

# Japan

## Technology & Innovation

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# Asia's testbed strives to adapt

The imperative to modernise presents dilemmas, writes *Jennifer Thompson*

The outlook for Japan's engineers and entrepreneurs is the brightest for 20 years – on the face of it.

Prime minister Shinzo Abe's three-pronged strategy to revive the economy – known as Abenomics – aims to help both ventures starting out and conglomerates that have existed for decades.

Tokyo kicked off the year with fiscal stimulus followed by an unprecedented monetary loosening from the Bank of Japan. Following that was the promise of additional reform measures, such as special zones in urban commercial centres where deregulation will go further than at the national level. To add to all that came the apparent removal of funding barriers for entrepreneurs.

For those budding enterprises that do make the grade, a stock market rally instigated by a new flush of investor optimism about the world's third-largest economy is boosting the chances of successful initial public offerings, should the enterprises wish to raise further capital.

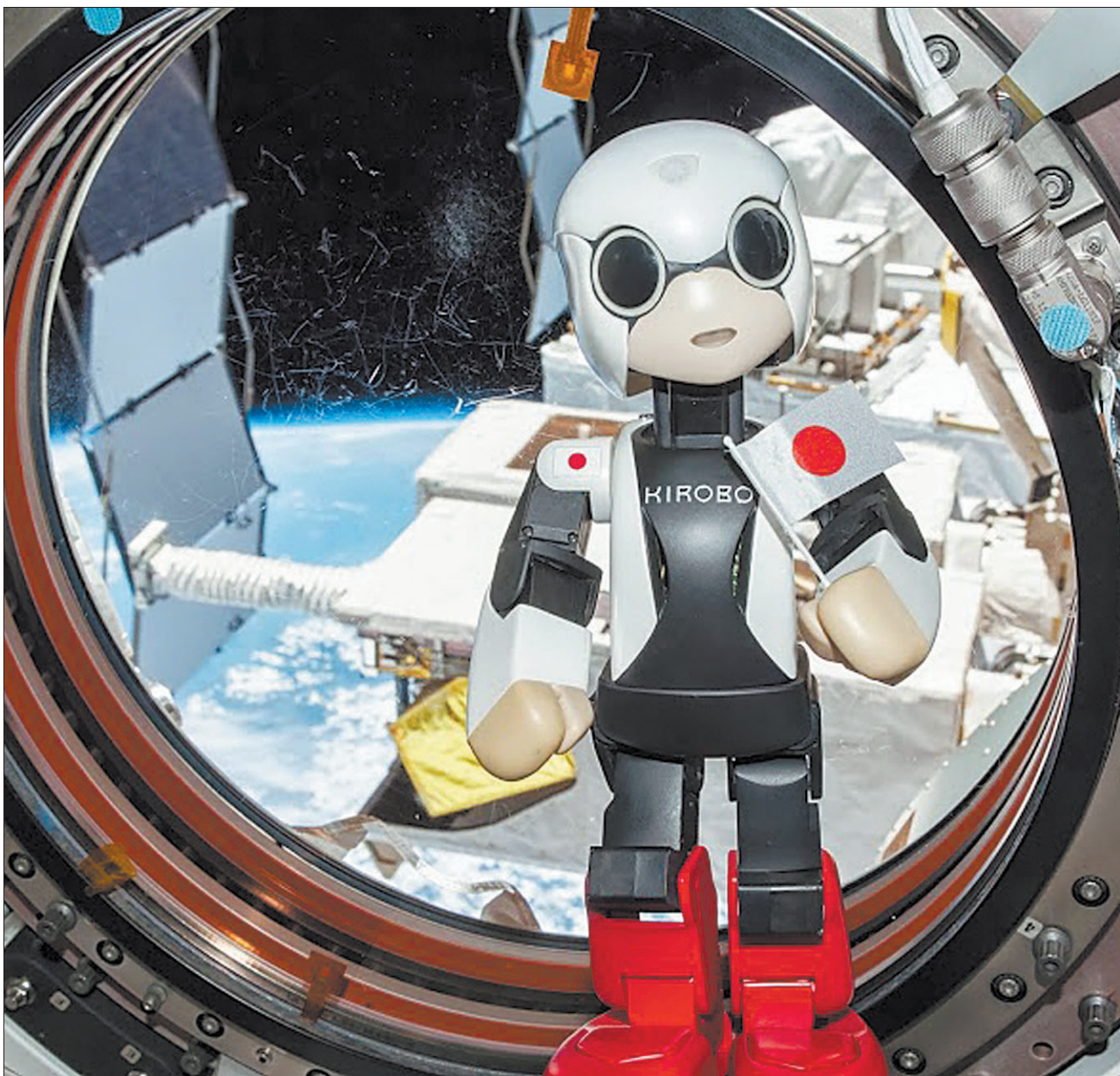
Japanese companies compete hard to remain technological frontrunners in traditional areas of strengths such as the automotive industry. Nissan and Toyota want vehicles with self-driving technology to start rolling off their mass production lines by the end of the decade.

But businesses in other traditional areas, notably consumer electronics, continue to struggle.

Last month Sony slashed its full-year net profit forecast by 40 per cent as the consumer electronics company fell back into the red for its second quarter.

Much rides on whether the group will make good on a promise that its Xperia smartphone range and PlayStation 4 game console, for which it has set an initial sales target of 5m, will help Sony return to profitability. Sharp, which this time last year warned of doubt about its survival, is fighting back after two years of multi-billion-dollar losses.

