

Synthesized Systems: Toward Emergent Architecture in the Era of Global Cities

“Architecture and all the design professions are undergoing a major transformation that is both proactive and reactive: proactive as a search for roles with greater relevance, and reactive as a response to the humanitarian and environmental crises facing the world.”¹

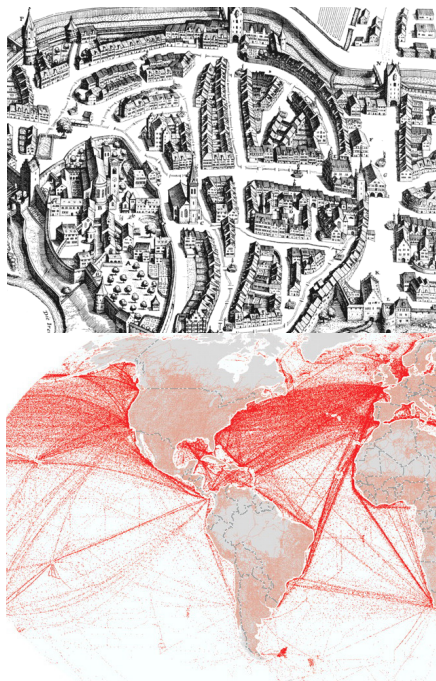
A CALL FOR ARCHITECTS

For the first time in history, the urban population of the world has outnumbered the rural. In 1950, there were 86 cities in the world with populations exceeding a million—today, there are nearly 400.² Even more impressive is the burgeoning of new megacities with more than 8 million residents and hypercities in excess of 20 million. Rapid urbanization, however, is not the only outcome of globalization. Networks that once terminated at city ramparts now extend across countries and oceans. Socially and culturally, we are more connected than ever before. Trade and commerce have grown exponentially while new industries have taken off. An increased investment in new-age education, technology, and innovation reinforces a new unified global identity that will supercede 20th century regionalism and nationalism.³

Globalization has created transcontinental design opportunities from which a new urbanism has emerged: the open city, characterized by hybridized buildings, infrastructural landscapes, new high density housing typologies, and a design culture with limitless opportunities for interdisciplinary collaboration.⁴ While on one hand the open city signifies connectivity, growth, and opportunity, it has simultaneously exacerbated global poverty, homelessness, unemployment, and climate change. Currently, 80% of humanity lives on less than \$10 a day and 22,000 children die each day due to conditions of poverty.⁵ Many urban areas in developing countries are unable to keep up with the demands for housing and employment, while the adverse impacts of climate change resulting from population growth has further intensified the vulnerability of the urban poor by exacerbating famine, drought, flooding, and disease. Organizations like Christian Aid and Oxfam are working tirelessly around the globe everyday to help lift people out of poverty, rebuild their lives, and empower them.

Meanwhile, architects have maintained their business-as-usual perspective. They remain focused on form-making and aesthetics, disconnected from the larger

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1

Figure 1: Fortified cities vs. Open cities.

real-world problems and producing projects that have limited agency or impact. The “Bird’s Nest” Olympic Stadium in Beijing designed by Herzog and De Meuron, for example, is an incredible feat in architecture and engineering but has actually sat there unused since the 2008 Olympic Games. With construction costs upwards of \$420 million, the building is merely a very expensive aesthetic exercise seeking no opportunity for greater impact or meaning. Projects like the Burj Khalifa in Dubai, the Shanghai World Financial Center in China, and Taipei 101 in Taiwan are no better and have become iconic in the open city. These sleek modern glass and steel towers with bold forms that seemingly defy gravity are more about which country can claim the tallest building than a testament to global awareness and problem solving. In extreme cases, like Dubai, these towers are creating entire cities overnight lacking in meaningful intention. If the problems we face as a human race are ones that far surpass something which can be solved through buildings and landscapes, why do we continue to operate in isolation of our greater global context? What problem is architecture *really* seeking to solve?

