

RT Revolution to Vault Japan onto Higher Plane

– Overview Based on Robot Policy Committee Report –

By Takahashi Taizo

1. Introduction

Robots are currently facing the dawn of a new era. Japan has so far been regarded as a “robot power” in terms of both technological aspects and the size of the robot market. However, the use of robots has been limited since the 1990s to some parts of the manufacturing industry (coating and electronic packaging, welding and so on). And the market size has grown only moderately to move around ¥600 billion a year (as shown in Chart 1). As for robots providing support for various services, there have been only a few cases of practical use.

But the landscape involving robots is steadily changing. In the manufacturing industry, more sophisticated and intelligent industrial robots such as robot cells are being released into manufacturing sites. The demonstration of practical-use service robots during the 2005 World

Exposition in Aichi Prefecture drew wide attention both at home and abroad. On the actual business front, the introduction of service robots for practical use, such as cleaning robots, is steadily increasing.

Japan's robot industry has thus taken a step ahead steadily from the conventional R&D level to the stage of practical use. Japan faces tough challenges such as a declining birthrate coupled with the rapid aging of the population, a decrease in the workforce population, and intensifying international competition. Under such circumstances, robots and robot technology (RT) are expected to give clues to resolving the problems and play a role in achieving Japan's further growth.

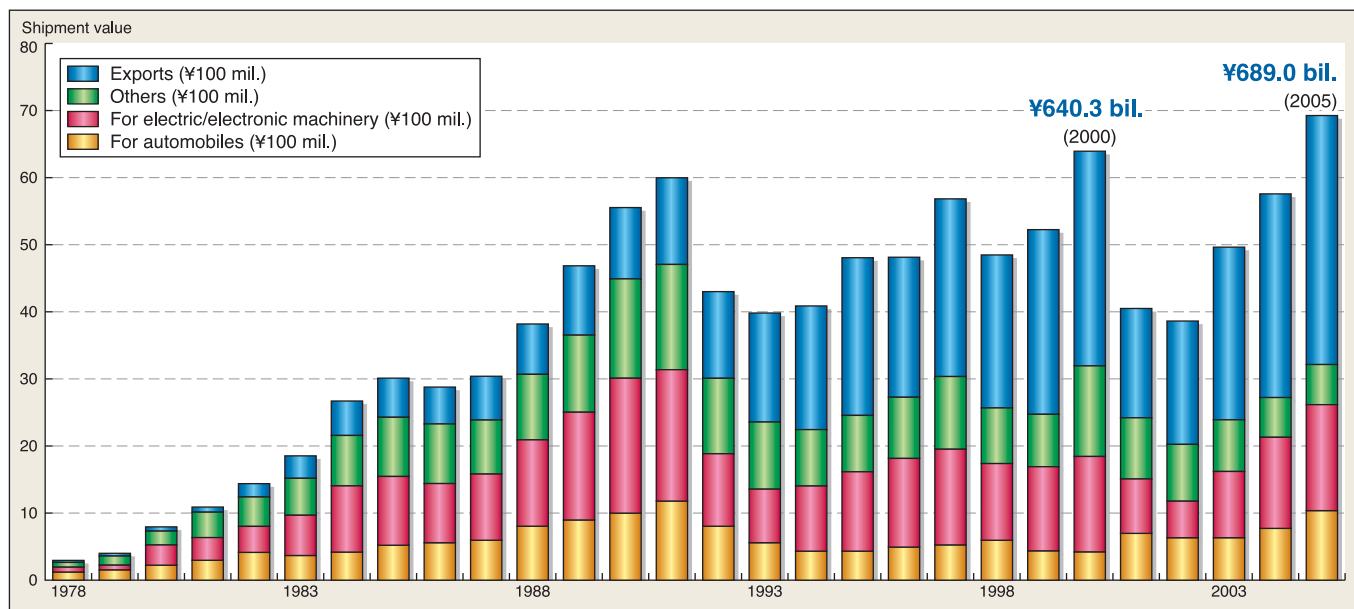
Based on a report compiled in May 2006 by the Robot Policy Committee, headed by Miura Hirofumi, president of Kogakuin University, this article seeks to describe basic ideas behind, and the future direction of, Japan's robot policy

to be promoted by the Ministry of Economy, Trade and Industry (METI). Since it was launched in January 2005, the committee has discussed specific measures, based on actual and potential needs for RT, on how to improve the market environment, ensure safety, and promote mission-oriented technological development. The committee report is the result of its studies and shows the future direction of Japan's comprehensive robot policy.

