

Japan Economic Research Institute

Fukukawa Committee May 2011

Robot Technology Hold the Key to a Bright Future for Japan

- Nursing care services as the next frontier for the robot industry -

Abstract

Japan's robot industry and robot technology (RT) are among the best in the world. Japan tops the world in the number of industrial robots in operation, boasting a one-third share in this regard. Behind the high competitiveness of Japanese industrial robots lies the fact that they have grown into what they are today by meeting the tough demands of various Japanese industrial users, including the automotive industry and electrical machinery industry, along with the great breadth and depth of Japanese robotics research and development. Indeed, Japan has a global advantage in terms of the number of robotics research papers published and that of researchers working in the robotics field. Japan even hosts a number of international robotics competitions, such as "Robo Cup", "Robo Con" and "Robo Gran Prix".

Japanese RT has the potential to provide a promising solution to the accelerating low-birth rate and aging population trends, phenomena Japan and other parts of the world face, as well as various problems arising from them. Generally speaking, RT is general purpose technology comparable to IT, and is expected to contribute to sustainable economic growth through improved productivity at a time when a contraction of the labor force is looming. In concrete terms, hopes are high for its ability to provide effective tools to alleviate the

shortage of nursing care workers and physical and psychological burden placed on them and improve the QOL of nursing care recipients. Such hopes have led to the development of a variety of nursing care robots.

Here are some examples. A robotic suit called “ROBOT SUIT HAL®” (Figure 1) extends and magnifies human physical functions by detecting minute bioelectric potential signals. It was developed by Prof. Yoshiyuki Sankai of Tsukuba University to help support the independence of nursing care recipients and reduce the burden on nursing care workers.

Figure 2 is My Spoon, developed by SECOM Co., Ltd. It is a robot that enables a nursing care recipient to eat independently by moving a part of the body. PARO is a baby seal-shaped robot developed with a therapeutic function and dementia prevention effects in mind. In the aftermath of the Great East Japan Earthquake, it was swiftly taken to disaster refuges and other facilities to improve the mental care of disaster victims (Figure 3). However, the reality is that, despite various commercialization efforts, those outstanding robots have yet to find their way into mainstream use.



Figure 1 HAL (Prof. Sankai, University of Tsukuba / CYBERDYNE, Inc.)
* "ROBOT SUIT", "ROBOT SUIT HAL", "HAL", and "Hybrid Assistive Limb" are registered trademarks of CYBERDYNE, Inc.



Figure 2 My Spoon



Figure 3 PARO

To realize the widespread use of RT in the nursing care field, there are several hurdles to clear. In this endeavor, it is important to have a broader perspective that encompasses a grand design of the social system as a whole. Namely, robotic experts need to design an aging population-prepared social system and explore possible roles for robots to play in it in collaboration with others parties, including experts from other technical fields, such as medicine, nursing, information systems, architecture and urban engineering, and those from humanities fields, such as economics, management, law and politics, as well as health service practitioners, such as physiotherapists and occupational therapists, administrative authorities, and the industrial community.

From the viewpoint of the grand design of an aging population-prepared social system, various problems can be identified in the current institutional systems and R&D approach. First of all, rules, infrastructure and the like needed for robots, whether manually operated or autonomously controlled, to coexist with people in the social environment are yet to be put in place, giving rise to the need for their development through, for example, the utilization of a special district. Also, the current working environment and conditions at front-line nursing care sites are very tough, and this is a major reason for the shortage of nursing care workers. There is a need to design an appropriate regulatory framework for front-line nursing care sites and improve the working environment and conditions through the utilization of RT on the basis of it. While ensuring the safety of robot use always takes precedence, there is an essential need to introduce a safety net for robot developers and manufactures that will protect them against unforeseeable risks so as to promote development and manufacturing activities. As a practical solution to this problem, it is necessary to design appropriate certification and insurance schemes.

There is also a need to reformulate a strategy for the research and development of robots on the basis of such a grand design and institutional framework. Namely, it is necessary to adopt

a new R&D approach that starts with user needs and usage environments and goes on to develop technological solutions to them, rather than one that starts with technology seeds and ends up looking for suitable applications for them. To this end, there is a need to pursue projects that closely involve wide-ranging stakeholders, including users, service providers and system integrators, right from the R&D stage. When drawing up a R&D strategy, it is necessary to take note of the division of the usage environments of nursing care robots into institutions and homes. In this regard, an effective approach may be to initially concentrate available R&D resources on institutional robots given the relative affinity of institutional environments to robots and later convert them to home use to increase penetration, in light of the examples of earlier cutting-edge technologies, such as video machines and computers. When undertaking R&D, it is desirable to target international markets right from the outset from the viewpoint of recouping development costs quickly and achieving economies of scale.

As can be seen from the above, to implement institutional reform and R&D in an integrated manner on the basis of a grand design, the long-term strategic involvement of the Government is essential. While the “application of robot technology in nursing care and disability welfare sector” has been included in the current national goals, set in the form of the new growth strategies of the Cabinet, it is vague in terms of what kind of organization should play the cross-cutting leadership role over various ministries and agencies. The author recommends that, upon designating the development of robot technology and its application in the nursing care field as a great strategic goal, a national executive body (in the mold of NASA and DARPA) be established to manage the national-level allocation of all funds and human/material resources relating to that goal in an integrated manner.