The openness that the global city affords offers an opportunity for architects to redefine their values and reconstruct their relevance in the 21st century as well as search for new opportunities to make meaningful impacts beyond buildings and landscapes. It is here that we can establish a new global agenda for architects: balancing the development of innovative building and infrastructural landscapes with the mitigation of rapid urbanization’s adverse socioeconomic, political, and environmental outcomes. In this text, we will begin by deterritorializing architecture so that we can examine how systems thinking and emergence can provide a springboard for new modes of practice. MIT Professor Peter Senge’s three guidelines for systems thinking will be used as the framework around which three case studies are organized to create an argument for an emergent architectural design practice. While insularity and lack of agency in architecture are not new problems, now more than ever it is critical for architects to reconsider their role in mitigating the challenges of the open city.

A NEW AGENDA AND APPROACH

In her chapter about slums, Jane Jacobs asserts that it takes more than housing to overcome slums—unslumming is actually the by-product of other forms of economic, social, and intellectual change. She writes, “We must regard slum dwellers as people capable of understanding and acting upon their own self-interests and also discern, respect, and build upon forces for regeneration that exist in slums themselves and that demonstrably work in real cities.”⁶ In other words, housing is only part of the problem. The crisis facing architects goes much deeper than physical space and built infrastructure. Poverty, famine, drought, disease, and climate change are all challenges plaguing society whose mitigation calls for change on a scale greater than can be accomplished by one site or one building. As Bryan Bell writes, “To make design more relevant is to reconsider what ‘design’ issues are. Rejecting the limits we have defined for ourselves, we should instead assume that design can play a positive role in seeking answers to many different kinds of challenges. We have limited our potential by seeing major human concerns as unrelated to our work.”⁷

In the spirit of the open city, we can use Deleuze’s notion of deterritorialization as a means for injecting openness into, or broadening, how we conceptualize architecture. Simply stated, deterritorialization is a movement producing a change.⁸ To deterritorialize means to free up constraints surrounding a body or entity so



2

that it can be receptive to new organizations and functions. Let us consider the discipline of architecture as a whole body composed of parts that stand in relation to each other. By abandoning our current understanding of building, landscape, and infrastructure as the means by which we ground, contain, and connect, we can emancipate architecture from its fixity as a purely physical practice and can begin to explore its potential for broader impacts. In other words, if we cease thinking about object-building and start thinking about process-problem, we may be able to derive alternative solutions that are not only object-buildings.

Systems thinking can offer a line of flight through which architecture can establish these new capacities. A system is a set of elements in dynamic interaction organized around a goal. Examples of natural systems include the human body, the solar system, and ecosystems, while designed systems include locomotives, airplanes, software, government agencies, and businesses. Systems thinking is a set of habits or practices within a framework that is based on the belief that the component parts of a system can best be understood in the context of each other rather than in isolation. Systems thinking fosters problem solving by encouraging questioning, flexible thinking, and appreciation of new, emerging insights and multiple perspectives.⁹

Systems thinking is in fact not new—it dates back hundreds of years. James Madison argued for a system of checks and balances as a means of controlling the government, which led to the creation of the legislative, executive, and judicial branches of government. Charles Darwin's theories on natural selection suggest that evolution is a systemic product of the differential survival of individuals with different combinations of survivor traits. More recently, Peter Senge, the director of the Center for Organizational Learning at the MIT Sloan School of Management, developed a systems thinking approach for converting companies into learning organizations. Senge distills three characteristics of systems thinking that can offer framework for its incorporation into architectural practice. First, systems thinking involves a deep, persistent commitment to learning. Second, it requires us to challenge our mental models and prepare ourselves to be wrong. Third, it means triangulating our perspectives.

Figure 2: "Bird's Nest" Olympics Stadium, Beijing, Herzog and De Meuron.

The foundation of systems thinking is seeking collective intelligence so that we can balance short term and long term needs in favor of a global commons. While everything is connected, no one is ever going to figure out all that interconnectedness because of the complexity of the system. Instead, the potential of systems dynamics lies in its ability to empower people and support the human capacity to create.¹⁰ As Senge argues, smart individuals are no longer needed but rather smartness collectively along with a change in values and supply.¹¹ This means a shift away from the traditional role of architect as the expert and sole visionary as well as abandoning the binary client/architect relationships in favor of a team approach where everyone—architect, client, user, community, stakeholder, other multidisciplinary groups—is considered a designer and the best interests of the community at-large are among the top priorities.

