

Invisible but indispensable

A host of medium-sized Japanese electronics firms have developed dominant positions in many areas of technology. Can they keep them?

About 40 nuclear reactors are under construction around the world, designed by half a dozen companies from America, China, France, Japan and Russia. But to obtain a huge, solid-steel vessel to contain the radioactivity, all must turn to a single firm, Japan Steel Works, on the northern island of Hokkaido. Though smaller or welded vessels exist, only the Japanese company has the technology to forge the critical \$150m part from a single 600-tonne ingot.

Few companies find themselves in such a privileged position. But Japan Steel Works is only the most visible example of an insufficiently appreciated feature of corporate Japan. The country has a host of medium-sized firms that dominate specialised global markets. Some of these are in simple engineering: Shimano earns around \$1.5 billion a year by supplying 60-70% of the world's bicycle gears and brakes; YKK makes around half the world's zip fasteners by value, and used to control far more. But it is in the arcane corners of electronics, engineering and materials-science that Japanese companies reign. The technologies are largely invisible to consumers, but the firms enjoy outsize market shares because they are essential for making particular products.

For example, around 75% of motors for hard-disk drives in computers come from a firm called Nidec; 90% of the micro-motors used to adjust the rear-view mirror in every car are made by Mabuchi. Often the products are components, materials or equipment used to make other equipment: TEL makes 80% of the etchers used in making an LCD panel; Covalent produces 60% of the containers that hold silicon wafers as they are turned into computer chips.

A choice: Japanese or Japanese?

In some instances the companies' only real rivals are also Japanese, making the country indispensable even if there is more than one supplier. Shin-Etsu has 50% of the market for the photomask substrate, used to place patterns on semiconductors, but the other producers—Covalent, NSG, AGC and Tosoh—all hail from Japan too. Japanese companies have a similar grip on, for example, bonding material for integrated circuit packages and the lithography machines (called steppers) to make LCD panels. So far, despite their dominance, most have avoided antitrust trouble.

Whereas big Japanese electronics companies such as Panasonic, Sharp and Sony have been losing market share to rivals from China, South Korea and Taiwan, these smaller, less well known Japanese firms continue to dominate niches upon which the global technology industry depends. The Japanese even have a term for them: *chuken kigyo* (strong, medium-sized firms). It doesn't matter if the brand on the casing says Apple, Nokia or Samsung: the innards are stuffed with Japanese wares. According to an official at Apple, the company depends on Japanese firms for vital components because few suppliers elsewhere can live up to its rigorous standards.

"They may not be the sexiest products, but you can't make a semiconductor chip or an LCD panel without them," says Alberto Moel, an expert on high-tech manufacturing with Monitor Group, a consulting firm, in Tokyo. Japanese companies serve more than 70% of the worldwide market in at least 30 technology sectors worth more than \$1 billion apiece, according to the Ministry of Economy, Trade and Industry (METI). They range from certain films to diffuse light used in LCD screens (where they have the whole of a market worth more than ¥270 billion, or \$3 billion) to multilayer ceramic capacitors that regulate the current in electrical equipment (77% of ¥540 billion).

Japan's technological prowess is a reminder of the country's industrial strength at a time when it is struggling to overcome nearly two decades of economic stagnation and is poised to lose its place as the world's second-largest economy to China. It is also an answer to decades of criticism by Western management experts who breathlessly argued that the country's business culture, from a rigid labour market to weak shareholder rights, was holding companies back. Corporate Japan must have been doing something right after all.

Of course, some foreign companies can boast similar supremacy in global markets. Microsoft's Windows operating system is on more than 90% of the world's 1 billion or so personal computers, of which around 80% are powered by Intel chips. And chips designed by ARM, a British firm, dominate the market for application processors, which run software on smartphones. Germany's Mittelstand, the closest Western equivalent of the *chuken kigyo*, also boasts many smallish world-beaters. In much the same way as the Mittelstand, Japan's *chuken kigyo* is not simply a part of the national economy, but the core of its industrial structure. It enables the country's bigger, well-known electronics firms to exist, as well as meeting foreigners' essential needs. Strikingly, doubts are growing about Japanese companies' ability to maintain their enviable position—but for now their grip remains mostly firm.

