

Trends in the Japanese Robotics Industry

Japanese Economy Division

Summary

Most of the growth in interactive robots at present centers on those that can perform cleaning, security and human-interface tasks. The market for interactive robots is still in its infancy. Industrial and academic organizations have assembled research teams of highly qualified technicians, some of whom cooperate. Japan has world-class technology in hardware, software and accessories for manufacturing robots, and is the largest robot market in the world. The leading makers of manufacturing robots are expanding production, particularly for automobile production. Growth in this market is expected to continue, driven mainly by demand from outside Japan.

The potential market for robots is expanding, particularly for those that can perform tasks normally done by older workers and homemakers. This report examines the growth potential for machines capable of cleaning and security, as well as for interactive robots, such as those used in interfacing with humans. Also examined are manufacturing robot, particularly those for which overseas demand will grow.

Japan is facing a declining birthrate, leading to the rapid aging of its population. The Japanese Ministry of Health, Labor and Welfare announced a net decline in the population in 2005, when deaths exceeded births by 10,000. The National Institute of Population and Social Security Research estimates that the population, which stood at 127.76 million as of October 1, 2005 (2005 census), will fall by 27.17 million to 100.59 million in 2050 (an average estimate).

The first wave of baby boomers (those born between 1947 and 1949) will retire in around 2007. Japan faces a serious problem with the impending contraction of its labor force, especially in manufacturing and construction, where baby boomers make up 25.6% and 14.5% of the workforce, respectively. There are fears that both productivity and quality will suffer as a result of so many experienced people leaving the workforce in such a short period. Accordingly, work environments will have to be made friendlier to working wives/mothers, which will require greater use of robots and other innovations to increase homemaking efficiency.

1. Interactive Robots

A. Market Outlook

Although interactive robots have already been developed for a few practical uses, most are still prototypes. The market for such machines is just beginning to take shape. Furthest along in

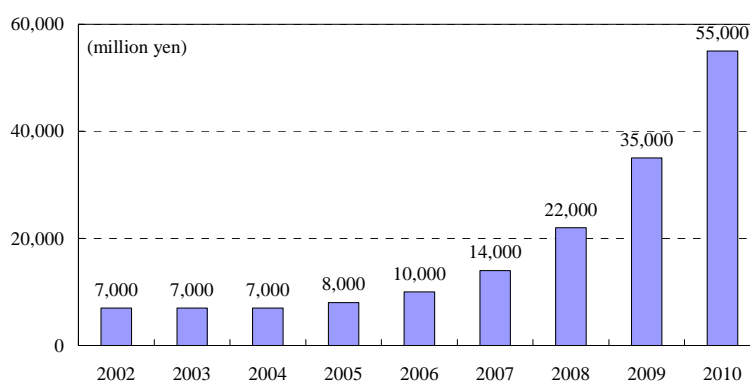
development in this field are the human-interface robots *AIBO* and *Doraemon the Robot*. One drawback in robot creation is the perennial question of whether a particular robot will be accepted in the market. Many current interactive robots were not built for any particular purpose other than to represent the technological prowess of their manufacturers, with a typical example being Honda's *ASIMO*.

At this point, companies are still putting more effort into technical development than market development. While interactive robots are increasingly in number, they need further development before being ready for the market. Manufacturers have been unable to get a good read on the market potential of their inventions, which has dampened interest in pursuing commercialization.

Following the demonstration of many different kinds of robots at the 2005 World Expo in Aichi, Japan, the consensus is that industrial robots designed to perform set tasks will dominate the market.

Fuji Heavy Industries' cleaning robots and ALSOK's security systems have already been quite successful, and sales are expected to remain steady. The robotics market is estimated to be worth ¥55 billion by 2010 (including cleaning, security and human-interface robots), although this depends on manufacturers' marketing plans (Fig. 1).

Fig. 1 Scale of Interactive Robot Market



Source: Fuji-Keizai Co., Ltd.

B. Industry

1. Trends

a. Great need for humanoid robots

The image of robots in Japan has been formed largely by humanoid robots appearing in animated cartoons, such as Astroboy and the cat-like robot in the long-running "Doraemon" series. Robots are seen as heroes and partners in Japan, while in the West they are considered more as tools. This has spurred demand for humanoid robots in Japan, but has also stimulated somewhat excessive expectations among the public regarding the abilities of robots. The current capabilities of actual robots somewhat disappoint consumers, leading to concerns that some manufacturers might abandon the field. This could fuel a vicious cycle of further delays in development, causing even more manufacturers to pull out.

