Digital Studio Confronts Tradition

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Abstract: This is a record of a collaborative teaching effort of two architect/educators, each contributing theoretical components to the educational process necessary for the development of an urban housing strategy vis à vis an integrated digital/judgment effort. Twenty graduate architecture students were involved in this 'computer design studio'. The focus of the studio was the 1997 Otis Elevator Housing Design Competition. A prerequisite introductory computer class was required for participation in this studio. Two distinct analysis and design methodologies were introduced; one concentrating on the formal tectonic aspects of architecture and the other highlighting the multiplicity, and often competing, forces shaping the built reality. The summary offered at the conclusion of this document both supports and questions the direction of the class as a whole and further classifies the relative success and failures of the individual student initiatives. In some cases, the computer simply facilitated (and occasionally hindered) progress. In the most opportunistic examples, the computer undoubtedly changed both the process and the consequence of the design effort.

The Premise:

> '... revolutions (are not interesting by) what they 'revolutionize,' which is always perishable and constantly threatened with becoming the opposite of what it was at the beginning. If revolutions are interesting it is solely because in revolutionizing they disinter and recover fragments of the tradition that was believed dead because it had been forgotten, and that needed simply the spasm of revolutionary convulsions to make them emerge, so that they might live anew.'
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> -- *Salvador Dali* [Dali42:360]

Evolution of the design studio into the twenty-first century has created a persistent and vexing problem for the architect/educator. An untapped world of possibilities awaits the intrepid designer who is willing to engage the novelty and seductiveness of Computer Aided Design (CAD). However, the promise of digital technology – at least with respect to 'design' – has remained largely unfulfilled. Despite numerous attempts by software developers to meet the demands of architects for an integrated design product, a convincing solution has yet to emerge.

No doubt, some of the confusion over what CAD is, or is not, is responsible for the many conflicting and apparently unsubstantiated claims that cloud the debate. For the sake of this discussion, Computer Aided Design is defined as, '*the use of digital means to achieve a unique design solution that would not or could not have been obtained by any other reasonably available means.*' This definition is not intended to deny the revolutionary impact that digital technology has delivered to production or management or the stunning marketing capabilities that are now available to the architect. It is, however, intended to focus the discussion on that unique, often difficult to define, component that is at the core of the architectural studio – 'design'.

Since the introduction of the computer into the architectural profession, many have assumed that digital technology

would eventually assimilate the entire architectural process: Conceptual Design, Schematic Design, Design Development and Construction Documents. The 'design' component in the conceptual phase, to date, has resisted digital integration. Perhaps the single most important reason for this failure is that the requirements of architecture are simply too complex, the consequence of divergent technical demands and socio-cultural expectations.

'Design' must therefore engage abstract ideas while simultaneously addressing the technical means required to build architecture. In a perfect world, an imaginary software would need to address 'reason', 'the intellect', 'aesthetic values' as well as the 'human condition' in order to succeed. It should come as no surprise that design has resisted technical solutions that fail to address these requirements.

The premise of this studio was to acknowledge that the Information Revolution has forcibly brought the digital world and computers into all levels of architectural practice and education. It also acknowledges that 'critical thinking' is a pedagogic prerequisite to understand the multiplicity of forces affecting the built environment. There was a deliberate attempt to balance the relationship of old and new by researching and learning from architectural precedent and tempering this knowledge with the whirlwind drive for the new. The studio became the laboratory and the students were the active participants in the search for a working solution.

This graduate studio was conducted in the spring of 1997, at the University of Colorado in Denver. The project, the Otis Elevator Competition, was implemented using an urban housing strategy via à vis an integrated digital effort. The inseparable notions of tradition and innovation were investigated in both precedent analysis and design methodologies. The computer was the intermediary used to develop a concept of dwelling within a post-industrial American urban setting. The issues of housing and urbanism are often foreign to American architecture students. Through the prism of information technology, canonical contemporary precedents of housing from Japan and Europe were analyzed. Analytical strategies led to design strategies, seeking to project adaptations and transformations upon the essential order of historical housing precedents in light of contemporary American culture.

