

Forging a Model of Digital Practice

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PARADIGM

The shift from oral to print culture enabled the development of analytic—scientific—thinking as the dominant cognitive practice. Alberto Perez-Gomez describes how this development dismissed myth, poetry and personal experience as subjective and unreliable for the new form of justifiable cognition.

“The poetical content of reality, the a priori of the world, which is the ultimate frame of reference for any truly meaningful architecture, is hidden beneath a thick layer of formal explanations. Because positivistic thought has made it a point to exclude mystery and poetry, contemporary man lives with the illusion of the infinite power of reason. He has forgotten his fragility and his capacity for wonder, generally assuming that all the phenomena of his world, from water or fire to perception or human behavior, have been “explained.” For many architects, myth and poetry are generally considered synonymous with dreams and lunacy, while reality is deemed equivalent to prosaic scientific theories. In other words, mathematical logic has been substituted for metaphor as a model of thought. Art can be beautiful, of course, but only seldom is it understood as a profound form of knowledge, as a genuine, intersubjective interpretation of reality. And architecture, particularly, must never partake of the alleged escapism of the other fine arts; it has to be, before anything else, a paradigm of efficient and economical construction.”¹

The shift from print to electronic media constitutes a new paradigm from which to evaluate the education and practice of architecture. The technological shift under way creates an opportunity to institutionalize invention and discovery as analysis and critique were institutionalized by print media. Gregory Ulmer, in his book *Teletheory*, explores the pedagogy of academic discourse in the electronic age through the invention of euretics. “Euretics is a cognitive practice coming into formation as an alternative to (not opposed to, but supplementing) hermeneutics and critique. The term, re-

lated to ‘Eureka! I found it!’ is synonymous with thinking as discovery rather than as interpretation.”² Teletheory and euretics provide a basis for evaluating the relationship of digital technologies to architectural practice.

“A central thesis of Teletheory is that the new electronic technologies relate to euretics the way alphabetic literacy relates to analytic thinking. Just as the features of alphabetic writing provided the prosthesis of analysis, so is the prosthesis of invention available in {electronic technologies}. Until now we could not institutionalize invention in the way that we have institutionalized analysis, because we simply lacked the prosthesis needed to democratize it. Teletheory seeks the genre that might be the bridge between the two technologies {print and digital}. What is at stake involves not just the introduction of {electronic technologies} into the classroom, but the formulation and practice of conduction, an electronic mode of reasoning that is already available, and necessary for using the full potential of our emerging apparatus.”³

The goal of this paper is to put forward a model of architectural practice that uses the new digital paradigm to institutionalize invention and craft in making architecture. I will use this paper as a guide—manifesto and experiment—for how I would like to practice architecture. Polyphilo will be my companion, as we compare architectural practice to lean production. He will help me use teletheory and euretics as tools to construct a foundation for digital practice, a practice that is invested in both craft and technology.

“For this article itself to be euretic it has to function at the level of pragmatics, to be composed in such a way that a reader might want to switch strategies—to stop trying to understand what the author means and decide instead to make something out of it. It is not that this article, or a class organized euretically, does not communicate something, but that the learning effect is related to something other than the conveyance of precise messages.”⁴

The history of architectural production can be viewed concurrently with the history of industrial production, both have witnessed a similar transition from craft to mass production. We will use the different forms of industrial production to categorize methods of architectural practice. A principle ingredient in building a healthy architectural practice and profession is education. Today the path of architectural education, and practice, is much the same as the path of Polyphilo.⁵ Three doors of opportunity present themselves.

DOOR ONE – CRAFT

The first is the door on the right, *vita contemplativa*, it leads to “a life of architectural creation inspired by the gods through contemplation.” Behind this door architectural production is organized as craft production. The origins of industrialization lie in craft production, which continues to serve as a viable model for architectural practice.

“In their book *The Machine That Changed the World*, James Womack, Daniel Jones, and Daniel Roos examine the revolutionary changes in the manufacturing of automobiles that has occurred over the past century. They recount the story of the Honorable Evelyn Henry Ellis, a well-to-do member of the British Parliament, who in 1894 paid a visit to the Paris machine tool company of Panhard and Levassor to “commission” an automobile. The company’s owners Panhard and Levassor, met with Ellis, soliciting his ideas about the kind of automobile he wanted. Their skilled craftsman then set about the task of designing the vehicle and ordering the materials to be made by other machine and tool shops in Paris. The custom-ordered parts and components were brought together in the Panhard and Levassor shop, where they were assembled by hand to make the automobile. Ellis’s car, like the few hundred other automobiles made each year by Panhard and Levassor, was unique and drawn up to meet very exacting standards of an individual customer. Ellis became the first Englishman to own an automobile.”⁶

In craft production goods are conceived one at a time and produced to meet very particular needs and specifications. The production process is flexible and tailored in response to those needs. This process allows for great care to be taken to maintain the integrity of the finished product. Craft production is very labor intensive, slow, and expensive, which limits its availability to a small group of wealthy patrons.

