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ENTREPRENEURIAL SOLUTIONS TO GLOBAL CHALLENGES

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About *Innovations*

***Innovations* is about entrepreneurial solutions to global challenges.**

The journal features cases authored by exceptional innovators; commentary and research from leading academics; and essays from globally recognized executives and political leaders. The journal is jointly hosted at George Mason University's School of Public Policy, Harvard's Kennedy School of Government, and MIT's Legatum Center for Development and Entrepreneurship.

Mary Walshok

A Systemic Approach to Accelerating Entrepreneurship

Extraordinary changes have taken place in the United States since the mid-1980s, when the passage of the Bayh/Dole Act, which allowed research institutions to license inventions coming out of federally funded grants, and the creation of the Small Business Innovation and Research (SBIR) program helped unleash an unprecedented era of innovation and entrepreneurship across the country. It is clear that the larger environment in which entrepreneurial enterprises emerge is critically important to the incubation, growth, and sustainability of wealth- and job-creating companies. We have a long history in this country of celebrating heroes, pioneers, and individual entrepreneurs, based on our deep belief in the power of the individual over his or her environment. However, increasing evidence suggests that environment, timing, and support can either enable or inhibit individual achievements, including successful entrepreneurship.

The 21st-century environment for innovation and entrepreneurship has become globally interdependent in terms of inventions, innovations, markets, production, and talent. Discretionary resources are dispersed, rather than being concentrated in the hands of a few individuals or companies. Thus, many of the policies and practices vis-à-vis incentivizing and accelerating entrepreneurship in the 1980s may be insufficient for the challenges of the 21st century. It may be time to rethink what it takes to accelerate innovation and entrepreneurship in a global knowledge economy.

My experience working in a community that completely reinvented itself over a 30-year period suggests that accelerating entrepreneurship is as much about community transformation as it is about helping individual entrepreneurs. Enhancing community capacity as it simultaneously supported entrepreneurs was at the core of San Diego's strategy, especially the University of California, San Diego's innovative CONNECT organization, which was created to be a catalyst for technology entrepreneurship. Started in 1984, just as the larger environment that enabled more localized innovation and entrepreneurship was unleashed by less restrictive intellectual property and financial policies, CONNECT began with an

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explicit commitment to enhance community capacity as it simultaneously provided support to individual entrepreneurs.

SAN DIEGO'S TRANSFORMATIVE JOURNEY

In a nutshell, well into the 1970s, San Diego's economy had benefited from and leveraged federal relationships while supporting four wars—World Wars I and II, the Korean War, and the Vietnam War—and from the expanding military industrial complex that emerged in the late 1940s and 1950s. The military's growing appetite for advanced technologies built on good basic science, especially in the naval and aviation arenas, drove the growth of a major R&D sector. All of this activity was animated by concerns about defending democracy in the world and protecting national security on the home front. The remainder of San Diego's economy consisted of small businesses and booming real estate and tourism sectors. The result is that San Diego's economy throughout the 20th century and even in today's "new economy" has been and remains significantly dependent on military expenditures, which were close to 50 percent of the economy during the major wars and is approximately 25 percent today because of the installations and R&D activities going on in the region. However, the city's business culture has consisted of diverse small enterprises that collaborate and co-invest in a variety of initiatives, among which was assuring continued federal investment in the region.

The extent to which the military, and now the federal government more generally, has been the driver of economic prosperity in the San Diego region is the subject of a book I published with my colleague, historian Abe Shragge, *Invention and Reinvention: The Evolution of San Diego's Innovation Economy* (Walshok and Schragge, 2013). The story line, which is extremely relevant to contemporary discussions about accelerating entrepreneurship, highlights how important collaborative mechanisms, as well as an ambitious and adaptive civic culture, were to San Diego in its journey to becoming a major innovation hub. Supporting the development of new technology clusters and edgy, risky entrepreneurial enterprises, along with leveraging assets, especially land, has been a key component of the region's DNA for more than a century.

