Computer Planning Board
Educational Subcommittee
Implementation Plan

Electronic Studio Plan

for

Architecture

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A FIVE YEAR PLAN FOR EDUCATIONAL COMPUTING

ARCHITECTURE

Electronic Studio

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1. EUCATIONAL COMPUTlNG IN ARCHITECTURE

Electronic Studios

Architecture's Computing Commitment

It is possible that part of the origin of the Electronic Studio concept may have originated in Architecture with the notion of the studio environment being an appropriate metaphor for student computing in general. More importantly, we feel that our unique needs for computing and the solutions that we've found and are currently exploring offer input both to other divisions and to an overall plan for educational computing.

Educational computing in architecture has had to solve, and will continue to have to solve, several difficult problems:

1. Traditionally architects deal with classes of problems that are "ill-defined" versus "well-defined." Experienced designers know that the boundaries for the set of potential solutions may be vague and fluid, and the solution criteria fuzzy, ambiguous and largely implicit rather than explicit.

2. Design problems and problem solving processes are largely visual in their nature. The designer's organization and transformation of information usually involves a shift from a verbal and numerical medium to a visual medium. In computer applications this visual medium must support more than simply making computer images, the images must be the mechanism of computer based problem solving.

3. Architects in education must have software that is easy to use, but not "wrapped in packages" that restrict problem exploration. In addition, the software must allow thoughtful processes to be more important that output products.

Over the years we have experienced some successes in finding solutions to these problems which we wish to share with the concept of electronic studios. In our **opinion,** the concept of electronic studios emphasizes process over product The product view would simply see the need for equipment and software.

The process view sees the establishment of the concepts of the electronic studios as most important, One of the main problems with hardware and software is the pace at which they are always changing. What equipment, what software and what uses? In architecture we were always faced with the difficult question: "How do we learn and use a product to do what we need to do?" We finally learned that the correct question is: "Can we make this product contribute to what we are doing?" In other words, the first question always chases products, and the second question preserves process and uses products.

Finally, the process approach emphasizes the need for an organizing concept to underlie the purpose of the electronic studios. The broad reasons behind why we should compute in education need to be explored for computing is rapidly changing education. There is a great opportunity for Rice to take a leadership role in exploring and developing the processes of educational computing.

2. SPECIFIC REQUIREMENTS FOR ARCHITECTURE

While architecture has standard needs for access to computer tools for well-defined tasks such as word processing, our main interest in computing is visual. Thus the needs in architecture are for graphic capable computers - the better the graphics, the more relevant to architecture. These machines are even today more expensive than non-graphic computers.

Architecture wants BOLD computers. The students and faculty really do not have much interest in less. In visual computer technology currently there are helmets, data gloves, virtual reality and whole implementations that obviate yesterday's systems. Computers for architectural computing need to be on the edge of the state-of-the-art in visualization. (see Figure 1)

The traditional design studios are the core of architectural education. Our students drafting desks are literally where they "live" throughout their education. The functioning of these desks as educational environments is how architecture's design studios work. An electronic environment as an enhancement, and perhaps someday even a replacement, to these desks is a logical foresight. Opinions differ greatly in architecture as to the replacement role of computing versus the enhancement to traditional methods, but either way the conclusion is that there should be a computer on every desk. The electronic studio concept will provide an excellent mechanism to get to this final result. The following equipment, personnel and cost projections are based on the following plan:

1989-90 . Establish the electronic studio in architecture as a focused enhancement to the existing computer labs currently in architecture.
Enhance current research into advanced computer graphics into courses.

1990-91 . Supply enough computers and staff to accomplish the successful support of 'at least one design studio.

1991-92 . Integrate computers into at least one design studio on site.’

1992-93 . Determine the best balance between a central facility and computers in studios and class rooms.

1993-94 . Full implementation of educational computing in architecture.

