Game Change
for Built Environment Professionals

Part I: Growth Through Innovation & Entrepreneurship

Kyle V. Davy AIA
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The last thirty years have been tough for engineers, architects, and other design professionals. Markets have shrunk and core services have become commodities. Firms find themselves trapped in limited, reactive, risk-averse roles, playing a game they can't win -- increasingly marginalized, put upon by clients, and threatened by new types of competitors.

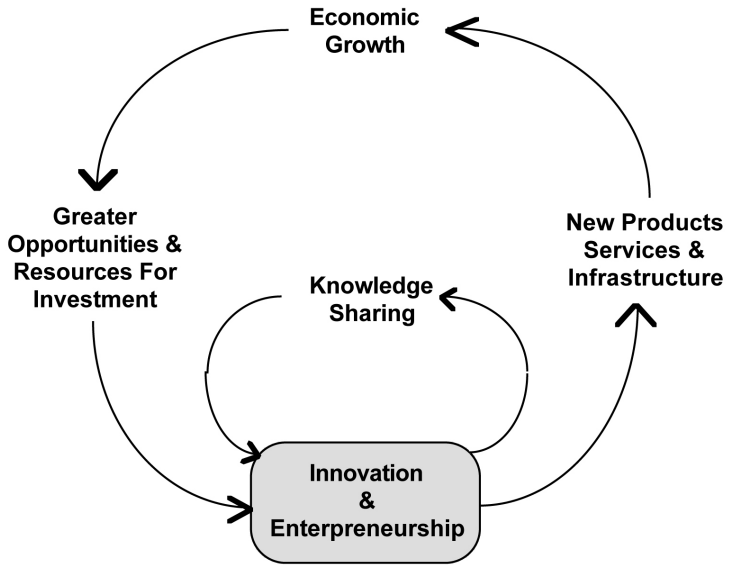
But, engineers and architects can change the game. Given the right moves, design professionals can once again become drivers of economic growth -- turning challenges that confront clients and communities into opportunities for technical innovation, entrepreneurial initiative, and ultimately, the transformation of their professional practices.

Innovation Drives Growth

Technical innovation and knowledge sharing are, according to economist Paul Romer, the fundamental drivers of economic growth and development. In the hands of entrepreneurs, new ideas give birth to new products and services, which in turn generate more new businesses. He describes how a cascade of technical insights and knowledge flowing from innovator to

innovator and entrepreneur to entrepreneur creates a dynamic of ever increasing returns, a phenomenon that explains the lion's share of economic growth.[1]

The explosive growth of California's Silicon Valley is a living example of Romer's virtuous cycle—a crucible of technical invention and knowledge sharing within an extended, open community of private sector computer engineers and programmers, scientists and researchers, and business entrepreneurs. Across an arc of fifty years, people and ideas flowed from semiconductor companies (Fairchild Semiconductors) to personal computer makers (Apple) and a growing venture capital community. Venture financiers, in turn, funded generations of technology startups including Internet pioneers (Netscape), whose work created fertile ground for the emergence of search companies (Yahoo, Google), which led to social network innovators (Facebook, Twitter), and so on in this highly networked, creative hotspot.



Virtuous Cycles
Innovation, Knowledge Sharing, & Growth

[1] *Knowledge and the Wealth of Nations: A Story of Economic Discovery,* David Warsh, W.W. Norton & Company, New York, 2006. Original source: *Endogenous Technological Change,* Paul M. Romer, Journal of Political Economics, University of Chicago Press, October 1998, pp. S71-102.

Fundamental to this virtuous growth dynamic is Romer's observation that although there are first costs incurred in developing a new idea, future use and reuse of that same idea is virtually free and often spreads rapidly. The original sequencing of the human genome, for example, took over a decade and cost billions of dollars. Today, new genomes are mapped in hours at a cost of just thousands of dollars. The how-to of genome mapping is now "in the air" of the biotechnology industry, available at little additional cost to help create and grow new enterprises. Those businesses, in turn, generate their own innovations and knowledge, which then feeds the creative thinking of the next generation of researchers and entrepreneurs -- accelerating the growth of the bioscience economy.

Romer's insights offer a game-changing path for built environment professionals. By combining their capacity for generating new ideas with a renewed willingness to take initiative as professional entrepreneurs they can drive economic growth and development. And by following this path, firms can become lynchpins in an emerging entrepreneurial economy.

Past as Prologue

This is a role they have played before. Engineers and architects were highly esteemed engines of economic growth in the Nineteenth Century. They not only helped invent many of the technologies that drove much of the industrial revolution in North America, but also led in the creation of many of the great enterprises of that era.

The building of the Erie Canal was one of the earliest projects that demonstrated the powerful impact of design professionals on growth and development. Completed in 1825, it drove the nation's economy for the next fifty years. The technical ingenuity and drive of engineers like Benjamin Wright and James Geddes -- men who literally learned their profession on this job -- made the construction of the canal possible. Their engineering achievements ranged from inventing new means of grubbing the standing timber that covered much of the 350 mile-long canal route, to creating new concrete materials to seal the waterway's surface, to designing the mechanical works and structures for over 80 locks and 18 aqueducts located along its course.

