

JAPAN

Fourth Industrial Revolution, challenge accepted

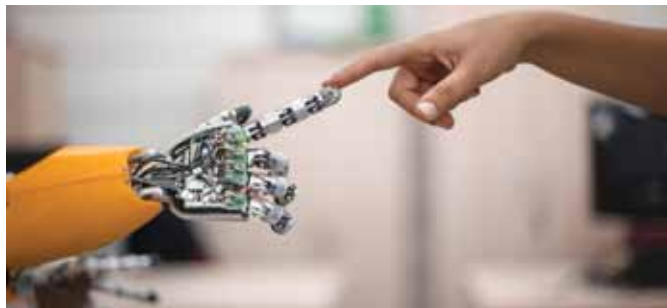
A guide to understanding why Japan is set to re-own international leadership in the 'era of acceleration'

As the dominant force in global manufacturing in the 1970s and early 1980s, particularly in the consumer electronics industry, Japan became an economic juggernaut and a poster boy for technological innovation.

However, what followed has since become commonly known as the "Lost Decades": a period of economic decline characterized by a loss of ground to manufacturing rivals in the Asian region and further exasperated by the global financial crisis in 2008.

The pendulum though has swung once again, and this period in the run up to 2020 – the year Japan will host the Olympics – is being marked as the country's great comeback to manufacturing competition, while the nation itself is tipped to become a new leader in the so-called Fourth Industrial Revolution.

The Fourth Industrial Revolution, or 4IR, is best described as a range of new technologies – artificial intelligence, robotics and nanotechnology, for instance – that are fusing the physical, digital and biological worlds, and impacting all disciplines, economies and industries. If there is one sector that will be transformed more than any other, it is manufacturing, especially as demand for better products at a better cost in a market defined by constant innovation exponentially increases.



Like any revolution, there will be winners and losers, so Japan, it seems, couldn't have timed its manufacturing comeback much better. On the back of Prime Minister Shinzo Abe's eponymous 'Abenomics' strategy and Japanese industry's great globalization push, the country shipped \$645.2 billion worth of goods internationally last year, up by 11.1% since 2009 when the economic recession kicked in, and up 3.2% from 2015.

Yuji Kaneko, President of one of the world's leaders in electrical discharge machinery, Sodick, believes that such figures show that international appreciation for Japan's renowned innovative spirit is finally returning.

"China has been winning in terms of cost efficiency, but Japan has been regaining its strength as the technological leader," he says. "For Japan, optimization of products makes our strength, and it is the reason behind our latest sales increase."

There are certain sub-sectors directly linked to the 4IR where Japan is particularly in prime position to prosper. The global industrial robotics market for example – in which Japan

is already a pioneer – is expected to grow at an annual rate of 12% to reach \$79.5bn by 2022.

Yoshiharu Inaba, Chairman and CEO of FANUC – Japan's leading robotics company – believes the significance of such growth will be historically monumental.

"With the invention of steam engines, Britain's industrial revolution boosted the efficiency of manufacturing processes," he says. "In today's revolution, the steam engine has been replaced with Internet of Things and robotics, but the outcome will be the same: greater efficiency and greater speed."

Shozo Kawanishi, President and CEO of Yamato Scale, a pioneer in multihead weighing technology, puts the new technological revolution into greater historical perspective, comparing the changes afoot to the monumental economic transformation the country went through in 1940s.

"After World War II, the Japanese economy and industry developed incredibly rapidly," he recalls. "The reason for this soaring growth was due to the reputation of the 'Made in Japan' products. Our prod-



"Japan's forte is in creating high-quality authentic products"

Kazuhiro Kashio,
President, CASIO

ucts were synonymous with quality and reliability, and the world knew them as such."

If Japan is indeed to undergo a similar transformation during 4IR, cementing its status as a manufacturing and economic giant once again, then the focus now must be on how to carry its recent progress firmly into the future. That means education, stresses Takashi Matsuoka, President at Doshisha University.

"AI will have a tremendous role in society in the future," he says. "Therefore, it is important that universities diversify and create courses from the perspective of humanities while involving AI technology. I do believe Japanese universities are ready to educate students who can lead the fourth industrial revolution in the coming years."