It is making a \$1.4bn share offering and various equity agreements with



Robot dreams: Kirobo travels to the International Space Station to support a Japanese astronaut

manufacturers in Japan, focusing on restructuring rather than novelty. "The electronics industry is changing drastically and it has become vital to build systems to provide high value-added products as quickly and as efficiently as possible," says Yoshihiro Nishida, a manager at Murata Manufacturing, a Kyoto-based supplier of components to Apple and Samsung.

The challenges of introducing structural reforms and fostering entrepreneurship remain.

One recent row is a case in point. Last month Hiroshi Mikitani, the chief executive of Rakuten, Japan's largest e-commerce company, who has

the ear of the prime minister as a member of a council advising on legislation to boost Japan's growth, threatened to quit after questioning the government's commitment to reviving the economy through deregulation.

Mr Mikitani was acting in response to a draft pharmaceuticals bill, one of the first reforms promised by Mr Abe after his election last year.

Bricks-and-mortar pharmacies oppose the bill's removal of a ban on internet sales of non-prescription drugs.

Yet Mr Mikitani was dismayed to discover that the planned legislation contained caveats that would prolong

pharmacies' hold over more than two dozen popular medicines, in some cases permanently. "If Mr Abe cannot decide on this, he cannot decide on anything," he said.

Another eternal complaint about Japanese industry is that too many companies make the same things. Their executives complain of profit-squeezing competition yet are loathe to leave money-losing businesses or merge their companies with rivals.

There has been progress this year. Panasonic, for instance, has said it will abandon smartphones, while television makers across the board have trimmed production. But experts agree more consolidation is needed.

Part of the government's grand plan to haul the economy out of more than a decade of low growth and 15 years of deflation is to encourage businesses to collaborate in the hope that reducing the number of players in a single sector will relieve downward pressure on profits, wages and prices.

Excess capacity plagues virtually every industry, particularly food, retail, chemicals and construction where the top five businesses have as little as a 30-40 per cent share between them.

Changing corporate law is one part of the solution. Mr Abe's administration is pushing for tax breaks to reward companies that carve out overlapping operations and combine them in a new entity.

Some areas are already witnessing growing innovation.

Japanese engineers at Toyota and Tokyo university this year created a robot capable of holding a conversation about everyday events. Not an answer to mankind's most pressing needs, perhaps, but certainly a useful addition to the International Space Station, where the robot, Kirobo, acts as a companion and instructor to a Japanese astronaut.

"I believe robots will be the next smartphone, just like Google believes Google Glass will be the next smartphone," predicts the robot's designer, Tomotaka Takahashi.

Other breakthroughs will reach wider audiences.

Japan's prototype levitating train, in development for years, broke the 500kph barrier in testing this summer.

JR Central is aiming to start a Maglev service on a line between Tokyo and Nagoya in 2027. Some have called for construction plans to be speeded up so the service can start

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# Start-up seeks to profit from ageing population

## Entrepreneurship

Those ventures that succeed can expect to reap rewards, writes *Gavin Blair*

As an undergraduate in the late 1990s, Shuhei Morofuji was facing the traditional and laborious process of applying for jobs at leading Japanese corporations.

With established companies at the time beginning to merge, lay off staff and even go bankrupt, however, he concluded that life as a white-collar salaryman was no longer a stable option.

"I thought that it would be better to take charge of my career and form a company at my own risk," says Mr Morofuji. After a couple of years spent working in sales, he set his sights on one of the few parts of the domestic economy that was almost guaranteed to see future growth.

"The ageing of Japanese society was beginning to be featured on the news regularly at that time; how the percentage of older people in the population would keep on rising and how they held the most of the country's assets," he recalls. "But I realised that going into the actual medical or healthcare business required a lot of investment, and there were a lot of barriers."

His first foray into the market did not go according

to plan. The venture was an agency that specialised in finding accommodation for elderly people, complete with suitable facilities and available care. However, when Japan's long-term care insurance system came into operation in 2000, competition increased and fees dropped, rendering the business unprofitable.

Fear of this type of failure partly explains the lack of entrepreneurs in Japan in recent decades, according to Mr Morofuji – something he believes must change if the economy is to grow.

Undaunted, Mr Morofuji then founded SMS in 2003, with the aim of providing "information infrastructure" for the elderly care market and its associated industries. His first step was to take the advertising related to elderly care, including personnel recruitment, and shift it from leaflets and newspapers to an online model. With revenue from the success of this venture, SMS was able to expand its offerings.

"A lot of people don't understand what we do as a company, and think we're just an employment agency for elderly healthcare. In fact, that is only a part of our operations," he says.

SMS now operates more than 20 web-based services to meet the needs of the elderly healthcare and medical industries, companies supplying it, those working in it and the elderly themselves. These include a website that provides advice from industry professionals

for people caring for elderly relatives recently discharged from hospital; an online community for care workers and managers, and another site promoting professional qualifications for those employed in the sector, collecting commissions from schools when its members sign up for courses.

With 80 per cent of Japan's numerous elderly-care companies consisting of independent, often family-run, concerns, SMS created a dedicated, computerised management system, which is now used by more than 15,000 of them.

The overlapping nature of the various services mean many of the businesses feed into each other, while big data analysis has helped identify needs and develop new offerings, according to Mr Morofuji.

'This will soon be a problem for countries all around the world – Japan has a head start'

"Our overarching strategy is to be ahead of the curve in creating the full range of information infrastructure services," he says.