DOOR TWO – MASS

The second door is on the left, *vita activa*, it leads to “a life of architectural creation that stems from technology as the physical fulfillment of material desires through a will-to-power.” Behind this door architectural production is organized with the model of mass production.

“Less than twenty years later Henry Ford was producing thousands of identical cars each day at a fraction of the cost Ellis paid for his hand-crafted vehicle. Ford was the first automaker to mass produce a standardized product using interchangeable parts. Because the individual components were always cut and shaped exactly the same, they could be attached to each other quickly and simply, without requiring a skilled craftsman to put them together. By the 1920’s Ford was mass producing more than 2 million automobiles a year, each one identical in every detail to the one before and after it on the assembly line. Ford once quipped that his customers could choose any color they wanted for their Model T as long as it was black. This principle of mass-produced standardized products set the norm for manufacturing for more than half a century.”⁷

A new model for the organization of “efficient” production had been created. By increasing the rate and efficiency of manufacturing, mass production lowered prices and broadened the market of potential customers. For the first time products that been out of reach became accessible. The increases in production came at the expense of the individuality and quality of hand crafted products. Perhaps more significant however, were the shifts that took place in the organizational structure of production. In 1895, Frederick W. Taylor established the principles of “scientific management”⁸ which streamlined mass production and introduced efficiency as the dominant frame of reference for modern life.

“In strict *Tayloresque* style, the workforce assembling the cars was stripped of any kind of skilled knowledge and denied independent control over the pace of production. Design and engineering skills and all production and scheduling decisions were placed in the hands of management.”⁹

Mass production created an organizational model that isolated decision making from the site of production. In dislocating design from production, this model became inherently sluggish, making change and adaptation extremely difficult. Modifications and improvements became obstacles to daily output. Down time is costly, disruptive, and can lead to other production problems down the line. All attempts are made to avoid changes to the production plan once it is instituted.

To a large extent modern architectural practice follows this model of dislocated practice. Design takes place away from the site of production. A complete set of instructions, construction documents, are prepared and issued. Changes to the construction documents after construction begins create logistical problems, communication and scheduling become potential disruptions in the flow of work. Construction costs rise dramatically with the introduction of change orders. In adopting this model of dislocated practice architects have marginalized themselves from the site of production and jeopardized their role in the production process.

DOOR THREE – LEAN

Polyphilo leads us through the door in the middle, *vita voluptuaria*, behind it lies “a life of desire where fulfillment is never fully present nor fully absent, somewhere in between yet in a different place where a radically different role for the personal imagination might emerge.” This is the door that leads to architectural production modeled after lean production. Developed by a Japanese automobile company in the 1950’s, lean production differed so radically from the American style of management that it became known as post-Fordist production.

“The Japanese form of lean production starts by doing away with the traditional managerial hierarchy and replacing it with multiskilled teams that work together at the point of production. In the Japanese lean factory, design engineers, computer programmers, and factory workers interact face-to-face, sharing ideas and implementing joint decisions directly on the factory floor. The classical Taylor model of scientific management, which favored the separation of mental from physical labor and the retention of all decision making in the hands of management, is abandoned in favor of a cooperative team approach designed to harness the full mental capabilities and work experience of everyone involved in the process of making an automobile. For example, in the older mass-production model, research and development is separated from the factory and housed in a laboratory. Scientists and engineers design new models and the machinery to produce them in the laboratory and then introduce the changes to the factory floor along with a complete set of detailed instructions and schedules for mass producing the product. Under the new system of lean production, the factory floor becomes in effect the research and development laboratory, a place where the combined expertise of everyone in the production process is utilized to make “continual improvements” and refinements in the production process and the final product.”¹⁰

Lean production offers architectural practice a model of organization that supports the development of both craft and digital technology while collapsing the distance between design and production. It is a model that substitutes the American managerial pyramid for networks operating along a common plane. Information is processed horizontally rather than vertically in a structure that eliminates the logistical problems of communication by removing barriers between those involved in the production process. At the same time, lean production takes advantage of both the efficiency of mass production and the responsiveness of craft production.

To pursue lean production as a model for architectural practice we must examine the product of the architect’s labor, the construction documents. These documents form the basis of the relationship between architect and builder,

and have a direct effect on the final outcome of their work together. The construction documents are the principle means of communication between an architectural idea and built reality. They are the primary tools at work in architectural practice. As forms of communication they are borrowed from analytic reason. Polyphilo shows us that *conduction* has a different set of tools to lend. That lean production and digital technologies, engaged in the service of euretics, can be used to redistribute the organizational dynamics of architectural practice.