The arrival of the Robot Age was heralded by the media on Astroboy's 40th anniversary in 2003.

Consumers are clearly interested in practical robots, so hopes are high for their rapid development.

b. Public support for practical robot development

Great sums of money will be necessary to develop and test new robots, which is why next-generation robotic research has been made part of national policy in Japan. The Ministry of Economy, Trade and Industry is providing 50% financing to domestic producers, as well as promoting research on practical robots. Advanced robots will be a collection of hardware, software (voice recognition, etc.) and a huge array of sensors and controls. Many teams of technicians from industry and academic institutions are combining forces for joint development (Fig. 2). However, neither Honda nor Toyota has any interest in turning their humanoid robots into commercial products. They only aim to publicize their technology, so development work has been kept private. Most security systems are also developed in-house to maintain secrecy.

c. Sale as standalone items vs. system components

AIBO and *Doraemon the Robot* are for ordinary consumers, and since they are much less expensive than true industrial robots, they are sold as standalone items, with accessories sold separately. However, robots selling for millions or tens of millions of yen are bought for research or for public events. Customers usually require control software written for specific applications, so they usually purchase complete systems rather than just the robot itself.

d. Alliances

Most Japanese companies involved in robot-related collaborations are working with other Japanese companies; few have tied up with foreign concerns (Fig. 2). In principle, the Ministry of Economy, Trade and Industry offers assistance for robotic development only to Japanese firms.

Fig. 2 Alliances for Robot Development

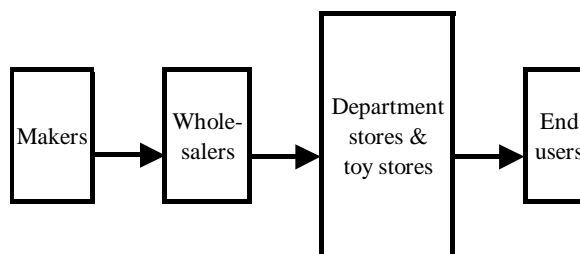
Manufacturer	Robot	Other participant(s)
Sony	AIBO	Developed in-house
Honda	ASIMO	Developed in-house
ALSOK	Guard Robo C4	Developed in-house
Mitsubishi Heavy Industries	Wakamaru	Advanced Telecommunications Research Institute International Tsukuba University Matsushita Electric Works Omron
tmsuk	Banryu	Sanyo New Cosmos Electric Co. Kanazawa Institute of Technology Sanyo Denki Co., Ltd
Tohoku University Nomura Unison Group	PBDR	Troiso
Kokoro Dreagns	Actroid	Advanced Media
Bandai	Doraemon the Robot	Evolution Robotics (U.S.)
Business Design Laboratory	ifbot HelloKitty ROBO	NEC Asahi Kasei Nagoya Institute of Technology Brother Sanrio Futaba Industrial

Source: Fuji-Keizai Co., Ltd.

2. Sales Channels

At present, the market for interactive robots consists only of a few human-interface robots and commercially used cleaning systems. This market is still at an early stage. The distribution system for human-interface robots, the larger of the two sectors, is shown in Fig. 3.

Fig. 3 Distribution in Human-interface Robot Market



Source: Fuji-Keizai Co., Ltd.

Bandai's *Doraemon the Robot* human-interface model is sold at ordinary retailers for the comparatively low price of ¥20,000. It is produced in China and distributed to retailers by Bandai affiliate Happinet. Sony's *AIBO* was first offered through the Internet in 1999 in Japan and the United States. Sony dropped production in March 2006, but is planning to apply the technology to other fields.

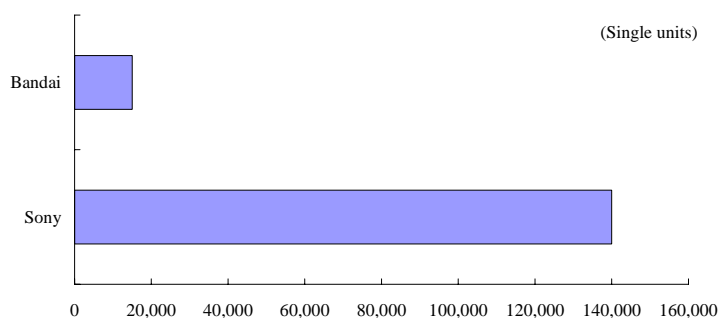
C. Products

1. Human-interface Robots

Only a limited number of interactive robots have been developed into commercial products, with human-interface, cleaning and security robots have achieved some market success. Sony's *AIBO* was a typical human-interface robot (Fig. 4).