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Japan Inc. leverages *monozukuri* philosophy

The art of excellence still drives Japanese competitiveness

Japan's acclaimed *monozukuri* philosophy – that trademark creativity and craftsmanship responsible for the country becoming synonymous with innovation – has been put on trial over the past few years as its manufacturing industry faltered.

Some Western observers in particular suggest that Japan's supposedly extreme conservative corporate culture is to blame for hampering its innovative output and claim the country has lost its crown as the king of electronics. More specifically, critics say, the Japanese have focused too much on developing products and less on adapting to customer needs.

However, with manufacturing exports from the archipelago having bounced back strongly recently, Japan is proving its critics wrong. While this is happening on one hand through switching to more of a business-to-business (B2B) approach to manufacturing (see



"Our competitors make generic products, and then let their clients choose which one suits them best. Our company adapts its products to the needs of its customers"

Koichi Ogata, President, Nitta Gelatin Inc.



"Because we operate globally, our sales structure extends all around the world, and we have a material presence in almost all of the countries in which we operate"

Yuji Kaneko, President, Sodick



"Manufacturing plays an essential role for the economy, and we want to offer our manufacturing clients IT products and services to boost efficiency of production procedures"

Fujio Tahara, President, CEC

page 5), on the other hand, Japanese companies are also refocusing on the unique strength that saw the nation become a creative powerhouse in the first place: *monozukuri*.

"People engaged in the manufacturing sector thrive to produce high-quality products in order to

make their customers as happy as possible," says Jun Yamaguchi, President of Tokuriki Honten.

Japan Inc.'s entrenched commitment to quality and precision has indeed led the country to be reputed for its technical infallibility, and in the era of increased technological complexity, reliability is a golden attribute. Along with this reliability that Japanese manufacturers provide, in response to the criticism they have received, corporations are now putting greater emphasis on customization to cater for the needs of clients' demands.

"If the forte of Japanese companies is in making high quality products, their weakness is in launching their products into the market," admits Kazuhiro Kashio, President of CASIO. "Our future objective is to make new products, while also enhancing the user value, usability and usefulness of existing devices.

"Today, the best-selling smart watches are made by Apple. However, our focus is not on making the best-selling smart watch, but instead on making something that will offer value and usefulness for the users."

This is a way of thinking today being shared across the board in Japan, from watchmaking to gelatin production.

"Our competitors make generic products, and then let their clients choose which one suits them best. Our company adapts its products to the needs of its customers," explains Koichi Ogata, President of Nitta Gelatin Inc. -- a world leader in the manufacture of food, pharmaceutical and technical gelatins.

"We tailor-make our solutions to satisfy our client's demand," adds Mr. Ogata. "While this creates many difficulties, it allows us to create a bond with our partners, making sure that they do not switch to the competition."

Such an increased emphasis on adapting to the differing preferences of customers is linked closely to the globalization of commerce – a concept welcomed more so now in Japan than ever before in its history.

Yuji Kaneko, President of Sodick, identifies this trend as especially significant in how Japanese companies are now approaching doing business.

"Our philosophy of client care is pursued thanks to our international bases," he says. "Because we operate globally, our sales structure extends all around the world, and we have a material presence in almost all of the countries in which we operate. This global presence allows us to actively solve our clients' problems."

As for smaller, independent Japanese firms such as Computer Engineering & Consulting Ltd. (CEC) which hasn't yet become fully international, then embracing this new, more outward-looking and customer-driven strategy is quite clearly the objective.

"My personal goal is for this company to create 'Made in Japan' software products that can be used worldwide," says CEC president, Fujio Tahara. "Manufacturing plays an essential role for the economy, and we want to offer our manufacturing clients IT products and services to boost efficiency of production procedures."

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Riken drives performance with its cutting-edge and cultivated technology

The autoparts maker, whose advanced piston rings can be found in cars around the world, has developed a diverse portfolio of groundbreaking technologies that will promote further development of global industries

Technology moves fast in the automobile industry, with some of the world's brightest engineers working in the R&D departments of the likes of BMW, Mercedes, Toyota, Nissan and the Detroit 3. In turn car part suppliers to these leading carmakers must stay ahead of the curve, by constantly adapting and developing new technologies.