2. Why Robots Now? – 3 Reasons

Why are robots drawing attention afresh now? The following three reasons can be singled out. First, robots are technology and products that can expand the scope of human activities. Take a look back at technologies and products of growth industries in the past. Even though those technologies

Chart 1 Robot shipments by value/year



Source : Japan Robot Association

and their products were developed out of human needs, demand for them exploded when they achieved steady progress, became practical and sharply exceeded human capabilities, as was the case for computers and automobiles. Robots can join these groups, backed by an improvement in peripheral technologies and a rise in needs.

Secondly, both the accumulation in Japan of sophisticated parts industries and the country's manufacturing capabilities backed by it provide the base for the international competitiveness of Japanese robots and RT. Robots are the outcome of the integration of a wide spectrum of technologies ranging from materials to drives, sensors, control and systemization. Because of such characteristics of robots, the sophisticated parts industry accumulation, which generally excels in integration, offers a great advantage to Japan in developing robots as a leading next-generation industry.

Thirdly, as mentioned at the outset, Japan is confronted with a declining birthrate combined with the aging of the population and a workforce shortage. The country's population is aging and its birthrate sagging at the fastest pace in the world. Its productive-age population has been on the decline after peaking in the middle of the 1990s, while the working population has been falling since 1999. The so-called baby boomers who helped Japan achieve rapid postwar economic growth are retiring en masse in the coming 10 years. Against that background, labor shortages are expected not only in the manufacturing industry but in the construction, nursing care, social welfare and various other service sectors. This appears to underscore the presence of potential needs for robots and RT.

3. How to Promote Robot Policy – 3 Viewpoints

(1) Take robots in a broader sense as RT

How should Japan promote its robot policy under such circumstances? There are three points for Japan's basic idea in

promoting its robot policy. Firstly, robots should be taken in a broader sense as RT. What on earth is a robot? The definition of a robot is varied. One definition limits a robot to a humanoid one while another covers even computer software. Moreover, automobiles, information-oriented home appliances, housing equipment, medical and welfare instruments, and construction machines have developed into intelligent devices in recent years. These products and robots are becoming borderless and integrated.

Given such a reality, Japan's robot policy defines robots – from the viewpoint of market creation – as those that are actually useful and physically operative at various sites. Specifically, robots are defined in a broader sense as intelligent mechanical systems equipped with the three key elements of sensor, intelligence/control, and drive technologies. In other words, RT overlaps with technologies in other fields such as automobiles and home electric appliances. So, RT can develop further by integrating with those technologies.

(2) Make a start from market needs

Secondly, market needs are the starting point for Japan's robot policy. Japan's past robot policy was relatively oriented to "seeds" rather than to the marketplace, covering mainly R&D projects. Similarly, universities and research institutes tended to set their own themes and did not necessarily take user needs into full consideration. But analyses of successful cases of robot commercialization indicate that RT innovations have been achieved in one cycle – production of a robot, market reaction to it, improvement of the robot in response to the reaction, and the release of an improved version to the market.

Coordination between makers and users is essential in the introduction of robots. Look at the specific successful case of cleaning robots introduced in office buildings. It is essential to regard the robot not as a mere "thing," but as a device which, in a value chain of services, certainly performs the duties of

cutting costs, making the work more efficient, and improving the quality of service. In this case, it is necessary to thoroughly narrow the robot's performance to a field best fit for it. This can be true in the introduction of service robots to the nursing-care and social welfare fields. For example, METI has been undertaking since fiscal 2005 a project to develop a nursing-care and welfare-service robot. Under the human support-type robot development project for fiscal years 2005-2007, robot developers have invited representatives of users (doctors, physical therapists and other staff from hospitals and social welfare facilities) to their team from the development stage to realize a user-developer cycle. Under the cycle, the developers demonstrate the robot on envisaged field sites while the users feed back the results to the developers.

