledge in such a way that the layman may use that knowledge, although the specific details of the knowledge are not revealed or necessary. The evolution of photography provides a simple example. At one time, the family portrait required the employ of a professional photographer who provided film and camera, staged the portrait, operated the equipment, and developed the film and prints in a laboratory. Since all of this required a high degree of professional knowledge, the market was limited to only those who could afford it, and consumed so little film and equipment that Kodak could never have developed into a Fortune 500 corporation. Embed the professional knowledge of depth of field, light and shadow, and the relations between film speed, grain, and camera aperture into a "point and shoot" camera and sales explode while film/print processing becomes a new industry. Look closely; the knowledge transfer has been only partial. Film processing knowledge and control has not yet been transferred. The next opportunity, as the requisite home computer sales grow, looms in film-less digital photography, in the transfer of yet more information to the consumer.

Professional photographers are still here, some being well paid as advertising and fashion photographers, others advertising wedding and graduation picture packages. But the real money has been in the transfer of professional knowledge to the masses. Apply the photography example to the future of the architectural professional and you have, depending on the point of view, a frightening scenario or wealth at your doorstep.

The degree to which any single architectural enterprise is willing and able to provide access to information to its employees and client base is part of that enterprise's market focus, and vision for growing the enterprise.

In an Information Age environment, architectural practice is the business of creating new information (value) from professional and/or enterprise knowledge. It follows that the broader the distribution of professional knowledge,

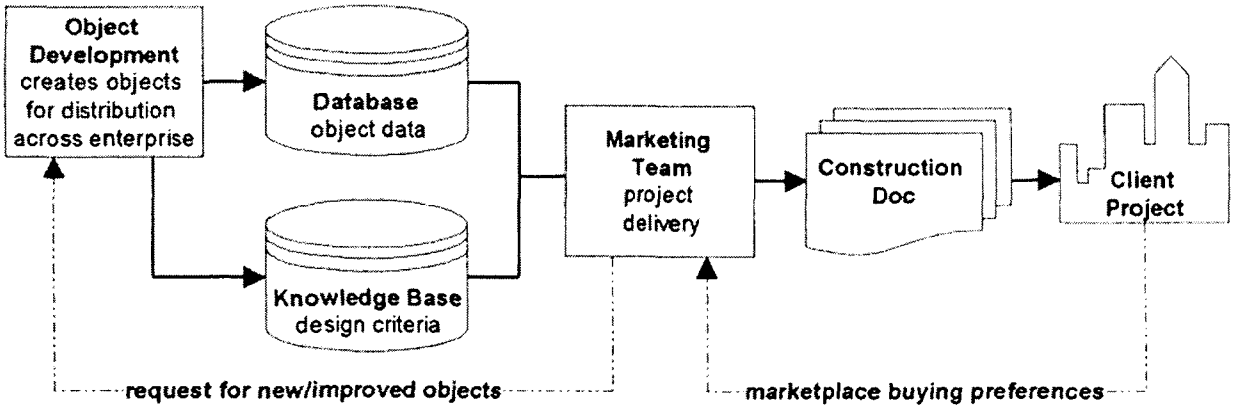

Fig. 1. Initial Enterprise Reorganization.

the greater the potential for generating new information and increasing the enterprise's revenue. Economic success requires that the enterprise's distribution of knowledge and work flow processes be organized in a manner which will maximize the generation of information.

Objects

Objects and object-oriented design processes represent a manageable methodology for vesting a broad range of people, whether they be employees or clients, with the knowledge base and authority (knowledge + authority = empowerment) required for the creation of information and value. Objects and object-oriented programming techniques are now being widely used in the corporate environment to create computer applications which give a broader range of employees access to corporate data. The result has been increased productivity, smaller staffs, reduced training requirements, and improved customer service. Objects, commonly in the form of push buttons or check-off boxes, are linked to otherwise lengthy and technically complex procedures formally completed by, for example, a highly paid financial analyst or experienced loan officer. The knowledge otherwise held exclusively by these few experts can be embedded in electronic objects and widely distributed across the organization.

Objects, in architectural practice, can represent and direct design decisions, building spaces, physical components, and may be linked to additional construction/specification data existing both in text and graphic format. While linking graphic objects to additional quantitative data is a straight forward procedure, embedding qualitative design knowledge, design decision, and design process into an object is less well understood. However, the capacity to distribute design process/decision capability represents the authority component of empowerment; it is crucial.