About 140,000 were sold between 1999 and 2005, with the last models costing around ¥200,000. Bandai's *Doraemon the Robot* went on sale in April 2004, with about 15,000 sold so far. Other robots have only sold in comparatively small quantities. Business Design Laboratory's *ifbot* is offered for a high ¥500,000 price tag, which is not affordable to ordinary households. Its market appears to be limited.

Fig. 4 Human-interface Robot Sales



Source: Fuji-Keizai Co., Ltd.

2. House-sitting Robots

The remote controlled *BANRYU* (“watch-dragon”) by a company named “tmsuk” has sold only about 30 units so far. It is quite expensive at ¥2 million. A simplified, down-market version called *ROBORIOR*, selling for about ¥300,000, has also been released. In 2005, the *Wakamaru* was introduced in a limited trial run in 2005 by Mitsubishi Heavy Industries, which is now assessing buyers impressions to support further releases.

3. Cleaning Robots

Fuji Heavy Industries has been successful with its line of indoor cleaning robots. They are now in use in Tokyo’s fashionable new Roppongi Hills development, and at Chubu International Airport. Harumi Island Triton Square has seven cleaning robots. Yearly sales of around ten robots are expected. The basic robot is priced at about ¥5 million, but most are sold with accessories, pushing the final price to around ¥10 million. Fuji Heavy Industries and Matsushita Electric Works brought new outdoor cleaning systems to the 2005 World Expo in Aichi to test their operation. The industry is expecting the development of such machines to gain momentum.

4. Security Robots

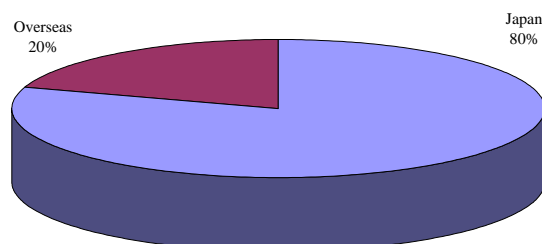
ALSOK and SECOM are leading in the security system sector. However, ALSOK is the only manufacturer that can really claim to have developed a commercially successful product, the *Guard ROBO C4*, which was launched in 2002. The robot can guide customers in indoor locations (such as shops in malls) and provide other kinds of assistance. Four machines have been sold to date. The basic price is ¥9.5 million, but a separate battery-charging unit, monitoring devices and guidance software must be purchased at the same time, which raises the final cost of a system to about ¥20 million.

In October 2005, SECOM introduced the *SECOM ROBOT X*, which is capable of operating outside. The robot is not for sale; rather, it is leased for ¥300,000 per month. If the application requires covering a route of more than 500 meters, the user must pay an additional fee of about ¥5 million for route construction.

D. Exports and Imports

Since the market for interactive robots is in its infancy, product development is proceeding slowly, with none of the manufacturers moving aggressively toward exporting. About four-fifths of Sony’s *AIBO* have been sold in Japan (Fig. 5).

Fig. 5 Geographic Breakdown of AIBO Sales



Source: Fuji-Keizai Co., Ltd.

Some consultants warn of strong, religion-based opposition to robots that resemble humans in certain markets overseas. Few manufacturers have moved to export, and some believe this is hindering the acceptance of humanoid robots in foreign markets.

Like their Japanese counterparts, robot manufacturers in other countries have concentrated on establishing themselves in their local markets first, partly because of the relative ease of servicing products and supplying spare parts. So far, no manufacturer has exported an interactive robot to Japan. Still, companies like iRobot and Electrolux are introducing simple robots, such as those for housecleaning.

Academic research teams in Europe and North America are pursuing aggressive programs. The iRobot, designed mainly for cleaning and military purposes, was created by a group of students and professors at MIT. A team originating at Carnegie Mellon University is pursuing joint research and development in voice-recognition technology with Advanced Media, a Japanese company.

Many venture-capital trusts have established investment funds in robotics, suggesting there is strong potential for the emergence of new manufacturers with sophisticated managerial talent. While Western manufacturers are considered to lead in the elemental technology of voice recognition, both hardware and software are essential parts of robotic technologies, so when it comes time for foreign manufacturers to enter the Japanese market, they will seek tie-ups with local companies to benefit from their partners' hardware skills and established sales channels.