A distinguishing feature of San Diego's economic character is the fact that it has relatively few Fortune 500 companies, no significant history of multigenerational family wealth and influence, and little history of dominant employers, with the exception of the aerospace industry throughout World War II and during the Cold War. Lacking the traditional "anchor" institutions hosted by larger, older industrial cities, such as Pittsburgh, Detroit, St Louis, and even Seattle and Los Angeles, San Diego has had to rely for more than 150 years on coalitions of small businesses, collaborative initiatives between government and business boosters, and a unique relationship with the federal government that began as early as 1907.

In the 21st century, the features of San Diego's economy that were a liability during America's amazing agriculture and industrial growth—community practices and a social infrastructure that support, celebrate, and accelerate entrepreneur-

ship—are now important assets. The San Diego story, and especially the story of CONNECT, an organization created by a group of civic leaders in partnership with UC San Diego, may have much to teach about which characteristics of community encourage not only individual entrepreneurs but also the growth of new business clusters driven by innovators and entrepreneurs on multiple fronts—communications, software, biomedical devices, pharmaceuticals, and sporting goods.

My experience working in a community that completely reinvented itself over a 30-year period suggests that accelerating entrepreneurship is as much about community transformation as it is about helping individual entrepreneurs.

San Diego's transformative journey began early in the 1980s, when the entire Southwest was dealing with the implosion of the savings and loan industry, which resulted in bankruptcies and an overall decline in the powerful building and real estate financing industries, both of which had been major drivers of regional prosperity since the 1950s. This crisis was paralleled by a significant decline in defense manufacturing; in San Diego this included the aerospace industry and the Atlas missile. In fact, General Dynamics, whose workforce in the San Diego area at one time numbered 60,000, completely closed down over an 18-month period, leaving thousands of engineers, technicians, and other workers without jobs by the late 1980s.

At this time, the entire country was coming to terms with the emergence of new global competitors, especially Germany and Japan: foreign cars, televisions, computers, and semiconductors were entering the U.S. market and significantly challenging U.S. industries that essentially had had a monopoly in their markets since World War II. There were many significant initiatives in response to these new global competitors, and to the decline of global market share, jobs, and the wealth of U.S. companies. Bayh-Dole, SBIR, and the deregulation of the banking industry were but a few.

Meanwhile, a consortia of industries interested in advancing technology in sectors where U.S. dominance was threatened came together to co-invest in major R&D and commercial centers. The Microcomputer Consortium in Austin, Texas, and Sematech in Northern Virginia are two examples. Smaller consortia were also developing across the country. In 1983 at UC San Diego, for example, 3M, Control Data, Eastman Kodak, and others joined with a local entrepreneurial company, Spin Physics, to create an R&D consortium around information storage for the computer industry. Their investment included hiring a full-time librarian, whose primary focus was Japanese and international research publications in the area of

information storage and magnetic recording. These developments and perceived threats, which began to dominate conversations among industry and government leaders about challenges to America's competitiveness, had a profound impact on how regions in crisis began to think about new paths to prosperity.

San Diego began to develop strategies for engaging these new realities earlier than most cities. The city's long history of military-related R&D led to the establishment in the 1950s of institutes valuable to the military's technology needs. They were located on the Torrey Pines Mesa and included the new University of California, San Diego, which opened its doors in 1964. By the mid-1980s, the city's decision to give valuable land to organizations such as General Atomics, the Salk Institute, the Scripps Research Institute, and UC San Diego resulted in an array of basic research institutions that were attracting more than their fair share of funding from the Department of Defense, National Science Foundation (NSF), National Institutes of Health, and private foundations.

Although the robust basic research budgets for these institutions were clearly focused on advancing science and not on entrepreneurs who were commercializing technology, a number of companies were founded by the talented individuals who had been drawn to the research institutions. This suggested to civic leaders that there might be potential to develop the region's entrepreneurial sector. The area already hosted entrepreneur-driven, high-growth companies that had been incubated on the Mesa contiguous to the rapidly growing basic research institutions: iMed and IVAC were founded by engineers working on the research vessels operated by the Scripps Institution of Oceanography; and military contracts related to satellite and wireless communications development were spurred by companies such as Linkabit and the groundbreaking biomedical company Hybritech, both of which were founded by UC San Diego professors. So at San Diego's moment of crisis, when large employers such as General Dynamics were beginning to downsize, a national furniture manufacturer was leaving, and efforts to attract R&D consortia had failed, regional leaders shifted their attention to growing more local enterprises that would draw on the technology applications emerging from the basic research being done on the Torrey Pines Mesa.