One of the primary goals of designers must be distributing capacity. In the context of architecture, capacity refers to the self-sufficiency, resourcefulness, and resiliency of a community. In order to build capacity, macro-level thinking must be brought to the local affected community. Bruce Mau contends that we need to explore broader systems of exchange, or “design economies,” rather than operating too microscopically. For example, instead of isolating graphic design, we must consider economies of information, and instead of isolating architecture and planning, we must look at urban economies. This allows new, unseen patterns to emerge, revealing complexity as well as offering opportunities for integrated thinking across disciplines. Capacity building happens when interconnected knowledge becomes collective intelligence that is accessible to the local community and can thereby catalyze greater, systemic outcomes. As Mau writes, “The contradiction embodied in the practice of architecture is that it has traditionally chosen to focus on the big buildings rather than to see the big picture as the most compelling design project. Architects have tended to build pieces of city without regarding their relationship to the whole. But holistic thinking is exactly what we need here if we’re ever to develop the capacity we need to provide shelter on a global scale. It’s clear that synthesis is not merely useful: it’s critical.”¹²

The second component of Senge’s framework is that our ability to be systems thinkers is hindered by the fact that we see straight lines when the world is actually comprised of circles.¹³ We are inhibited by our mental models—the images, assumptions, and stories we carry in our minds of ourselves, other people, institutions, and every aspect of the world. If we do not challenge these deeply ingrained assumptions, we will limit our abilities to discover non-obvious areas of leverage when we attempt to solve problems. Systems thinking requires a unique approach that is both analytic and synergistic in order to address complexity and nonlinearity.¹⁴ As architects, by breaking the problem down into its constituent parts and simultaneously synthesizing it, we can explore both macro and micro solutions that are more than just buildings.

Senge’s last point about systems thinking is that we must be open and receptive to different points of view. He asserts that it is critical to bring together people who each see different parts of the whole and collectively see something that individually none of them see. Our current approach to architectural design is not particularly open to broader perspectives—it is very top-down both on the client’s end and on the architect’s. It is critical to dismantle these dynamics and pierce through the hierarchical mentalities that dominate most design processes. If we can transition from the architect-as-master-builder mentality to the architect as the facilitator of a collaborative, interdisciplinary process, we can include



3

a wider variety of perspectives and skillsets into our work which will lead to better, more sustainable solutions.

HOW CAN THE PRACTICE OF ARCHITECTURE BE EMERGENT?

A key principle of systems thinking is the concept of emergence, the idea that the whole is greater than the sum of its parts. This principle states that when elements of system interact, something else emerges from the interaction that was not present in the elements themselves and is usually quite complex in comparison. Science author Steven Johnson has studied emergence in a wide variety of contexts—from amoeba-like slime mold which consists of thousands of cells that intuitively swarm together when the weather conditions are unfavorable to ant colonies that can quickly determine the shortest distance to a food source or create intricately patterned ant hills the size of a human-being without any executive oversight. Emergent phenomena are unique in that they draw on the collective intelligence of the group to solve problems and adapt to the changing needs of their dynamic environment. The following three case studies exemplify emergence in architecture by seeking solutions beyond buildings.

Case Study 1: Building Capacity in South Africa

As we are seeing, the problems that architects are tasked with addressing are often underpinned by a component that is intangible. As Cameron Sinclair, founder of Architecture for Humanity (AFH), saw in South Africa, the issue was the AIDS epidemic. Young girls ages nine to 14 are three times more likely to become HIV positive than youth in other parts of the world.¹⁵ The goal of AFH's Siyathemba project was to use sports as a vehicle for bringing health services and HIV/AIDS awareness to this hard-to-reach demographic. In 2004, AFH hosted

Figure 3: Siyathemba Soccer Clinic, Architecture for Humanity.

an international design competition for a community health clinic. Nine finalists were publicized in schools and health clinics throughout the region so that the youth could make the final choice. Winner Swee Hong Ng worked with local architect Steve Kinsler of East Coast Architects, volunteers from the Africa Centre for Health and Population Studies, community members, recreation officials, and the players themselves to adapt and refine the design. Through a series of workshops and meetings, the project took on a life of its own—the facility became not only a health clinic but a soccer field that offered practice space as well as the opportunity for the community to compete at the regional and national level. A healthcare worker was slated to serve as the facility coordinator, providing basic medical services as well as organizing both sporting events and HIV/AIDS prevention programs.

