



Big Picture

BY JOHN KAO

Tapping the World's Innovation Hot Spots

Countries around the globe are creating distinctive innovation models. What are those models, and how can you take advantage of them?

DURING THE TWENTIETH CENTURY, the world watched as the United States churned out innovation after innovation. Now, however, the tables are turning. Many other countries are placing innovation at the top of their national agendas. From Singapore to Finland, from Chile to China, countries around the world are designing novel approaches to innovation strategy. They are creating forward-looking education and talent-development policies, pouring money into large-scale initiatives, and snapping up new assets in the form of intellectual capital and infrastructure.

What does this new "innovation world" mean for companies, and what are the implications for the people who lead them? Executives can now weigh different national approaches to innovation in terms of their firms' strategic requirements. The models described in this article offer companies both range and richness in developing their

plans. Some of the models exist in a "pure" form in a given country, as the centerpiece of a national innovation system; others are but one component of a nation's overall strategy. By partnering directly with various countries and setting up a lab or a marketing office in a yeasty environment where talent is concentrated and resources are readily available, companies can select from a menu of benefits. For example, high-tech start-ups can be "born global" by availing themselves of talent, capital, R&D tax credits, regulatory relief, and specialized facilities in such innovation hot spots as Helsinki, Singapore, and Shanghai.

Companies can also position themselves as "systems integrators," which incorporate the elements of the models that are most appropriate for their strategies. Indeed, corporate strategists have more opportunity than ever to pick and choose from best practices and resources across the globe and combine them in new and unpredictable ways. In doing so, they can practice what I call innovation arbitrage, taking advantage of differences in regulatory environments as well as in the cost of talent, specialized services, and other inputs to the innovation process.

Model 1: The Focused Factory

The production and operations expert Wick Skinner used the term "focused factory" in a 1974 HBR article to describe the benefits of concentrating manufacturing effort on just a couple of tasks. The focused-factory innovation model combines a clear strategic intent with a concentration of infrastructure and high-octane talent in an effort to discover and deploy new solutions to big challenges. Countries such as Singapore and Denmark, for instance, focus their innovation investments on a handful of industries or research fields.

Singapore has made an impressive commitment to scientific research, illustrated by its plan to increase funding for R&D projects in life sciences, clean technology, and digital media from 2.6%

IDEA IN BRIEF

- **There's a whole new world of innovation opportunities opening up for your company – if you know where to look. Dozens of countries sponsor programs to lure innovative enterprises to their home territories. Singapore offers tax relief, employee training, and R&D grants to life sciences firms that locate there. India provides talent management for some of the world's most sophisticated technology development work. Finland is becoming a global center for innovative design.**
- **To capitalize on these and other innovation hot spots, identify which countries' offerings best fit your company's innovation strategy. Be prepared to mix and match. For example, Nile Therapeutics, a biopharmaceutical firm, uses intellectual property from Italy and conducts clinical tests in Eastern Europe. The company employs eight people rather than the 100 that similar firms require.**

to 3% of GDP by 2010, despite the economic downturn. If a company conducts research in any of those areas and sets up a facility in Singapore, the government will consider providing tax relief, state-of-the-art infrastructure, training for technical staff, and research grants covering up to 40% of expenses.

So far, the Singaporean government has devoted more resources to the life sciences than to any other field. Witness the creation in 2003 of Biopolis, a 2-million-square-foot biomedical research center. Singapore scours the world for both established scientific leaders and top post-doctoral students to work at the center, which is on track to employ 4,000 researchers on-site by 2015. Located close by will be another 6,000 scientists in fields such as materials science, clean technology, and digital media, which is housed in its own facility, called Fusion-

opolis. (The U.S. National Institutes of Health, which currently employs approximately 10,000 scientists, serves as a useful benchmark.) Biopolis has become a globally recognized center for stem cell research, and although it's too soon to tell whether Nobel Prize-winning breakthroughs will emerge from Biopolis, articles from researchers based there have been published in major peer-reviewed journals such as *Cell* and *Nature*.