Measure of Effort:

> 'Architect's do not invent anything, they transform reality.'
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> -- Alvaro Siza [Fram93:17]

The speed at which the digital revolution is progressing, compounded by the ever-increasing power of visual rhetoric, hastily consumed, is radically changing the profession of architecture. This studio attempted to simultaneously embrace this reality of a world of fast expediency and to critically analyze built reality through the dual perspectives of history and culture. Students were encouraged to be rigorous with not only with the emerging tools of the information/communication era, but also with the 'tool' of the mind.

Since purely technical, computer approaches to architecture have met with limited effectiveness, what would be the effect of integrating a structured decision making processes throughout the digital effort? Would it overcome this inherent limitation evidenced by the application of isolated technological innovation? Is it feasible to concurrently teach a critical reading/analysis of architecture's rich historical legacy and to encourage digital innovation, informed by these traditions? Ultimately, the measure of this digital design studio must be its success or failure to link critical decision making capabilities and creative design implementation.

A Strategy of Analysis and Design:

The first requirement was to examine architectural precedent through the formal decomposition/recomposition of selected works of contemporary architects. Lowest Common Design Denominator (LCDD), was implemented to identify the actual implementation of design strategies. LCDD is a process of identification of unique design characteristics. It examines the expression of the decision making process, but it is not intended to evaluate design judgment. Therefore, a second analysis methodology was required to compliment LCDD; Architectural Confrontation Analysis (ACA) was the strategy adopted. ACA is an analysis methodology which seeks to ground the often-opposing forces of market and culture in the shaping of architecture. The combined approach was employed to achieve a technical understanding moderated and guided by an understanding of competing interests.

In addition to the dual investigative aspects of analyzing contemporary precedents to inform, an intriguing aspect was the possibility to implement a reverse strategy that would guide student design efforts. This ability to simultaneously inform the design process of architecture with a predictable, yet flexible methodology of purpose, became the core implementation strategy of analysis and design in the studio.

The impetus for choosing an urban housing competition was to confront and examine process and tradition in the evolution of urban housing. The intention was to critically analyze precedents in architecture through a digital lens and to provide a reference for design judgment.

The organization of the intellectual effort was fully digital, as was the final printed exhibition of student work. The investigation deliberately avoided creating analogues of traditional pencil and paper methods. However, there was no attempt to deny the contribution of the sketch or hand drawing, but instead to incorporate the traditional into an expanding digital universe. Hand sketches, drawings, and photographs were scanned into the presentations while electronic imagery was used in its native format. Additionally, the students developed a web site where final projects were electronically published for critical review.

> ‘Adolf Loos’s ‘Spoken into the Void’ ironically represents the waste of the last century. There is more information than ever but we are less able to assimilate it. You can really only assimilate material by working with it and internalizing it.’
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> -- *Kenneth Frampton* [Fram94:12]

Analysis Methodologies - ACA and LCDD:

These two methodologies were designed to address the fundamental concerns raised by the creative demands of contemporary urban housing; they are specifically inter-related by the fact that they address the issues of *why* and *how*.

Architectural Confrontation Analysis (ACA) - Kelly Shannon

Architectural Confrontation Analysis (ACA), address the *why* of architecture, it questions the role of the architect as the mediator between competing interests. The objective was to assess a specific housing project within the particular social, economic, political and market context, as well as the architectural culture of the chosen architect. The implicit and explicit values built into the residential framework were to be distilled from a rigorous analysis of context, image and dwelling form of both the scale of domestic organization (the housing form) as well as the urban scale, accounting

for the agglomeration of units and the provision of social amenities.

In this approach, architectural expression is understood within the fabric of time and the culture of society. ACA was designed to bring clarity and understanding of the decisions and choices made within the historic framework of design and implementation. ACA (Figure 1) frames a range of alternative factors in the decision-making matrix, a prerequisite of architectural expression.