NURTURING AN ECOSYSTEM OF INNOVATION

In the summer of 1984, Dan Pegg, head of the San Diego Economic Development Corporation, approached Richard Atkinson, chancellor of UC San Diego, who had come to the school after six years as director of the NSF, where he had been a key player in the creation of both Bayh-Dole and SBIR. Atkinson was responsive to the idea of UC San Diego creating a school for entrepreneurship, with the goal of accelerating the kinds of success achieved by companies such as IVAC, a medical device company, Linkabit, a wireless communication company working with the Navy, and Hybritech, one of the nation's first biotech companies developing monoclonal antibodies for cancer drugs and other purposes. At that time, however, UC San Diego was firmly committed to being a basic research institution that prima-

rily offered PhDs. It did have a medical school, but it was producing more medical researchers than practicing doctors. By 1984 the university had consolidated the computer science, electrical engineering, and applied mechanics departments into a division of engineering, but these departments also were graduating primarily doctoral students. The school's academic senate was adamantly against starting a business school or any applied professional schools, so the campus was ill equipped to create the kind of entrepreneurship education program civic leaders were advocating. However, the campus had developed a number of close ties to the technology companies on the Mesa through its extension division, in large part to support Atkinson's desire to build links with local industry similar to those at Stanford University, where he was a professor for over 25 years.

In Atkinson's first two years at the helm of UC San Diego, the university's extension division launched an executive program for scientists and engineers, and a division of engineering continuing education that grew by leaps and bounds as it served engineers working primarily in local companies. I had been appointed dean of the extension division shortly after Atkinson's arrival, and as a sociologist I also had been studying the character of the local industry, its aspirations and needs. Chancellor Atkinson asked me to do a series of interviews with key technology leaders in the region to assess what UC San Diego might do to accelerate entrepreneurship and business creation, given the academic parameters within which we had to work. What we learned from this process proved pivotal to the region's development, and in the fall of 1984 it became the basis for the CONNECT organization, which has been credited by numerous sources (from Michael Porter to *Time, The Economist,* and the *Wall Street Journal*) with being the catalyst for reshaping the economy of San Diego.

What I learned from the interviews in San Diego varied enormously, depending on which player in the larger ecosystem I talked to. Leading attorneys, bankers, accountants, and marketing people in the region were quick to say that the only way to accelerate entrepreneurship in San Diego was to develop programs that taught scientists and engineers about business—how to assess the market value of their technology; to cost out what it would take to develop the technology; and to access customers, understand their competition and, eventually, build a winning business plan. The business service community was focused on the lack of traditional business skills among would-be entrepreneurs in the technology sector—skills without which the region was unlikely to start and grow more companies. Fortunately, I also interviewed some of the scientists who had built successful companies in the region, and their view was entirely different. They saw the absence of a tech-savvy business services community as the biggest challenge to accelerating entrepreneurship in San Diego. To a person they described how they had to go outside the city for their legal services, and how they had to recruit for marketing and human resources professionals and general managers outside of San Diego. Their view of how entrepreneurship was understood within the business community was that, if they "got" it at all, it was to build on an industrial model by creating products and companies for the local and regional market, and eventually to expand to

national and international markets. This is what successful San Diego companies such as Price Club, Jack-in-the-Box, and WD40 had done. The tech entrepreneurs underscored how important it was to understand IP, innovative financing, and global regulatory issues, and to tap into global sources of financing and build business strategies that were global from day one. The scientists asserted that this kind of competency did not exist within the regional San Diego business community.

With these inputs, a small advisory group that Atkinson and the CEO of the Economic Development Corporation had put together agreed that what was needed was some sort of organizational platform to change practice and align the two sectors, with UC San Diego acting as an honest broker. The platform would provide education, training, and networking to create the knowledge flows between these two communities, enhance the competencies of each vis-à-vis new models of entrepreneurship, and in the process create a community of innovation and entrepreneurship, rather than just a set of mechanisms that would enable individual entrepreneurs to create individual companies. The strategy and insight proved pivotal to how CONNECT organized and launched its initiatives. It focused simultaneously from day one on enhancing community capacity and providing support to individual entrepreneurs. I had gone into sociology in part because of my interest in how the balance between individual problems and opportunities are shaped by a community's assets and gaps, and thus I was energized by the consensus that had emerged—what C. Wright Mills described as the connection between private problems and public issues (Mills, 1959).