Scientists are attracted to the center by the facilities and the amenities (the neighborhood boasts gourmet restaurants, world-class retail, an extreme-sports facility, and a variety of cultural venues); their companies appreciate the welcoming regulatory environment. GlaxoSmithKline (GSK), for example, founded its Centre for Research in Cognitive and Neurodegenerative Disorders at Biopolis. For GSK, the center feels like a Skunk Works. With a relatively small team of 50 scientists located there, it's possible to "break out of business as usual and be open to other influences and participate in the buzz and vitality," says center director Paul Chapman. "The advantage in being part of a compact community is that we can get to know and trust colleagues in a setting that doesn't relate to work. Suddenly you get ideas and fermentation." Novartis, likewise, based its Institute for Tropical Diseases at Biopolis, and other international pharmaceutical companies, such as Japan's Takeda and U.S.-based Valeant and CombinatoRx, also have a foothold at the center. Organizations that set up shop at Biopolis participate in relationships with government agencies, venture capital firms, global pharmaceutical companies, academic research labs, and other institutions. They also partake of shared resources. For example, Biopolis's colony of research-ready nude mice provides a welcome relief for scientists concerned about duplicating animal research; scientists from all kinds of firms can share the use of the colony.

Singapore is just one of several countries hosting focused factories; companies that want to leverage their existing

patents and intellectual property—say, in wireless technology, precision manufacturing, or clean technology—might also look to Finland and Denmark. Emerging economies such as Chile and Vietnam have focused factories as well. (For a map of global innovation hot spots, see the exhibit “Innovation World.”)

Model 2: Brute Force

The brute force model is an innovation version of the law of large numbers. By applying massive amounts of low-cost labor and capital to a portfolio of innovation opportunities, countries (most obviously China and India, but also Brazil) hope that a huge quantity of ideas from a substantial number of talented people will eventually yield valuable discoveries.

China, currently the world’s center of outsourced manufacturing, will be the next hub of brute force innovation. The Chinese Politburo has set itself the concrete goal of turning China into an innovation-driven country by 2020. To that end, China has chosen 10 of its leading universities to receive extra funding in order to achieve world-class status. It is noteworthy that Chinese institutions of higher education doubled in number, from 2,000 to 4,000, between 2002 and 2005. The goal is to churn out well-educated specialists in every area of science and technology.

The Chinese automobile industry offers a glimpse of the brute force model in action. Thanks to an outpouring of educated innovators from Chinese universities, there are now an estimated 50 car companies in China, producing a Precambrian explosion of new business models and automobile designs. Many of these companies will fail, but some may prove to be world-beaters. Warren Buffett’s recent \$230 million investment in BYD Company, a Chinese maker of batteries for electric cars, signals his awareness of the potential for Chinese R&D.

China offers innovation advantages to other kinds of companies, as well. Microsoft, for instance, recently celebrated the 10th anniversary of its Beijing re-



By churning out well-educated scientists, China will become the next hub of brute force innovation.

search center. The company has found that the center allows it to tap expert and junior Chinese talent at a comparatively low price. Microsoft supports the work of top Chinese academics (some of its scientists are also part-time faculty members at Chinese universities such as Tsinghua, Fudan, Beida, and Jiao Tong) and encourages researchers to publish their work and participate in academic conferences. It also funds projects selected by the National Research Fund of China. In return for all this, Microsoft can gain access to a trove of IP and build invaluable collaborative relationships.

Firms considering the brute force model will need to establish long-term relationships with local universities, venture incubators, trade associations, and other potential partners. Service provid-

ers that target the entrepreneurial community—such as specialty consultants, professional-services firms, and venture capitalists—may also wish to find ways to set up research operations in countries offering plenty of brute force.

Model 3: Hollyworld

The Hollyworld model is all about providing opportunities to build what author Richard Florida has described as a “global creative class.” It leverages what I call “the increasing returns law of cool community”: As more and more smart entrepreneurs gather in one place, the more attractive that place becomes to other like-minded people. In the 1990s, Silicon Valley pioneered this law to excellent effect. Today, urban centers as diverse as Bangalore, Helsinki, and

Toronto have adopted a Hollyworld model.

Entire countries are also moving in this direction. India, for example, is shifting its role as the world's back office to that of innovation epicenter. The country is doing this by partnering the best graduates of its Indian Institutes of Technology with Indians who have trained at such universities as Stanford, MIT, and Cambridge and are now thriving in Western economies. Indian entrepreneurs who have already made their mark in Silicon Valley are now cementing commercial ties to their homeland in globalized technology enterprises. As this occurs, India's resident creative class is becoming more influential, cosmopolitan, and skilled.

