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BY ERNEST J. WILSON III



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In 1893, J.R.N. Tata, the founder of Indian multinational company Tata, and the maharaja of Mysore met by chance on a ship sailing from Japan to Chicago. They agreed that science would be the path to successful modernization of India. During the following years, Tata donated money and the maharaja donated 370 acres of land in order to build a “science city” near a town then called Bengaluru, which had recently been struck by a devastating plague. The result was the Indian Institute of Science (IISc), which soon became one of the world’s great centers of science and technology education (and remains so today). In the ensuing decades, graduates established other

science-related enterprises nearby. After World War II, the government of India located its nuclear science program in the area, and an Indian space program followed.

By the 1980s, new businesses began emerging there, including Infosys (today the second-largest exporter of IT services in India). Bangalore, as the growing city was now called, became a center of commercial activity. It filled with ambitious entrepreneurs and engineers, who used new, technologically sophisticated business models to serve global clients. Yet for all its accomplishments, the city lagged behind Silicon Valley in the United States.

Bangalore seemed to have the right ingredients: It had many companies and banks, both established and startup; a relatively efficient

local government with ties to the private sector; a large network of nonprofit organizations and cultural institutions, and a group of renowned schools and institutes, of which IISc was just one. Yet even with all these conditions in place, one more development was needed before Bangalore could bloom. This was the dramatic shift by the national government in 1990 away from the all-encompassing “license raj” regulatory regime that had stunted Indian growth rates for decades. Once these punishing levels of government controls on business were swept away, and relationships between national government officials and new business leaders became less antagonistic, entrepreneurship reached a critical mass. Bangalore businesses accelerated their climb up the value chain toward product and service innovation.

The Bangalore story is not unique. The same scenario is found in California’s Silicon Valley, Shanghai’s new high-tech centers, Boston’s Route 128, Seoul’s Digital Media City, the biotech corridors around Washington, D.C., and the pharma region near Basel, Switzerland. Other regions, seeking to emulate the prolonged success and influence of Silicon Valley in particular, have been less successful; their investments have not paid off. Most of them pursue a formula that was codified by strategy writer Michael Porter in his book *The Competitive Advantage of Nations* (Free Press, 1990). They set out to create an “innovation cluster,” as it’s called: a network of interrelated organizations intended to jumpstart competitive industries at a regional scale.

But many efforts to generate clusters never reach their goals. In-

novation researcher and *Washington Post* columnist Vivek Wadhwa pointed this out in a July 14, 2011, column. He cited a Norwegian–British study of more than 1,600 companies in the five largest Norwegian cities, all of which have cluster-like qualities. Most of the companies failed. This, says Wadhwa, makes “industry clusters” the “modern-day snake oil.”

For the last 15 years, I have studied innovation clusters in more than a dozen countries. My own research findings echo Wadhwa’s conclusion. Clusters can be vitally important to a country’s innovation and prosperity, but when they are misunderstood, they do not realize their potential. Most efforts to create clusters focus on one or two elements: the heroic innovators who champion their creation, the collocation of companies that lets engineers switch jobs by crossing the street, the business school spawning grounds with professors sympathetic to their students’ entrepreneurial ambitions, the startups with foosball

works. Four different sectors must be linked together: government, business, civil society (not-for-profit organizations), and academia. This is what I call “the quad.” In such an environment, creativity needn’t wait for the unpredictable “aha” moment. It is continually nurtured. The decisions made at every level — investment funds, corporate engineering teams, regional planning boards, philanthropic councils, academic faculty reviews, and many more — are naturally aligned.

In most communities, this quad alignment can be deliberately developed if leaders put three measures into effect. First, they should construct cross-sector networks that are richer, more diverse, and more deliberately structured than those of the past. Building Silicon Valley took 30 years and Bangalore took 100, but we now know how to accelerate the process by drawing on the collective efforts of leaders in all four sectors of the quad.

