

## Develop Your Technical and Social Perspectives While Nurturing Your Inspiration



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### Overview

The NTT Information Network Laboratory Group aims to create a compassionate and flexible information-network infrastructure that connects everything. Researchers at the laboratory group are working diligently with pride, joy, and responsibility in creating technologies that will be implemented in society. We asked Shinya Tachimoto, senior vice president, head of the NTT Information Network Laboratory Group, about the capability required of top management of laboratories and the skills researchers should have in regard to research and development.

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### Continuity of research and development

*—Could you tell us about the NTT Information Network Laboratory Group?*

The NTT Information Network Laboratory Group is promoting research and development (R&D) of technologies to construct simple, smart, and sustainable networks that will contribute to the development of an information-network infrastructure that connects everything.

To make the Innovative Optical and Wireless Network (IOWN)—a future communication infrastructure proposed by NTT—a reality, while maximizing the potential of transport networks by promoting *all-photonics* technology, we are focusing on two initiatives: (i) R&D of flexible networks through Cognitive Foundation that enables prompt service provision and optimization of value chains and (ii) R&D of innovative environmental energy technology

that contributes to achieving zero environmental impact.

The NTT Information Network Laboratory Group is engaged in such R&D at three laboratories: (i) the Network Service Systems Laboratories, which conducts R&D of a future information-network infrastructure and the network services provided on it; (ii) the Access Network Service Systems Laboratories, which conducts R&D on access networks that cover service areas by linking optical and wireless networks and the access services provided on them; and (iii) the Space Environment and Energy Laboratories, which conducts R&D on next-generation energy technology and sustainable system technology to achieve zero environmental impact, as well as environmental adaptation technology to adapt to global climate change and build a resilient society. With approximately 500 enrolled researchers, these three laboratories are positioned at the core of R&D on information and communication technology in Japan.

Together they aim to contribute to society through a wide array of research results, ranging from research on elemental technologies (including energy technology) to architectures of entire information networks and network operations.

The Musashino base in Tokyo, where the NTT Information Network Laboratory Group is located, has been a hub of R&D on telecommunication networks in Japan, starting from the Electrical Communication Laboratory of the Ministry of Communications to Nippon Telegraph and Telephone Public Corporation and NTT. Initially, the R&D was centered on telephony, and a telephone network was constructed on the basis of the results of that R&D, and many of the devices and systems configuring the network were based on specifications devised at the laboratory. As the era of telecommunication networks changes from telephony to the Internet, general-purpose products and open platforms have been used for the devices and systems that make up the network. Adapting to this trend, we have expanded our R&D to cover various network functions, services, and operations that use those products and platforms. As we head toward the IOWN era, the core technology of communication and information processing will shift from electronics to photonics. We want to take this opportunity to implement our research results into networks and systems and expand them globally. From the birth of R&D on telecommunication to the present and into the future, we have taken the challenge of developing new technologies while inheriting the results and expertise of the past and flexibly adapting our style of R&D and social contributions to the times.

*—Could you tell us the important point for R&D activities adapting to the changing times?*

I believe there are three approaches to R&D. The first is pursuing the advancement of technology from the perspective of a researcher. In other words, R&D is promoted on the basis of technological evaluation to steadily improve a technology, for example, to achieve 10% increase in performance or a decrease in cost. The second is R&D from the perspective of society. In other words, R&D is carried out by setting up one's own R&D theme according to his/her desire to change the society for the future, make society better, or solve issues facing society. The third is R&D driven by inspiration. In other words, R&D is launched by the inspiration through which one day one suddenly thinks of something that will be of great



use to society or one somehow combines two mechanisms from completely different fields and come up with a completely new mechanism.

I think that the technological and social perspectives can be cultivated to some extent through learning. For example, R&D from the technological perspective is the style of R&D that many researchers had been doing since university days; for instance, one could create the next “new” technology by reading papers or repeatedly examining ways to improve the shortcomings and issues that were clearly identified from the results of one's experiments. R&D from the social perspective involves considering how to use one's technology on the basis of daily life and information about the world. Even if a problem is in a completely different field, it may lead to an idea that your technology can be used to solve that problem. However, I think that the third one, inspiration, is often triggered by chance and is not something that can be acquired through learning. As well as increasing your knowledge base in preparation for inspiration, you should constantly ask yourself the question,

“What if...?”

