NewsBriefs

SEPTEMBER 13—The European Union debuts a new innovation indicator, intended to measure how well innovative ideas reach the market, create jobs, and enhance Europe's competitiveness; it is intended to provide a way to compare national innovation policy across member countries. The new "Indicator of Innovation Output" is intended to supplement the annual Innovation Scoreboard, which provides a broader measure of innovation performance. In this initial measure, Switzerland, Germany, Ireland, and Luxembourg came out on top in Europe, and the EU as a whole appeared to be holding steady against the United States, while Japan and Switzerland led the world. Beginning in 2014, results for the new indicator will be published alongside the scoreboard assessments.

SEPTEMBER 18—Orbital Sciences Corporation launches its first cargo rocket to the International Space Station. Cygnus took off from NASA's Wallops Island Flight Center on Virginia's Eastern Shore, carrying 1,300 pounds of supplies. It was slated to arrive at the ISS on September 22, where it remained for one month, after which it was loaded with trash from the space station and sent back to burn up on re-entry. The launch makes Orbital Sciences the second private supplier for the ISS; California-based SpaceX has been ferrying supplies to the station for about a year.

OCTOBER 1—The US federal government shuts down after Congress fails to pass legislation to fund its operations for fiscal year 2014; the shutdown continues until temporary funding is passed on October 17. The two-week shutdown interrupted R&D funding and idled federal R&D workers, nearly all of whom were designated nonessential. Some analysts fear the shutdown will have a longer-term impact on R&D, as inconsistent and unreliable funding make US research look like a less viable investment for multinationals and a less desirable career path for the most promising young scientists and engineers.

OCTOBER 8—The OECD releases initial data from its first-ever Survey of Adult Skills. The study assessed key skills among adults in 24 countries, focusing on information-processing and problem-solving skills in technology-rich environments, as well as literacy and numeracy. Japan scored first and Finland second in all three domains, with Spain, Italy, and France near the bottom. The United States ranked in the middle in literacy, but fell to the lower half in the other two domains. The United States also had the most polarized results, with big differences between those with postgraduate degrees and those with less education. Second and third rounds of data collection, with additional countries, are planned for 2014 and 2015.

OCTOBER 31—Rockstar Bidco, the coalition of tech companies that won Nortel's patent portfolio in a 2009 bidding war, launches the next salvo in the ongoing smartphone patent wars, filing patent infringement suits against Google and seven makers of Android smartphones. The suits allege infringement of seven patents, the oldest going back to 1997, and all covering fundamental technology that enables search-based advertising, search-engine operation, graphical user interfaces, and other familiar elements of the smartphone experience. Rockstar, whose members include Microsoft, Apple, RIM, Ericsson, and Sony, paid $4.5 billion for the patents, which analysts believe it is now using to launch an indirect attack on Google.

four R&D leaders believe that their managers excel in these competencies. Indeed, the average R&D manager's emphasis on adherence to process, minimizing variation, short-term delivery, and limited tolerance for disappointments—an emphasis largely encouraged by results-oriented performance measures—inhibits the development of behavioral markers of innovation potential in staff.

The CEB study found that companies where R&D talent has higher innovation potential deliver almost twice as much in terms of new product sales performance. Progressive executives adopt a "talent mindset," augmenting business metrics with talent data to improve teams, raise innovation productivity, and build a strong leadership bench. The future of innovation may well be one where talent dashboards depict R&D staff's effectiveness, potential, and readiness in real time, enabling managers to place the right people in the right roles and systematically deliver on innovation strategy. R&D executives should seize this future now by identifying the five markers of innovation potential in their workforce, and then use this knowledge to build behaviorally diverse teams and create a leadership environment that nurtures innovators.

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From Innovation to Manufacturing

The demise of American manufacturing has become a cliché in analyses of industrial policy, and not without reason. Since the beginning of this century, the number of US manufacturing jobs has fallen from 17 million to 12 million, continuing a decline that started 50 years ago, when 29 percent of American employees worked in such jobs. Equally disturbing, the most inventive American high-technology firms such as Apple, as well as their overseas rivals, now locate many of their production facilities abroad.

A recent report by a multidisciplinary commission at MIT, *Making in America: From Innovation to Market,* outlines the reasons for the deterioration and suggests ways in which the corporate technology sector, government, and other stakeholders can reverse the situation. The need for such a reversal goes beyond the call to increase the number of jobs in the economy. The country continues to produce potentially valuable innovations, the report asserts. But the ecosystem that moves such innovations

from their progenitors in small firms and academic laboratories into the market has developed blockages that halt that movement.

