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Towards Dialogue between Technology and Society

As research continues to drive the development of advanced technologies in fields as diverse as the life sciences, information and communication, and the environment, the nature of the relationship between technology and society is increasingly being questioned. The interviewees in this issue of *My Vision* stress the necessity for the development of mechanisms to link technology to competitiveness in industry, and for efforts to ensure that society adapts to technology. They also indicate the importance of eliminating the isolation produced by specialization, of the recognition by scientists and engineers of their social responsibilities, and of the opening of research to the general public.

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Science and technology are advancing in tandem, generating significant changes to society. How should we think about these changes, and how should we respond? What responsibilities should academia, industry and government fulfill, and what are their strategies? In this issue of *MyVision*, we ask scholars and experts with a deep knowledge of technology for their opinion regarding the relationship between technology and society in the realms of management, policy, sociology and thought.

Interviewer: Yuya Nishiyama, NIRA Senior Researcher
Period of interviews: November-December 2013

An era of business creativity that will offer technologies to society

Kenichiro Senoh
President, The Industry-Academia Collaboration Initiative (Nonprofit Organization)

It is essential for technology to reach and benefit the broader society via industry. Industry plays the vitally important roles of activating the economy and providing employment. However, while today's Japan might possess technological capability, this does not result in industrial competitiveness.

One reason for this is that the business model by which technologies are utilized has remained stagnant for many years. Japan is still trapped by an extremely antiquated model, by means of which technologies are fitted in products (i.e., actualized as goods), and these products are sold for direct remuneration. By contrast, winning companies in the U.S. and Europe attempt to commercialize technologies using a range of different methods. The management of intellectual property – and this is what supports the business model in use – is another area in which most Japanese companies use an old-fashioned model, applying for patents in order to obtain the rights to technologies. They must understand that patents make technologies public, and function as textbooks for competitors. Surely it would be better for companies to possess tricks that represent confidential aspects of their technological expertise? In the final analysis, companies must give close attention to strategies of opening and closure – which areas of technology to open in order to accelerate the formation of markets, and which to close in order to ensure profits.

Another reason that Japan's technological capability does not result in competitiveness for the nation's industries is the fact that business managers are not able to imagine the form of the technologies and industries that will offer new value to the society of the future. In the past, the founder of Sony, Masaru Ibuka, and the founder of Honda, Soichiro Honda, offered grand visions that generated excitement. Apple's Steve Jobs did not create the iPhone using only his own company's technologies. He avidly sought out the necessary technologies to create new value for society from outside the company. The question here is one of business ambition originating in the power of the imagination. ■

We must adapt society to new technologies

Takeshi Natsuno
Guest Professor, Graduate School of Media and Governance, Keio University SFC

Technology is a tool to maximize human abilities and expand the possibilities of evolution. Human abilities are innately limited, but the advent of information technology has considerably expanded the potential for imagination and creativity.

The era in which we live is marked by the fastest pace of technological evolution in human history. Using search technologies, it is as if we have access to an external brain, and we become able to access the necessary information when it is needed. As a result, we can use the time that would previously have been spent in memorization on more creative pursuits. In the coming decades, we will develop technologies able to send electrical signals directly to the brain, and our ability to process information will once again increase dramatically.

The evolution of social technologies has also brought radical changes: We are now able to share specialized papers, and specialists working in a range of different areas are able to exchange opinions. The time required to share knowledge has been dramatically reduced, and as a result, new sources of knowledge are being born spontaneously.

This makes social adaptation, the way in which society adapts to new technologies, an issue of tremendous importance. In the U.S., the use of the Internet in election campaigns has ushered in a new era; this represents an example of skillful adaptation. In Japan, by contrast, a law allowing the use of the Internet in this way was only passed in 2013. In contemporary Japan, the legal system, business customs, and management systems are all outdated, and this is placing a brake on innovation, impeding social adaptation. If this situation continues, the adaptation of society to technology will not progress, and we will be overtaken by other countries. Unless we are able to realize this adaptation even a little more rapidly, we will be leaving a difficult legacy to future generations. ■

Living in a trans-scientific age

Yoshinori Yokoyama
Program Professor, Executive Management Program,
The University of Tokyo

Past technologies were developed on the basis of experience, through a repeated process of trial and error. For example, the Wright brothers, the inventors of powered flight, did not possess expert knowledge in the area of fluid dynamics. It was the experience of a great many mistakes that provided the basis for their development. This shows us that the technology of these times was something that could be understood through direct sensation.

However, many technologies developed in the 20th century, such as nuclear power, the life sciences, and information and communications technologies, bear no relation with experience. These technologies are born from the accretion of scientific knowledge and the accumulated publication of technical papers, and their details are understood only by specialists. The proliferation of technologies of this type means that ordinary people are unable to understand technology through direct sensation based on experience, creating the conditions for the spread of ignorance and misunderstanding of technology.

In the case of advanced technologies such as genetic engineering, we can also observe conflicts of opinion. Cross-pollination has long been practiced in order to improve agricultural products, but many people believe that genetically engineered crops created on the basis of theories in the life sciences are dangerous. In this case, it is essential not only for specialists, but also for large numbers of other concerned individuals, to consider the issues together. The U.S. nuclear physicist Alvin M. Weinberg calls areas such as this "trans-science." These are areas in which science is able to ask questions, but science alone is unable to provide the answers.