SMS listed on the Tokyo Stock Exchange's so-called mothers section for high-growth start-up companies in 2008, and was promoted to the first section in 2011. Annual revenue topped



Potential: elderly Japanese people take exercise

Getty

Y10bn (£62m) for the first time in the year to March 2013, while net profits for the quarter ending September jumped 35.5 per cent on the previous year to Y1.08bn.

As the populations of Japan's Asian neighbours are expected to age rapidly in the future, SMS is positioning itself to take advantage. The first generation of parents from China's one child policy will retire over the next few decades, skewing the demographics of its vast population even more than that of Japan. SMS has subsidiaries in China, as well as in the greying nations of South Korea and Taiwan. This is in addition to operations in countries with younger demographic profiles, including Malaysia, India, the Philippines, Thailand and Indonesia.

"If there is any one area where Japan leads, it's the shrinking, ageing population," says William H Saito, a serial entrepreneur, venture capitalist and government adviser. "And this will soon be a problem for countries all around the

world. Japan has a 20-year head start on this.

"The person who figures out how to address this issue – and it's going to be through ideas and technology – is going to do very well. That is going to be exportable to many countries very soon."

Having run SMS for a decade, Mr Morofuji, who still owns 31 per cent of the company, has decided the time has come to step aside and let another chief executive take the reins. He believes that companies that continue to be run by their founders tend to underperform, often becoming vehicles to implement the boss's will.

"In order to develop an organisation that can continue for 50 or 100 years, it's important to nurture talent properly in the company and have a career route for them through to chief executive," he says.

Mr Morofuji says he plans to provide support to the development of SMS's business overseas from April 2014 – while thinking about his next move.

## "Craftsmanship"



Engineer checks tooth forms of broach for precision cutting

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## Japan Technology & Innovation

# Robots must earn their keep with serious engineering

**Androids** Humanoid models may help promote manufacturers’ abilities but they need a practical purpose, writes *Jennifer Thompson*

It was not quite as memorable as “That’s one small step for man, one giant leap for mankind,” as uttered by Neil Armstrong in 1969. But the matter-of-fact statement was thrilling for the creators of a new breed of astronaut sent into space this summer: “On August 21 2013, a robot took one small step toward a brighter future for all.”

Kirobo – a combination of the Japanese words for “hope” and “robot” – is a machine with a difference: not only does it provide technical assistance, it is also designed to provide companionship to human astronauts who spend months working in space.

“I believe robots will be the next smartphone just like Google believes Google Glass will be the next smartphone,” says Kirobo’s creator, Tomotaka Takahashi, referring to the efforts made to enable the machine to hold basic conversations.

Kirobo was last month joined by Koichi Wakata, a Japanese astronaut, having travelled ahead to the International Space Station in an unmanned rocket which blasted off from a Japanese island this year.

Mr Takahashi, a robotics engineer at Tokyo university, was inspired by the Manga character Astro Boy, a classic cartoon robot, and worked on the project in collaboration with Toyota and Dentsu, an advertising firm.

Kirobo has been programmed to communicate in Japanese and recognise voices and faces. He is capable of holding a conversation and improvising basic responses. On the more practical side, he is there to act as an observer and recorder, and can relay instructions verbally to Mr Wakata sent from earth. But despite the attention the project received and the high

level of Japanese robotics expertise, other manufacturers are unlikely to follow suit, say those working in the industry.

“They don’t recognise space robotics as a big area for the business,” says Hiroki Kato, an engineer at the Japan Aerospace Exploration Agency (Jaxa). He says projects such as Kirobo make great PR – the little space companion generated headlines worldwide – but are not the basis for a sustained commercial programme unless they could earn their keep by performing a wide range of tasks.

Jaxa has created prototype robots sent into orbit on several missions for tasks such as refuelling and maintenance but is not currently working on a humanoid robot, although it has not ruled that prospect out. The US regards itself as leading the field.