E. Japanese Companies Involved in Interactive Robots

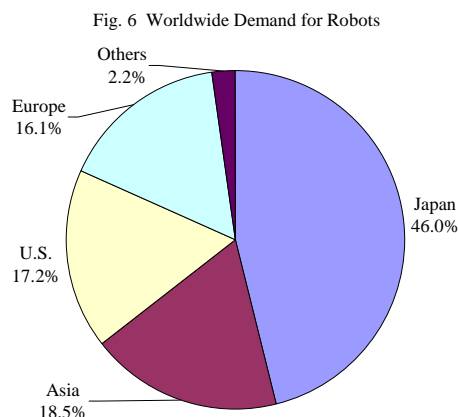
Company	Activities
Toyota	<p>■ <u>Robots that play musical instruments</u> Automotive production technologies were combined to develop Toyota Partner Robots. At the 2005 world expo in Aichi, Japan, Toyota demonstrated an <i>Instrument-playing Robot</i>, <i>DJ Robot</i> and <i>i-foot</i> to exhibit Toyota technology. No sales are planned.</p>
NEC	<p>■ <u>Economical robots for childcare</u> <i>PaPeRo</i> is a small machine that can carry on a conversation with a child. It runs on MS Windows. Cost of the current model is about ¥200,000 to ¥300,000, although there is a home-use model priced at less than ¥100,000, depending upon user options.</p>
Hitachi	<p>■ <u>Guidance/receptionist robot</u> Hitachi's <i>EMIEW</i> recognizes spoken commands to retrieve objects. It moves at 6 km/h, the same speed as humans. Continuous operation is limited to 30 min., and there are questions about its ability to avoid collisions. It cannot be called practical yet.</p>
ALSOK	<p>■ <u>Guidance/receptionist security robot</u> Long engaged in developing security robots, ALSOK began selling a model capable of guiding visitors in 2002. A similar model, <i>Guard Robo i</i>, which operates outside, was demonstrated at the 2005 World Expo. <i>Guard Robo D1</i>, introduced in 2005, offers enhanced patrol and superior safety features.</p>
Yaskawa	<p>■ <u>Improved component technology through interactive robots</u> Yaskawa is acquiring component technology by developing interactive robots, such as <i>Smart Pal</i>, a waitress robot with seven-joint arms (commercialization not planned).</p>
Fuji Heavy Industries	<p>■ <u>Interior cleaning robots</u> FHI annually sells about 10 robot systems for cleaning interiors. The robots can operate in the dark and clean at night, thus saving power costs and personnel. FHI says initial investment can be recouped in three years. It sold three <i>Subaru RoboHiter-RS1</i> for exterior cleaning at the 2005 World Expo, and intends to increase sales.</p>
Kokoro Dreams	<p>■ <u>Humanoid robot for reception and visitor guidance</u> <i>Actroid</i>, a very human-like robot, guided people through the Kokoro Dreams' exhibit at the 2005 World Expo. The basic machine costs ¥30 million, but the buyer must also purchase control software. The company plans to develop robots in other fields.</p>
Bandai	<p>■ <u>Human-interface robot capable of holding conversations</u> The interactive robot <i>Doraemon the Robot</i>, which is capable of holding a conversation, began selling in April 2004. It has a word-spotting function, and can converse, sense human presence, noise and touch. Bandai plans to develop a "real" version of this cartoon character by 2010, implementing improvements in three stages.</p>
Honda	<p>■ <u>Biped walking robot</u> Honda, having worked on robots since 1986, introduced the humanoid <i>ASIMO</i> in 2001. Capable of walking on two legs, the robot is powered by 38.4V 10Ah NiCad batteries. <i>ASIMO</i> symbolizes Honda's technological prowess, so the firm does not intend to turn it into a business, although <i>ASIMO</i> can be rented. Honda plans to pursue new robot technology to impress consumers, rather than to make a profit.</p>
SECOM	<p>■ <u>Outdoor security robots</u> The SECOM Robot X performs security functions at large installations, such as airports and factories. It has been available by lease since October 2005, but is not for sale.</p>
Mitsubishi Heavy Industries	<p>■ <u>Human-interface robots</u> <i>Wakamaru</i> robots for human-interface, security, health management and other fields entered trial runs in 2005. The robot moves on its own, and is intended for home use. It recognizes faces, connects to the Internet, warns of emergencies and performs other functions. Its battery supplies two hours of power and recharges in two hours (based on the assumption that humans won't interact with robots for over two hours).</p>
SNK	<p>■ <u>Robot for cleaning air-conditioning ducts</u> The <i>SDC3500</i> cleans the air-conditioning ducts of nuclear-power facilities, mainly in locations difficult for people to reach by hand. It is designed for a specific in-house purpose, so it is not slated for sale.</p>

2. Manufacturing Robots

A. Market Outlook

Manufacturing robots are driving the worldwide market since capital investment has been robust in industries where they are used most — automotive and electric/electronic goods. Demand is strong in the Asia-Pacific region. Japan, the most important supplier of robotic software, hardware and peripheral equipment, is the largest market (Fig. 6). Western

manufacturers, led by ABB, are well respected for their expertise, but manufacturers in Taiwan, South Korea and other nations have been increasing their presence in recent years, introducing inexpensive products, and are looking to expand into North America and Europe.