Objects, when representing basic physical building components, like a "kit of parts," store limited and primarily quantitative information. Spatial objects, by comparison, store more professional knowledge, both quantitative and qualitative, simply because they include a far greater range of profession design decisions for their creation. This inclusion of professional expertise into spatial objects has the additional advantage of reducing the numeric quantity of objects which need to be distributed and managed during design at the client facility level.

The design of any specific facility becomes primarily a process of selecting and orchestrating those spatial objects into relationships which satisfy the requirements of the client. Defining the qualitative basis for decisions which set such relationships between objects is a more difficult issue to resolve. Fortunately, embedding and linking professional knowledge to objects reduces the magnitude of the issue to a level which allows for experimentation with some simple strategies.

One such strategy incorporates *Shells, Organs, Turtles* and *Images* as classes of objects, which respond to defined sets of criteria for their design and interrelationships. These criteria are dynamic, being contracted, expanded, and re-prioritized over time and within the framework of a specific facility design. Generally, *Shell* objects are major spatial enclosures which respond to environmental and contextual influences, tend to have long physical lives, and are relatively independent of the specific functions they house. *Organs,* which do respond to a specific activity and tend to have a short life expectancy (three to five years) in commercial environments, are spaces nested within *Shells. Turtles* share the characteristics of both the *Shell* and *Organ* spaces, while *Images* are usually independent components which communicate the character, values, attitudes, and/or vision of the current facility occupant. The *Shell, Organ, Turtle,* and *Image* objects are supported by related sets of boundary and infrastructure objects ranging from national, state, community, and site geographical data objects to space conditioning and power supply systems. All of these spatial and component objects are incorporated into a 3D electronic model and relational database schema from which presentation and construction documentation is extracted as a *report.*

Enterprise Structure

"This changes everything."

The distribution of objects changes the basic organization structure (figure 1) *within* the enterprise. In broad terms, two major activities exist:

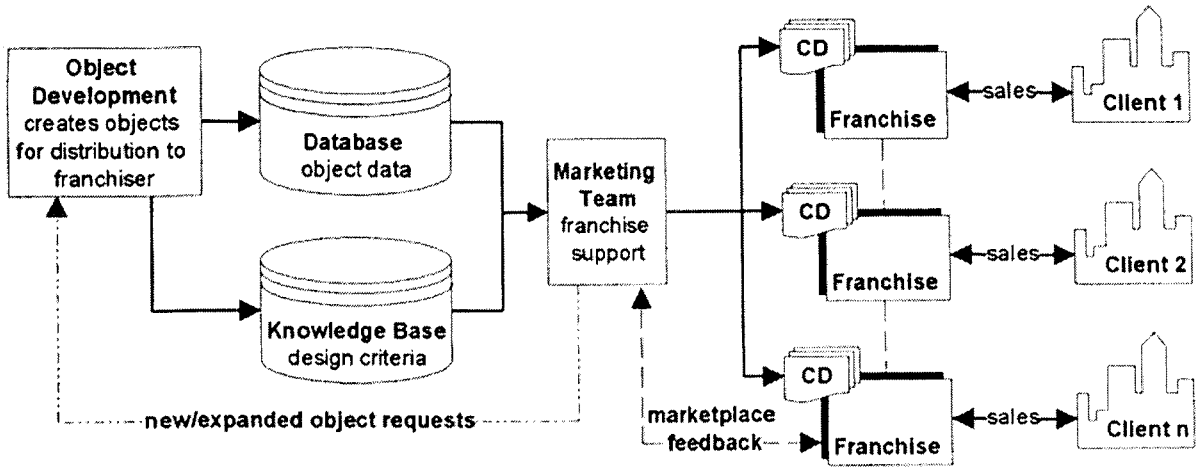

Fig. 2. The Franchise Model.