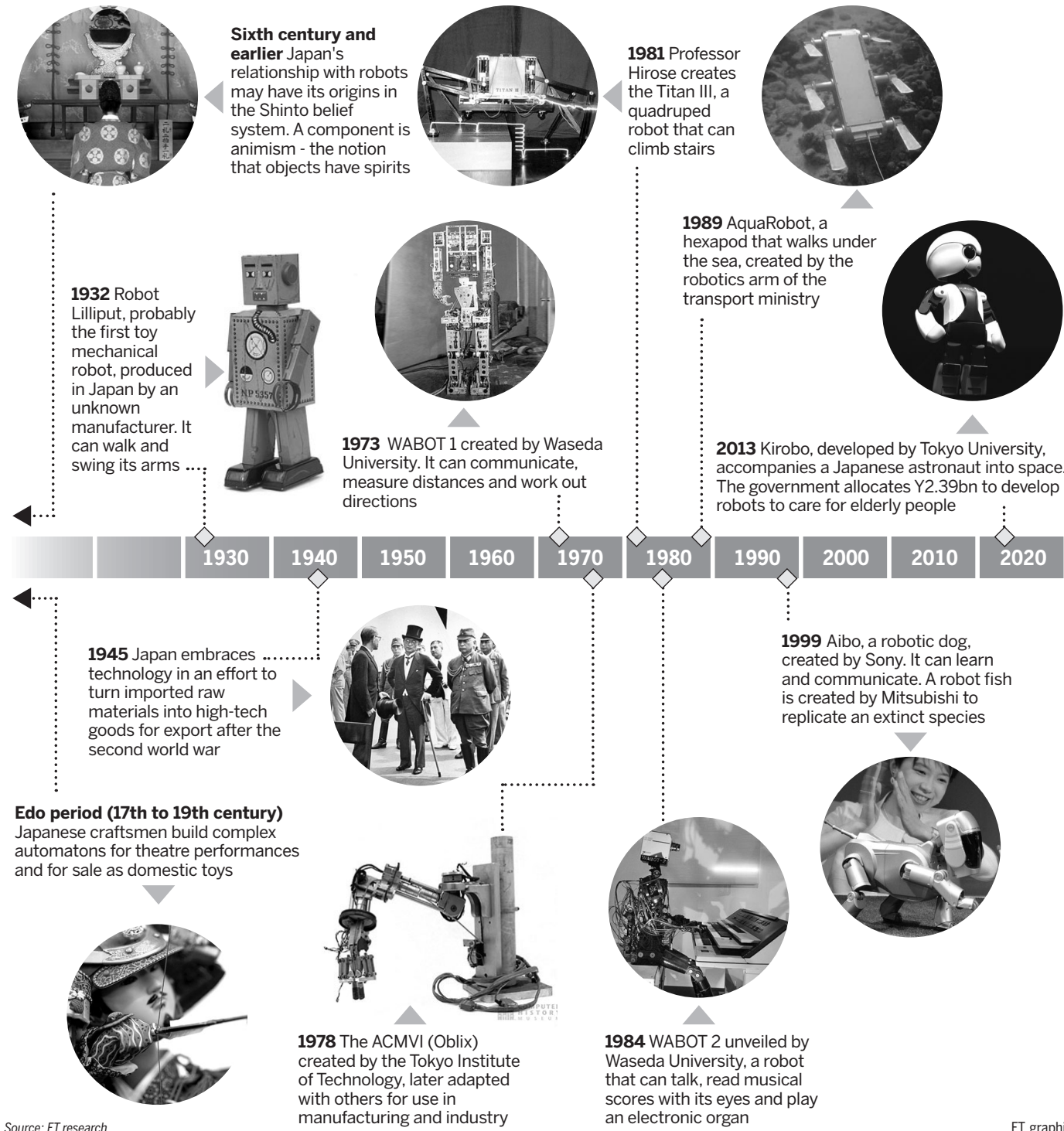
“Japan has significant experience with its advanced robotics but only Robonaut [the first humanoid robot in space] has worked side by side with astronauts performing tasks that currently only humans perform,” says Ron Diftler, manager of the Robonaut project at Nasa.

Japanese roboticists have sometimes come under fire for making machines that entertain rather than pursuing serious engineering projects.

Honda’s Asimo robot, the “world’s most advanced humanoid robot” according to the carmaker, can walk like a human and is the size of a small adult. But it has usually made headlines for conducting symphony orchestras, performing dances and greeting royalty.

The March 2011 tsunami and subsequent Fukushima nuclear disaster was a wake-up call. The event ought to have been an opportunity for

### Japan's history of robotics



Source: FT research

FT graphic

In 2011, few robots were capable of responding to the Fukushima nuclear accident

roboticists to show what their technology could do, given the dangers for humans during the clean-up operation at the stricken power plant.

But few robots were capable of responding to the nuclear accident, a situation that has since encouraged many to focus on developing robots that can perform rescue operations.

After Fukushima, space is no longer regarded as a priority for Japanese roboticists – but some believe robot astronauts will eventually come into their own.

Technology used in Honda’s Asimo and other robots can easily be applied

to machines created with space missions in mind, says Mr Kato. But for those that decide to go down this path profits may not materialise for 50 years, he predicts.

“Interest in space robots is growing more quickly now than 10 years ago,” says Mr Diftler. “The space station is a very busy place and having an extra set of hands, in this case robot hands that can handle maintenance tasks, frees up the crew for more science.”

Mr Takahashi argues the good publicity is enough at this stage. “A lot of people are interested in this project, and that’s the important thing.”

# Stem cell scientist warns on profits

## Regenerative medicine

Pioneer is wary of high expectations for making money, says *Jonathan Soble*

Masayo Takahashi is Japan’s latest medical celebrity. Next summer, the 52-year-old ophthalmologist will extract skin cells from a volunteer whose vision has been impaired by age-related macular degeneration, a common retinal condition that makes it difficult for those affected to see straight ahead, but leaves peripheral vision intact.

Dr Takahashi, who works at the Riken Centre for Developmental Biology in Kobe, plans to transform those cells into retinal tissue using an experimental stem-cell technique, then implant them into one of the patient’s damaged eyes.

Because the tissue will be extracted from the patient’s body, Dr Takahashi hopes it will be integrated easily by the eye, regenerating it and restoring at least some of the lost vision. “Fifteen

years ago, I thought, I will develop cell transplantation therapy,” she says. “Gene therapy and stem cells were completely new to ophthalmology then, but I saw the importance.”

Dr Takahashi’s work is the first clinical trial in the world involving iPSCs – induced pluripotent stem cells – a type of stem cell derived from adult tissue. It is backed by a high-profile national effort to capitalise on a Japanese scientific discovery: last year, Shinya Yamanaka, a professor at Kyoto University, shared the Nobel Prize in medicine for working out how to “trick” mature cells into becoming iPSCs.

Stem cells have enormous potential in treating diseases because of their ability to grow into any sort of tissue. Until now, most have been cultivated from the cells of human embryos, but iPSCs offer two distinct advantages: they are free of the ethical objections that surround the use of embryonic tissue and they can be genetically matched by making them out of patients’ own cells. Laboratories around the world are

using iPSCs to study how diseases progress and to develop treatments: scientists imagine creating everything from brain cells for Parkinson’s patients to insulin-making cells for diabetics.