Capacity building is the groundwork for emergence through architecture. In the case of Siyathemba, what started out as filling a need for HIV/AIDS awareness outreach spawned into a competition-caliber soccer field and health clinic with social, cultural, health, education, governance, and community building components interweaving to create a complex system. As TED speaker Nicolas Perony notes, complex does not mean complicated. While complicated means “cum plico” or with folds so that it can be unfolded, complex means “cum plexus” or with weaves so that it cannot be unfolded or reduced. The more complicated a system, or rather the more folds it has, the more likely it will fail. Hence, emergent properties grow out of simple parts whose interaction creates a complex, global behavior which then leads to resilience. The simple components of the Siyathemba project combined with their ability to synthesize and fill so many social and cultural gaps put the residents of Somkhele in a better position for future resiliency.

Case Study 2: Analyzing and Synergizing Property Law in Mexico

Peruvian economist Hernando de Soto has been using systems thinking to redesign property law so that the poor in developing countries have access to property rights. He argues that it takes more than a roof: you need a roof within a system because it is the system that provides the potential for the poor to increase wealth.¹⁶ In Sonora, Mexico, a low-income self-help housing program called El Programa de Vivienda Ecológica (PVE) addresses both “the roof” and the assimilation of new homeowners into the capital and credit markets of Mexico. After a growth spurt in large-scale export farming caused the men of the severely marginalized Yaqui tribe to relocate in search for new work, thousands of single-mother households were left behind in poor living conditions. In response, PROVAY, a Sonoran nongovernmental organization, developed PVE to provide homeownership access to these women based on their capacity to form and maintain small credit support groups. These groups were not only mechanisms for attaining credit, but they also supported the formation of other types of capital—the women developed a thermally insulative adobe block that could be mass produced as well as rooftop insulation panels made from recycled cardboard and straw. Beyond economics, the PVE credit support groups reinforced the social fabric of the Yaqui community—group members supported each other through other forms of capital exchange such as babysitting, helping construct one another’s houses, and joint fundraising.¹⁷

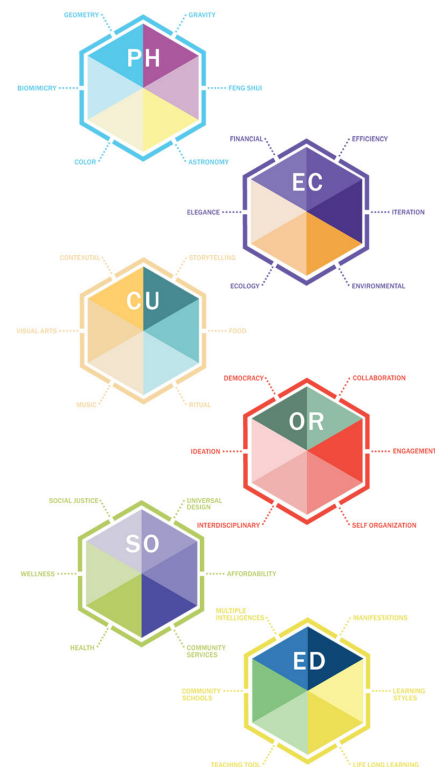
De Soto acknowledges that macroeconomics is unsustainable over time unless you also have the micro: property networks and capital-creating systems that

