Holism in Foundation Design: Avoiding the "Silo Effect"

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INTRODUCTION

Standing in contrast to Descartes's scientific reductionism, Systems Thinking is a logic and working methodology which one may employ to understand complex organizational issues. It is change-based in that it often attempts to understand and predict how actions result in reactions and/or interactions. Architectural design and its role as a contingent of (global) environmental design has begun to embrace this logic to better address ethical and professional challenges facing the next generation of architects. While this may be happening in interdisciplinary and cross-disciplinary practices such as OMA/AMO, SHoP, MVRDV, Field Operations, as well as some corporate giants, its application academia is largely limited to the graduate level of study where students are more likely to hold a higher level of educational diversity. Foundation design curricula (years one through four) have often been anchored upon knowledge silos, a term common among the business community that is used to describe discrete knowledge domains that lack an operational reciprocity. The design studio has traditionally served as a kind of *anti*-silo, or laboratory for knowledge synthesis. Taking advantage of this latent learning format, the interest here, is to understand how a Systems approach to design, if engrained in the students' modus operandi, might stimulate and advance the profession as it works to address issues of ecology and ethical development. This paper attempts to outline how Systems Thinking is enabled via retrospective causality diagramming and meta-discussions regardless of a student's educational background or perspective. A means of bringing a Systems Thinking approach to the foundation years of a design education are outlined utilizing the vehicle of time-based performance.

Figure 1. Grain Silos of St. Elmo; Drawing by: Gregory Watson

Silo Effect

To begin let me make clear the term *Silo Effect* or at least its definition within the context of this paper. Common in the organizational lexicon, the silo refers to a singular knowledge domain, isolated from others and without operational reciprocity. Modeled after the functional purpose of the commonly witnessed grain storage device, educators have been using this term to isolate various forms of knowledge and/or to delineate the boundaries of a discipline. While the concept is useful, it runs the risk of closing the door on cross-disciplinary or even trans-disciplinary study. As universities face ever-increasing standards of educational effectiveness, silos become more common as a means of clearly defining the

many subjects of education. Paradoxically, this demonstration of "effectiveness" creates a vacuum among the subjects or silos which, according to trans-disciplinary researchers is often the home of innovative discovery. In this paper it is important to understand that all elements of education, subject, method, knowledge domain, discipline, etc. may be separated and held as a silo irrespective of the domain's relative scale.

One application of this term in regard to graduating students is that they are emerging from professional education with skills in only *silotized* design thinking. By this, I suggest that students are being pushed more and more toward fine-grain answers to *small* questions of design. A building project is multifaceted and in practice numerous players are involved in many decisions. When a project is subject to scientific reduction as an educational model, facets of the project are removed to focus on specific issues. This method of discovery places the project facets into silos which, if never reconnected, leave students with an incomplete understanding of design as an inclusive synthetic act. This is likely not because educators do not see or believe in taking a broad perspective, but because they are under extreme pressure to ensure many "skill sets" are covered. While the skills are critical to the production of relevant architecture they are not all that is needed to ensure it.

Why the Silo is Dangerous

The weakness of silo-based pedagogies is that architectural theory, visualization, organization and functional system/materials knowledge domains, when separated into individual course topics, become singular in dimension. Much like the effect of a small hole in a grain silo, when all the grains (knowledge domains) are separated to the same size the silo may be drained very quickly by a small hole. Analogously, if a student hedges their entire design on fulfilling or addressing a single facet of a project, that project may easily be dismissed by the finding of a single shortcoming in the work. However, if the grains were mixed within the silo the bottom (like a student's project) may not be made to fall-out as easily. Operating like a soapy-foam within a tube, an ethical design takes on a multifaceted response to the question, addressing it with answers that create a dispersed response, like the structure of foam, not relying upon one leg but many. This approach to design results in a field-based resolution which does not answer the question in only one way but rather, it attempts to reveal and answer the constituencies of the original question. In this way, I suggest that an architectural project aligned and justified via numerous disciplinary acknowledgments and intentions will run a far lesser risk of being deflated or, returning to the grain silo analogy, drained due to its' lack of compositional and operational variation.