Moreover, India is now managing the talent pools of other countries as part of its global strategy. As the country moves up the innovation chain, some of the early-stage work originally done there is migrating elsewhere. Tata, for example, now outsources some of its IT development assignments to Chile and Ecuador and in 2005 acquired a Chilean financial-services back-office outsourcing firm. By exporting its own back-office work, Tata has been able to move up the value chain.

Another country that is adopting this model successfully is Singapore, where Hollyworld and the focused factory meet. Singapore is willing to generously fund life-sciences graduate students – regardless of nationality – providing that they maintain a suitable grade point average and return to Singapore for the equivalent of national service. In this way, the country will enlarge its overall population of the creative class. Indeed, Philip Yeo, the former head of Singapore's Biopolis, referred to himself in a *Time* interview as a “people snatcher.”

**Model 4:
Large-Scale Ecosystems**

Several countries have developed end-to-end innovation systems combining stewardship mechanisms, funding bodies, research institutions, and structures

for business and academic collaboration, all in support of an overall national strategy.

Finland's innovation system was designed, in part, as a response to the cataclysmic economic change in 1991, occasioned by the collapse of the Soviet Union. In one stroke, a significant percentage of Finland's foreign trade vanished, plunging the country into recession. Faced with an economic near-death experience, the country decided to focus on education, science, and technology and to improve its innovation capability.

Today, Finland enjoys a well-run innovation system benefiting from strong governmental stewardship. For example, Prime Minister Matti Vanhanen chairs the Science and Technology Policy Council, which is responsible for the country's overall innovation efforts. Finnish investment in public education has resulted in a number one worldwide ranking by the Organisation for Economic Cooperation and Development (OECD) and the World Economic Forum. The government allocates funding flexibly and across a range of public and private players, most notably via Tekes and Sitra – the national industrial R&D fund and the national innovation fund, respectively. Sitra subsidizes a variety of initiatives that have included user-centered design, new kinds of health care services, food and nutrition, and energy conservation.

One of the best examples of Finland's large-scale, holistic approach to innovation is Aalto University, which is scheduled to open its doors in the autumn of 2009. Named for the legendary Finnish architect and designer but referred to locally as Innovation University, the new institution will be the result of the merger of three established universities: Helsinki's School of Economics, University of Art and Design, and University of Technology. Established with close to \$1 billion in new funds, Aalto will develop curricula and stimulate research to explore novel, commercially significant ideas. One planned “design factory” at the university will focus on human-

centered, or “universal,” design for products that can be used by any adult, regardless of age or physical ability. The university also has ambitious plans to foster research in specific areas, such as technology that promotes health, wellness, and quality of life for the elderly. In bringing together experts from disparate arenas including design, media, and technology to develop new approaches to common problems, the university manifests the Finnish government's conviction that innovation will come from cross-disciplinary efforts.

Small countries like Finland are self-contained environments. The moment you land there, you meet relevant players and have the opportunity to set up important alliances. In a way, such an ecosystem is akin to the Japanese *keiretsu*, with its shared purpose, common managerial culture, and intricate web

Innovation World

A cartogram is a map in which countries have been resized according to certain data; it shows the world from the data's point of view. This cartogram, created by Bryan Boyer on behalf of the Institute for Large Scale Innovation, sizes countries according to several factors related to their innovation efforts: R&D spending, the number of postsecondary degrees awarded, and the number of patents issued.

In 2005–2006, the top 20 innovators worldwide were:

United States	1	Denmark	11
Finland	2	Brazil	12
Israel	3	New Zealand	13
United Kingdom	4	France	14
Singapore	5	Netherlands	15
Japan	6	Sweden	16
Korea	7	China	17
Canada	8	Germany	18
Ireland	9	Russia	19
Australia	10	Chile	20

Up-and-comers (not visible on this map) were India, Vietnam, and Estonia.

of financial connections. But the fast pace of networking can trip you up if you aren't fully prepared or don't have the requisite alliance-management skills. Word can quickly spread about your deficiencies as a potential partner. The tight interweaving of elements in an innovation ecosystem and the many informal connections among the players also mean that an incorrect approach can lock you out, perhaps for good.