underpin it and make even the poorest participate in the social contract that it rests on.¹⁸ This lesson not only applies to economics but to all of systems thinking. In order to truly create massive change on a global scale, there needs to be continuous oscillation between analyzing and synergizing. As Manuel de Landa describes, a top-down analytical approach starts with the whole and dissects it into its constituent parts, such as breaking an ecosystem down into species or a society into institutions. Since the emergent properties of a complex system belong to the interactions between the parts and not the parts themselves, an analytical approach is destined to miss the emergent properties that resulted from complex interactions. A top-down model must therefore be complemented with a bottom-up approach—analysis must go hand in hand with synthesis. In the case of the Yaqui, PVE created a micro-level system that could be broken down into a variety of local social, cultural, organizational, and economic strategies that, when synthesized, not only integrate the Yaqui women into a larger macro-economic system but also create emergent outcomes such as strengthening their social fabric and reinforcing their culture.

Case Study 3: Collaborative Feedback Loops in New Orleans

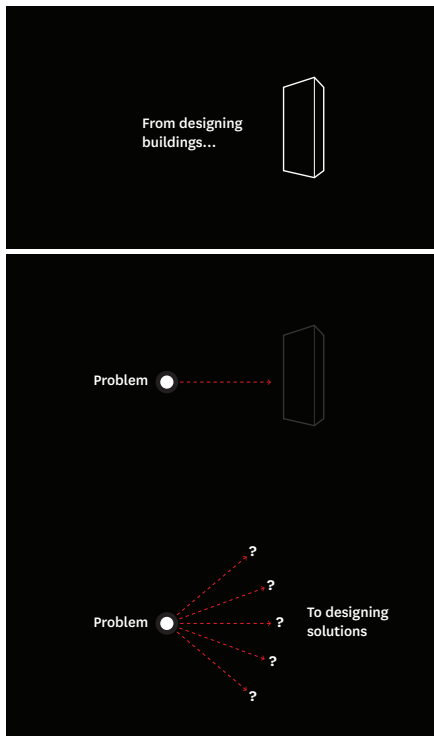
For the last five years, I have worked with Concordia, a New Orleans-based architecture and planning firm, whose mission is systemic alignment through civic engagement and collaboration. Following Hurricane Katrina, Concordia facilitated an interdisciplinary team of urban planners, architects, and community organizers to develop the Unified New Orleans Plan (UNOP). Twelve national and local design firms collaborated to deliver ten district plans and one citywide redevelopment plan in less than five months.¹⁹ The project included voices of more than 9,000 local and displaced residents. In 2011, Concordia collaborated with the Louisiana Public Health Institute and the Neighborhoods Partnership Network to create Healthy New Orleans Neighborhoods (HNON), an online tool for systemically gauging neighborhood health in New Orleans. Since community health includes a variety of factors such as household income, education, economy, environment, and transportation, the HNON website enables citizens to search for statistics in six indicators—social, health, education, economy, environment, and transportation. The education indicator considers factors such as student performance, school environment, and education attainment in the adult population, while the environmental indicator considers air quality, recreation facilities, and access to grocery stores and farmers markets.²⁰ Graphic gauges in each section indicate green, yellow, or red status depending on how the neighborhood compares to other U.S. counties. In 2013, Concordia worked with the City of Alexandria, Virginia and community members to design a process through which the City could engage citizens in decision-making. The What’s Next Alexandria process identified the key principles of civic engagement, a framework for implementation, and a citywide outreach infrastructure, each aimed at nurturing and strengthening the relationship between the City and its residents.²¹

In addition to engagement, Concordia’s process also features a robust systems thinking framework called Nexus Planning and Design. Comprised of six domains—physical, cultural, social, economic, organizational, and educational—Nexus creates a system for identifying a community, organization, or facility’s most vital assets and needs.²² The physical domain includes all the community’s built and natural resources; the social domain houses all aspects of well-being, health, and human services; the economic domain includes programs that balance all forms of financial, human and environmental capital; the organizational



4

Figure 4: Nexus planning and design framework, Concordia, New Orleans LA.



5

Figure 5: In order to attack some of the world's greatest problems and maximize our impacts as architects, we must reframe the practice of architecture from designing only buildings and landscapes to designing processes and solutions.

domain includes private, civic, and public groups; and the educational domain includes pre-K through high school and all post secondary programs for continuing education and workforce training. In collaboration with residents and stakeholders, Concordia identifies potential opportunities and partnerships by mapping and studying the community's assets and needs in each domain.