CONDUCTION

Conduction¹¹ is a cognitive practice that allows the rigor of analytical reason and the discovery of personal experience to operate as partners rather than foes. Its purpose is not to communicate but to bring about understanding by other means. It allows us to organize construction documents as an alchemist might, as a set of tools that possess the power of transmutation.

How do we practice architecture with these tools that have been lent to us by conduction? I am not interested in the computer as a creator of virtual environments or spatial simulations, as a device that remains in the confines of the architect’s office as an instrument of formal manipulation. But, I am interested in using the computer to develop new tools of digital communication between the architect and builder?

The idea of *continual improvement*, introduced by lean production, brings into question the effectiveness of traditional blue prints. Is it possible to imagine a set of construction documents where change orders and addenda are not viewed as obstacles to the production process, but as refinements and improvements to the both the process and the product?

As an example, consider making a set of digital construction documents using technology that is available today, a multimedia document on the world wide web. This document would contain an internally linked array of drawings and specifications that seamlessly describe a project from overview to detail and back again. Additional documents that contain references to history, theory, or other projects could be easily embedded or attached. The information within this set of digital construction documents is no longer a collection of isolated articles, but becomes a web of association and reference where the informal and the expert registers of knowledge are brought together.

Perhaps the most profound attribute of our example is its ability to be continually improved or updated during the course of construction. Unlike printing a certain number of paper sets, whose accuracy is overshadowed with the first change or deviation, the digital construction documents are never “printed” in mass. They are referenced at various stages (bidding, permitting, rough in, finish out) through an easily accessible network. Everyone involved in the production process has access to the most accurate and up-to-date

information. The documents can be annotated, amended, allowing the formal incorporation of “as-built” dimensions into the construction set. They are malleable, fluid as a conversation about the intentions motivating the project. Making construction documents available in the field electronically allows us to collapse the distance between design and production. Bringing design to the site of production, and encouraging us to treat it as a laboratory of research and development.

INFERENCE

Can a pedagogy of invention and discover be fostered with pencil, paper, and cardboard? Many have voiced the concern that the computer—the box—is not very much fun to draw with or use. Brian Eno said, “the problem with computers is that there is not enough Africa in them.”¹² We need to develop interfaces for our new apparatus of communication, our prosthesis of invention, that encourage broader streams of input and the inclusion of dis-similar types of information (text, video, music). We must engage digital technologies as we would any new tool, learning exactly where to hold it so that we can forget we have to hold it. Most cad programs today are not used to take full advantage of our new digital apparatus. For the most part, they are used as mechanical pencils—they never need sharpening, always draw the same line, and erase without a trace. We need to think of the computer first as a communicating medium that has organizational ramifications, enabling us to consider entirely new ways to distribute the information required for architectural production. Practicing architecture with print media and practicing it with digital media present two drastically different approaches for bringing the general and the specific together.

It is incumbent upon architectural education to take a more proactive role in shaping the pragmatics of architectural practice. For an education that prepares architects to enter a world that no longer exists or a world that exists only in virtual fiction is to further diminish and splinter the work of the architect. We must continue on the path of the middle door, forging a union of craft and digital technology, developing new tools of communication that support invention, discovery, and the re-investment of the poetic register.

NOTES

- ¹ Alberto Perez-Gomez, *Architecture and the Crisis of Modern Science* (Cambridge, MA: MIT Press, 1983) 6.
- ² Gregory L. Ulmer, “The Euretics of Alice’s Valise,” *Journal of Architectural Education* (November 1991) 4.
- ³ Gregory L. Ulmer, *Teleteory*, (New York: Routledge, 1989) 71.
- ⁴ Gregory L. Ulmer, “The Euretics of Alice’s Valise,” *Journal of Architectural Education* (November 1991) 4.
- ⁵ Alberto Perez-Gomez, *Polyphilo, or. The dark forest revisited: an erotic epiphany of architecture*, (Cambridge, MA: MIT Press, 1992). Based on *Hypnerotomachia Poliphili*, Francesco Colonna, (Venice: Aldus Manutius, 1499).
- ⁶ Jeremy Rifkin, *The End of Work: The Decline of the Global Labor Force and the Dawn of the Post-Market Era*, (New York: Tarcher/Putnam, 1995) 95.
- ⁷ *Ibid.*, 95
- ⁸ *Ibid.*, 50. “Scientific management is the organized study of work, the analysis of work into its simplest elements and the systematic improvement of the workers’ performance of each of those elements.”
- ⁹ *Ibid.*, 95
- ¹⁰ *Ibid.*, 97
- ¹¹ Gregory L. Ulmer, *Teleteory*, (New York: Routledge, 1989).
- ¹² Kevin Kelly, “Gossip is Philosophy” interview with Brian Eno, *WIRED* (3.05, May 1995) 149.