**Systems Integration:
The Mix-and-Match Approach**

The advent of a global marketplace for innovation means that the astute company – whether a start-up or an incumbent – can choose from among the foregoing models and blend country and corporate strategies into a “systems integration” approach. Consider the case of Nile Therapeutics, a San Francisco-

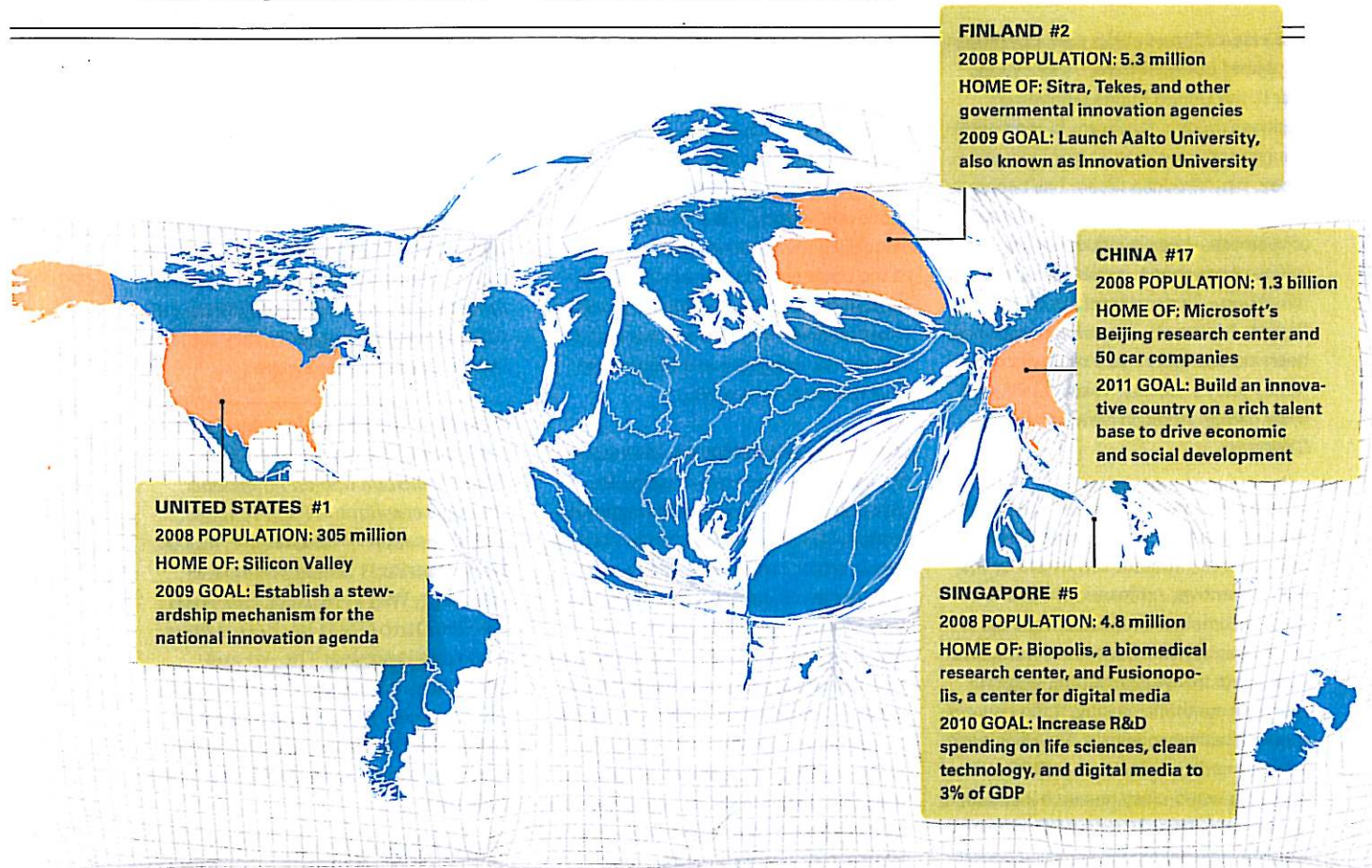
based biopharmaceutical firm. Nile is developing a compound licensed from an Italian university and conducts comparatively rapid, cost-effective clinical tests in Eastern Europe. CEO Peter Strumph reckons his company would have employed close to 100 people a decade ago; the current head count is eight. “I like to think of us as a film production company,” he says. “We don’t write the scripts; we buy them. We don’t own the production facilities; we rent them.” By mobilizing a global network of resources, Nile can employ the right number of people for the right amount of time and capture the lion’s share of value.