The structure of ACA analysis is as follows:

1. Context: an analysis of the way, in which the housing fragment does or does not relate to the urban fabric in which it is situated, and the significance of this implicit statement as a contextual and social standpoint.
2. Image: the implicit value systems incorporated in ‘dwelling form’, as these are represented by architectural images or by other ideological inferences.
3. c. Dwelling Form: the domestic organization (the housing form) and the provision of social amenities (the residential fabric)

Figure 1. The ACA Diagram

The ACA methodology raises these complex issues:

- • How far can *housing* go against *market logic*?
- • What are the *cultural* implications of the architectural (*housing*) expression?
- • Can *housing* be the mediator between the *unit* (new 'family structure) and *public realm* (new ‘civitas’)?
- • How, within today's 'culture of fragmentation', can housing contribute to the construction of personal and collective *identity*?
- • What are the possibilities of *housing* in the definition of *social interaction*?
- • What is the ethics of architecture *housing* within *market* conditions?

Lowest Common Design Denominator (LCDD) is a methodology that addresses the *how* of architecture; it is an exploratory, investigative design tool to formally, programmatically and structurally distill the inherent, essential order of precedent. It uses a process of 2 and 3 dimensional architectural analysis. Its distinction from other analytical methods is the introduction of dynamic links made possible through computer technology. LCDD analysis is a process of identification and recomposition of unique design characteristics using a series of empirical guidelines and principles. The dynamic link is the capability of the computer to affect changes from one component to all related components simultaneously. Mastery of the dynamic link allows one to re-establish the original, physical design control of the architect, to understand the intention and conception from the detail to whole.

LCDD requires the identification of unique architectural components and their corresponding spatial organization. Validation through technical analysis of plan, section and/or elevation required a diagrammatic proof involving the reconstruction of critical LCDD components to verify the observable organization of the architect. Appropriate cautionary admonishments were offered to clarify that this examination was for the purpose of understanding scope and organization and that a comprehensive design investigation would need to be guided by the companion ACA.

The urban housing typology responds to LCDD analysis due to its functional organization, a composition of unique components arranged to create the agglomeration. As a corollary, the simulation of design studies within the software of the computer allows a powerful capacity to mimic compositional organization. Therefore, the ordering of the fragment to the whole can be explicitly explored via a spatial reconstruction of paradigmatic precedents in housing.

Rules of LCDD

LCDD analysis is a process of reductive identification and recomposition using the following guidelines and principles:

1. Identify, rotate and remove symmetry at the building and component level.
2. Identify, rotate and remove repetition at the building and component level.
3. Unwrap or unroll curvilinear and non-planer components and apply rule one and two. Note that this system interprets design by way of projection.
4. Identify, rotate and remove any item that repeats at any scale.
   For clarification one Doric column represents all Doric columns of similar proportional construction.
5. Remove reference of feet, meters and cubits from consideration. Establish a base of one. Column spacing is an example.
6. Identify geometric order first, followed by material subset identification.
   Different materials are not the basis of separate components.
7. Reconstruct the architecture with dynamic LCDD components.

Critical Assessment of the Integrated Digital Effort:

Following the three-week analysis project, students developed, either in small groups or as individuals, a program of

urban. The analysis methodologies, ACA and LCDD informed design strategies. Innovative urban housing schemes were digitally developed upon the foundation of this precedent research.

At the introduction of the studio, each student was individually assigned a housing project to analyze. These pre-selected housing projects are internationally recognized as having made significant contributions to the concept of urban dwelling. The fact that the projects to be investigated were foreign (executed in Europe and Japan) was intentional and served two pedagogic purposes. Firstly, a number of students would be exposed to architects that are virtually unknown in American architectural education (Yamamoto, Ciriani, etc.). Secondly, the research into the foreign cultural and market forces, although difficult, would also prove invaluable. It was the intention that the pure imitation of these architect's 'styles' would not be meaningful in the design work, as the methodologies should have proved. Each student produced an analysis according to ACA and LCDD strategies and presented the research to the class. Then it was assembled and bound into a reference manual that included twenty separate studies. At the conclusion of the class this work, along with the competition entries, was published in a class web site.