The economic impact of the canal was profound; farmers across the American interior found new markets for their crops, new cities and industries sprang up along the canal's length, and New York City grew rapidly into the nation's dominant urban center.[2] Beyond these direct impacts on economic growth, the Erie Canal also set off its own virtuous cycle of technological innovation -- an explosion of invention and a sharp rise in patenting in areas adjacent to the canal as inventors and entrepreneurs tapped into the rich stream of information and opportunities that accompanied the rising tide of trade, commerce, and people flowing along the canal's route.[3]

The completion of the canal signaled the dawn of a gilded age of technological innovation and entrepreneurship by the country's engineers and architects. Beginning in the late-1830s, James B. Francis, Chief Engineer of the Locks & Canal Company pioneered numerous innovations in canal, weir, flume, and turbine technologies as well as hydraulic operations that were pivotal in making the mill town of Lowell, Massachusetts the first major industrial center in the United States. Moreover, Francis' inventions and experiments as well as the calculations, rules, and insights he shared in his seminal publication, *Lowell Hydraulic Experiments,* shaped the new discipline of hydraulic engineering and influenced the design and operation of waterworks around the world well into the Twentieth Century.

During the middle decades of the century, engineers such as J. Edgar Thomson designed, built, and operated America's emerging network of railroads. In 1847, Thomson took over as engineer of the newly established Pennsylvania Railroad, which was to connect Philadelphia west to Pittsburgh. In response to his impressive performance designing and constructing the rail line across that mountainous terrain the board named him president of the railroad. By the end of the Civil War, he had made the Pennsylvania Railroad into the largest transportation company in the country, with more that 6000 miles of track. As late as 1975, *Fortune* magazine named Thomson

[2] Peter L. Bernstein, *Wedding of the Waters: The Erie Canal and the Making of a Great Nation,* W. W. Norton & Company, New York, 2005.
[3] Kenneth Sokoloff, *Inventive Activity in Early Industrial America, : Evidence from Patent Records, 1790-1846,* Cambridge, Mass.: National Bureau of Economic Research, 1988 (Working Paper #2707).

as one of the first 19 people selected for its newly established Business Hall of Fame, along with such other notables as Henry Ford and J. Pierpont Morgan.[4]

The completion of New York City's Central Park in 1873 cemented the reputation for innovation, entrepreneurship, and artistry of landscape architect Frederick Law Olmsted. Olmstead not only designed, but also, supervised the construction of this first-of-its-kind naturalistic landscape located in the middle of a major city. With its use of idyllic, densely planted areas, its segregation of circulation systems for pedestrians, horseback riders, and vehicles, and numerous advances in the construction of the park and planting or transplanting of over four million trees and almost 1500 species of vegetation, the design set the gold standard for parks designed in North America for the next century.[5]

Following Chicago's Great Fire of 1871, the construction of tall buildings, made possible by the technical ingenuity of architects and engineers such as Daniel Burnham, John Root, and Louis Sullivan, transformed that city's Downtown Loop into America's mercantile center. Their innovative solutions for concrete mat foundations, metal framing systems, electric illumination and ventilation systems established prototypes that would be used in the design of steel framed skyscrapers for decades to come. And their artistic treatment of the building envelopes for these structures elevated "Chicago School" architects to a preeminent position in architectural design and professional practice.

Marginalized and Commoditized in the Twentieth Century

By the end of the Nineteenth Century, engineers and architects had established themselves as driving forces in the nation's economic growth and development. Unfortunately, in the next hundred years they largely ceded this position of leadership.

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[4] *The Innovators: The Engineering Pioneers Who Made America Modern,* David P. Billington, John Wiley & Sons, New York, 1996, pp. 114.

[5] *A Clearing in the Distance: Frederick Law Olmsted and America in the 19th Century,* Witold Rybzynski, Scribner, New York, 2003.

During the first decades of the Twentieth Century, the vast majority of engineers opted for employment by industrial corporations, exchanging aspirations for technical invention and personal entrepreneurship for the security of "domesticated" company service as operational managers and efficiency experts.[6]

At about the same time, in an act of professional hubris, leading architects (represented by the American Institute of Architects) traded their progressive stance as technological and design innovators away in pursuit of an ultimately unsuccessful gambit "to elevate the social status of the architects in the public's mind" as artists and keeper's of the nation's cultural identity.[7] Divorcing the art of architectural design from the technicalities of building and construction, architects lost a primary avenue for innovation and creativity and surrendered much of their role in fostering economic growth.

As the century progressed, both consulting engineers and architects in private practice gave up on entrepreneurship and adopted less risky stances, content to provide mostly plain-vanilla services to others. Instead of initiating projects -- they waited for clients to call. Few challenged themselves to invent new technologies or knowledge -- most stayed within their comfort zones of proven technical formulas and well-worn ways of working. Making matters worse, architects and consulting engineers institutionalized these tendencies in the 1970s and 1980s by widely adopting an economic business model focused on selling technical services by the hour that still dominates practice today.