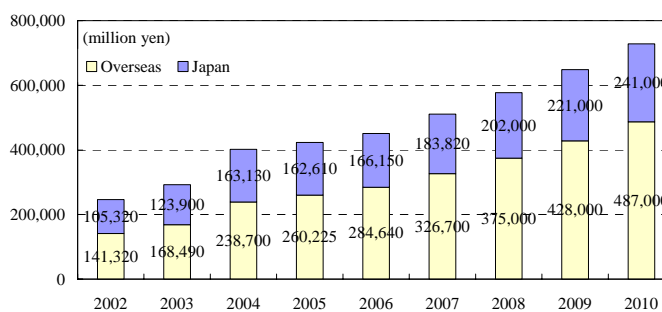


Source: Fuji-Keizai Co., Ltd.

B. Market Trends

Intelligent robots have been employed an expanding range of processes in recent years, and their increased functionality is expected to help stimulate demand. The demand for consumer digital electronics is predicted to grow, pushed by such factors as broadcasts of the 2008 Olympics in neighboring China. Accelerated capital investment in the electric and electronic industries will increase the market for manufacturing robots (Fig. 7). At the same time, robot manufacturers are strengthening sales and maintenance bases overseas to attract customers in these markets. Leading manufacturers are also initiating overseas production of robots for foreign auto industries.

Fig. 7 World Market for Manufacturing Robots



Source: Fuji-Keizai Co., Ltd.

C. The Industry

1. Distribution

Generally, manufacturing robot producers sell through their own sales offices, which maintain contact with the market and supply after-sales accessories

2. Business Practices

The automotive and electric/electronics industries are the biggest customers of robotics manufacturers. Welding robots account for about half the number of robots purchased by automotive manufacturers. Production lines are designed specifically for each manufacturer, and involve many other systems besides the robots themselves. A huge amount of labor and money would be needed to refit an existing production line for use by another manufacturer. FANUC sells heavily to Nissan, while Kawasaki Heavy Industries and Nachi sell most of their products to Toyota. Once a company has secured an automobile manufacturer as a customer, it becomes much easier to sell to that manufacturer's *keiretsu* (family of companies). When an automotive manufacturer builds a new facility overseas, *keiretsu* component manufacturers also establish their bases there, creating great demand for the robot supplier, as well as new sales opportunities.

Leading robot manufacturers are challenged to maintain market share, in part by midsize Japanese manufacturers and foreign manufacturers striving to increase sales. As Japanese automakers moved production overseas, leading robot manufacturers were compelled to follow. While this has been a burden, it has also enabled robot manufacturers to establish the presence needed to develop customers in foreign markets. At the same time, other manufacturers have also worked hard to provide automakers and other big multinationals in these markets with robots for peripheral work, such as de-burring and painting, as well as welding robots in recent years.

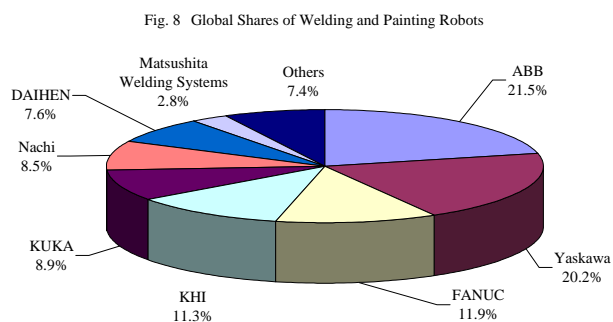
The second largest customer for robots, the electric/electronics industry, has a less pronounced need for specialized production tools, including robots, so they usually choose suppliers based on price, capability and after-service.

D. Worldwide Sales

1. Welding/Painting

(Robots: arc welding, spot welding, painting, shearing, de-burring & grinding)

ABB's line of spot-welding and painting robots has been quite successful in export sales, earning the firm the largest share in terms of volume (Fig. 8). Next is Yaskawa, which has supplied Toyota's plant in the Czech Republic



Source: Fuji-Keizai Co., Ltd.