"We discovered that manufacturing is very important in bringing good ideas, whether they form in the shop floor or the laboratory, through the stages of prototyping, pilot manufacturing, larger-scale production, and finally commercialization," says Suzanne Berger, an MIT professor of political science who co-chairs the commission responsible for the report. MIT president Rafael Reif reinforced the point at a conference introducing the new report. "Innovation takes place at multiple points along the line before commercialization," he said. "If we want to stay strong in innovation, we must regain our strength in manufacturing."

In-Depth Interviews

The MIT commission, called Production in the Innovation Economy (PIE) and launched in 2010, set out to discover how American strengths in innovation can lead to new production capabilities, thereby spurring growth and employment. To do so, the group's 21 MIT faculty members and other researchers conducted 255 in-depth interviews with four types of manufacturing companies: US-based multinationals that invest heavily in R&D, start-up firms, small-scale manufacturers operating locally or regionally, and overseas firms in China and Germany.

The initial goal was to discover why the link between innovation and manufacturing had broken down in the United States. With the American multinationals, for instance, the PIE team focused on why they kept their production facilities in the United States or moved them abroad and, if they had chosen to move manufacturing, how they dealt with quality control and other technical issues that had to be handled by R&D departments literally an ocean away. Interviews with start-ups revealed the critical nature of financial issues. After all, it can take 12–15 years for non-software start-ups to begin producing revenue. Small firms, meanwhile, face the same dilemma as real estate firms: location matters. Local technology businesses don't necessarily need to be close to rivals or partners in the same industry. But they benefit greatly when they collocate with companies that have complementary products and abilities. "If there's a diverse production ecosystem, it gives them an advantage," explains commission member Martin Schmidt, an electrical engineering professor. "That proximity effect is incredibly valuable.

Reasons for the Decline

One key result of the interviews was a fresh understanding of the reasons for the decline in American manufacturing. Most prominent among them is what Berger calls "the transformation of corporate structures" that started in the 1980s. "US financial markets demanded that companies become asset-light," she explains. To do so, many high-technology firms reduced or completely outsourced many of their business activities, such as R&D, detailed design, manufacturing, and after-sales service. "These activities had all once been joined under one corporate roof. Indeed, most management mantras of the time proclaimed that the tighter the integration of functions, the better the company performed," the PIE report notes. "By 2013, however, very few large American companies remain with vertically integrated structures. The great new American companies of the past 30 years like Dell, Cisco, Apple, and Qualcomm have little or no manufacturing in-house . . . Advances in digitization and modularity in the 1990s made it possible to carry out this strategy and outsource production to manufacturing subcontractors like Flextronics and Jabil and eventually to foreign suppliers and contractors like Taiwan Semiconductor Manufacturing Company, Quanta, and Foxconn."

The same financial pressures on large companies that produced the modularization of the corporation have shifted the locus of innovation to academic and government laboratories and small spinoffs. But those organizations lack the capability and funding necessary to support the basic steps toward manufacturing: scale-up, prototyping, pilot production, demonstration and test, early manufacturing, and full-scale commercialization. "When scale-up is funded mainly through merger and acquisition of the adolescent start-up and when the acquiring firms are foreign," the report asks, "how does the American economy benefit?"

The report largely repudiates one frequently quoted reason for the flight of American manufacturing: a lack of skilled workers. "You do need skills," MIT management professor and PIE commission member Paul Osterman told the conference. "But they are within the reach of most Americans." Manufacturers, he added, simply need production workers who can digest one-page memos and convert into actions the instructions they contain. On the other hand, the report states, finding workers with more specialized skills can prove difficult for firms in certain regions, and very small companies might lack local connections to find suitable workers.

Overseas companies contacted by the PIE commission provided hints on how the United States might reverse the decline in manufacturing. "Today, German manufacturing is still so strong. About 20 percent of the workforce is still employed in manufacturing, their wages are almost double US wages when you count benefits, and Germany has a trade surplus," Berger says. "And we could see that many German firms have more integrated structures than many American firms. They have kept their arms around production and we could see the benefits for those companies in the long run." Similarly, the success of Chinese manufacturing rides on more than low labor costs. "It's also because the Chinese have developed real capabilities for scaling up production," Berger continues. "So they're able to do rapid product introductions, taking designs and prototypes produced by Western companies and figuring out how to simplify them, find materials, and move from innovation to product rapidly. That's an extremely important skill." But the fundamental message from firms in those two countries, she says, is "that being able to scale up from prototype and pilot production involves significant innovation."