One such company that has been doing this for decades is Japanese firm, Riken Corp. Riken's predecessor company was founded in 1927 by The Institute of Physical and Chemical Research (now known as RIKEN), which is Japan's largest and most comprehensive research organization for basic and applied science. Its purpose is to commercialize its advanced inventions, as exemplified by the innovative piston ring manufacturing method it crafted 90 years ago.

Since its foundation, Riken's management has nurtured a culture of innovation amongst its

employees, which has allowed for global competitiveness and expansion. With piston rings as one of its core businesses, Riken has evolved into a leading manufacturer of high-performing automotive and other functional components.

According to the company, half of Japanese cars around the globe are equipped with its piston rings. Riken's advanced and custom-made piston rings are also in high demand in the professional racing world, such as in NASCAR and in the race cars that compete in the 24-hour race of Le Mans.

In response to concerns for the environment, engines have been dramatically improved in terms of offering higher fuel efficiency and reduced emissions. Piston rings may not be much to look at, but their important role in overall engine performance cannot be understated.

"The general public may not be fully aware of the incredible impact our piston rings have on fuel consumption," says Chairman and CEO Noritada Okano. "There is no end to improving fuel efficiency. We must therefore make our best efforts to provide innovative solutions that help lead to more efficient fuel consumption."

Piston rings are a key component at the heart of the engine, the power cylinder unit (PCU), and they have evolved in tandem with the advancements in overall engine performance. Riken is currently concentrating its R&D

efforts on the development of high-performance PCU systems technology. In 2015, it entered into a partnership with major German piston maker, KS Kolbenschmidt GmbH, in order to enhance the PCU systems capabilities of both companies, and to provide advanced PCU solutions to their customers.

Thanks to its materials technologies, precision processing and state-of-the-art heat management and various surface treatment technologies, Riken has developed a diverse range of high-tech products that are used in a variety of industries beyond the automobile industry.

Riken's superior metal sealing products can be found in nuclear power plant turbines and in rockets. The company also supplies high-end heater modules to leading manufacturers of semiconductors, glass and industrial furnaces; while its advanced plastic products are used for a variety of applications, including in automatic transmissions for cars. It also has a sophisticated EMC (Electromagnetic Compatibility) engineering business group.

"All of these product developments were made possible thanks our core technological competencies and the innovative spirit that is inherited from our RIKEN roots," says Mr. Okano.

"I believe there should be many diversification opportunities for us across a broad range of industries. Another focus is to ex-



"We are constantly looking abroad for expansion opportunities and we are enhancing sales activities in the U.S., Europe and other foreign markets"

Noritada Okano, Chairman and CEO, Riken Corp.

and the application of our core technologies to non-automobile areas."

This year is Riken's 90th anniversary. Going forward in line with its new mid-term plan through 2020, Riken is pursuing "Growth through Diversification" and "Pioneering Technologies", and is accelerating its activities to provide advanced solutions and groundbreaking products to address global challenge such as climate change, and to promote further development of industries around the world.

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Innovation behind the scenes

Real innovation might be where you least expect it

Traditional technology pioneer Japan has faced increasingly stiff competition from the likes of Korea, Taiwan and China in the manufacturing stakes in recent years, and in many cases, has been completely overtaken by its regional counterparts in international consumer markets as some of the country's most well-known technology brands have experienced a dramatic fall from grace.

To the outsider looking in, it would seem that Japan has somewhat lost its characteristic innovative edge. Both the Japanese and industry experts alike, however, argue that this is far from the truth. While goods made by once-leading Japanese electronics firms such as Sharp and Toshiba may have been steadily and undeniably replaced by gadgets from their Asian competitors on department store



shelves, the country's manufacturers are indeed still ahead of the game in the technology sphere, only in areas where it's not so obvious to customers.

Though innovation is most often discussed in a business-to-client (B2C) context, with B2C companies (who brand, package and sell the final product) earning most of the credit, many business-to-business (B2B) companies who operate in a more behind-the-scenes role – supplying vital parts and research – have also earned recognition for their

pioneering work. It is in this B2B field where Japan continues to lead the way, just as it did in the B2C market during the 80s.