But Dr Takahashi and her team at Riken will be first to try an iPSC treatment on a human subject.

Despite the novelty of the technology, Japan’s government is already betting that it can become the basis of a major new industry.

Shinzo Abe, the prime minister, has given regenerative medicine a central place in his “Abenomics” growth strategy, and he is backing revisions to Japan’s pharmaceutical law that are intended to shorten approval times for new research and treatments. The changes are expected to be approved by parliament before the end of the year.

“Regulation is the biggest hurdle in this field, but Japan will be the best place in the world to pursue regenerative medicine,” Dr Takahashi says.

Yet for all her confidence in the health benefits of stem cells and other regen-

erative therapies, she is wary of the high expectations building up around their economic potential.

“Start-up companies are already involved and the road to commercialisation is there, but to assume that the concept of iPSCs and regenerative medicine will yield a lot of money is naive,” she says. “Only parts of the field will become industries. It’s dangerous to think that all of regenerative medicine will.”

Still, she believes moving quickly to find applications for stem cells is a positive turn for Japan’s scientific establishment. The country has an impressive record in basic research – Dr Yamanaka was its 11th Nobel laureate since 2000 – but when it comes to commercialising its discoveries, she acknowledges that the country has been “weak”.

“In Japanese academia there is this idea that poor equals pure,” she says.

She draws a contrast with Riken, which has partnerships with universities and the government but was founded as a private institution. “Our project is seen as special, but at a Japanese

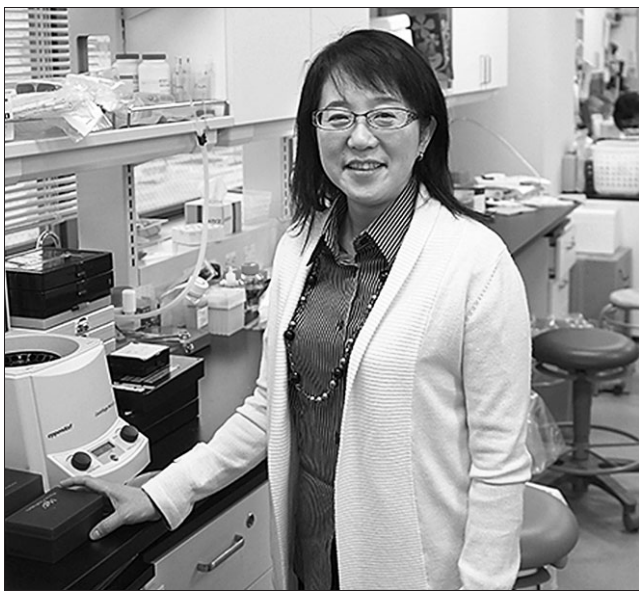
university every department is supposed to be treated equally. I think a lot of universities will be watching us.”

Dr Takahashi did not always have ambitions to run a cutting-edge clinical laboratory. She says she drifted into medicine at the urging of her parents, and chose ophthalmology because she wanted children, and the field offered stable working hours. Her husband, a neurosurgeon, was the more illustrious doctor. “I saw it as my job to support him,” she says.

It was in 1995, when she followed her husband to the Salk Institute in California, that she started on her own path to prominence. She was introduced to the field of stem cell science and saw that no one was exploring its use in ophthalmology, so she began her own research project. “I was the only person in the world who understood it,” she says. “That was an exciting feeling.”

On returning to Japan, Dr Takahashi continued her work at Kyoto University.

Paradoxically, because she had chosen clinical research, academia’s mix of



Restoring sight: Masayo Takahashi

glass-ceiling sexism and disdain for applied science worked in her favour. “I could do what I wanted because I was a woman,” she says. “I didn’t think about career advancement.”

Today, she believes, barriers to women in science have largely disappeared in Japan. Although the country has mostly resisted quotas and other formal anti-discrimination measures, qualified women are often given priority for jobs.

“At Riken, the other candidate for my job was a woman and a foreigner, so I was pretty worried,” she

half-jokes. “Luckily, she dropped out.”

The bigger barrier is a psychological one imposed by traditional culture, she argues. “Japanese women don’t want to stand out, they don’t want to be leaders. They don’t think, ‘I want to have my own lab and reach the top in my field’. I certainly didn’t until Salk.” But Dr Takahashi believes things are changing, in part because of the growing number of role models such as herself. “Sometimes,” she says, “I meet young women who tell me, ‘You’re cool!’.”

# Asia’s testbed strives to adapt

Continued from Page 1

before the 2020 Tokyo Olympic Games.

On a smaller scale, one Japanese company is examining ways to reinvent that most basic and quintessential Japanese staple: rice.

Keiji Saikahas spent years perfecting alternative ways to polish the grains in order to remove the outer bran and leave a thin, nutritious membrane intact.

“I feel I have a duty to help protect Japan’s rice culture,” he says. After he worked on the idea for more than a decade, *musenmai* – wash-free rice – was launched.

By 2011 about 460,000 tonnes were being made, equal to 6 per cent of Japan’s total rice production.

Such ventures indicate that the particularities of Japan make the country a vital testing ground for new technology.

Some developments will potentially be slowed, at least in terms of their commercial availability, by regulation and the need to create the infrastructure in which they can operate, most notably in the case of self-driving cars.

But there are strong imperatives for many more businesses in Japan to work more closely together in order to combat rising energy costs, serve an ageing population and develop cutting-edge technologies.

The country also needs to foster an environment which enables entrepre-

There are strong imperatives for businesses to work more closely together

neers to keep trying even if a first venture fails.