Reasons for Hope

The commission found some reasons for hope, primarily in collaborative efforts at the local level that create "diversified industrial ecosystems." In these initiatives, a private firm or public institution provides a "convening function," creating new resources that start-ups, small local firms, and others can enhance.

As an example, the report describes a partnership between the Timken Company, an Ohio company that manufactures tapered bearings and specialty steels, and the nearby University of Akron. The company transferred its coatings laboratory, equipment, and several of its key researchers to the university. In turn, the university used funding from Timken and the state of Ohio to set up new graduate programs in coatings-related technologies and to generate potential start-up companies. In another instance, the state of New York has invested in semiconductor manufacturing facilities that link private companies, research laboratories, the state university system's degree programs, and SEMATECH, a consortium of prominent semiconductor and semiconductor equipment manufacturers. "Convening," the PIE report states, "brings into existence new collaborations and new common resources."

The MIT commission, meanwhile, plans to continue its focus on 21st-century manufacturing. One concept for future manufacturing that the commission is exploring is distributed virtual factories, which would allow small-scale manufacturers to bid on jobs, use designs transmitted online, make products locally, and create greener, more efficient supply chains. Other facets of MIT's continuing initiative include research on manufacturing policy, the development of academic courses aimed at developing skill in innovation, and efforts within the university to put its new ideas into practice. "There doesn't seem to be anything inexorable or natural about the rundown of our manufacturing economy," says Berger, who summarizes the report's conclusions in *Making in America*, a book just published by the MIT Press. "There is a great deal of optimism in our group."

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Carnegie Mellon Teams with Health Insurance Provider to Accelerate Healthcare Innovation

Health care is fertile ground for disruptive innovation—there are innumerable opportunities to improve delivery and reduce costs through both technical and service innovations. But health insurance providers and other participants in the overall healthcare system have sometimes resisted innovation. A new initiative is partnering one of the nation's top research universities with a national health insurance provider to remove traditional barriers to disruptive innovation in health care.

Carnegie Mellon University's Disruptive Health Technology Institute (DHTI), created in partnership with health insurance provider Highmark, aims to use data mining to spur disruptive innovation for healthcare improvements and cost reductions. With an initial investment of $11 million building on a $2.5 million grant from the Heinz Endowments, the Institute will use Highmark's de-identified aggregated data to target areas where the university's considerable research power and expertise can be applied to increase affordability, simplicity, and accessibility of health care. The aggregated Highmark information—data that researchers can use to track issues across time, organizations, patient populations, or other variables—contains no identifications or personal information about patients. The partnership is giving the insurance company an uncommon seat at the innovation table and researchers unusual access to data that can help steer their innovation work.

DHTI is focusing on seven key areas that correspond to healthcare areas ripe for innovation and Carnegie Mellon's particular areas of expertise. These include six areas related to patient treatment—accessibility of medical diagnostics, behavior change, chronic disease management, endoscopy, diagnostic ultrasound, and infection prevention. The institute will also work to build on the University's expertise in data mining by developing more efficient and effective ways to harvest and analyze data, to improve both research and patient care.

Executive Director Lynn Brusco says the ability to use real and direct input from Highmark's administrators and clinicians allows a new approach to disruptive innovation in health care. "Typically, innovators come to investors with an idea and say, 'This is my idea and I think that it will solve this problem,' and then an investor has to decide whether they want to give the idea backing," she said. "We are coming at solutions differently. We are getting thought leaders together with the right data, sitting down with them discussing real issues and doing horizon mapping to identify where the problems are for healthcare delivery and patients. Researchers are then aligning their work and innovative ideas to provide solutions to these unmet needs."

Brusco said the DHTI approach seeks to replicate the successes attained when the search for safer motor vehicles led to data mining of automobile insurance information. As Brusco describes it, "What is exciting is that we are looking at problems and letting the brightest minds of Carnegie Mellon come up with solutions rather than innovating an idea and then seeing if there is a market for it. We have more than 100 faculty and clinicians doing horizon mapping." The horizon mapping has already resulted in more than 50 specific proposals for targeted innovation, according to Brusco. She declined to specify their nature but said to expect significant announcements about advancing the projects by fall 2013.

Thought leaders in disruptive innovation have long identified the innovator-to-investor step as the first of a set of resistive barriers in health care. As disruptive innovation theory pioneer Clayton M. Christensen put it in a 2000 *Harvard Business Review* article coauthored with physicians Richard Bohmer of Harvard and John Kenagy of the University of Washington, "Powerful