Meanwhile, leasing and rental business operators are expected to play a major role in spreading the use of robots. Users can utilize leasing and rental services to avoid the risk of purchase involved in introducing products of fast technical innovation like robots. Robot makers can find advantages such as a boost in the volume of transactions, an increase in contact points through the return of rental products, and expansion of the buy-on-impulse type of use through the presentation of many similar products.

(3) Ensure robot safety to users

Thirdly, the safety of robots to users must be ensured. What is important here is that the introduction of robots must be actually useful. That is to say, it is nonsense, in an extreme instance, to discuss the safety of robots when they are useless and actually not used. The starting point of discussion must be that users would take certain risks in return for some benefits in introducing robots. Based on this assumption, manufacturers will be required to take advance responsibility for developing state-of-the-art robots. In fact, there will be no risk-free products because there are limitations to makers'

preliminary safety measures. But manufacturers are obliged to have supreme conscience and take usual safety measures in advance from a user's point of view. This is the basic concept of robot safety.

Under this principle, makers are required to minimize risks at the design level and take failsafe and other safety measures for remaining risk factors. Moreover, in preparation for accidents involving robots, further studies must be made to look into responsibilities under the Product Liability Law and other matters on the basis of past accidents.

4. Policy for Spreading Robot Use – 3 Measures

As mentioned above, expectations for robots and RT are becoming stronger to meet the needs for laborsaving and automation on various scenes as Japan

has fewer babies and its population ages fast. Under such circumstances, METI intends to pursue a set of three measures actively based on market needs – (1) market creation, (2) ensuring safety, and (3) development of mission-oriented practical technologies (see Chart 2). Details are as follows.

(1) Creation of robot market

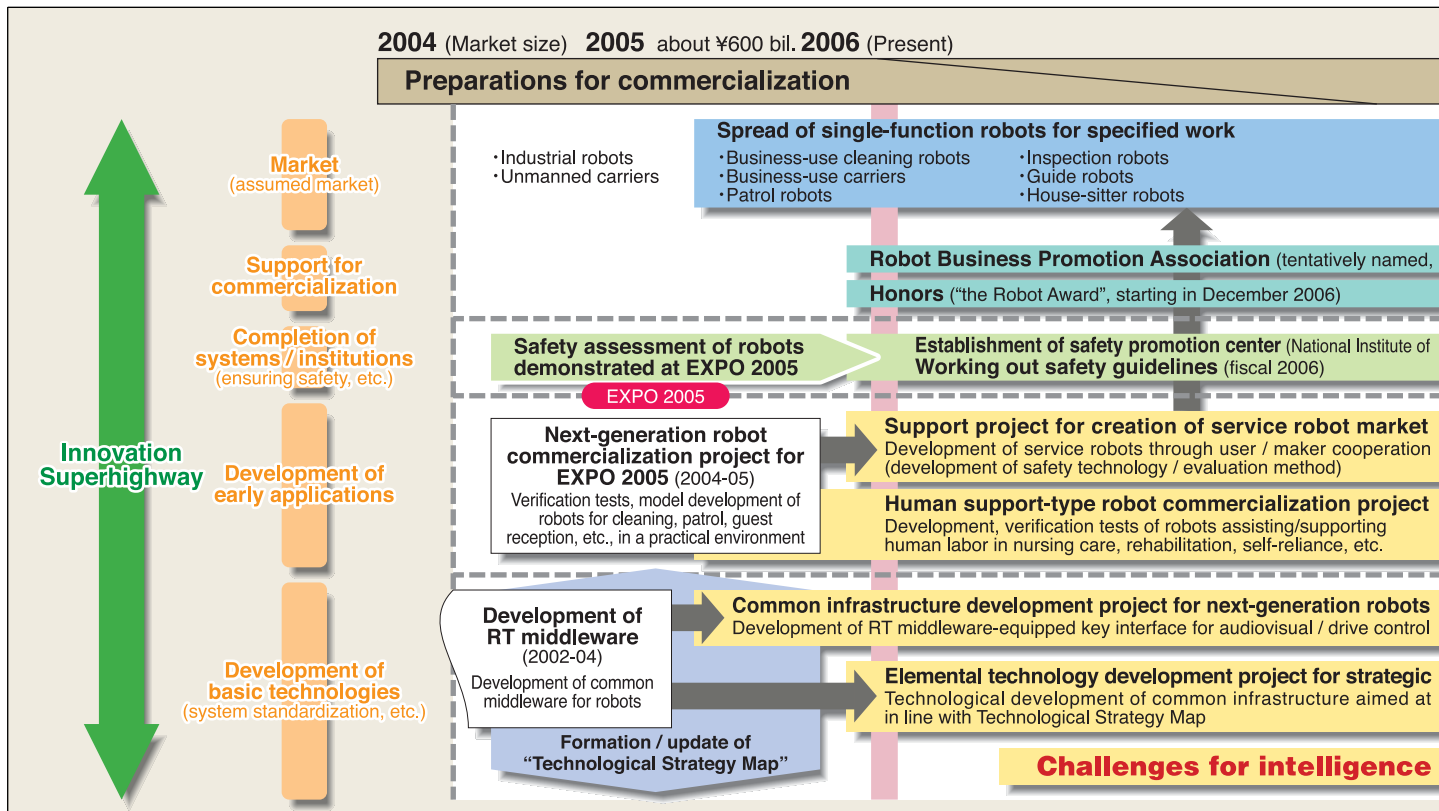
First of all, as market creation measures (“Support for commercialization” and “Development of early applications” in Chart 2), METI will assist practical development and use of robots and RT that are expected to be introduced to actual service sites and will also help development of measures to ensure their safety (basic safety design, risk assessment, and failsafe and other safety technologies) over a period of two years