By the end of the century, design professionals found themselves relegated to the sidelines of power and influence and increasingly regarded by clients as providers of commodity-like services to be purchased on the basis of lowest cost. Playing victim to these developments is

[6] *The "Revolt of the Engineers" Reconsidered,* by Peter Meiksins in *The Engineer In America,* Edited by Terry S. Reynolds, The University of Chicago Press, Chicago, 1991.
[7] *Leadership By Design: Creating An Architecture Of Trust,* Richard N. Swett, Ostberg-Greenway Communications, Atlanta, 2005.

hardly a recipe for success: these conditions could spell the death of not only firms, but also the professions themselves.

Romer's Virtuous Cascade in Action

Fortunately, built environment professionals are beginning to confront this adaptive challenge and take steps that thrust themselves back onto Romer's virtuous cycle of technical innovation, entrepreneurship, and growth.

The recent evolution of LEED (Leadership in Energy and Environmental Design), a rigorous set of green building standards created under the auspices of the U.S. Green Building Council (USGBC) offers a prime example of this new dynamic. From its beginnings in the mid-1990s, architects and engineers were pivotal players in the creation and implementation of the LEED standards and rating system. Widely adopted across the building design industry in the last fifteen years, LEED has had a significant impact on the design and construction of tens of thousands of projects, saving energy and materials, reducing greenhouse gases, eliminating toxins, improving human health, and enhancing the experience and productivity of building users and occupants.

LEED, in turn, has been midwife to the birth, or rebirth, of numerous businesses in the design and construction industry. Over 1000 businesses and non-profits are now engaged in the recycling and reuse of building materials alone. According to a study by Booz Allen Hamilton, LEED projects will have generated an additional $12.5 Billion in GDP and created over 230,000 jobs in the U.S. economy by 2013[8]. LEED's success has also been a spur to the broader green movement within the design and construction industry and in society as a whole, shifting mindsets and fostering innovations that not only use less energy and do less harm, but also heal and regenerate larger living systems, prompting leaders in government and industry to add sustainability as a key criteria in decision-making processes.

[8] *Green Jobs Study,* Booz Allen Hamilton, prepared for U.S. Green Building Council, Washington, DC, 2012.

Seeing and Seizing Opportunities

Beyond the spin-off effects of technical innovations, small numbers of design professionals are also reawakening to the potential of professional entrepreneurship, seeing and seizing on opportunities for innovation and change that lie within and/or adjacent to their professional domains. Some, like their Nineteenth Century ancestors, they are choosing to not only design, but also finance, build, operate and/or own facility and infrastructure projects. Others are developing alliances with manufacturers to design new building products and systems (from eco-friendly fabrics to building envelope systems); creating new forms of intellectual property by creating software for, and mining, "big data" from client systems; engaging in performance contracting for energy projects; and establishing companies to design and build their own lines of pre-fabricated housing.

Young architects and engineers are also starting new types of practices, often as non-profits or for-benefit companies, focused on goals of social entrepreneurship--serving needs of neglected or disadvantaged populations, often overseas, helping in disaster recovery efforts, or pursuing strategies to prevent or lessen the damage from global climate change.

For these professionals, it's a game changing strategy. They are bearing the risks and reaping the rewards that come from bold new value propositions that move beyond selling technical services by the hour.

Game Change: Mind Shift Required

A mind shift, from a fear of consequences to being open to possibilities, is fundamental to this game changing strategy. Fear of consequences (lawsuits, commoditization, lost clients, economic losses, loss of self esteem, etc.) drives professionals and firms into protective crouches designed to ward off the worst effects of turbulent economic conditions and changing industry dynamics. Although this stance may be helpful in the short term, it dramatically undermines long-term viability. As leadership consultant David Aitken points out, a living organism cannot protect

itself and grow at the same time. Protection inhibits the flow of knowledge, people, resources, and opportunities a living company needs in order to thrive.

Openness changes the game. Dramatic challenges come with new possibilities – "mysteries" to be explored, partners to connect and collaborate with, forums for bringing creative people together, and opportunities to craft bold new value propositions. Changing the game through technical innovation, knowledge sharing, and entrepreneurship renews the life-sustaining connection between professional designers and their environment. It re-establishes the symbiotic relationship between engineers, architects, and other creative design professionals and economic growth. And, it can propel firms toward more prosperous futures.

Coming Next: Part II: Becoming A Professional Entrepreneur

A Note On This Series

Game Change for Built Environment Professionals: Growth Through Innovation & Entrepreneurship, is the first of a three-part series exploring how engineers, architects, scientists, and designers can change the game of professional practice through technical innovation, knowledge sharing, and entrepreneurship. The second essay examines specific strategies for technical innovation and becoming a professional entrepreneur -- including case studies of firms are already engaging in these types of entrepreneurial initiatives. The third essay raises the bar for built environment professionals regarding their mission to spur the growth and development of society, going beyond just economic growth to propose a broader definition of responsible growth, bringing more people up to decent standards of living while making our living systems healthier and more resilient.

I would appreciate thoughts and feedback about this essay. Please send your comments to: *kyle@kylevdavy.com*