Shuhei Morofuji’s first business did not survive but his second, operating web-based services to meet the needs of healthcare and medical services for elderly people, saw annual revenue surpass ¥10bn (\$98m) for the first time this year.

As a fellow Japanese entrepreneur describing the battle to adapt products and services to suit changing demographics puts it: “The person who figures out how to address [demographic-related business challenges] – and it’s going to be through ideas and technology – is going to do very well. That is going to be exportable to many countries very soon.”

As Japan has proved time and again, lessons learned by the Japanese will inevitably be transferred elsewhere.

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## Comment

P REED MAURER

While governments elsewhere wrestle with cost control and austerity cuts to research, healthcare in Japan is a growth industry. But that was not always the case.

From the end of the second world war until the mid-1970s, Japan’s intellectual property protection policy fostered imitation rather than innovation. In the pharmaceutical industry, foreign companies could enter Japan only as joint ventures with 50 per cent or less ownership. Patents

were granted for processes rather than products, so researchers in Japanese companies focused on finding innovative or unpatented processes to make drugs that had been discovered elsewhere.

All this changed in 1975 when a product patent system replaced the process patent system, and foreign companies could establish 100 per cent owned affiliates in Japan. Researchers were forced to discover new substances instead of new processes.

Western critics considered Japanese research inferior because it produced small-step innovations, such as

‘Japan still lacks a bridge between new drug ideas and marketed products’

second or third generation products that were not a threat to first-in-class drugs. However, the approach was rational in Japan because higher prices were awarded for small innovations. The goal was to launch any new version of a drug rather than a new and unique drug.

Consequently in the 1980s Japan approved and launched more new – or at least new versions – of drugs than either the US or Europe. Many of these were not sold outside Japan, but they did solidify a dominant position for Japanese companies in their home market, the

second-largest in the world. Japan no longer had to rely on foreign partners, and researchers worked to discover first-generation drugs that would establish a presence in international markets. In the 1990s some Japanese-origin drugs became international blockbusters. Regulators were convinced that stronger intellectual property protection yielded positive outcomes as Japan took a position alongside the US and Europe in new drugs discovered rather than copied. Further policies supported innovation. One was to shorten the time required to review and

approve patent applications.

The result was a gradual decrease from between a five and eight-year wait for approval in 1998 to an average of 18 months today. Another, in 2007, gave new drugs eight years of exclusivity regardless of patent status.

New drug ideas spring from laboratories, and in Japan most are in large national universities. Researchers were government employees unable to profit from their discoveries.

But once that restriction was removed in 2004 there was an explosion in new bio-venture companies and

new drugs today are most often large molecule biopharmaceuticals rather than small molecule chemicals.

Innovation is changing but Japan still lacks a bridge between new drug ideas and marketed products.

The next steps must be venture capital, ease of public listing on stock exchanges and a central agency to optimise the allocation of government money for research.

*P Reed Maurer is president of International Alliances Limited and author of “They Do Well Who Do Good”*







Japan Technology & Innovation

High-tech toilet makers contrive to make a splash

**Household goods** Manufacturers such as Toto hope to persuade the world to purchase what is regarded as a Japanese oddity, writes *Amie Tsang*

The walls outside the other-wise minimalist bathroom cubicles in Toto's London showroom are adorned with messy scraps of paper, each with the header: "My first Washlet experience was...". One reads: "I became a child again".

Others range from fearful – "Very scary" – to rhapsodic – "Orgasmic", "Bangin!", "The most exciting toilet experience of my life!"

High-tech toilets have been common in Japan for 30 years. At least 70 per cent of households have one fitted.

They are more unusual outside the Japanese domestic market, but companies such as Toto are hoping to make them popular worldwide.

Toto, which sells them under the brand name Washlet, is growing steadily outside Japan. The company entered the European market with a base in Germany in 2008 and the London showroom opened in 2010. It forecasts that by the end of 2013 overseas sales of all its equipment will have risen 22 per cent year on year.

This is much higher than the 9 per cent rise in sales in Japan, but comes from a lower base. The company's overseas sales of housing equipment rose 9 per cent year on year in the second quarter of 2013 in the Americas and 16 per cent in Europe.

Hiroki Oizumi, global marketing officer for Lixil, the group that owns Inax, another Japanese high-tech toilet maker, says the prices of such products can be a barrier to new business within the UK and the US.

The "retail price of a shower toilet is significantly higher than a normal toilet", he explains. "And people have no experience when they try to use it," which makes it a harder sell.

Mr Oizumi says that giving customers the "real experience is the key to expanding the market". However, high-tech toilet manufacturers cannot just rely on showroom visitors.

Sohei Nishida, Toto's London manager, thinks it can expand only by establishing the same bathroom preferences in Europe as Japan. He recognises talking about toilet habits can be unsociable, but Washlets certainly have enough features to discuss.

Floyd Case, a manager at the "concept store" in London's Clerkenwell, demonstrates how the technology works with a sheet of glass placed over a showroom toilet seat. A nozzle appears and squirts a spray of water up at the glass. He keeps up a



running commentary as he presses buttons: "You can have an oscillating movement or massage and there is a drying system." The nozzle recedes and an avocado-shaped patch of water on the glass shrinks as the dryer gets to work.

Showrooms are a crucial way to convert people to using these toilets because they provide a way to test the product. Since setting up in London, Toto has also targeted potential customers in places such as five-star hotels to create awareness. It hopes that making the brand more recognisable will establish a bigger sales network and lead to more individual

customers, as it has done in China, the Caribbean and the US.