from fiscal 2006. In Chart 2, this corresponds to the “Support project for creation of service robot market.” At the same time, METI will strive to put into practical use experimental robots being developed since fiscal 2005, including nursing-care and welfare robots.

It is necessary to help form the private sector-led Robot Business Promotion Association, as it is tentatively called, and thus promote cooperation among manufacturers, users and concerned parties (researchers, leasing and rental business operators, various service providers, local governments, etc.). In addition, METI has launched “the Robot Award” to honor developers of useful robots. The winner is to be given the METI minister's prize. The first prize-awarding ceremony took place on December 21, 2006.

These efforts are expected to gradually help expand specific applications of

Chart 2 Whole picture of Japan's robot policy for 10 years through 2015



Source : Ministry of Economy, Trade and Industry

robots – from business-use robots whose introduction will produce clear effects but whose users are limited (business-support robots) to consumer types that can be used in ordinary life to improve living convenience.

(2) Ensuring robot safety

The second measure is to ensure the safety of robots to users (“Completion of systems/institutions” in Chart 2). METI will work out safety guidelines covering basic ideas and specific measures for anticipated cases of trouble to secure the safety of robots. In addition, METI will collect and analyze information, data and specific examples concerning robot safety, offer the results to parties concerned, and build up a safety promotion center whose work will be reflected on studies about international standards.

(3) Development of mission-oriented practical technologies

Finally comes technological development (“Development of early applications” and “Development of basic technologies” in Chart 2). METI will simulate practical robot applications and help develop matching technologies. As a core undertaking, METI has launched a project spanning fiscal 2006-2010 to strategically develop elemental technologies for advanced robots. Under the project, seven missions are specified for three sectors – manufacturing, services, and duties in special environments. In the manufacturing sector, for example, METI has put up two missions, including development of a robot system capable of handling soft objects (such as wire harness) in the assembly process of automobiles and electric appliances. METI

has also laid down three missions for service robots. Among them is the development of a robot system that can communicate with people in various age groups, including the elderly, and enable communication with them.

Through these measures, METI will seek to boost the introduction of robots for practical use and develop mission-oriented technologies after ensuring robot safety. METI is required to continue implementing its robot policy actively, combining these two factors, in a bid to help realize an RT-backed affluent society by promoting innovations of RT and expanding its applications. **JS**

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