The two contrasting views of what was needed to accelerate entrepreneurship in the San Diego region in the early 1980s became two interlocking themes within CONNECT over the next 20 years. Today most scholars and planners recognize that innovations in science and technology are supported by an ecosystem of complementary competencies and resources, but in the 1980s the CONNECT organization was distinctive in that it was set up to become the hub or connective link within the San Diego region's ecosystem of innovation. Its mission and goals, which were spelled out in a simple one-page statement, reflected two primary themes: the need to develop more sophisticated science and technology product development knowledge within the business community, and to develop more financial, marketing, and management intelligence within the scientific community (Walshok 2009).

One key characteristic of CONNECT is the frequency and intensity of the interactions it facilitates, which included more than 80 programs a year in its early days and more than 200 programs a year today, all of which have focused on both sides of the coin. Scientific briefings targeted to business, finance, and legal professionals such as Meet the Researcher, Frontiers of Science, and Stem Cells on the Mesa create forums through which business professionals can learn about the latest breakthroughs in science and technology and their potential applications down the road, whereas global strategies for financing high-tech companies and marketing bio-companies globally are examples of topics of value to entrepreneurs and business professionals alike. Programs such as Strategies for Financing High-Tech

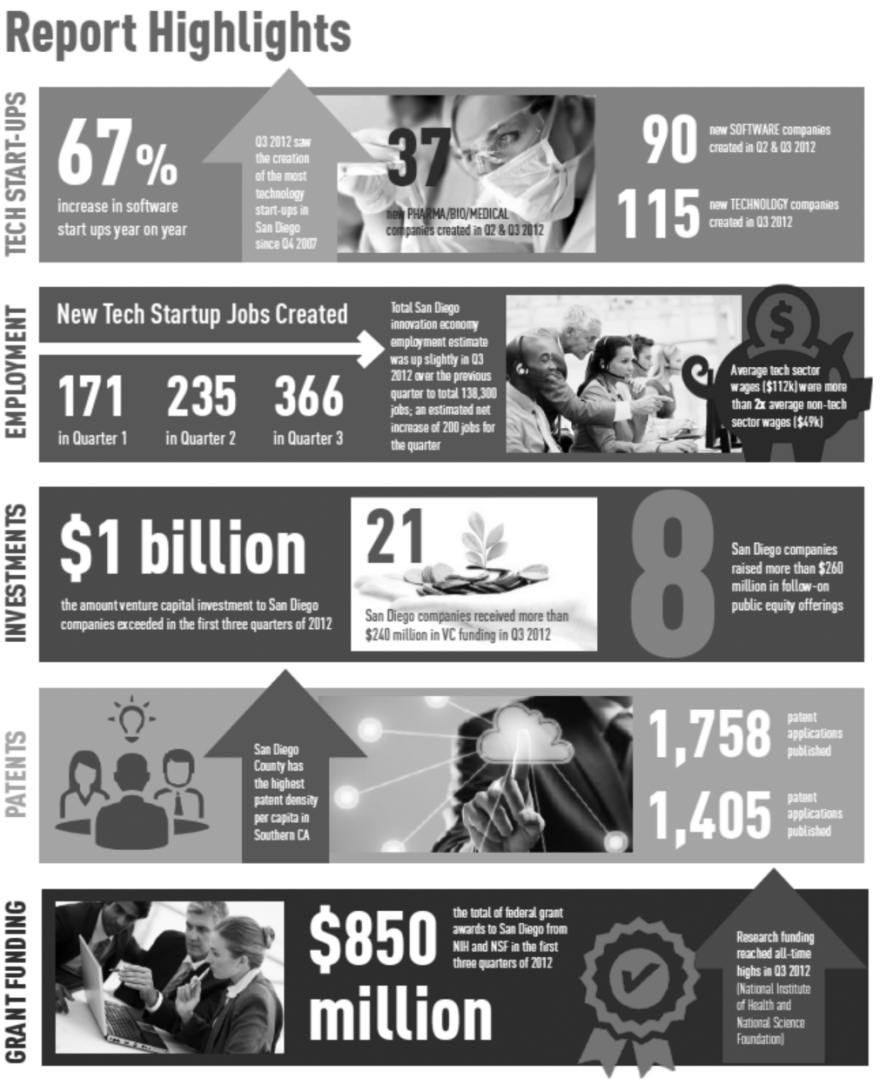

Figure 1. Summary of CONNECT impact from "2012 Innovation Report Highlights"