Where once TVs and audio equipment were the icons of Japanese innovation, it is now with the likes of semiconductor devices, bullet train design, and robotics (in other words, products that your normal, everyday consumer wouldn't buy) in which the country has an edge over its competitors.

Being a leader in this field, B2B innovation in Japan is by no means a new thing. With Korea,

Taiwan and China having assumed the role of mass electronics producers, leaving the consumer market no longer cost-effective for Japan to focus on given the competition, it's only recently however that the B2B segment has come more to the fore.

"These nations focus on replicability and mass-production, while we focus on customization," explains Yoshiharu Katsuta, President of consumer electronics firm, Maxell, regarding the shift. "Most technologies developed by neighboring Asian countries have already been made by Western firms, so their success resides in lessening the cost of operations. However, when it comes to constructing electronic components and structural part, the Japanese spirit of *monozukuri* has a great competitive advantage."

It's this deep tradition for creativity in Japan (think of the painstaking effort that goes into making sushi or origami) that has allowed Japanese firms to prosper in the technically complicated

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processes involved in making vital components, affirms Mr. Katsuta.

"Manufacturing the pieces that will enable the end product to be assembled requires technique, expertise and professionalism; and Japanese *monozukuri* offers just that. So, while we cannot compete in terms of assembling ready-to-use devices, we remain extremely competitive in technological manufacturing."

This is a sentiment and experience shared by a whole host of Japan's B2B manufacturing firms, the majority of whom cannot count on internationally-famous brand status among the general public, but are no less respected and recognized as important pioneers in the world of innovation.

And it's not just in the high-tech realm in which Japan continues to blaze a trail. The reasons given for the ongoing success behind the country's B2B manufacturing industry remain largely the same no matter who you talk to, be it an electronics firm or a gold-refining company, such as Tokuriki Honten. They all attribute Japan's achievements in the sector to the country's long tradition for invention.

"Our greatest competitive advantage is based on our Japanese style of manufacturing," says Tokuriki Honten's president, Jun Yamaguchi. "We have a long history of almost 300 years, and during this time, we have always focused our business on precious metals. We have built a reputation of creditability by selling high quality bullions and precious metals to industries and jewelers."

"Japan has a foundation of high-quality technology," he adds. "By focusing on capturing what the market wants or needs, we will remain strong."



Jun Yamaguchi,
President, Tokuriki Honten



Hirokazu Nakajima,
Chairman, Kodenshi Corp.



Satoshi Sawamura,
President, ROHM

Aside from the spirit of *monozukuri*, Mr. Yamaguchi also highlights another ancient Japanese philosophy as a factor in the country's manufacturing success story: *omotenashi* (roughly translated as hospitality, and the trait responsible for Japan's world-renowned customer service).

"The major feature that composes Japanese manufacturing is the ability to tailor the manufacturing process to our users' needs," he says. "We want to make customers happy. In Japan, there is a famous phrase which is 'The Customer is God.'"

Semiconductor manufacturer ROHM is another example of a Japanese company that embraces both philosophies.

"First, ROHM has always applied the strictest standards of quality to all of its products and processes, and we strive to improve our activities every day," says president Satoshi Sawamura. "Second, we hold customer satisfaction as one of the key priorities for business success. In addition, one of our core characteristics is that this philosophy is not shared by our top management only, it is embraced by all employees."

Though B2B companies by nature are not very customer facing, *Omotenashi* certainly applies to business clients as well. Combined with their well-established reputation for world-class innovation and technological expertise, this makes Japanese B2B firms a popular partnership choice for international manufacturers. And such partnerships are only likely to multiply going forward as collaboration between multinational innovators increases in order to confront growing global

challenges, such as in health and environment issues.

"Our next step is to move towards a smart society," says Hirokazu Nakajima, Chairman of Kodenshi Corp, on the common challenges that lies ahead. "When talking about building a smart society, the elements are first smart cities and smart transportation, then smart life, for example medical equipment and environmental care. These are elements which will make our lives more comfortable, and which we are developing."