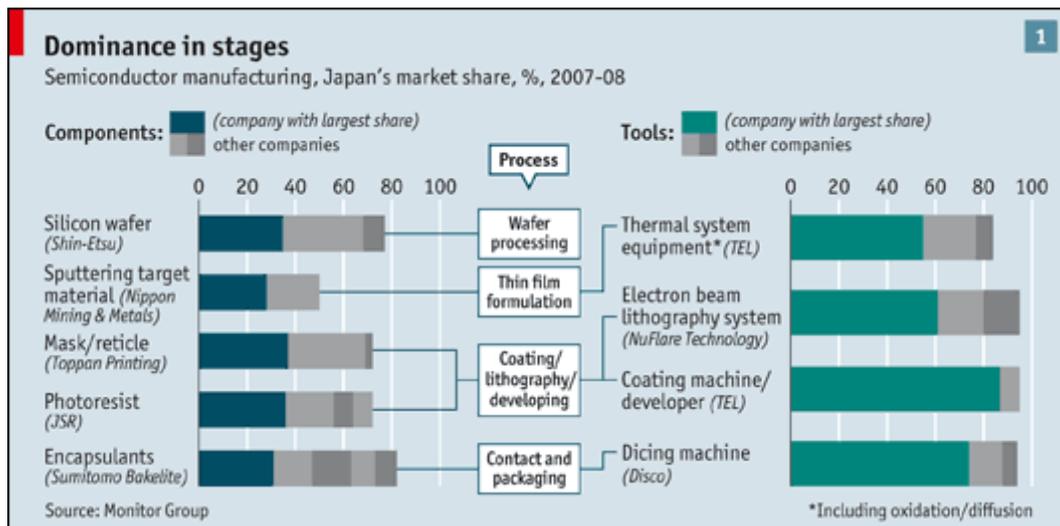
Treasure in small things

The best example of Japan's technical strength is hard to see: a capacitor. With some being as small as a grain of salt, a magnifying glass is needed. They store electricity in a circuit and are a basic building-block of many electronic devices. They cost somewhere between a quarter of a cent and 20 cents each, but a mobile phone may need 100 of them and a PC 1,000. A Japanese company called Murata has 40% of the global market.

Though the profitability of Murata's capacitors is hard to know, the company's overall margins are typically about 50%, estimates Macquarie, an investment bank. Japan's total market share (other suppliers include TDK and Taiyo Yuden) is 80%. But that is down from around 90% at the start of decade. Ground has been lost to ambitious foreign rivals such as Samsung Electro-Mechanics of South Korea and Yageo of Taiwan.

Other Japanese companies boast similar strengths. Nitto Denko claims to have more than 20 market-leading products, mostly for making LCD displays. Covalent also has several; it controls, for example, 70% of the market for carbon brushes in electric motors. Mitsubishi Chemical commands a near monopoly in red phosphorescent materials used to make natural-white LED light bulbs. Shin-Etsu enjoys the top spot for certain silicon wafers for semiconductors. Kyocera leads in several integrated-circuit components.

The process of making computer chips illustrates Japan's dominance. Among the many steps are four in which the Japanese are indispensable: wafer processing; thin-film formation; coating, lithography and developing; and contact and packaging. Japanese companies rule the markets for essential components in all four stages and equipment in three of them (see chart 1).



Electronics manufacturers everywhere turn to Japanese makers for these sorts of tools and components because of their high quality and reliability, explains T.W. Kang, a Korean semiconductor expert who recently retired from the board of NEC Electronics. No one wants to have a car dashboard malfunction because of an inferior part that cost only a few pence.

Many technology products have become commodities, but certain components have not, since they require continual innovation. So entry barriers to the business of making them remain high, and although the margins on the final goods have deteriorated, the margins on specialised, high-end components are still juicy.

Japan's technology champions share certain characteristics. They invest handsomely in research and development (R&D). Many have factories abroad for basic products but keep the high-end stuff at home—in a "black box", they like to say. They often own their supply chains: chip companies that might use crystal components generally grow their own. Some firms even make the very machines they use, in order to control costs, remain independent of suppliers and maintain a deep understanding of their technology.