Companies, Springboard, which provides peer review of early technology ideas and business opportunities, and Meet the Entrepreneur help build the competencies of would-be entrepreneurs.

CONNECT is important not simply because of its programs but because of the extent to which all of its programs rely on the knowledge and insights of experienced entrepreneurs and professionals. It relies, for example, on panels of entrepreneurs in the medical device sector, who describe their experiences while a savvy moderator sums up the lessons or principles that come out of this experience. This sort of education has proved extremely helpful for entrepreneurs and would-be

entrepreneurs, particularly in the technology arena. Another distinctive feature of CONNECT is that it offers a number of celebratory events and social activities that have helped to define and affirm the San Diego region's community of innovators and entrepreneurs. The Most Innovative Products of the Year Awards, for example, are like the Oscars for nerds. The Entrepreneur Hall of Fame celebrates the achievements of entrepreneurs who have built enterprises of substantial value but may not be known among the general public. CEO dinners and wine socials at law firms and incubators create opportunities for local innovators to interact informally. In sum, over a 30-year period, CONNECT has been instrumental in building a community of innovation and entrepreneurship, and in seeding a variety of complementary intermediary and trade organizations relevant to the future of the region's entrepreneurial economy, such as BIOCOM and CommNexus.

The results of not only CONNECT's efforts but those of the whole region to grow the innovation economy and support entrepreneurs and startup enterprises are demonstrated dramatically in CONNECT's "2012 Innovation Report Highlights" (see figure 1).

ESSENTIAL COMPONENTS OF A SUCCESSFUL STRATEGY

If one looks at the key components of an entrepreneurship accelerator such as CONNECT, it becomes clear that certain principles are embodied in its governance, financing, and activities that enable both the growth of an ecosystem of innovation and entrepreneurship and the acceleration of individual entrepreneurial activity, as measured over time by startups and successful companies. In a chapter from a book on developing university/industry relations, I described the essential components of the CONNECT program as follows:

1. CONNECT enables cross-professional knowledge sharing relevant to innovation.

CONNECT is a platform through which the business community, the research community and the innovation community made up of entrepreneurs and investors can regularly interact around issues of mutual concern, learning from one another, not only principles of business and entrepreneurship but from the on-the-ground experiences, practices, and needs of colleagues. This in turn builds the kind of trust that enables continuing collaboration and, most especially, willingness to share risk.

2. A risk-oriented culture adept at managing uncertainty may be the sine qua non of entrepreneurship-rich regions.

The growing understanding among the business community of the multiple factors that need to be addressed in the startup process and the varied resources that can make or break a startup company have significantly helped local companies. In San Diego, more than most regions I have studied, expensive attorneys, consultants, marketing experts, even accounting and venture capital professionals con-

tribute a great deal of pro bono time to help the new entrepreneur with a lot of front-end knowledge, assistance, and advice. As a technology becomes a product with the promise of business creation, the companies and the consultants realize there may be a return to them in a new customer or a new service contract.

Thus the pro bono work becomes a type of longer term business development opportunity. Nearly all of CONNECT's activities are pretransactional, with CONNECT and its advisors receiving no direct monetary benefits in the early stages. Operating costs for CONNECT ($3 million) are covered primarily by memberships, underwriting, and selected event fees.

3. An additional distinctive feature of CONNECT is the extent to which it provides an integrated platform through which all members of the eco-system eventually interact.