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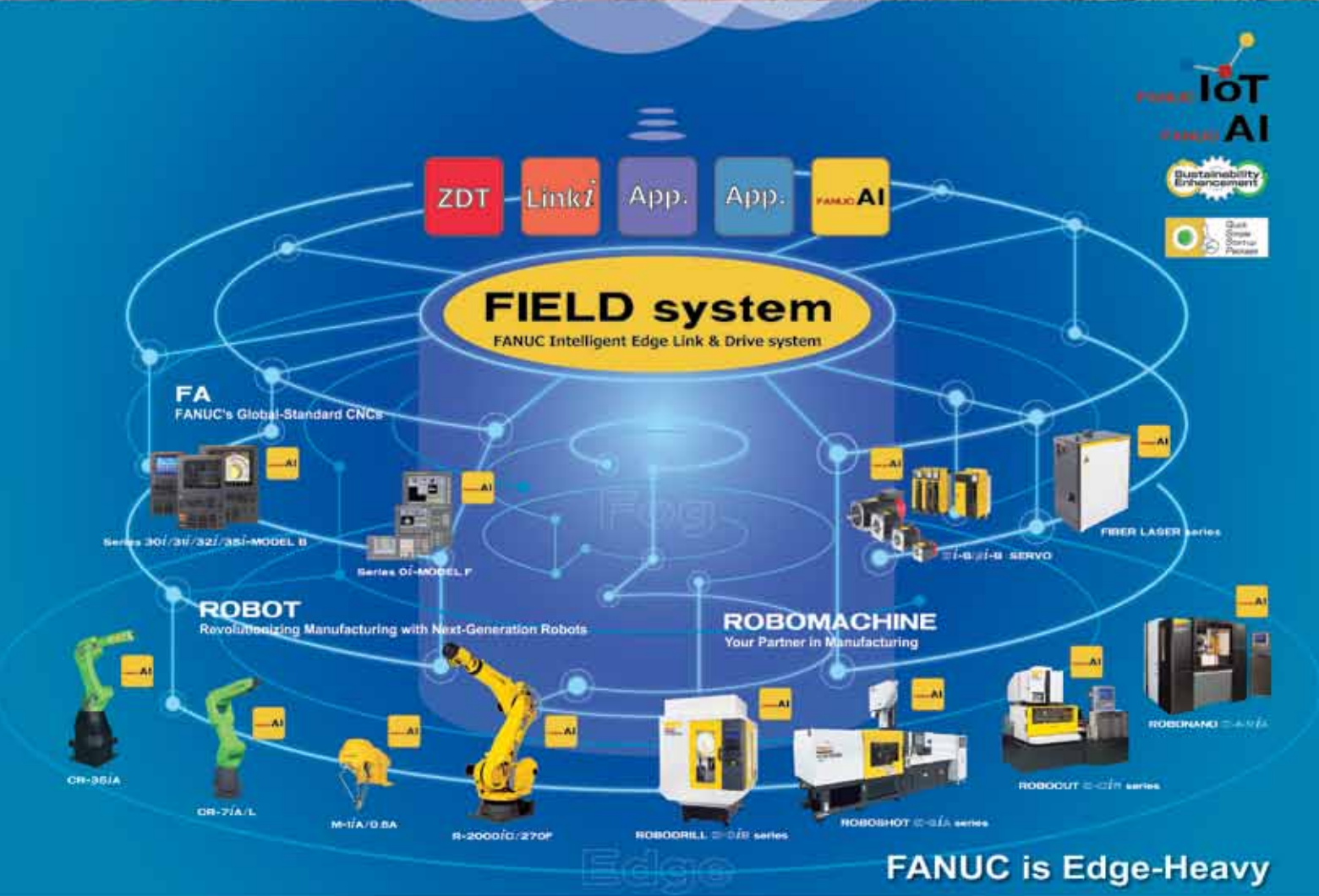
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Japan is positioning itself at the forefront of this change and with its expertise in manufacturing, particularly in consumer electronics, the country is emerging as a key player. It shipped \$645.2 billion worth of goods last year and is now in the midst of shifting its focus from being simply a producer of consumer goods to having interests throughout the manufacturing chain.

