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**RESEARCH & IDEAS** 

# Kodak: A Parable of American Competitiveness

Published: February 6, 2012 Author: Dina Gerdeman

When American companies move pieces of their operations overseas, they run the risk of moving the expertise, innovation, and new growth opportunities just out of their reach as well, explains HBS Professor **Willy Shih**, who served as president of Eastman Kodak's digital imaging business for several years. Key concepts include:

- Outsourcing ends up chipping away at America's "industrial commons"—the collective R&D, engineering, and manufacturing capabilities that are crucial to new product development.
- If the United States wants to keep from slipping any further in its ability to compete on the industrial stage, the government must increase its support of scientific research and collaborate with the business and academic world.

When American companies move pieces of their operations overseas—often because manufacturing and labor costs are much cheaper—they run the risk of moving the expertise, innovation, and new growth opportunities just out of their reach as well.

Take Eastman Kodak, for example, the 120-year-old American company that filed for bankruptcy protection in January. The company developed the first digital camera in 1975. Yet Kodak was never able to ride the digital wave over the long haul, and the company's invention ironically served to thwart its success.

## "Much of the camera technology was invented in the United States, but US companies gave it all up."

HBS Professor of Management Practice Willy C. Shih served as president of Kodak's Digital & Applied Imaging business through the turn of the 21st century. Shortly after starting at Kodak, he visited the company's highly automated production line and realized that all the significant pieces used to make Kodak's digital cameras—lens, shutters, electronic screen displays—were manufactured far from the factory floor in Rochester, New York, largely because American companies had ceded much of the camera-related technology to Japan years earlier.

Worse, he knew that mobile phones, which were also being made outside the United States, would start stealing business away from digital cameras.

"Much of the camera technology was invented in the United States, but US companies gave it all up," says Shih, an expert on industrial competitiveness who joined the HBS faculty in 2007. "Because of the decisions of managers in the distant past, the United States had lost its capability to make all the critical components that were needed to put together digital cameras."

### **Disastrous fallout**

Outsourcing manufacturing operations has been occurring for decades, based on the assumption that moving grunt work overseas wouldn't affect US companies' competitive edge in the global marketplace.

But this assumption is wrong, and the fallout has been disastrous, Shih says.

In reality, developing and executing a manufacturing process often sparks ideas that lead to creation of innovative new products, Shih explains. So when American companies allow the production of high-tech products like televisions and memory chips to disappear from the local landscape, they also inadvertently risk losing expertise to produce the next generation of cutting-edge products like high-end servers and electronic paper displays for e-readers.

Outsourcing ends up chipping away at what Shih calls America's "industrial commons," the collective R&D, engineering, and manufacturing capabilities that are crucial to new product development. This concentration of expertise can be found in places like Silicon Valley, where clusters of experts and firms feed growth and spur innovation.

Much of the damage to American competitiveness in the science and technology fields has already been done. The United States has lost a great deal in the area of energy storage and green energy production, for example, including lithium ion batteries for cell phones and laptops, silicon solar cells, and power semiconductors for solar panels. As a result, Shih says, the country risks losing thin-film solar cells, the latest solar-power technology.

America's lead in the advanced rechargeable battery business also slipped through its fingers when manufacturers retreated from investing in them, choosing to focus instead on disposable batteries that had been their bread and butter. The Japanese filled the void in rechargeable battery production, leveraging their capabilities first in portable audio products, like the Walkman, then in camcorders, notebook computers, and mobile phones—and most recently in hybrid and electric vehicles.

"In an electric car, the battery is 50 percent of the bill of materials," Shih says. "We don't have the capability for making rechargeable batteries in the United States today, and that's because the decisions made by other industries let that [industrial] commons wither away."

# "Companies will certainly limit their ability to innovate."

Executives who defend outsourcing argue that there aren't enough American workers with the right skills or American factories with the same speed of production found in other countries. And besides, by moving work outside the United States, they contend that enough profits can be generated to stoke innovation at home.

Until recently, Apple manufactured its products in the US, and even built its own factory. But today, iPhones, iPads, and other Apple products are made overseas, largely because a country like China is able to get the job done without the time and expense that the company would expect to incur domestically.

The problem for US policymakers and companies competing in a global marketplace is this: the trend toward outsourcing has gone beyond simple assembly-line work.

## Heading upstream

As low-paying production jobs have

disappeared from the United States, so too have more sophisticated, higher-paying design positions. Nearly all notebook computers, cell phones, and other handheld devices are now designed in Asia. The domestic software industry, which initially outsourced only simple code-writing projects to Indian firms, has more recently signed on with outside companies for more complex work, like designing architectural specifications.

Letting go of the design work is dangerous, Shih says, because it could block American companies' chances of designing the newest high-tech products and learning from those experiences. "Companies will certainly limit their ability to innovate," he adds.

The United States didn't always allow technological innovation to run adrift. In the post-World War II era, the country had a tradition of global leadership, spurred in the 1950s and '60s by innovation in semiconductors and in the 1960s through '80s in chip design, aeronautics, and satellite communications. Many high-tech products could only be found in the United States. These successes were due in large part to government investment in basic science research and mass production.

"During World War II, the American public believed science won the war with the atom bomb, radar, computer technology, antibiotics," Shih says. "There was a feeling that if we invest in science and technology, it would lead to jobs and prosperity, and for that, the United States was an unquestioned leader."

The government continued to feed scientific

exploration with a healthy dose of funding through the 1990s, but these investments began to falter in 2003 and have remained flat or slightly lower ever since.

### **Government's role**

If the United States wants to keep from slipping further in its ability to compete on the industrial stage, Shih says, the government must increase support of scientific research and collaborate with the business and academic world. In addition, government officials and business leaders need to map out a long-term plan focused on efforts to keep important capabilities in the United States with the idea that they might bear future innovative fruit—perhaps by attempting to correct some of the biggest challenges today, like climate change, oil dependence, and life-threatening diseases.

Outsourcing by itself is not evil, Shih says. In many cases it makes perfect sense, but "we need to be more thoughtful and take a more sensible approach."

US companies need to continue making long-term investments in R&D, and at the same time, management needs to stop "exaggerating the payoff and discounting the danger" of outsourcing production and cutting R&D, Shih says.

Shih and HBS Professor Gary P. Pisano have been studying how other countries have performed in the high-tech and science-based industries, and they believe the United States could learn some lessons from other countries that have grabbed certain industries by the horns.

In China, for example, in 1986 four Chinese academics met with government officials to develop a "wish list" of strategic capabilities for the country to focus on, with great success. Today China has captured the supply chain in the electronics industry and will be a dominant player for years to come.

Likewise, Taiwan is a relatively small country of about 23 million people, and yet it owns 70 percent of global semiconductor foundry capacity. That commons helped Taiwan to tap into the same capabilities to make it a critical player in flat-panel displays and energy-efficient lighting, all because the country was tenacious in its investment in technology.

"The United States is still the world's richest and largest economy," Shih says. "But at some point we need to have a discussion on the national agenda about what kinds of capabilities are important for the United States in the twenty-first century, and we need to invest in them. People are less convinced today that science can solve our problems, but science is crucial to the care and feeding of the [industrial] commons. By the time people figure it out, I hope it is not too late."

#### About the author

**Dina Gerdeman** is a writer based in Mansfield, Massachusetts