Platforms such as these represent more than simply a collection of networking activities and events; they involve stakeholders in a variety of meaningful interactions that produce three sets of benefits that are sufficient to retain the commitment of hundreds of business professionals to providing services over multiple years. Successful integrative platforms do the following things, based on our experience:

(a) *They organize activities and harvest experience and knowledge that help validate ideas or provide truly meaningful input.* This is accomplished in large part because of meticulous attention to aligning the experience and knowledge of advisors with entrepreneurs; in technology assessment, business planning, and financing companies;

(b) *They occur in a setting that is pretransactional and completely open.* Ideas and plans can be discussed, criticized, and adapted in a highly collegial manner in advance of any "official" presentations. What results is a culture in which ideas are not stolen and side deals are not made. People therefore feel confident that sharing in a collegial manner is not a threat but an opportunity;

(c) *People learn about one another, their chemistry, their personalities, and not just about specific technologies or a business plan.* We have done research on members who contribute endless hours to various CONNECT mentoring, evaluation, and education programs. The comment that comes back time and time again is that the value of participating is not only providing support to an entrepreneur or a would-be entrepreneur but learning about the personalities, capabilities and culture of peer service providers and colleagues in the legal and business service environment.

The net effect of all of this is that people can identify pretransactionally potential partners or service providers they would be most comfortable working with.

4. A fourth principle that has emerged from the CONNECT experience is the importance of multiple gateways to the scientific community, as well as to the business community.

The frequency and diversity of activities and the wide range of topics and talent that are brought into the CONNECT program in any given year enables a multiplicity of issues and technologies to be addressed. In addition, the San Diego experience, which began in 1984 with the founding of CONNECT, over the years has witnessed the proliferation of regional intermediary institutions, each of which has a valuable role to play, none of which are directly competitive. A biotech company, for example, could be a member of CONNECT, a member of BIOCOM an industry trade organization, a supporter of the Von Liebig Entrepreneurism Center activities within the School of Engineering as well as an industrial affiliate of the School of Medicine. Many communities worry that too many organizations will result in competition and redundancy, but the overlapping networks serve to reinforce the culture of innovation and entrepreneurship in the region.

5. A final principle that we have concluded is an invaluable lesson learned from the CONNECT experience is how important a culture of co-investment and reinvestment is to sustainable entrepreneurial regions.

By reinvestment, we mean that the beneficiaries of programs or of company success reinvest some of the profits or benefits they have received back into the innovation/entrepreneurship community. This begins with sharing knowledge and relationships and through contributions of personal time, to mentoring, speaking, and evaluating technology and business plans; in other words, a contribution of personal time. However, it also includes actual financial reinvestment. In San Diego, the growth of the Tech Coast Angels is an example. It numbers more than 150 individuals using the offices of CONNECT to run programs that enable early investments in promising ideas. It also is manifest in the significant growth in philanthropic support for the core research enterprises in the region. The San Diego region over the last 30 years has added in excess of $2 billion in new foundations and endowment funds. These institutions, in turn, are investing hundreds of millions of dollars in endowed chairs, fellowships, research facilities, and even scholarships and programs for high school students in science and technology topics. It is clear that the innovation and entrepreneurship community that has developed in San Diego is one that remains here in large part because of the quality of life, but it is also one that reinvests here, both in terms of time and philanthropy, including increasingly in the gifts to the CONNECT organization itself (Walshok 2009).

CONCLUSION

I wrote this essay to help broaden thinking about future strategies for accelerating entrepreneurship. The scholarly literature has given an enormous amount of attention to such things as university technology transfer and IP policies, business-plan-

ning competitions and entrepreneurship education for undergraduates, and the complex financing needs of technology-based startups, especially for proof of concept and clinical applications development. Less attention has been focused on the importance of the larger ecosystem in supporting emerging entrepreneurs on their journey to convert a promising idea or technology into a viable business that can create jobs for the region, as well as revenue that contributes to the local tax base and, eventually, to philanthropy. The San Diego experience and the catalytic role played by CONNECT represent an interesting case of an organization that focused from day one on building an ecosystem that broadly supported innovation and entrepreneurship, and not just a narrow set of issues related to individual entrepreneurs. In other writings and forthcoming articles, my colleagues at UC San Diego and I document many of these ideas through comparative regional studies, as well as quantitative analytical work on the cultural and social dynamics of innovative regions. At its heart, the CONNECT story is about changing the business culture and changing the social dynamics of the San Diego region. My hope is that the outcomes described in this essay help make the case that a systemic approach to accelerating entrepreneurship has great promise.

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