The country's pioneering development and use of robotics throughout the manufacturing industry is providing notable results, and with the global industrial robotics market expected to reach \$79 billion by 2022, Japan is well placed to capitalize.

"We are the pioneers of automation and robotization for manufacturing sites," explains Yoshiharu Inaba, Chairman and CEO at FANUC, which provides automation products and services such as robotics and computer numerical control systems.

The company, which had its beginnings as part of Fujitsu, is one of the largest makers of industrial robots in the world and developed early numerical control and servo systems, something Mr. Inaba says now sets it apart from its competitors.

"Throughout our years of operation, we have developed a unique set of skills based on experience. This accumulation of expertise allows us to advance and progress in a tough competitive environment, adds Mr. Inaba, who says the company has catered for B2B operations throughout its history.

"Our technical expertise is coupled with the preciseness of Japanese manufacturing."

Indeed, producing products with remarkably low defect levels has become a mainstay for Japanese manufacturers and companies such as FANUC see this, and delivering greater efficiency, as central to their business. Sony's automation activities, for example, have reduced defect rates from 2000 to 20 parts per million.

Mr. Inaba argues that robotics will not only improve manufacturing processes but deliver a "society where there would only be three work days of five hours for an even better result and delivery. The decrease of manufacturing work will also create an increase for service-oriented jobs.

"Relying on automation processes and robots will be one of the solutions to answer our decreasing workforce and aging population," he adds. "However, this solution is clearly not limited to Japan for it will be applicable to the entire world. Our industry is focused on developing robots that can help human beings. The idea is to have machines, robots and such, do the heavy and monotonous labor, while humans focus on precise and unique work."

The motoring industry remains the global leader in the use of robotics, but electronics and metal firms are catching up fast with sales of industrial robots expected to rise to 2.6 million in 2019, up from 1.8 million today. Despite such rapid growth, Mr. Inaba says ensuring the safety of the robotics environment remains the most important consideration for this booming industry.

"We are the pioneers of automation and robotization for manufacturing sites"

Yoshiharu Inaba, Chairman and CEO, FANUC

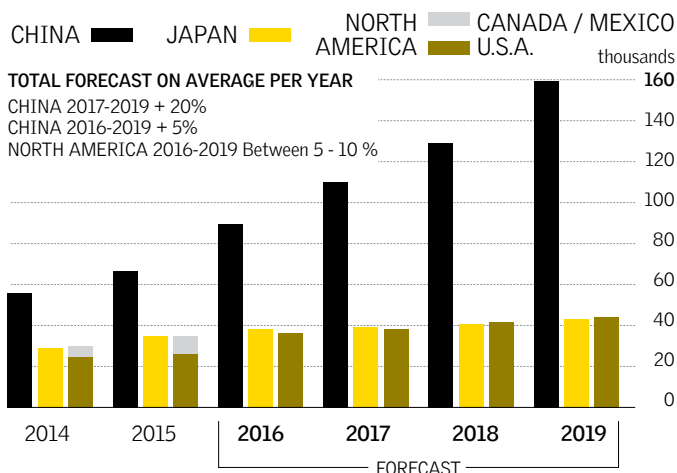
"To secure the safety of our robots, we have implemented our unique Dual Check Safety (DCS, a kind of dual circuit) function for all of our products, so that if one of our robots does something wrong, it immediately stops itself autonomously," he explains.

"Alongside this DCS function, we also apply optical sensors so that if a human ever puts a hand in the way of the robot, the latter is able to recognize it and stop. These two examples are but a drop of the many activities that we conduct to ensure the utmost security of our robots."

FANUC has also developed a unique open platform called the FIELD system, which allows the status of every operation to be visualized, resulting in smoother operation and enhanced efficiency.

"One of the key characteristics of this FIELD system is that it enables robot-to-robot communication, machine-to-machine communication, as well as communication amongst robots and machines," says Mr. Inaba, who adds that AI technologies are also being adopted. It is another indication of just how quickly FANUC, and this forward-looking sector as a whole, is adapting to a rapidly changing world.

