

PARADIGMS AND PROCESS

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Before we propose a “vision” for the future of the design and construction industry, it would be useful to look at some constraints and issues than not only concern our own society but by the larger human community.

1. There are 6 billion people on the earth as of 1999. Most of them are born in less developed countries. The United States will have its own increase in population from 272,500,000 in 1999 to a population range of 282,524,000 to 518,9032,000 with the mid-range of 393,931,000 in fifty years.
<http://www.census.com>
2. There is a deep concern of the future availability of resources-both energy and materials. These resources will not only be used in the building industry but in other sectors of the economy. Attempts are being made to track and promote efficient use of materials in construction. The EPA/AIA Energy Resource Guide attempts to document the material and energy flows in construction materials and criteria for “sustainable” design.
3. Human beings are encroaching on all land areas as well as in the oceans. The destruction of the rain forests, the denuding of old growth forests, the disposal of toxic materials and nuclear waste, sprawl, etc. are all environmental issues impacting the earth.

Thus, just responding to these three issues would have great impact on the design of buildings and the design process. Can we deliver projects fast enough? Can we use and recycle materials in an elegant way? What land is appropriate for building? What is the human niche in the environment?

Of course, there are many other issues and trends that influence the building industry and its delivery system. However, the variability of the future has to be considered when trying to “envision” the design of the building system process. The properties of adaptability and a self correcting systems would permit a building process that would evolve to meet the needs of the changing human community as well as respecting the constraints of the environment. Since we are an object obsessive society, we may want de-emphasis the built object with a greater emphasis on process and flows.

If process is emphasized; then, the tools that are used for the process are critical to the development and control of designing, building, managing and recycling a structure. I feel that we are in one of those seminal times in history that allows us to actually design the process for an industry. This is an evolution of appropriate tools to meet the needs of the larger society. Computers have become ubiquitous. The paradigm shift in storing and communicating design information has moved from line, circles and arcs to intelligent objects. This AEC data format is taking on a life of its own within the industry. However,

these new tools and processes are still in the very early stages of development. The synergy of the following elements suggest an adaptable system for the building process that becomes the larger “vision”:

1. What exists? A survey is needed of all software developed for and used by the AEC industry. There is an incredible range of packages. Each package needs to be evaluated. The International Alliance for Interoperability (IAI) <http://www.interoperability.com> is promoting a 3D-database model with software interoperability. This concept would be an appropriate model to evaluate the software. The interaction of documentation, design, analysis, construction, visualization, management and reuse of projects is a research goal that can be coordinated with the industry.
2. The existing industry consists of independent professionals working on projects. The designer, contractor and owner relationship is a linear delivery system. The new paradigm suggests a different delivery process. The object model can allow the design and analysis to be simultaneous across the life of the project. Thus we can ask what is the structure of the AEC firm of the future? What would be the models for different delivery systems for different end users?
3. Another area that has had little discussion is the education and socialization of future professionals as well as professionals in existing firms.
 - A. Some AEC firms are highly adaptive and are adopting this new paradigm. By default these firms are doing cutting edge research. We can learn from their valuable insights. However, most firms are small and cannot spend the time and resources to redesign the firm to use these new tools. Courseware is needed to help working professionals to incorporate these new tools in their firm’s design process.
 - B. The existing university graduate and undergraduate curriculum needs to be redesigned in order to reflect the paradigm change as well as preparing students for jobs in the industry. Instead of educating students vertically in specific disciplines, there needs to be horizontal components that enhance one disciplines’ understanding of the other. Dr. Fruchter’s “Computer Integrated A/E/C “ at Stanford is attempts to have a totally integrated design environment. The National Research Council has sponsored a study for the: “Education of Architects and Engineers for Careers in Facility Design and Construction.” The architectural organizations: AIA, AIAS, NCARB, ACSA and NAAB recently commissioned a study on architectural education by Ernest Boyer and Lee D. Mitang “Building Community: A New Future for Architectural Education and Practice.” The study emphasized the interconnection between education and practice.
4. Another analytical component that has to be explored and developed is the concept of “green” building or “sustainability.” The whole notion of what is “green” or “sustainable” is subjective and is probably counter intuitive. Present criteria are based on decreasing pollution, conserving energy, recycling and good

will. There is no analytical system yet developed that can be as specific for materials as energy analysis is for buildings. The EPA contracted with the School of Architecture at Ball State to create an architectural curriculum with an emphasis on sustainability. <http://www.ease.bsu.edu> Some jurisdictions have energy budgets for buildings. If there are energy budgets why not material budgets for buildings?