When asked what is the main reason for their success, executives invariably gush about the quality of their customers. The response initially sounds scripted, or perhaps typically humble. Of course, good customers impose strict standards, forcing suppliers to raise their game. But there is more to it than that. As Susumu Kohyama, the boss of Covalent, points out, the components, tools and materials in which Japanese firms excel are highly customised. It is only by working closely with clients over many years that suppliers gain insight into their future technical plans and are trusted to learn about thorny problems that a clever supplier might solve. Once firms become technology leaders, it is harder to unseat them.

Moreover, the knowledge about the technology is tacit, not formal. It cannot be transmitted by writing a manual or reading a patent application. Rather, it accumulates by working with colleagues over many years. This poses a barrier to entry for rivals. It is also why firms try to maintain lifetime employment in specialised high-tech sectors, though it is ebbing elsewhere in the economy.

This belief that the strength of the company is stored in the collective mind of employees—rather than in the share price of the moment—also helps explain why Japanese companies disdain mergers and acquisitions. Firms resist takeovers, rather than viewing them as the natural combinatory process of business, as in the West.

Ironically, the very success of Japan's hidden technology champions is in part due to changes in the industry that have hammered Japan's big electronics firms. Companies anywhere can

buy the machines, chemicals and know-how to get into the manufacturing business, so the leading Japanese brands have suffered. But the country is also home to the firms that supply those very machines, chemicals and know-how. As the giants have struggled, the chuken kigyo has thrived.

The foreigners are coming

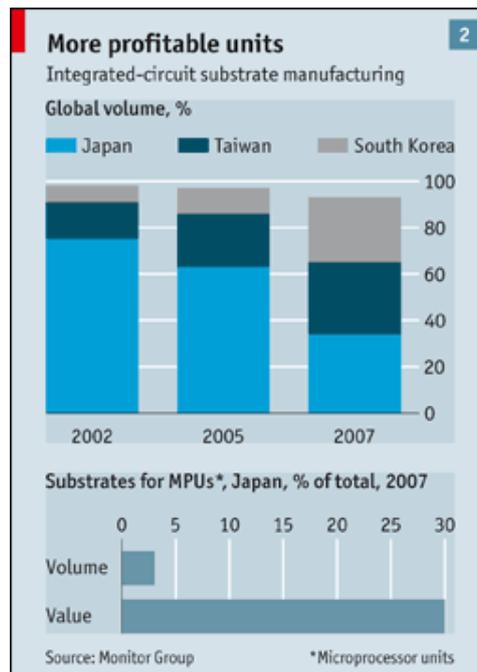
Impressive as it is, however, Japanese firms' continuing dominance is not guaranteed. They conquered their markets partly by adopting and improving on foreign (largely American) technology, first with low cost, then better quality and finally with technical superiority. Along the way, they developed close relationships with their customers, gaining intimate knowledge of—and then satisfying—their precise needs. A technical edge and customers' trust amounts to a formidable barrier to entry. The question now is whether China, South Korea and Taiwan could do to Japan what Japan did to America.

Worries about the sustainability of Japan's lead stem chiefly from a belief among some executives and officials that Japanese firms are not doing as much as they could to realise the value of their technology. Hiroaki Okamoto, the director of R&D at Shin-Etsu, even believes the industry is in crisis. "We know that Korean and Taiwanese firms might catch up. There are so many competitors in Japan, no one is really making much money" on certain products. Lower margins mean that Japanese companies have less money to invest in R&D. "This lets Taiwanese, Chinese and Korean companies compete."

That said, market dominance is a pretty strong starting position. Some executives believe that when a narrow market is shared by a few firms, they should consolidate. They also rue the inwardness of Japanese firms that resist co-operating with others. Jun Saito, a researcher at the University of Tokyo, notes that Japanese tax law actually discourages partnerships from forming. Mr Moel of Monitor believes that the firms could generate new revenue opportunities if they were more outward-looking and managed the technology better.

The very attributes of Japanese business that led to its technical dominance also risk holding it back. The lack of shareholder pressure that lets companies focus on long-term projects removes the market discipline to boost performance and cull weak projects. Vertical integration ensures supply and quality, but leads companies into non-core areas better done by others. Lifetime employment keeps knowledge in-house, but firms lose flexibility, employees lose labour mobility and fresh ideas can be stifled.