Second, these leaders should continually reform the way their

ing the right mix of people who can foster serial innovation. Both Silicon Valley and Bangalore benefited from having large demographic cohorts of young, gifted entrepreneurs; other places sometimes have to attract or develop them.

### Cross-Sector Networks

Collaboration between the public and private sectors is the most visible ingredient of a successful quad system; it represents the heart of Michael Porter’s prescriptions. But the variety and quality of the stakeholders involved can make all the difference.

Fairchild, Intel, Hewlett-Packard, Apple, Sun Microsystems, and Cisco were essential to the evolution of Silicon Valley, but so was the presence of great universities such as Stanford and the University of California at Berkeley. Frederick Terman, Stanford provost between 1955 and 1965 (and an engineering professor before that), is sometimes called “the father of Silicon Valley” for encouraging his students to start businesses. Two of his students were William Hewlett and David Packard. Government also played a critical role. Indeed, Terman came to Stanford in 1946 from the U.S. Office of Naval Research, where he had directed the staff that developed jammers to block enemy radar. In the early 1960s, the U.S. military was the market for the first wave of integrated circuits, which were largely made in northern California. The nonprofit sector was less visible, but it played a significant role in the 1990s — especially as computer firms began to invest in clean and healthcare-related technologies.

When all four sectors act together, they can pull and push one another into game-changing collab-

## Building Silicon Valley took 30 years and Bangalore took 100, but now we can accelerate the process.

tables in the conference rooms, or the provision of cash from an earnest government funder seeking to bypass bureaucratic roadblocks.

These factors, no matter how appealing, don’t make a difference unless they can add up to sustainable serial innovation. To generate one groundbreaking technological development after another, innovation must be embedded within long-lived social institutions and net-

organizations are managed — creating a climate that fosters innovation, and adjusting the incentives and organizational structures to reward creativity and collaboration. That’s what venture capitalists provided in Silicon Valley — and what the prohibitively strict license raj managed to prevent in Bangalore.

Third, leaders should invest in talented, innovative individuals, attracting, retaining, and empower-

orations, beyond what any of them could achieve alone. The communities of practice that grow around them become creative havens where people build careers that transcend any one particular company or organization. At the same time, each plays a particular role:

- **Government agencies** provide the necessary infrastructure investment — for example, in transportation, schools, power transmission lines, and land — that can make or break a would-be center of innovation. In Bangalore, a government agency built one of the first software parks for private companies. Governments also provide the stable investment rules, regulatory incentives, and tax breaks that clusters need. In the U.S. in the 1990s, the Clinton administration's insistence on keeping e-commerce tax-free buttressed the bottom line of hundreds of innovative New Economy firms.

- **Universities** provide a steady supply of highly skilled people and experiments that feed the constant hunger for new knowledge. Most universities are established enough to take a long view in their investments and activities, beyond the quarter-to-quarter focus of many firms. The university environment also provides a high quality of cultural life.

- **Nongovernmental organizations (NGOs)** — a category that overlaps significantly with the nonprofit sector — provide a larger contribution than many people recognize,

especially in emerging countries. They are the groups most familiar with conditions “on the ground” in rural and urban communities. The first Internet service provider in Brazil was a nonprofit called Ibase. Grameen Bank and other NGOs provide rural banking and telephony through microcredit. As the financial crisis continues, NGOs are picking up some formerly commercial functions, such as retail banking and publishing.

- **Businesses** provide the cluster with its economic engine. Because they will close down if they fail to innovate successfully, they take the many risks that innovation entails. The private sector furnishes a large part of the capital needed to fund strategic innovation. Most fundamentally, it is a unique source of vitality and creativity, and the only sector that attracts customers in large enough numbers to support a growing economy. For all these reasons, business leaders have a particularly important role to play in moving an innovation cluster forward.

To bring these four sectors together, a quad cluster needs to nourish a high level of mutual trust. Leaders in all four sectors must work cooperatively, knowing that their interests will be protected well beyond the transaction at hand. You can tell when this trust is missing in a prospective cluster; in those cases, people act only on their short-term interests, transaction by transaction, ready to pull out quickly with the first faltering step. Trust must be built gradually, through social infrastructure such as professional associations, social clubs, and other forms of ongoing contact and exchange.