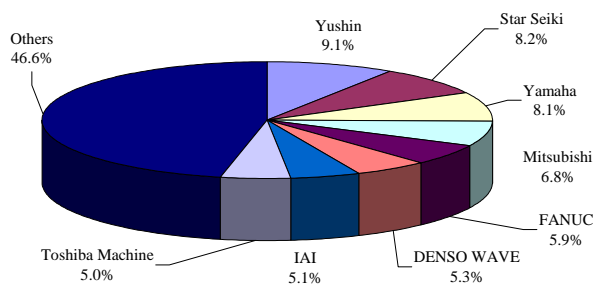
and is getting more orders from other Japanese manufacturers building plants overseas. FANUC and Kawasaki Heavy Industries are supplying Western customers. Japanese manufacturers hold about a 70% share of the worldwide market.

2. Assembly and general transport

(Robots: orthogonal, SCARA, small RPP, take-out, palletizing & desktop robots)

Many robot manufacturers are supplying these sectors, so market share is broadly distributed. Yushin holds the top share in volume, though still at less than 10% (Fig. 9). Japanese manufacturers occupy the top of the market. Although Adept and Staubli are suppliers, these and other overseas competitors have small shares.

Fig. 9 Global Shares of Assembly/Transport Robots



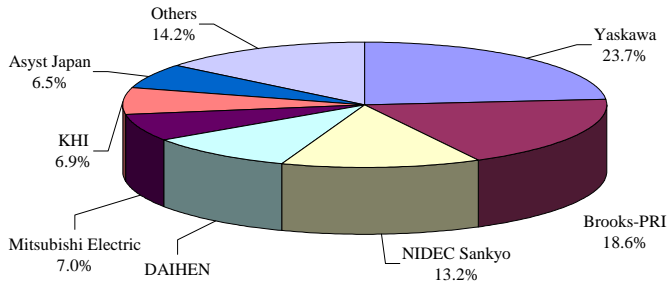
Source: Fuji-Keizai Co., Ltd.

3. Wafer and LC component transport

(Robots: Wafer and liquid-crystal PDP substrate transport)

Yaskawa holds the top share in this market, thanks to its strong relationship with large manufacturers of semiconductors and LC components (Fig. 10). Among overseas manufacturers, the Brooks-PRI wafer transporter is popular in America, where the company occupies the No. 2 spot. In the market for robots that transport LC PDP substrates, however, Yaskawa and other Japanese manufacturers have an unrivaled hold on the market, with virtually no foreign competition.

Fig. 10 Global Shares of Wafer/LC Transport Robots



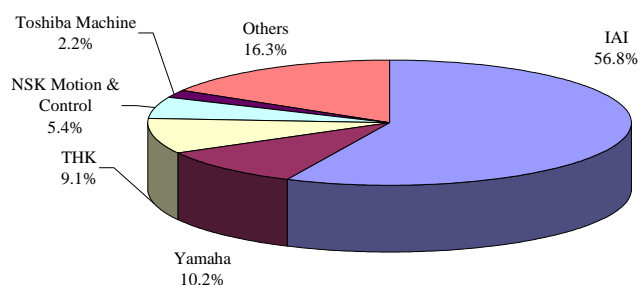
Source: Fuji-Keizai Co., Ltd.

4. Single-axis applications

(Robots: Single-axis type)

The Japanese market represents 60% of global sales volume for single-axis robots, and the products of the five biggest Japanese manufacturers account for 80% of global production. IAI is far ahead of its domestic

Fig. 11 Worldwide Shares of Single-axis Robots



Source: Fuji-Keizai Co., Ltd.

rivals in market share (Fig. 11). Foreign manufacturers Bosch and Adept are in the market, but are focusing on high-end products popular in the West, so have limited markets in Japan. South Korean manufacturers such as Robostar and Dasatach have concentrated on low-end products, but have also been penetrating markets in the West and China in recent years.