"Frankly speaking, the changes are starting now," confides a manager at Taiyo Yuden. South Korean products are good, he says. "We see others coming after us. If we don't do anything, they will run over us. So we're struggling to find a new way."



What is Japan's response? If possible, more innovation. In substrates for integrated circuits—the foundations for chips and other components—this has worked (see chart 2). Between 2002 and 2007 Japan's market share collapsed, from 75% to 34%, as Taiwanese firms doubled and South Korean firms quadrupled their presence. So the Japanese moved to higher-value products, focusing on substrates for microprocessor units (MPUs). The 3% of substrates for MPU applications shipped in 2007 accounted for 30% of the market's value.

However, innovation alone may not always help. High volume also counts for a lot. Japan went from making half of the world's solar panels to less than 20% over the past four years. Although it continues to make the best-performing ones, the industry has largely shifted to China. Furthermore, the best technology is less prized in the fastest-growing markets—poor countries like China and India that want basic products. Japanese makers of mobile phones have the world's most sophisticated devices but their market share abroad is virtually nil.

A warning to the *chuken kigyo* is the experience of two big firms, Canon and Nikon, against ASML, a Dutch company, in the market for steppers, the tools used to make computer chips. In 1990 ASML had less than 10% of the market, while the two Japanese firms dominated it. Yet today ASML controls 65%. Japanese executives raise the matter to decry corporate complacency. How did ASML win?

"We were too small to compete with Nikon and Canon directly," explains Willem Maris, who devised the strategy as the boss of ASML from 1990 to 2000. The Japanese had far more resources and did everything in-house. So ASML redesigned the product to make it modular, which let it farm out work to specialists. For instance, Carl Zeiss, a German company, made precision lenses. This ultimately enabled ASML to innovate faster and surpass the Japanese, says Mr Maris.



Illustration by Gary Niell

ASML's openness took a more literal form, too. "When a machine at Samsung broke down, 20 Japanese would come over and place a tent over it, so no one could see exactly what they did," he says. ASML took the opposite approach, and showed customers the problem and how it would be fixed. Today, Nikon and Canon remain as closed as ever—and separate, even though merging their stepper businesses would make sense.

Old skills, modern times

Japan's technical success has its roots in old strengths. Its excellence in fine ceramics harks back to its expertise in pottery. Its brilliant steel forgings are a vestige of ancient swordmaking. Japanese will say this reflects their culture of monozukuri (making things) and kaizen (continuous improvement). But not all of Japan's customs serve it well. Its tradition of resisting outsiders—be they foreigners or other companies—today risks undermining it.

To help overcome the reluctance among companies to share technologies or join forces, in July METI established the Innovation Network Corporation of Japan. Packed with people from business, it acts as a sort of national private-equity fund, with assets and credit guarantees totalling \$9 billion. It aims to invest in promising intellectual property, with the idea of creating spin-out companies or encouraging consolidation.

"They never merge," laments a METI official, who fears more companies will go the way of Nikon and Canon in steppers. "We can't lose that," he says about Japan's technical dominance. In the past, Japan's closed approach made sense, admits Mr Kohyama, the boss of Covalent. But not today. "We have to think a lot more openly," he implores.

Japan's hidden champions will probably need to unite in some form to maintain the financial and technical strength they need to stay dominant. They will also have to be wary of antitrust watchdogs, even if they have largely avoided them hitherto. The American authorities are investigating makers of optical drives (used in computers and DVD players) and Japanese trustbusters tend to focus on a merger's effect on the domestic market although it would create a strong global supplier.

As for Japan Steel Works, its technical superiority is legendary. Even today it makes samurai swords using time-honoured techniques. Yet its absolute dominance in nuclear-containment vessels is coming to an end, as rivals from China, South Korea and elsewhere emerge.

“In the not too distant future we’re going to have at least five options,” notes Aris Candris, the boss of Westinghouse, which builds reactors. “Unfortunately none of them are from Philadelphia”—where Westinghouse is based and which used to be the centre of America’s steel industry. The lesson is clear: once the expertise is lost, it is hard to regain.

INVISIBLE but indispensable. **The Economist**, New York, Nov. 5th 2009. Disponível em: <www.economist.com>. Acesso em: 6 nov. 2009.

A utilização deste artigo é exclusiva para fins educacionais