ANNUAL SUPPLY OF INDUSTRIAL ROBOTS



Source: IFR World Robotics 2016

The future of productivity and growth in the semiconductor industry passes by automation

By implementing the right automatic systems, manufacturers can improve their factories' productivity by more than 20 percent

They may be small but the global semi-conductor business has grown into a seriously big industry. Worldwide sales reached \$335 billion in 2015, up 15 percent on 2012's figures, according to statistics from the World Semi-Conductor Trade Statistics (WSTS), and this competitive market looks likely only to grow further over the coming years.

U.S. manufacturers remain the largest player in the sector, accounting for about half of worldwide semi-conductor sales over recent years, but in such a tough environment, keeping one step ahead of the competition has become an obligatory survival technique.

Automation is one area in which semi-conductor companies are look-

ing to improve their productivity when it comes to manufacturing, avoiding manual handling as much as possible to ensure fewer errors. Companies such as RORZE Corp. have grown in importance as the industry has matured and are now offering a variety of solutions that have become critical to the success of the semi-conductor manufacturing industry.

"Our goal is to bring the next major innovation in the automation of the semiconductor industry," explains Yoshiyuki Fujishiro, President and CEO of Japan-based RORZE. "Our founders invented the clean robot which was a significant achievement in the semiconductor industry. Our team is the generation that will create the next innovation in this industry."

RORZE was founded in 1985 and now has manufacturing centers located throughout Asia, including in Japan, South Korea, Taiwan and Vietnam, as well as in the U.S. The

company was founded by Mr. Sakiya, who came up with the idea of belt-free robots, and it is now focused on further inventions in the field with more than 40 patents related to automation and clean substrate handling of wafers, LCD substrates and mitigation of particles to its name.

It is this focus, says Mr. Fujishiro, and delivering ever greater levels of reliability that is enabling RORZE to maintain and grow its market position and client base.

"Semiconductor device manufacturers make large investments for the best manufacturing equipment, that must operate 24 hours a day, seven days a week. Therefore reliability is the most important factor to maintain high productivity and high performance. RORZE offers just that."

RORZE is also focused on delivering new innovations to the market to ensure its position within this growing sector. Semi-conductors are present in an array of products that look likely to emerge as everyday items – from driverless cars to computing devices and so-called smart city infrastructure – meaning endless avenues of opportunity for the Japanese firm.

The company has already started working on a three-way project with Intel and Sony by providing them with semi-conductor technology. The new technology allows robots to recognize the problem in advance. And the smart robot can signal the need for preventive maintenance because of the IoT (Internet of Things) technology we developed," says Mr. Fujishiro.

The RORZE president adds that innovation within the company occurs in a methodical manner, ensuring all



Yoshiyuki Fujishiro, President and CEO, RORZE Corp.

new products are built to deliver long-term value, even if the research and development process is sometimes costlier than that of its competitors.

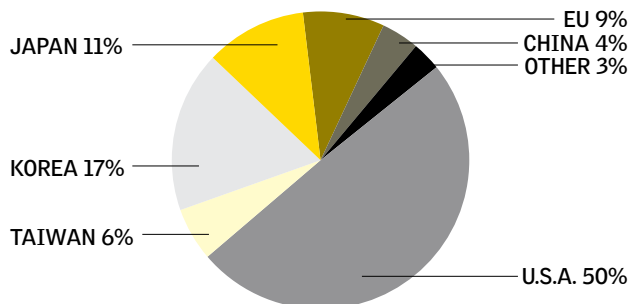
"When we design a new product in our company, we do so in the RORZE way," says Mr. Fujishiro.

"For example, the engineer that designs a part will do so thinking about maximum quality. That mindset has an impact on the cost of operation, however, we have the same kind of understanding of what the Rorze way is. So when we create new products, we target a balanced approach that meets customer's long-term satisfaction, and that is the Rorze way."

The company has established itself as an industry leader in offering so-called "ultra-clean substrate handling solutions" and it also offers both atmospheric and vacuum robots to the industry. Mr. Fujishiro is clear that innovation, something RORZE is well versed in, is a vital weapon to ensure survival in this fiercely competitive industry.