As more countries start providing innovation services, companies can take advantage of the best resources available worldwide. Pharmaceutical firms, for example, can tap India, which excels in drug testing for diabetes and infectious

diseases as well as in medicinal chemistry. China provides manufacturing and market access, plus an army of scientists and engineers. Even off-the-beaten-track Vietnam offers services that can help firms interested in the treatment of tropical diseases.

In playing the role of a systems integrator, a company might ask the following questions: What are the best new fields to consider? How do we combine various ingredients? How can we best create risk capital for novel ideas? What are the most supportive environments for us? What kind of strategic foresight and planning processes do we need?

The United States is especially well-positioned to serve as a base for innovation systems integration. The country has the cultural diversity, global reach, reputation for innovation, talent base,



Source: World Bank data and the author's analyses of data on postsecondary degrees granted and patents issued

infrastructure, educational institutions, and scientific resources to transform the global innovation landscape. By increasing its efforts in areas such as green energy and health care, the United States could reposition itself as a global innovation leader. Silicon Valley, an area with a rich mix of skills, ethnicities, and resources, as well as abundant educational,

institutional, and even familial connections, could serve as a model for a U.S. approach.

Are You Ready for Innovation World?

These are early days for global innovation. Although a few nations have pioneered the models discussed here, the

map is still developing. As new centers of excellence are built and hot spots emerge, so will new models. Patterns of competition will also evolve as models collide. Regional dynamics will shift as countries grow into their roles as innovation leaders.

To make the most of the global market for innovation services, executives must understand the emerging models when considering where to make their direct investments. In deciding where to place a new factory, research lab, or customer insight center, it is important to weigh both national and corporate strategies.

Tapping the world's innovation resources involves more than deciding where to establish facilities and how much to invest in the effort. It's also about knitting together different strengths within and outside the firm's walls. Companies building their innovation strategies must also think long-term – in a sense, they are working to acquire membership in a club with very particular codes and cultural norms, which can carry evolving benefits. They must cultivate the skills of relationship building and alliance management in order to become trusted members of the local community. Once they establish roots in Singapore, Finland, Brazil, and other innovation hot spots, they stand to benefit in unimagined ways. 

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The Driving Forces of Global Innovation

Traditionally, we have thought of innovation as the output of a particularly hot team or company, or the result of a specific geographic or industrial concentration of the kind that made Silicon Valley great. But today, four trends are reversing U.S. dominance in innovation and ushering in an era of global innovation:

The rise of innovation as a currency of global competition. After World War II, the United States pioneered business models that were fundamental to a general understanding of innovation. Today, the American dream has become the global dream. An international style of business – heavily influenced by values of openness, exploration, and risk taking – has emerged, and it speaks English. Moreover, American culture has been increasingly in-sourced by non-U.S. firms such as Toyota, which established a key design studio in Newport Beach, California.

The global war for talent. Talented young scientists, designers, and entrepreneurs can be attracted anywhere by the right incentives, professional opportunities, and creative ambiance. Consider a small country with few natural resources that wants to invest in cutting-edge research in synthetic biology. If the country pays 10 leading scientists \$1 million each annually and spends another \$100 million to build a world-class research institute, it becomes a player in a strategic industry, yielding incalculable financial and social returns over time.

Innovation as a national agenda.

Several dozen nations now explicitly embrace innovation as a national priority and systematically develop innovation strategies, infrastructure, mini-Manhattan projects, and human capital initiatives. Various approaches are coalescing into distinct innovation models. Sweden's governmental agency Vinnova, for example, manages state funding for R&D and employs some 300 professionals. China has listed innovation as a priority in its 11th five-year economic development plan. Specifically, the country focuses on what it calls "indigenous innovation," the encouragement of locally generated intellectual capital. At the other end of the size spectrum is a Singapore Economic Development Board initiative that invites the world to innovate in Singapore and Singapore to innovate for the world.

The power of networks. As innovation capability continues to globalize, networks are becoming increasingly important. An entrepreneur can now access resources on a worldwide basis – and thus realize competitive advantage well beyond her weight class. Networks accord an important role to so-called brokers: individuals and companies that are able to link talents and assets separated by geographic location, time zone, language, culture, and business practice in ways that generate value. Countries such as Denmark are now actively pursuing a broker role in such emerging areas as sustainability.

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