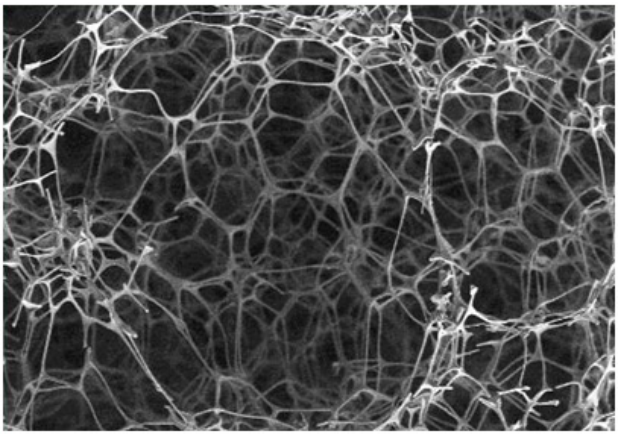

Figure 2. Melamine foam at 100 microns

Achieving a Systems Thinking result requires a great deal of commitment and time as well as knowledge in one's field. Because of this, it is often reserved for graduate students arriving with such a predisposition and knowledge. In recent years I have seen numerous institutions abandon the thesis project leading me to believe that few students effectively achieve a Systems approach to design even as advanced students. This led to an investigation of where and who might be accomplishing this form of study in the design field. To narrow my search I looked to allied programs of study including Urban Design, Environmental Design, Interior Design and Landscape Architecture. Of these, Landscape Architecture offered a unique aspect for discovery with its' preoccupation with time-based design parameters. In contrast to my program's fairly traditional architecture curriculum, Landscape Architecture frontloads issues of change and shift in design, devoting a great deal more of their curriculum to systems analysis and the causes and effects of designing in the world.

Carl Steinitz, Professor of Landscape Architecture at Harvard University, suggests in his paper "A Framework for Theory Application to the Education of Landscape Architects (and other Environmental Design Professionals)" three learning opportunities that educators must offer their students: *(1) the building of competence in changing or conserving the landscape (2) the building of experience and confidence in doing so, and (3) the building of the theoretical constructs that underlie the above two*. [1] This framework illustrates the emphasis placed upon the issue of change within the Landscape Architects' means of operation.

In 1971 Ian McHarg, in his book "Design with Nature" popularized a system of analyzing the layers of a site in order to compile a complete understanding of the qualitative attributes of a place. [2] McHarg would give every qualitative aspect of the site a layer, such as the history, hydrology, topography, vegetation, etc. This seminal work in Landscape Architecture along with its contemporary equivalent, Geographic Information Systems (GIS), further highlights the importance placed on understanding the baseline upon which the design of a thing will initiate a change. Where McHargs' system has been expanded is in the realm of scale and cause and effect. With advanced simulation software designers are now able to impart ecological changes to a scenario ecosystem to see what affect their changes may have to the system at multiple scales.

Foundation level architectural education may have lost sight of issues of change and shift, focusing perhaps too intently on the idea of a building's materials and methods (essentially shiftless silos) as the only measure of credible architectural production. In reality, the education must center on the ramifications of our work acknowledging that the site, context, clients, programs, energy flows and economies of living constitute the fabric and productive value of architectural design. The building's material palette and spatial composition are only a part of our work which is easily lost if we do not attend to and take advantage of the generative potential the whole project offers. The way the building influences change at the community, city and perhaps even regional scale are rarely considered in favor of fulfilling personal indulgences of taste and style. Balancing the foci of design studios is critical to ensuring that silo-based pedagogy do not come to dominate the undergraduate curricula which often are overly put-upon to cover the prerequisite skill driven components of design education.

Change and the Measure of Performance

> *Everyone designs who devises courses of action aimed at changing existing situations into preferred ones.* Herbert Simon-

Landscape Architecture has enjoyed the necessary parameter of Systems Thinking since its inception around 1828 when Gilbert Laing Meason coined the title, which was later institutionalized by Frederick Law Olmsted. The advantage Landscape Architecture brings to design pedagogy is it's skill in understanding life-cycle and larger 4 dimensional, or time-based, issues. While architects have always been required to consider their designs as functional devices serving over-time, more and more architectural design has become an act of image production above the making of functional space and place. Juvenile designers have the propensity to follow down a path trending toward isolated design devoid of time-based performance issues and aggregated affect. Given our vastly increased ability to speculate and test scenarios digitally, why is it so much emphasis has been placed on surface manipulation and materials development? Systems Thinking in design asks more of the designer and educator. Advanced scenarios are required to incorporate shifts in a building's life-cycle and community growth at the planning scale; this added parameter is complex and highly unpredictable yet crucial to our professions advancement. Comfortable issues of craft and composition are routinely the focus with few examples of schools preparing students for an education founded upon holistic design in a world desperately in need of empathetic, conscientious, and innovative thinkers looking to create a measurable and deployable means of change to our built environment.