In Malaysia in the mid-2000s, I visited Cyberjaya, a new city carved

out of miles of rubber plantations. At first glance it looked like Palo Alto or Cupertino. But it was a high-tech Potemkin village. Government leaders, under then Prime Minister Mahathir Mohamad, were politically heavy-handed and hostile, especially toward the universities; they feared student rebellions and faculty disloyalty. One professor told me, “Government pretends to support serious research and development, and we pretend to do it.” Collaboration was further blocked by Malaysia's complicated social structure. The government was dominated by local *bumiputra* (people descended from indigenous Malaysians), whereas the economy was run largely by ethnic Chinese, and their relationships could be tenuous and fraught with mistrust. The government's relationship with the NGO sector was also marked by mutual suspicion; the two sectors were potentially competing sources of power. As a result, Cyberjaya has never transcended its role as a mere electronic assembly center for global supply chains, vulnerable to external competition.

By contrast, one of California's recent economic achievements started with a deliberate effort to build trust across the sectors. In 1999, a group of about 20 leaders from universities, research institutes, and state government gathered to discuss the then sizzling state economy, wondering how to spread the jobs and other economic benefits beyond Silicon Valley. Under the governor at the time, Gray Davis, the state set aside US\$400 million of seed money for high-tech R&D. Universities and companies could submit proposals only by collaborating. Soon, four major new consortia, or quads, were formed: one each

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on biosciences and nanotechnology, and two on information and communication technologies. One of these latter two partnerships — the California Institute for Telecommunications and Information Technology (Calit2), based at the University of California at Irvine (UCI) and the University of California at San Diego (UCSD) — was especially successful. Its director, a physicist named Larry Smarr, set up incentives to foster greater collaboration inside UCI and UCSD, while forging external networks with leading private companies like Qualcomm, Akamai, Agilent, and DuPont. Calit2 also established relations with nonprofit business groups like Connect, which promotes high-tech investments in the San Diego area. Calit2 became a center of innovation for applying information and communications technology in healthcare, including new approaches for managing hazardous materials and disaster sites. One Calit2 project was Telios, an operating system that uses sensors and monitors to gather medical data, linking specialists at UCI with patients and medical staff in community clinics. Smarr himself became a leading figure in the “quantified health” movement, which encourages people to track their own medical statistics using technologies like those that Calit2 engendered.

### The Right Organizational Climate

Because entrepreneurs are generally open to organizational reform and opposed to unproductive bureaucracy, clusters can and should become seedbeds for organizational innovation. A successful quad system needs organizations that are willing to continually reform themselves, and to collaborate on building the clus-

ter’s capabilities as a whole, spreading good management practice from one organization to another. Infosys, for example, has created and spread a variety of distinctive new management approaches, including internal networks that seek out ideas. The company provides a variety of rewards — peer recognition as well as money — to employees for

tions — either government-based like the U.S. National Science Foundation or nonprofit philanthropies — which increasingly require grantees to create partnerships across sector boundaries. University researchers, for example, may be asked to work with local communities, the private sector, and the media. This in turn requires these organizations

## Larry Smarr, director of the Calit2 quad, became a leading figure in the “quantified health” movement that cluster engendered.

such proposals. Some entrepreneurially minded people within the organization are put on a fast track for promotion as a result. This practice, unusual for India at the time it was launched, has spread to other companies in Bangalore.

Sometimes the spread of management innovation takes place through explicit contracts: “If we work together, then you will have to make changes so that we can collaborate effectively and efficiently.” Sometimes it happens more informally, as managers and executives copy ideas and approaches on the fly from their fellow quad members. It may also occur through formalized communication: In Washington, D.C., the Government-University-Industry Research Roundtable of the National Research Council seeks out best practices for public-private-university partnerships, sharing them with its members and distributing them widely to interested parties.