In a genuine effort to overcome the formality of the normal 'jury' process, the students were given the opportunity to present in small groups (2 or 3 projects) to a group of 3 or 4 critics. A rotation was then made, thereby allowing each student to hear the comments of at least 6 critics. Finally, a forum was assembled to discuss the pertinent issues.

Final reviews in the design studio often provide a precarious assessment of student work. The pressing topic of urbanism in the contemporary American metropolis was disappointingly sidestepped in the lengthy summary discussion. While a fervent debate arose concerning the use of the computer and the legitimacy of the computer within the profession, the validity of the design investigation and the subsequent implementation was really the issue that required investigation. That debate would have appropriately considered the following four areas:

Computer as tool for representation:

The emphasis of presentation in international design competitions can unfortunately diminish the depth of the conceptualization as participants strive to master the art of representation. Several students in the studio primarily implemented the computer as an image-generating machine. The 3-dimensional image-building capacity of state-of the-art software allowed for the generation of seductive computer models. There is considerable room for concern over this methodology with respect to the ultimate requirement of transformation into purposeful architecture.

Computer as information processor / formal manipulation of complex forms:

The logic of the digital world led a small number of students to enter into the potentially hazardous territory of creating spatial configurations via simple commands (array, mirror, rotate, scale etc.) inherent to the software. The vulnerability of the projects created within this line of thinking lies within the self-generated and self-referential nature of the process. The layered intensity of formal gestures created sculptural architectonic elements that often had little relation to the specific site and culture for which it is intended.

Computer as spatial and conceptual generator:

There were several individuals and groups of students that were able to successfully navigate the conceptual leap from the analysis methodologies to the design process. The ACA and LCDD were reversed and informed the design process. The power of these projects emanates from a cultural understanding and projection of strong visions at the urban as well as the individual housing unit scale. The computer was recognized as a powerful tool to quickly experiment with complex spatial compositions within which conceptual visions could be tested.

Computer as manipulator / producer of imagery / mapping surfaces, creating the *appearance* of architecture:

A small number of students were able to begin to imagine the unimaginable in a playful experimentation, utilizing the power of the computer and the intelligence of the human mind. There was one group whose notable contribution was the adaptation of chalkboard drawings captured with a digital camera to 'layout' the overall concept. The computer building model was tightly referenced to the 'chalkboard site'. Additionally, this group relied on a process of compositional projection of materials onto form to suggest the design direction i.e. paintings and textures projected onto form. The concept of their housing as it related to varying conditions of the urban context was also demonstrated with a video presentation.

Digital Studio Confronts Tradition:

Rapid technological advancements, globalization of capital, and the omnipotence of 'the cult of the image' are changing our culture and the traditions of architecture forever. Far too often within this context, the ethical dimensions of architecture are lost. Consequently, architecture relates less and less to the everyday life of the inhabitants of the contemporary condition. The urban dweller becomes a consumer of economic necessity, occupying space offered for habitation, but not optimized for living. Is the computer part of the solution or part of the problem?

In this attempt to raise the level of awareness of the complex weaving of social, political, economic, cultural and technological forces in urban housing, the computer proved to be both. It is apparent that the computer can expand the scope of investigation and the extent of design expression, regardless of its potential to create new problems. A critical observation is that good or bad design is the province of the architect/designer, not the computer. Since judgment is ultimately at issue, ACA and LCDD can only provide guidance.

The strength of this educational model was in its ability to address technical and social factors simultaneously and keep the participant/designer informed. The weakness of this approach was that it attempts to solve complex social problems with complex technical tools. Improvements through simplification and flexibility of computer applications would be very beneficial. This would allow a greater concentration on the relevant issues of social responsibility and quality of life in urban housing design.

Hopefully, the potential of this studio will not be considered solely with regard to its static history; society and technology are evolving at a seeming exponential rate. To that end, this studio must continue to challenge and renew itself in order to be a meaningful participant in a world of escalating social and technical requirements. Only time will tell if this digital/judgment strategy has the inherent flexibility to adapt even as our technology becomes outmoded and society evolves in new dimensions.

The curious conclusion of our struggle is that as we approach consensus, this too will require a revolution, so that it might live anew.

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