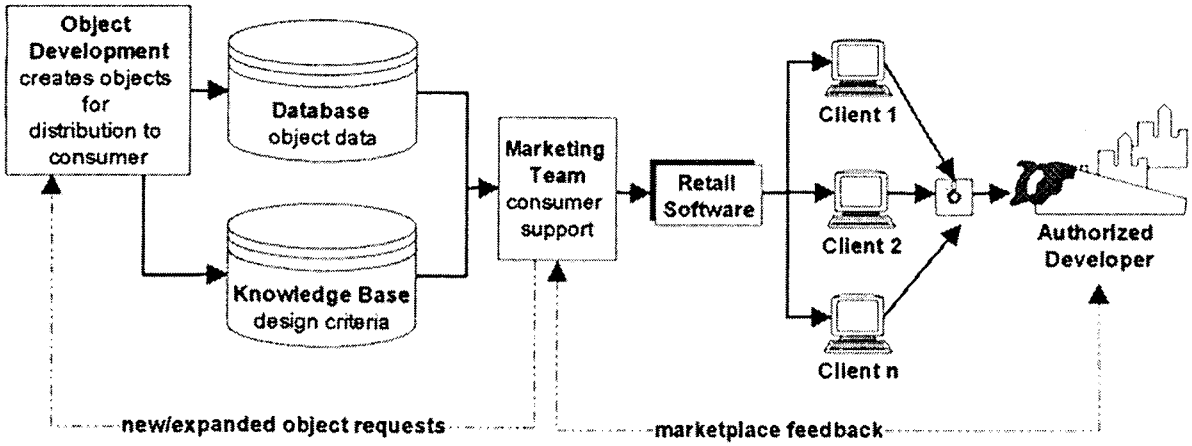

Fig. 3. The Consumer Model.

1. *Project Marketing*: Sales and para-professional design teams responsible for the identification of prospective clients and the application of objects to the facility requirement of a specific client. Delivers marketplace object buying decisions and preferences to research and development.
2. *Research* and *Development*: Professional architectural and engineering personnel engaged in the design, redesign, evaluation of objects and sales product strategies. Delivers objects to the marketing teams.

The deployment of objects within the enterprise requires adjustment to significant change in professional values and attitudes, the application of technical computer expertise, and large capital expenditures for information system technology and networks. These requirements, do however, serve as business barriers, providing those firms entering the world of objects to do so initially with little, if any, competition.

Enterprise Expansion

Expanding the enterprise becomes a matter of expanding the basic enterprise to include additional project marketing teams model (figure 2) located in branch offices, or, as a appealing device for reducing capital expense while generating expansion funding, these marketing teams may become independent franchises owned and operated by design professionals and/or para-professionals offering design services alone or as part of a design-build package.

Income flows from the franchiser to the larger corporate enterprise though a royalty fee for object usage, marketing support, and/or as fees for the expansion of the object designs prepared by the franchise into full construction and specification documents. The corporate enterprise would, when required by law, provide the requisite architectural and engineering professional seals. For better or worse, the current gaps in architectural registration make this scenario easily implemented. Although some legal challenge may be expected.

Tomorrow

Further expansion of the enterprise will be linked to the ability to further distribute enterprise knowledge directly to the consumer in the form of a shrink wrapped computer software package. The software would include libraries of

objects suited to the facility type, on-line help, on-line hints, and, depending on the level of quality control desired, the intelligence (inference engine) to detect design flaws and guide the user. Very basic software packages designed for simple do-it yourself home decorating, residential landscaping, and residential design are currently available at the local computer store and mail order catalog for $40 to $75. A more sophisticated business package, designed to sell for $150 to $500, could be developed through partnership with the vendors currently producing related software. Any business in need of design services will have the necessary computer equipment already installed.

The consumer would, in addition to purchasing the software/equipment from the franchise or a mail order house, would return a diskette or mini-CD to the franchise for generating the legally required construction documents, building permits, and/or physical facility. The corporate enterprise may distribute the software application and continue to expand the consumer disk, or develop only the objects distributed within the software and transfer, using currently available database replication technology, the document production business to the franchise or other independent vendor.

Look back at the photographic example. This may not be the model for architectural practice which everyone will support, but it does have the capacity to involve architects in more projects than does the present system, and will generate, for those who engage the future, rich economic rewards.

REFERENCES

Reading

B.-C. Björk, A conceptual model of spaces, space boundaries and enclosing structures, *Automation in Construction*, 1 (1992), pp. 193-214.

J. Campbell, *Grammatical Man, Information, Entropy, Language, and Life* (Simon and Shuster, 1982).

T. Peters, *Liberation Management, Necessary Disorganization for the Nanosecond Nineties* (Knoph, 1992).

T. Peters, *Thriving on Chaos* (Harper Perennial, 1987).

A. Toffler, *Powershift* (Bantam Books, 1990).

A. Toffler, *Creating a New Civilization, 1996.*

Y. Sakr and R. Johnson, Computer aided Architectural Design Strategies: One Size Does Not Fit All, *Reality and Virtual Reality ACADIA Proceedings,* (1991).

Software

MicroStation 95, Intergraph Corp., Huntsville, AL.

Access Database, MicroSoft Corp., Redmond, WA.

PowerBuilder and PowerMaker, Powersoft Corp., Burlington, MA.

Watcom SQL, Watcom Corp., Ontario, Canada.

Windows NT, MicroSoft Corp., Redmond, WA.