Managerial innovation also spreads through funding institu-

to recruit (and learn from) people with special skills and experience in partnering with different kinds of institutions. In this way, organizations that are not familiar with management reform — including many government agencies and universities — discover that there are better ways to make the most of their people and processes.

### Investment in Individuals

Sustained innovation flows from the ideas and actions of creative, capable individuals. They are especially critical to innovative clusters. In my interviews with quad leaders — senior executives and startup entrepreneurs alike — the same skills, talents, and attitudes are repeatedly mentioned. People who can combine them, and put them into action, are essential for the success of a cluster. These attributes include:

- **Synthesis.** People need to “connect the dots,” making the relevant context of a complex issue clear so everyone can move forward.
- **Perspective.** For sustained

collaboration, people must analyze and understand the economic and social environment — the “human ecosystem” — in which the quad operates.

- **Communication skills.** Working across sector boundaries, collaborators must negotiate with and convince others, building pro-innovation coalitions that can be mobilized for worthwhile goals.

- **Intellectual curiosity.** People must be passionate about exploring questions and alternative solutions together, making decisions with urgency but also with an eye to the long term.

- **Empathy.** Those working closely together need the unshakable willingness to listen to and understand others’ point of view, even when that means operating outside their comfort zone.

- **Substantive knowledge.** For those engaged in technical innovation, superior levels of specialized knowledge are essential — and when combined with the other skills and attitudes, they allow people to act strategically.

- **Cross-sector experience.** A successful quad cluster will feature many people with experience well beyond their own silo, preferably in a different country or economic sector. This is one positive side effect of the “revolving door” phenomenon, in which people can move from one firm to another. The wider the range of experiences, the deeper the empathy and the more finely honed an individual’s skills of cross-border communication and negotiation are likely to be.

Taken together, these attributes allow people to think, act, and move across all sorts of borders — institutional and sectoral, as well as national and regional.

### Making Innovation Sustainable

At the Annenberg School, we have seen firsthand the value of this type of collaboration — and the intense, sustained effort it requires. We are deeply involved in a quad-based effort to build an economic cluster in Los Angeles. To accomplish this, we are partnering with top business leaders, senior city and county government officials, presidents of startup companies, local foundations, and think tanks. In our own

of the model to create an integrated, mutually reinforcing whole. The quad becomes successful when a shared set of values and norms emerges, forming a common culture that welcomes innovation. As Barry Jaruzelski, John Loehr, and Richard Holman reported in their study of the business innovation practices of 2010 (“The Global Innovation 1000: Why Culture Is Key,” *s+b*, Winter 2011), the number one cultural attribute cited by successfully

## A successful quad system needs to collaborate on building the cluster’s capabilities as a whole.

university, we have set up new practices and incentives, including grants to incipient innovators, courses on innovation and entrepreneurship, and the new industry-supported Annenberg Innovation Lab, where students from around the university can come to collaborate and experiment. The laboratory’s 15 corporate partners include Verizon, Warner Brothers, and the Brazilian oil company Petrobras. We are now recruiting museums and other nonprofits.

We have also explicitly set out to develop competencies — organizational and personal — that can make these connections pay off. We have revamped our staff development practices, recruited new professors who work in interdisciplinary ways to produce innovation, and hired several new senior staff people with experience in non-academic sectors — people who are good at building partnerships.

As with all puzzles, the most difficult part is meshing together and leveraging the separate pieces

innovative companies is “openness to ideas from external sources.”

Even as communication technology makes it easier to connect with people around the world, the value of clusters will remain. Regions will continue to vie to become the next Silicon Valley or Bangalore. The ones that succeed will be those that deliberately cultivate talented, creative people; foster management reforms that promote innovation; and build networks among key leaders. By focusing on those three leverage points, leaders of a cluster can bring together the four critical sectors — public, private, civil, and academic — nurturing a community that becomes, in itself, an engine of sustainable innovation and economic growth. +

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