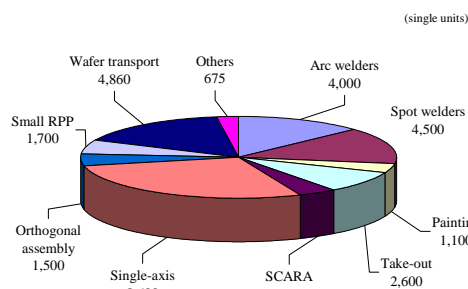
E. Imports and Exports

Welding robots account for very large percentages of the markets in Europe and North America (figs. 12 & 13), while removal robots and liquid-crystal PDP substrate transport robots are the largest categories of robots sold in Asia (Fig. 14). The number of removal robots in the Asian market has increased as exports to China rise in response to growing demand for formed resin. South Korea and Taiwan used to be the main markets for removal robots, but Japanese manufacturers are now selling mainly to China. Liquid-crystal PDP substrate makers have moved much production to South Korea and Taiwan, which has stimulated exports of transport robots to these markets.

Toyota *keiretsu* member Nachi has made inroads in the American spot welder robot market, formerly a bastion of ABB. It took market share away from ABB by concluding a contract with a Chrysler plant. As wafer transport robots are incorporated in semiconductor production equipment before shipping to users, the market has shifted from ex-Japan Asia, the base for semiconductor manufacturers, to Japan and the United States, where semiconductor production-equipment manufacturers are concentrated. Yaskawa aims to increase its contacts with Novellus, KLA, RAM and other U.S. manufacturers of such equipment in an effort to sell more in the American market. Brooks-PRI Automation is well respected by American semiconductor production equipment manufacturers and has sold many systems there.

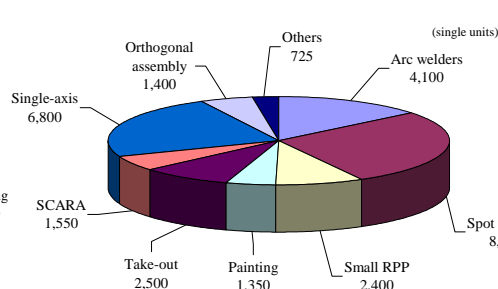
Welding robot manufacturers have increased their exports to Europe as a result of supplying major customers—Japanese automakers—who have moved into the region, as well as local automakers. FANUC has made great strides in developing a European market, selling 160 of its most popular model, the *R-2000iA*, to Volkswagen. Generally, the automakers first construct production systems at home, then ship them overseas for reassembly. This has helped Japanese robot manufacturers gain a high share of sales for such systems.

Fig. 12 Manufacturing Robots Sold in U.S. Market



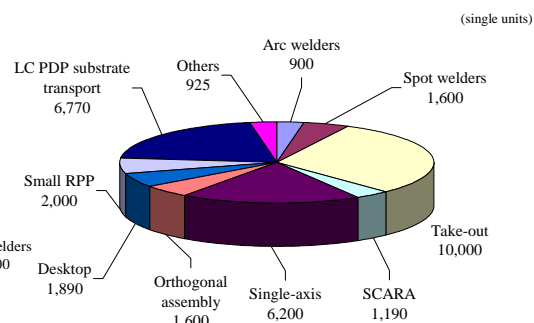
Source: Fuji-Keizai Co., Ltd.

Fig. 13 Manufacturing Robots Sold in Europe



Source: Fuji-Keizai Co., Ltd.

Fig. 14 Manufacturing Robots Sold in Asian Market (Excluding Japan)



Source: Fuji-Keizai Co., Ltd.

ABB, KUKA, Adept and others have exported robots to Japan. ABB sold 170 of its painting robots here in 2004, which corresponded to about 10% of the market (Fig. 15). It also uses Toyota sales channels for its de-burring robots, which are averaging sales of about 50 machines per annum. Other foreign manufacturers are also active in Japan, but none have made significant strides.

Fig. 15 Imports of Manufacturing Robots

Type	Maker	Sales in FY 04
Painting robots	ABB	170
Deburring robots	ABB	50

Source: Fuji-Keizai Co., Ltd.

F. Foreign-financed Enterprises

Four foreign-owned enterprises are operating in the Japanese manufacturing robotics field.

1. ABB: Painting robots

As of 2004, ABB had sold 130,000 robots. Its manufacturing bases are in Sweden and Norway, but it has also technical centers in the United States and Japan to accommodate requests for customization. It has had only modest success with its welding robots, a field in which Japanese robot manufacturers are especially strong, but it is steadily expanding its presence in painting robots, a field which it believes to hold the greatest potential for the company.

2. KUKA: Constructing an Asian network

KUKA has built a solid reputation among European automakers, and is now looking to expand into the United States and Asia. It is developing a network of support bases in the Asian region to follow its main auto customers as they move abroad.