"We have a motto created by our founders, which translated means 'create what is not in the world'. This is our company's culture, which is passed onto our employees. At RORZE, we have embraced this philosophy and we believe that it is our legacy to create new innovations."

GLOBAL MARKET SHARE OF SEMICONDUCTOR PRODUCTION, 2015



Source: SIA/World Semiconductor Trade Statistics (WSTS)/IHS/PwC/IC Insights
Share based on headquarters of seller: Foundry output not included, fabless included



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Japan has put itself at the forefront of the green manufacturing revolution. Innovative Japanese companies have made Japan a global leader in environmental-friendly products, from top selling green vehicles like the Toyota Prius and Nissan Leaf, to energy-saving paint developed by companies like NCK.

Other green products made by Japanese household names leading the charge include Toshiba's aerocyclone vacuum cleaner, Mitsubishi's FHT fluorescent lamp, Yamaha's Cygnus X scooter, Sharp's Plasmacluster Ion refrigerator, and Canon's range of Inkjet printers made from recycled plastic.

"Many companies, especially within the manufacturing sector, have been promoting energy saving technology in Japan," says Yasunori Tsujita, President and CEO of Fuyo General Lease, a company mainly engaged in the leasing and installment sales trading of equipment and fixtures, as well as financial transactions. "As we have come to this era of environmental focus, a lot of these companies have been putting in efforts to facilitate

this movement. I believe we can really make a difference, and there has been an increasing demand for those technologies internationally."

Aside from zero-energy vehicles, Japan is also leading the way in the construction of zero-energy houses (ZEH), thanks to manufacturers like Sekisui House, which has built over 25,000 ZEHs to date. The Japanese government has set a target that half of newly built houses will meet zero-energy standards by 2020.

But it's not just Japanese products themselves that adhere to high environmental standards. The majority of Japanese companies also ensure their factories and manufacturing processes comply with the highest environmental, waste management and energy efficiency standards. Fujitsu, for example, uses ICT to improve the environmental performance of products and minimize the energy used to manufacture them.

Another example is Takasago Thermal Engineering, a company whose main activity is the manufacturing of eco-friendly heating, ventilation and air conditioning systems. The company leverages the most advanced technologies in every stage from planning and design, installation and construction, and maintenance for all types of buildings, plants, and other facilities, to achieve the highest environmental standards.

"As we advance into the future, nations and companies alike are increasingly committed to environmental issues," says the company's chairman and CEO, Atsushi Ouchi. "For example, the former COP22 objective advocated for a lowering of the carbon footprint, but today, they are advocating full de-carbonization. It is proof that the world's mindset has

been changing a lot. Our core business is air conditioning, and that directly deals with energy consumption.

"Through our products, we try to attain environmental friendliness by lessening energy consumption. Because we deal with our clients following a business-to-business model, as long as we are able to manufacture and sell environmentally friendly products, we are directly contributing to society. Furthermore, we educate our employees through green activities. We made up our own word: "Green-Air-Activities", and we have established the Takasago forest initiative."

Takasago is also adopting fourth-industrial-revolution technologies such as the Internet of Things and artificial intelligence (AI) to improve green performance of its products and at its production plants, which is a growing trend amongst innovative Japanese manufacturers.

Takashi Matsuoka, President of Doshisha University believes that AI will play a "tremendous role" in addressing societal challenges such as climate change, and that universities like his will be responsible for churning out graduates with the relevant technical skills to address these challenges.

"We need to emphasize the importance for the students to have a globalized perspective. This is an important step in terms of how we respond to the fourth industrial revolution.

"To this end, it is important to have a strong collaboration between academia and industry. A more global approach is needed to address future challenges."

Like Takasago's Mr. Ouchi, Hirokazu Nakajima, chairman of optical semiconductor device manufacturer Kondenshi Corp., is also confident that his company can contribute to

greener future through its innovative products: "There are many worldwide problems related to energy consumption and consumption of resources. At Kodenshi, we hope to digitalize many of these problems, and by doing so, we will become a company that contributes to society by producing a clean future."



"Japanese universities are ready to educate students who can lead the fourth industrial revolution in the coming years"

Takashi Matsuoka,
President, Doshisha University




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