Entry into other markets has been helped by technological developments. Other manufacturers are moving into making high-tech toilets, and the quest for more environmentally friendly products has given them a foothold in other markets.

David Krakoff, president of sales for Toto in the Americas, says the push for lower water consumption for toilets in Canada and the US gave Toto an opportunity to get into the region. "It wasn't hard to create toilets that flushed 1.6 gallons – they just weren't flushing what was in the bowl.

Efficiency became a big deal and this is when we jumped in," he says.

The industry has been helped by the rapid development of technology. The pervasiveness of smart appliances has made smart toilets seem less odd.

Mr Krakoff is dismissive of the idea that people are worried about technology going wrong near their nether regions. "It's not an issue any more. We have ultra-high manufacturing standards...we get almost no warranty claims on Washlets," he says.

Back in the UK, Mr Nishida does admit to one serious cultural barrier – British consumers are not enamoured with futuristic design.

Jet set: a high-tech toilet on display in London

Charlie Bibby

'Efficiency became a big deal and this is when we jumped in'

Technology Game of thrones

Toto Neorest AC Washlet

This self-cleaning toilet has an integrated UV light to break down organic substances. It also sprays the bowl before and after use with electrolysed water, typically used to disinfect vegetables or as a mouthwash.



Inax Regio

The toilet has a sound system so that users can listen to classical music or relaxing sounds. The bowl is fitted with lights that turn on when someone approaches, which is useful for stumbling, night-time visits.



Toto SG Washlet

The spray wand can be adjusted to wash front and back. Water pressure and temperature can be regulated. It has a heated seat and a lid that closes automatically.



"In Japan, we hear about how easy [the toilets are] to use or clean – that's what's important. But here there is more care for design. That's something we're still struggling with," he says.

"We don't have it yet, but I think that in the UK it is about classical, traditional design."

Despite the aesthetic challenge, he is ambitious. It took Toto 10 years to become established in China and "it needs to happen quicker than that here".

"Once [consumers] experience it, they know how good they are," Mr Nishida adds. "I am not worried."

Rice shines as it passes chewing gum test

**Food**

Most Japanese prefer the grain buffed to its core, says *Jonathan Soble*

Keiji Saika's first innovation in rice polishing was inspired by a product far removed from Japan's cherished staple food: a piece of chewing gum.

It was the 1970s and Mr Saika was running his family's small manufacturing business near Osaka, which specialised in making rice-polishing machinery.

Most Japanese prefer rice buffed to its shiny white core. The grain is milled industrially to remove the husk, then polished in smaller batches by wholesalers, retailers or even at home. Cooks usually give it another wash in the sink to remove leftover traces of bran, thought to taste bitter and to be difficult to digest.

Mr Saika was concerned that the starchy water, or *toji-jiru*, discharged by millions of households in this process was contributing to water pollution, a big problem in Japan after more than two decades of industrial expansion.

"I wanted to find a way for people to eat rice without hurting the environment," he says.

The breakthrough came when a piece of chewing gum got stuck to his trousers. He removed it the way he learnt as a child: dabbing it with a second piece of gum and pulling both off together. "I suddenly thought, 'I can do the same thing with rice,'" he says.

Bran is slightly sticky, so he went about devising a polishing machine that would force the rice grains to jostle together. They would pull the *hada nuka*, or bran, off one another resulting in more cleanly

polished rice that did not need a rinse at home.

"I imagined myself as a grain of rice bouncing around in the machine," he says. After more than a decade of tinkering, *musen-mai* – wash-free rice – was born; by 2011, roughly 460,000 tonnes were being made, 6 per cent of Japan's total rice production.

Now at 79, Mr Saika is marketing a new innovation aimed at consumers' health. It is the result of a further refinement of his rice-polishing machine that he says produces grains that are more nutritious than regular white rice.

As most health fanatics know, *genmai* or brown rice is healthier than the white kind: the bran that is sloughed off during polishing contains micronutrients. Yet in spite of its advantages it remains a niche product, particularly in Japan and other big rice-consuming Asian countries.

Mr Saika sought a compromise – rice that would be as nutritious as possible while still being white. He achieved it, he says, by adjusting his polishing machine's design – specifically, the angle of the blade-like grain spreader attached to its central cylinder – to make the grains collide more gently and evenly. The result is the bran is removed but a delicate and nutrition-rich membrane underneath is left intact as is the *kinme* or germ.

Hiroyuki Inagawa, a professor at Kagawa University medical school, says that preserving the membrane, which is just 1/100 of a millimetre thick and is known as the subaleurone layer, may have benefits including boosting the immune system. "It's better at supporting the body's ability to self-regenerate than the rice we normally eat," he says.

Mr Saika says his rice contains nine times as much vitamin B1 and 1.5



Off-white: Kinmemai rice is processed and packed

times as much vegetable fibre as fully polished rice.

His company, Toyo Rice, is selling it under the brand name Kinmemai, or "golden bud rice". Although its price can be 10-15 per cent higher than that of regular white rice, Mr Saika points out each bag of Kinmemai stretches further – because it is slightly plumper than normal rice, the same volume can be made with a tenth fewer grains. Mr

'I wanted to find a way for people to eat rice without hurting the environment'

Saika says he hopes Kinmemai will re-energise Japan's rice farms, which produce a third less rice than they did 20 years ago – a result of changing eating habits, a shrinking rural population and a government policy of reducing acreage to support prices.

Last year, sales of bread in Japan overtook those of rice for the first time.