3. Brooks-PRI Automation: Capitalizing on its American success

Brooks-PRI is well-regarded in the American market as an established manufacturer of robots for wafer transport. In recent years, it has teamed with Japanese manufacturer Daifuku to sell equipment to Samsung, and has established a Japanese subsidiary. The aim is to sell to Japanese semiconductor production-equipment manufacturers while moving into the rest of Asia.

4. Adept: Still focused on the U.S. market

Most of Adept's sales have been in the U.S., and the company has gained few customers in Japan. Its main lines are controllers, software and mechanical components, which enabled it to win OEM contracts for two of the three SCARA robots manufactured in Japan. Adept's robots with controllers are expensive, high-end machines. They are well respected in Europe and North America, but have made few inroads into Japan or the rest of Asia.

G. Trends in the Japanese Robotics Industry

Company	Activities
FANUC	<p>■ <u>Intelligent robots</u></p> <p>Using the expertise gained in the manufacture of servo motors, numeric control equipment and other basic manufacturing equipment, FANUC began developing intelligent robots incorporating visual and tactile sensors for assembly tasks that were too difficult for previous robots. The robots are well suited to small-lot, large-variety production lines, meeting the needs of general manufacturers and FANUC's main clients, automakers. The firm teamed with Matsushita Welding Systems in 2004 to establish a fully digital arc welding robot system. It plans to increase sales to ¥500 billion by March 2008 by expanding sales/service centers in Brazil, Russia, India and China and by expanding use of intelligent robots in general industry.</p>
Kawasaki Heavy Industries	<p>■ <u>Functional robots</u></p> <p>KHI established its position as an expert manufacturer of industrial robots after filling an order from Kobe Steel in 2001 for new painting robots, as well as existing welding and assembly robots. First aided by automakers' expansion of capital investment in 2004, sales have grown to ¥35 billion, including robots for the semiconductor industry. It is emphasizing the functionality of its welding, painting and transport robots to help users rationalize cost of ownership. The company has also been manufacturing in the U.S., and now plans to strengthen its networks in China and Europe to prepare for the continued overseas expansion of Japanese automakers.</p>
Yaskawa	<p>■ <u>Service robots</u></p> <p>Applying expertise gained in producing industrial robots, Yaskawa developed the <i>Smart Pal</i> service robot to enhance its technological prowess. It plans to strengthen its European sales force to gain more orders from automakers there. In the U.S., it is pursuing orders for spot-welding robots from the Big Three automakers.</p>
Nachi	<p>■ <u>Production line robots</u></p> <p>Automakers account for about 70% of Nachi's sales, but the firm wants to lower this to 60% while increasing sales to electric/electronic manufacturers. Nachi's strength is mainly large robots, but it also has alliances with Daihen for midsize robots and Denso Wave for smaller robots. About 150 of its robots are on its own production lines, with plans to increase this to about 300 machines in 2006 to save labor.</p>

3. Laws and Policies

A. Laws

Mechanical products to be exported must comply with all Japanese export regulations and destination-country requirements. A manufacturer who intends to export large volumes must confirm that individual components/systems in each robot model may be legally exported from Japan.

B. Policies

1. Ministry of Economy, Trade and Industry

A policy designating robotics as part of a new industrial strategy and supporting their commercialization was adopted in 2004. Since January 2005, METI has been holding meetings on

policies relating to robotics to clarify objectives. METI has also been conducting robotics R&D projects aimed at supporting the creation of new industries. These are:

a. Practical next-generation robots (Project term: FY04-FY05)

Qualified Japanese companies were offered 50% financing for R&D into next-generation robots. The research had to be carried out in Japan. Cleaning robots, security robots and other promising systems were tested at the 2005 World Expo, and prototypes were developed and demonstrated.

b. Practical robots for care of the infirm (Project term: FY05 – FY07)

Hospitals and other medical/public institutions and robot manufacturers are working together to develop robots that can assist caregivers and their patients.

c. Common base for next-generation robots (Project term: FY2005 – 2007)

This used results of a previous program to develop middleware for modular robot development.

2. Other Ministries and Offices

Organization	Research and development
Ministry of Internal Affairs and Communications	Robot network technology
Fire and Disaster Management Agency	Robots to assist during fires and disasters
Ministry of Education, Culture, Sports, Science and Technology	Cognitive computers and rescue robots
Ministry of Agriculture, Forestry and Fisheries	Robotic pickers for fruit and vegetables
Ministry of Land Infrastructure and Transport	IT-controlled systems

Note: This report was compiled by the Japan External Trade Organization (JETRO) based on research performed by Fuji-Keizai Co., Ltd.