Returning to the question of how can the silo effect be avoided or at least controlled, I suggest *time* as a fundamental design parameter to be placed in the center of our pedagogical set of concerns. Landscape Architecture addresses this issue via the inescapable parameter of their material palette, living vegetable tissue and its dependence on the environment. Recounting interviews with Landscape Architecture colleagues and their writing, one trope emerges within their design pedagogies. To design a landscape is to design a change. In architecture, particularly with novice designers, design is increas-

ingly understood as being synonymous with invention and original creation. This misunderstanding and lack of correction by faculty builds a false belief that architecture is only invention, when in fact I would argue it is augmentation. In a world full of design and design ideologies one, regardless of design experience, cannot help but define his/her understanding and actions through prior knowledge. In this, students should be made to understand they are augmenting architecture and its aggregate effect on community and city. Planning and Urban Design as allied fields of Architecture and Landscape Architecture could and perhaps should be taught as one continuum. While their content would likely prove too much to cover in a single undergraduate education, the theoretical and operational means used in considering the effects of change may be co-opted and are absolutely passable.

Rolling-Start vs. Cold-Start

A good Landscape Architecture and Urban Design project is commonly initiated by an extensive site inventory and analysis phase. This form of Rolling-start puts the designer into the mind-set that they are provoking a change-of-state rather than creating a state. While architecture is often considerate of site, vis-à-vis a site analysis phase, it often only results in a minor set of design considerations forming a thin veil of groundedness.

Students do not begin a project seeking questions; they begin by seeking answers to only the questions we as educators provide in the project statement. It is our job to teach them to seek the unknown in order to create their personal working knowledge. The foundation skill is teaching students how to get on to something not how to finish something.

> *The search is what everyone would undertake if he were not stuck in the everydayness of his own life. To be aware of the possibility of the search is to be onto something. Not to be onto something is to be in despair.* Walker Percy-

At stake in the foundation years is the students' trajectory as a practitioner of design in effect they learn to become Technicians or Architects.

> *Engineering, medicine, business, architecture and painting are concerned not with the necessary but with the contingent - not with how things are but with how they might be - in short, with design.* Herbert Simon-

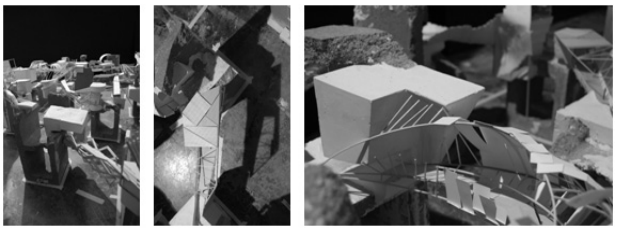

Figure 3. Meander Project Fall 2010

Demonstration; how foundation design can be about the gathering and interpretation of information not just the means of making: One active means of pressing students into a time-based way of understanding is the use of Causality Diagrams. Causality is the relationship between an event (the cause) and the consequence (the effect) of the event. This relationship can typically be expanded to include as much or little information and data as the instructor feels necessary. Critical are the conversations about the diagrams and the latent condition of change-over-time. I find by doing these diagrams students recognize the context of their work while realizing the paths that their work may progress toward. Once this understanding is made visible and hopefully clear, the student is empowered to manipulate the scale of the diagram including or excluding issues to place their work in a position of understanding that is appropriate for the project duration and expectations. Beginning students often lack this operational sensibility, seeing the vastness of a project's potential, paralysis is often the result. By contextualizing the design problem a student begins to understand the problem's local identity within its global challenge and vice versa. What is important is the fact that these models are not design paths/tracks made for students to follow in hopes of completion. They are awareness models, intended to frame and create the necessary context and push-back that drives design.

Prof. Carl Steinitz defines design as both noun and verb wherein the verb state is equated to the methods and actions of design, while the noun state is associated with design as its' theory and purpose. [3] In this case, by employing causality modeling I am able to refer students to the noun (theoretical conditions) and verb states of their projects, bringing focus to their efforts.

