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China ready to leap from industrial to information-age economy

Can its creativity and innovation be centrally planned?

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Beijing

After 30 years of securing China's role as the cut-rate factory to the world, its central planners are pouring money and political will into becoming an innovation economy.

But like other Asian tigers before it, China is finding making the shift from textile mills to Silicon Valley isn't easy. The biggest challenge is nurturing technological creativity in a society run from the top down, says a chorus of foreign and local experts.

"The stakes are extremely high," says Lan Xue, head of the Institute of Science and Technology Policy at Beijing's Tsinghua University. "The environmental costs make it impossible to go on growing like this; we have to transform growth so it is based on technology and innovation."

China, however, "has a long way to go to build a modern, high-performance national innovation system," according to a new report by the Organization for Economic Cooperation and Development (OECD), a Paris-based think tank. "China is just about to change from an investment and low-cost driven economy to one driven more by innovation," says Zhang Gang, one of the authors of the report, released here last week. "The nature of this transition is a great challenge." The government has poured large amounts of money into meeting this challenge, doubling its expenditure on research and development as a percentage of GDP from 1995 to 2005 – when it reached \$30 billion – to become the sixth-largest spender in the world. Since 2000, China has ranked behind only the United States in the number of scientific researchers, and in 2005 they published more scientific papers than their colleagues anywhere except in the US, Britain, Germany, and Japan.

Last year the government unveiled a plan to make China an "innovation-oriented" society by 2020, and premier Wen Jiabao has harped on this subject repeatedly in recent speeches.

"They missed the IT [Information Technology] revolution and they missed out on [micro] chips" says Fred Simon, a technology expert at the State University of New York in Albany. "If there is a biotech or nanotech revolution coming, they won't want to be left behind. They have to figure out how to plug in very, very quickly."

"China has excelled in mobilizing resources for science and technology on an unprecedented scale and with exceptional speed, and is now a major R&D player," the OECD report finds. But this "has not yet translated into a proportionate increase in innovative performance."

One key problem, says Dr. Zhang, is that "the government has so far followed planned economy, top-down thinking" to promote innovation. "This has its limits," he adds.

While Chinese officials are seeking to make individual enterprises the main drivers of technological innovation, they are running into difficulties, the OECD report says, because "the vast majority of domestic

firms have not put innovation at the core of their business strategy" and are unaccustomed to innovating.

A lack of capital is also a major hindrance to the creation of the sort of small hi-tech startups that have been the fount of so much innovation in the United States, experts say. Chen Kejian, a 20-something software developer who founded a company in Beijing with a group of friends three years ago, can testify to that.

"There is no chance a Chinese bank would invest in our company," which rewrites Microsoft and RealPlayer code to run on handheld mobile devices, says Mr. Chen. "In China, banks come to you when you are successful. But when you really need the money, they never lend it."

Chen is also a witness to another dissuasive factor behind the lack of innovation in China – the ease with which rivals can pirate new technology without being prosecuted. "We have not applied for any patents because they are useless here," he says. "Even if I sued a company violating my intellectual property rights and won, I could not be sure the judgment would be enforced."

Though Chinese R&D is rich in government funds and researchers, scientists "are not well connected with [business] enterprises," says Professor Lan. "China's national innovation system has not been very efficient: The different pieces are not well connected."

The government is seeking to remedy this by creating "grand alliances" between government-funded labs and key industries, and the authorities have offered tax incentives and other funds to encourage firms to innovate.

Many analysts, though, say that what the government does not do is as important as what it does, and that officials should not interfere with research, allowing scientists more freedom.

"The system must have a certain flexibility and adaptability," says Zhang. Chinese scientists who have moved abroad, he points out, have thrived "in an environment that allows them to be creative and free thinking."

"Chinese are not inherently uncreative," adds Dr. Simon, who is technology adviser to the coastal city of Dalian. "It's the institutional milieu" in both state-owned and private Chinese firms, "that does not promote innovative behavior," he argues. "The system does not reward you for taking the risk to go outside the lines."

Scientists returning from abroad could be the key to changing Chinese corporate and government attitudes to scientific research. "They understand what kind of creative juices are stirred by a free and open environment," says Simon. "If they can bring that culture in, they will become vanguards for change."

The government itself seems to have adopted this thinking. Earlier this year a former engineer with Audi in Germany, Wan Gang, was appointed minister of science and technology, the first in that position who did not to belong to the ruling Communist Party.

Mr. Wan has much to change, not least the fear of failure that is built into the education and research system and which inhibits scientists from going out on a limb. He has started by promoting a new law, currently before the National People's Congress, China's parliament, that promises "scientists and technicians who have initiated research with a high risk of failure will still have their expenses covered if they can provide evidence that they tried their best when they failed to achieve their goals."

Cultural changes go deeper than legislation, Lan acknowledges, and "this kind of thing always takes time, but China is changing." Simon agrees. "There is tremendous room for opening up parameters of individual thinking that is not being utilized," he says. "Fundamental cultural changes take a long time, but China is constantly being bombarded by pressures that make this a necessity."

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