Concordia's collaborative design and engagement projects demonstrate how continuous feedback loops can encourage the consideration of a variety of perspectives. Just as a thermostat regulates temperature through a "balancing loop," civic engagement provides a mechanism for regulating architecture by helping the project maintain alignment with the broader community's assets and needs. This process is not top-down but rather participatory where the community educates the architect about local issues, concerns, and opportunities and the architect helps the community to build capacity toward self-sufficiency. Not only does this result in greater trust and stronger relationships between the project team and the community, but it also leads to greater results and collective ownership of the outcomes.

FROM OPEN CITIES TO OPEN DESIGN CULTURE

Over the last several thousand years, cities have shifted 180 degrees. While walled fortifications reinforced insularity in our earliest cities, globalization has now shifted our focus outward; fortified cities have been replaced by open cities. In fact, while we still conceive of cities as discrete objects separate from their surroundings, there is actually no exterior to the global, open city that connects and sustains us all.²³ As architects, in order to produce social, ecological, and economic well-being, we must learn to operate within and embrace this larger, open system, rather than continuing to work in tunnel-visioned isolation.

The key to truly sustainable design in the era of the open city is an "open" design culture through which the emancipation of knowledge can create emergent outcomes and lasting, systemic change. There is no place for the self-important, elitist architect in the open city, much less anywhere; the architect must now be the facilitator of a collaborative, multidisciplinary process working toward collective intelligence. This means abandoning the binary client/designer relationship to work together toward strengthening the global commons. It means broadening the disciplines that make up the design team and considering members of the community as valued members of the design team. It also means empowering the community to operate autonomously at the completion of the project. We need to be less focused on intellectual property and the commodification of knowledge and more focused on the ongoing production of it.

Creating an "open" design culture requires a shift in pedagogical approach from one that reinforces competitive, survival-of-the-fittest mentalities to one that values systems thinking and interdisciplinary collaboration. Pedagogy is the critical place where openness and receptivity can be instilled upon aspiring architects. As mathematician and theorist Nikos Salingaros argues, architecture schools train students not to see the world, not to trust their own sensory apparatus, and not to question the approved images of fashionable architecture.²⁴ Students currently operate in boxes where they only see the aesthetic issues of architecture, resulting in metaphorical building partis and style explorations that have limited meaningful relevance or consideration of greater global issues. These projects approach buildings as if they are collectibles, not agents of change. It is critical that we train students to be curious, ask questions, look

for connections, and most importantly, seek opportunities to solve problems. Stanford University's Institute of Design offers an example of how systems thinking can be integrated into pedagogy. The D.School is an innovation hub where students and faculty in engineering, medicine, business, law, the humanities, sciences and education simultaneously work through industry, academia, and the "real world" to take on some of our greatest systemic challenges as a society. The program's intent is to prepare future innovators to be breakthrough thinkers and doers, use design thinking to inspire multidisciplinary teams, foster radical collaboration between students, faculty, and industry, and tackle big projects.²⁵ The D.School recognizes that the primary responsibility of design education should be to help prepare a generation of students to creatively rise up to the challenges of our times.

In addition to reframing architectural pedagogy, creating an open design culture also requires practicing architects and urban designers to acknowledge our current global state of affairs and be proactive in leading the charge toward systemic, sustainable change for all of humanity. If we truly want to create sustainable projects and lasting change, we cannot pick and choose what constraints we address—anticipating social, cultural, and economic impacts are as much design constraints as optimizing building orientation to reduce solar gain. If we want to maximize our impacts, we need to be open to the different types of "deliverables" that such an approach will produce. In one instance, an outcome might include an inhabitable structure while in another, it might be organizational governance strategies or an outreach process. We can no longer limit ourselves to what can be communicated in a Construction Documents set of drawings—we are design thinkers and visionaries after all. If the problems we are really trying to solve are the greatest issues that plague our world today, we must embrace openness and push toward emergence.

ENDNOTES

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