Working with beginning students it is important not to suggest a single answer or method exists in design. I allow students to first just work, produce and comprehend all they can intuitively. After the project is presented we take time to reflect on the work through a Causal Loop diagramming exercise where students list the issues they considered and how they considered them. This is usually difficult and slow to begin as students often do not see the complexity of the work they have produced. They are also uncomfortable in writing out decisions that seem simple or obvious, likely a conditioned response to their secondary education which generally strives for answer-based response above question-based response.

To begin this process of reflection it is important to address the question of knowledge creation and management, it is appropriate to develop some perspective on knowledge so the student can better understand the objective of the exercise. Neil Fleming, an Educational Developer, suggests these definitions for the constituents of knowledge;

- *A collection of data is not information.*
- *A collection of information is not knowledge.*
- *A collection of knowledge is not wisdom.*
- *A collection of wisdom is not truth.*

The idea is that information, knowledge, and wisdom are more than simply collections, similar to silos. Rather, the whole represents more than the sum of its parts and has a synergy of its own. [4] Below is a Causal Model I use to explain how a firm functions and how it is composed of many moving parts similar to their projects and the way their projects might affect the world if built.

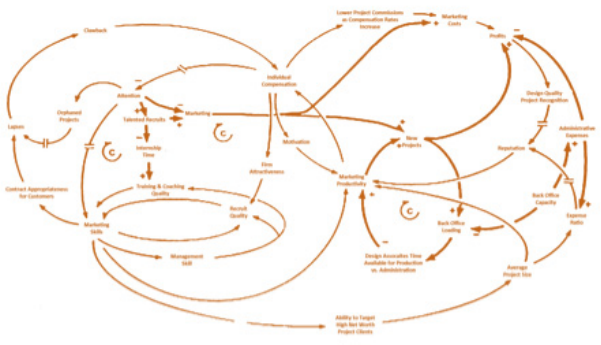

Figure 4. Causal Loop for a Firms Operation

This reflection brings students closer to an understanding that their work will one day have consequence on our built environment. Exposing students to the notion of consequence brings them back to the issue of time and shift as a fundamental parameter of design thinking.

The Hive and Meander Projects [fig. 3] were first year design projects aimed at building skills and confidence while also considering communal consequence in design thinking. In both projects students were given an abstract yet clearly delineated site. The sites were defined as baselines upon which their work would have effects. In addition to affecting the site, students were asked to design interventions which relied upon their neighboring designers' comprehension of intent. These projects probed and provoked cause and effect design scenarios resulting in aggregated designs that relied on Systems Understanding for project explanation and presentation.

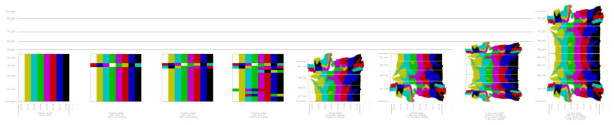

Figure 5. Silo Education Model Moving Toward Non-Silo Model

Smudging the Silos

At the foundation design level I believe the critical objective to know is that students need a place to stand. In this way I think the silo-based system of education allows students to "know" something, to have a confidence with the methods of representation, project organization, etc. However, these are all issues that could be taught in a non-studio format. The studio is the place where these distinct knowledge domains become smudged and muddled, blended and braided into new forms of knowledge. To teach design is to both clarify and smudge issues of design praxis. While clarification via texts on theory, drawing, material science, and construction abound, it is the role of the instructor to introduce variables that cause this information to be untangled and transformed into new methods and systems of project realization.

I conclude that the manipulation of time and its uncanny ability to measure design performance is the means by which architectural foundation design may be brought into a contemporary state. Time has focused our attentions on the environment's decline, politically empowered disasters, human tragedies and accomplishments. We measure our lives and our successes on the passing of time as we often do the value and nobility of great buildings throughout time.

By reminding our students that time creates the measure of performance, we the designers of education, may create a class of architects not interested in just now, but also tomorrow.

ENDNOTES

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2 McHarg, Ian L. "Design With Nature" February 6, 1995, Wiley; 1 edition

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4 Bellinger, Gene. "Systems Thinking: A journey in the realm of systems" 2004 http://www.systems-thinking.org/kmgmt/kmgmt.htm

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