5. If design/build/manage becomes the single source for some clients: this delivery system will have major impacts of associated areas linked to the industry. Such areas as licensing practice acts, tax codes, and ownership of instruments of service, liability, employee development, fees, management, information documentation and communications. These thorny issues need resolving so that AEC firms can be productive and a profit centers.
6. The paradigm shift from lines, circles and arcs to intelligent objects also implies a different way of thinking. Historically the process of thinking and designing has been linear and logical. The properties of the IAI model suggest that a holistic or systems approach to the process is necessary to make the new paradigm work. This is a major cognitive shift for professionals, academics and students. The pedagogic strategy to teach and reinforce this way of thinking needs to be formalized and institutionalized.
7. The process that may finally emerge may be influenced by other design disciplines in their respective industrial sectors. It would be useful to identify what other industries are doing as possible models for the building delivery process. Also, source of the ideas for potential research and educational reform can be observed in practice. Practice IS the feedback loop. Since we all are part of the same system, the interaction between these “separate” entities must be bridged for the benefit of all.
8. Finally, if we de-emphasize buildings as objects and model them as a life-cycle process, the process must be connected to larger systems. Eugene Odum in Ecological and General Systems: An Introduction to Systems Ecology discusses and models the flows of resources and building. The building process is part of a larger system. In the spirit of Ian McHarg’s Design with Nature the environmental system can be thought of as a series of layers describing the elements of the environment that interrelate with the building process. GIS software could be used as a connecting tissue with the building process. Also, there is a need for a common language. Architecture, for example, has an arcane jargon that only the privileged insiders can understand. We need to rethink how we express concepts and develop a common language that can be understood by disciplines outside of the building industry. Engineering within Ecological Constraints Peter Schulze. Ed. And Joseph Fiksel’s Design for Environment: Creating Eco-Efficient Products and Processes propose a interrelationship between designing and the environment. I suspect the literature is rich if we look out our web of intellectual lineage.

The ideas and discussion has been focused on issues that would contribute to a new holistic way of providing our society with its building needs and reflect social and environmental needs. Designers have been burned with “theories,” “programs,” “visions” and “manifestos.” Many have become disenchanted with these “political correct” ideas of design and looking to other sources for the meaning of design. Context, place and feedback provide the information that challenges these “ideas” and “theories.” Ultimately the prescriptive “ vision “ does not work. It becomes rigid and non-adaptable. However, a performance “vision” allows the criteria to be adaptable and change as the systems evolve. It is difficult to speculate the future with certainty. However, the synergetic interaction of the elements will create a building process different from our own “visions” and connected to life of ecosystems.

PERSONAL

I am an individual who discovered early in life that I wanted to be an architect. With a BA in sociology I became a Peace Corps Volunteer in Ethiopia. There I designed, estimated and built various rural public works projects and started my interest in design/build. Also, I became very interested in and applied appropriate technology as well as observing the diversity of housing forms as defined by ethnic groups and their habitats. Returned and attended The Design School at California Institute of the Arts. The School looked at design in a very holistic way. Not only did we deal with the material and energy expression in forms but also incorporated the cultural, ecological, legal and social constants in our form giving. At the Graduate School of Architecture and Planning UCLA, I developed a deep interest in energy and resource conserving design. As a practitioner the inability to do simultaneous design and cost analysis made the design process seem incomplete. The deeper I got into the intelligent object/digital paradigm the more I realized that all the functions of the design, building and management should be the province of a single database. At the School of Architecture and Planning at Catholic University I have tried to make interoperability work with off the shelf software as well as teaching and developing our digital systems. Being a member of our School’s Curriculum Committee, I find that the existing pedagogic strategies for educating architects and related professionals are counterproductive and need to be redesigned for the newly emerging AEC delivery process.

To create forms for human use that truly works and gentle on the environment is one of the joys in life.