In general, the equipment and software needed are:

- a sufficient number of graphic and advanced graphic computers and workstations
- visualization software and advanced visualization software
- output devices
- video equipment
- access to computers in the “graphic engine” class
- the exotic - helmets, data gloves, artificial reality, synthetic environments

See "Five Year Acquisition Table"

F. SPACE REQUIREMENTS FOR THE ABOVE HARDWARE

In that Architecture is hosting the Rice Advanced Visualization Lab (RAVL) and has the Rice Architecture ComputerL ab (RACL), there is no foreseen need to increase public computer space in Architecture. In fact, we have to convince our administration and facatyl that the large spaces for computing are worth the loss of the square footage for other purposes.

3. CONNECTIVITY

A CONNECTIVITY WITHIN THE SCHOOL OF ARCHITECTURE

The Rice Architecture Computer Lab (RACL) in room 310 Anderson Hall is connected to the University Backbone and has a local Ethernet to the Rice Advanced Visualization Lab (RAVL) in room 218, Anderson Hall Due to a grant from IBM, RAVL has 10 PS2's connected on a Token Ring with plans to connect to the IBM 3081 mainframe (Goliath). RAVL plans include a bridge between the Ethernet Net and the Token Ring.

Thus, Architecture has a strong start for supporting connectivity for Electronic Studios. As PCs and Workstations spread into the traditional design studios of Architecture, further Ethernet and/or Token Ring connections will be required, and these expenses are included in this plan.

More importantly, RACL/RAVL staff have devised software plans that allow for a great amount of transparency across the networks. Currently, we are shipping data, application programs and source code transparently between the IBM mainframes, SUNs and PCs. We have submitted a proposal to Apple to extend this capabilities to MACs under A\UX We feel that our solutions to the great problems of "machine transparency" are of potential benefit to other divisions. In addition we have user environment transparency. wecan type EXPORT on any machine under any operating system and IMPORT on another machine under another operating system and, we continue work without worrying about machines or operating systems.

B. CONNECTIVITY BETWEEN ARCHITECTURE AND THE UNIVERSITY BACKBONE AND MAINFRAME COMPUTERS

As mentioned above, Architecture through existing computer labs, is connected to the University Backbone and mainframe computers. This is an important step for any division, and we are fortunate to have a strong head start in connectivity.

4. COORDINATION OF ARCHITECTURE'S PLAN AND OTHER DIVISIONS

In that there is a broad based trend in computing to the visual, architecture has much to offer other divisions.

It has been pointed out several time in this report, that architecture has long had a computer lab named the Rice Architecture Computer Lab (RACL) and more recently architecture has provided a room in Anderson Hall (218) for a general multi-divisional visualization lab named the Rice Advanced Visualization Lab (RAVL). These two labs provide architecture, and other divisions, with a broad base of existing support from which the implementation of electronic studios could be made much easier.
The electronic studio concept comprises a very important addition to accomplish educational computing.

RAVL is in a position to be a PROTOTYPE ELECTRONIC STUDIO.

6. IMPACT OF THE ELECTRONIC STUDIO PLAN ON THE CURRICULUM

Architecture

Architecture's general plan is to see the two existing labs as a public core from which to extend computing in architecture to faculty, students and most importantly into the traditional design studios. The majority of our faculty are not opposed to computing, they do however express a very legitimate set of concerns for what the role of computing should provide to their well established processes of intellectual pursuit. The recurring dilemma of computer as product versus computer as process is at the core of these questions. To date we have attempted to provide both products and to continue to develop and research processes. There is no such thing as a computer product for architecture, nor is there a singular process. This dilemma is more than a problem, it is the very basis from which to explore the role of the computer in education.

Since the mid 1970's architecture has conducted a number of funded research projects and has developed a computer based capabilities that have been considered unique. currently we are finishing a contract with IBM in an advanced computer graphic standard that we feel lays the foundation for state-of-the-art research and teaching or the next several years. Architecture has much to contribute to the curriculum in sharing our experiences in visual computing.

see "Processing Graphic Information for Architecture and Planning"