However, Japan is vertically organized, and this includes the administrative and academic worlds. Government committees are made up of scholars representing a narrow area, and discussions do not involve a broad range of participants. There is also a lack of people able to understand science and technology from inter-disciplinary perspectives, even if in a general way. As the situation stands, we will not be able to find the answers to our contemporary technological problems. We urgently need to reconstruct social mechanisms, considering, for example, our relationship with technology and how we should approach education and training. ■

The social responsibility of science and technology

Yuko Fujigaki
Professor, Department of General Systems Studies,
The University of Tokyo

It is widely believed that technological innovation should be socially responsible. This means that scientists should respond to questions from the public concerning the effects that new technologies will have on society. For example, development related to shale gas is proceeding in the U.S., but in addition to celebration of the fact that sources of energy have increased, there is also unease over negative effects such as subsidence, and this is generating intense discussion.

In considering the social responsibility of technology in Japan, it is impossible to avoid the accident at the Fukushima Daiichi Nuclear Power Station. There are two views of this event overseas: That it necessitates reconsideration of the safety of nuclear power, or that it is a problem of Japan's management of technology. The former sees the issue as one that is shared throughout the world, while the latter views it as a disaster that was "made in Japan." The Japanese themselves may tend to take the view that the issue is one that is unique to Japan, but the investigation of the Fukushima accident from these two perspectives, without trivializing the issues, would represent Japan fulfilling its social responsibilities.

As specialists, scientists tend to display a greater insistence on their responsibility to ensure the rigor of science than on their social responsibility. However, over-scrupulousness regarding the accuracy of the scientific basis of conclusions can postpone the application of practical measures. In the case of Minamata disease, scientists were hesitant to make a judgment before obtaining precise data, and this resulted in the further spread of the effects of the pollution. There are numerous cases in which, despite the fact that there is uncertainty with regard to the evidence or the scientific basis for our conclusions, we must have the resolve to implement measures as a society. Recommending precautionary measures to administrations even while scientific uncertainty remains is a social responsibility that we urgently require scientists and engineers to fulfill in their roles as specialists. ■

Open research to the general public

Shohei Yonemoto
Professor, The Graduate University for Advanced Studies

The concept that science and technology are shared, universal assets of humanity is one that was propounded by the Western nations during the Cold War. In post-Cold War Europe and the U.S., this has been transformed into a view of science and technology that prioritizes national interests. Following the end of the Cold War, U.S. researchers in the history of science applied themselves vigorously to research on the subject of technological policy during the Cold War period. They concluded that while the highest priority at the time was the development of nuclear weapons, the simultaneous development of military technologies such as GPS and the Internet provided the foundations for the later development of the information industry in the U.S.

By contrast, Japan's academic sector does not possess the psychological flexibility to objectively investigate the relationship between science and technology and the military.
Seeing the issues as too difficult, they avoid research related to politics, policy or diplomacy, and their belief that the study of fundamental principles is more elegant has legitimized a situation in which they do not touch on social issues. Because of this, Japan's academic world is one without any political presence.

Changing the social meaning of research itself can, unexpectedly, offer a shortcut to changing this inward-looking stance. The specialization of research and its concentration in universities were characteristic of the 20th century. In the 21st century, research will be manifest in products that offer enjoyment and a sense of fulfillment, and it will be open to the

general public. In just the same way as, for example, booking a package tour, individuals with the necessary wherewithal will purchase research plans, and universities and research institutes will provide them with the knowhow required to conduct research and rent them equipment in order to open up new possibilities. If we can expand this network of research, attitudes towards research will change, and the general public will come to be able to evaluate science and technology and policy. By this means, Japanese society as a whole will simultaneously produce and consume knowledge, creating a new civilization. ■

This is a translation of a paper originally published in Japanese.
NIRA bears full responsibility for the translation presented here.

About this Issue

Towards Dialogue between Technology and Society

The next several issues of *MyVision* will focus on subjects that are important in considering Japan's course over the coming five to twenty years, and will offer opinions from experts working at the forefront of their fields. In this issue, we take up the theme of technology, and our interviewees discuss its relationship to society.

The progress of technology is changing Japanese society at an unprecedented pace. There can be no argument against the fact that technology has enriched our lives and increased our efficiency in all areas. At the same time, there are those who are concerned that technology is encroaching on our lives too much, to the point that it will come to dominate them. The Public Opinion Poll on Science and Technology and Society conducted by the Cabinet Office in 2010 contained the question "Does the advancement of science and technology present more positive or negative aspects?" 54% of the respondents answered that there were more positive aspects, 35% answered that positive and negative aspects were almost equally balanced, and 7% responded that negative aspects predominated. Given the effects of the Great East Japan Earthquake which occurred in the following year, there is a strong possibility that the ratio of respondents who would stress the negative aspects will have increased.

How should we consider the relationship between society and technology as it continues to evolve? How should we approach technology? What is the essential nature of technology? These are questions that Japan must reconsider as it seeks to be a world leader in science and technology.

"Technology" as used here refers to techniques and tools which apply scientific knowledge and which we use in our daily lives. In this paper, the word is often paired with "science," referring to disciplines which explicate the laws of the natural world.

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