"I feel I have a duty to help protect Japan's rice culture," Mr Saika says. Innovations like his may

become increasingly vital. Japanese rice farming has been insulated from foreign competition by onerous tariffs on imports, but the current level of protection may not be sustainable.

Shinzo Abe, the prime minister, has pledged to defend rice farmers in negotiations over the Trans-Pacific Partnership, a sweeping trade pact that his government is seeking to join, but other parties to the talks – including big agricultural producers such as the US and Australia – want exemptions to be narrow and temporary.

The small size of most Japanese farms means they cannot hope to compete on price, so offering premium products will be essential. Mr Saika understands this, and wants to broaden his customer base by appealing to health-conscious foreigners. He recently organised a "rice tasting" for journalists and diplomats at an expensive restaurant in Tokyo's Ginza district, where dishes including plain Kinmemai served with a pinch of sea salt, puffed Kinmemai and grilled Kinmemai in dashi broth won rave reviews.

"I was happy to see foreigners have basically the same taste in rice as Japanese do," Mr Saika says. "This is a good first step."

Land of rising sun pins hopes on increased use of solar power

Electricity

Nuclear disaster started race to find alternatives, writes *David A McNeill*

Less than 20 miles north of the hulking corpse of the Fukushima Daiichi nuclear plant, Eiju Hangai, a businessman, is plotting his own modest course toward Japan's energy future.

A native of Minamisoma – the largest city in the plant's immediate fallout zone – Mr Hangai says he is trying to help his devastated home town make a comeback with a solar-powered lettuce farm. "It's my contribution to our recovery," he says.

The farm, sheltering under two nylon domes on land leased from the city government, is powered by 2,000 Toshiba solar panels. Any surplus electricity is sold to the local utility, Tohoku Electric Power. Katsunobu Sakurai, the mayor, is an enthusiastic supporter and he hopes small projects such as this will help make Minamisoma self-sufficient in energy by 2030.

Even before the March 2011 disaster, Japan's electricity rates were among the world's most expensive.

The impact of Fukushima and the eye-popping price tag for cleaning up from the disaster are extra incentives in the race to find alternatives. One result has been a tripling in the number of independent power producers over the past two years, says Andrew DeWit, a professor of policy studies at Rikkyo University.

Since a feed-in tariff system for renewable energy began last year, dozens of companies have applied to generate solar and wind power. The tariff system means that small, renewable energy producers such as Mr Hangai are paid generously for their electricity: ¥42 (26p) per kWh, or about

twice the average price of power in the UK.

That solar rush, however, is from a very small start.

Power from renewable sources made up approximately 9 per cent of Japan's total pre-Fukushima energy supply, according to the ministry of economy, trade and industry. Most of that was hydroelectric. "Other renewable energy is still cost prohibitive," says the ministry. Even with the tariff system, independent power producers today account for less than 3 per cent of the nation's electricity market.

Nevertheless, renewable energy is being produced in European and US markets at prices competitive with coal and gas, says Tom O'Sullivan, an independent energy specialist. "There is no reason why this cannot be achieved in Japan since the technology is the same," says Mr O'Sullivan, adding that Japan needs solar and other renewables to meet its newly revised climate change targets.

Bridging Japan's energy gap has become more pressing this year. Japan was previously nuclear free in 1970, when its then two working reactors were shut

down for maintenance. Today it has 50 commercial reactors and these are now offline for safety checks that are tougher and more politicised after Fukushima. The triple meltdown at the plant in 2011, combined with the weaker yen, will add an extra ¥9.2tn to the nation's fuel bill between 2011 and the end of this year, say officials, as the nation's nine big utilities scour the planet for gas, coal and heavy oil.

Opponents of the nuclear restarts are putting their faith in power saving and renewables. Eventually solar power could conservatively supply more than 10,000MW of electricity in Japan, equivalent to the output of 10 nuclear reactors, forecasts Mika Ohbayashi, director of the Japan Renewable Energy Foundation, a think-tank. "There is no need to restart nuclear reactors," she insists.

But where is crowded, mountainous Japan going to put all those solar panels, asks Paul Scalise, an energy specialist at the University of Tokyo. He says supporters of alternative energy must confront what he calls the density problem – power generated per

available space. "Wind is about two watts per square metre; solar power 20 watts; with nuclear you get 1,000 watts per square metre."

In practice, this has meant most new large-scale solar projects have set up in Japan's less crowded north. Among the biggest reported investors is SoftBank, a telecommunications company, which announced plans last year for three solar stations in Hokkaido, the northern island, with a combined capacity of more than 180MW.

Concentrating the solar boom in the north has created roadblocks, however. Hokkaido Electric Power has been overwhelmed by applications for power sales and is dragging its feet in approving them.

Another problem is transferring power across a country divided into 10 regional power fiefdoms, with different technical standards overseen by separate local governments. Not surprisingly, SoftBank has been forced to scale back on the size of the solar project.

The slow growth of energy alternatives and opposition to nuclear drags on economic recovery. Prime minister Shinzo Abe's position is clear. In March, he removed most of the anti-nuclear panellists from an energy policy board advising the state on post-Fukushima alternatives. Mr Abe is acting true to form. His Liberal Democratic party brought nuclear power to Japan in the 1950s and will not let it go easily.

This month, parliament passed legislation aimed at triggering what many say is Japan's most ambitious reform of its electricity market since the US occupation ended in 1951.

Perhaps the most striking part of that reform is the establishment of a national grid company by 2015. That should help unify the divided transmission and distribution systems and allow solar power producers like Mr. Hangai easier access to the network.

Japan's electricity generation