In many cases, it has been difficult to introduce research results in a timely manner because conventional information networks and the systems that compose them must be operated for a long time once they have been constructed for a specific service. However, as the world is ever changing and at a faster rate, it is important to have a vision of how to use the technology from the initial stage of research and to link that vision to development. This vision is exactly what IOWN is all about, and it is important to coordinate various research projects to develop a network to achieve this vision, which includes the All-Photonics Network. Networks will become virtualization-based in the future. By taking advantage of the flexibility that comes with virtualization, I believe that it will be possible to implement research results partially or temporarily and refine them in a timely manner while operating the system—something that has been difficult to do.



### Discuss fully and make judgments and decisions that stakeholders are satisfied with

*—Please tell us about the management of researchers based on your experience as an engineer.*

I have been engaged in development activities for quite a long time. I majored in mechanical engineering and conducted R&D on robots at university. After joining NTT, I was initially engaged in the development of telephone-switching systems then the development of the asynchronous transfer mode in the 1990s and next-generation networks (NGNs) in the 2000s. In those days, I felt great joy and satisfaction when the results of my R&D were released to the world and used by people. As the senior vice president, head of the laboratory group, I am grateful to be able to think about—together with many other researchers—how to use our technology and consider future directions from a broader perspective than before while maintaining the same awareness and attitude toward contributing to society.

It is a real pleasure to be able to discuss matters of concern with researchers. In particular, it is very rewarding to be able to drive the process that guides our R&D in the right direction. Of course, there are responsibilities associated with my position, so I might ask myself if what I said is really correct or I might change my direction, if necessary, through information, people’s reactions, and discussions. I think my job encompasses the whole process of setting those directions.

I think there are three points that must be considered when making such decisions and judgments. The first is the correctness of information. The second is whether the discussion was sufficient and a variety of viewpoints was taken into account instead of a particular opinion. The third is whether there is potential that the idea will be materialized and achieve results. At times, I am asked to make a black or white decision immediately; however, I always make a judgment or decision on the basis of these points. The environment surrounding R&D is constantly changing, so I try to discuss the best solution for each situation and make a decision that satisfies the stakeholders.

*—Even though you are busy, you frequently hold discussions.*

Discussions are carried out not only in large meetings but also in individual meetings on each research



topic. By understanding the details of a topic, I sometimes encourage researchers to adopt a different perspective. We also have inspirational discussions that I talked about earlier. Talking about the possibility of something might completely and unexpectedly lead to new development; conversely, it might cause confusion. Looking back on my research life, I believe that it is important for researchers to discuss each other's opinions and ideas, even if they are just random thoughts, and to think from different perspectives in response to those opinions.

To prevent the spread of COVID-19, remote work has become a mainstay, so it has become difficult to have opportunities for face-to-face discussions, and most discussions are held online. Inspirational conversations are transmitted differently when they are heard through a computer than when they are said face to face. Moreover, the way in which the message is conveyed and resonates differs considerably in comparison with that when we look each other in the eye or draw a picture on a whiteboard and post questions such as, "Well, what about this?" From a different viewpoint, this difference is an issue for consideration. The promotion of smooth communication in a remote society, such as the difference between online and face-to-face communications in how the message is communicated as a real feeling and how to eliminate frustrations, is a major theme for the future.

### Talk about the world that our technology will make possible

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*—You make convincing judgments and decisions through discussions; that is, you value not only research results but also the process leading up to the decisions.*

The hardest part of the discussion, judgment, and decision-making process is telling a researcher disappointing conclusions I have made. For example, researchers may have to interrupt their research or change their theme owing to changes in the environment. Doing so is difficult regardless of how big or small the subject is because the researcher has been working on it diligently. However, offshoots always grow from the hard work that has been put into a particular research theme. The technologies and materials that researchers have worked on and studied will be useful in certain ways in new fields, so I encourage researchers to connect them to those fields.

I certainly don't want to force researchers, who have strong individuality and various motivations, to go in a specific direction. Rather, I think it's important to let researchers look in different directions and be on the cutting edge of each direction. I think that's what's necessary in the future, so we'll lay the rails for the future in a certain way, but it is not forbidden to go off the rails because going off the rails can get you in the right position in the future. Therefore, I want to develop each offshoot, and I want all our researchers to do what they need to do now and grow the offshoots for the future.

*—Please give a message to researchers and engineers inside and outside the company.*

I hope that you will broaden the scope of your research by adding offshoots one after another, incorporating various styles and information according to the changes in society and the environment of the time while keeping your own style. I believe that this approach will broaden the scope of your life in the future.

I have learned a lot from the various comments on the news that flood the Internet. In the past, we did not have much exposure to anything other than the exemplary solutions organized through the mass media, but now, for better or worse, many people can speak freely on the Internet, and we are less likely to settle for such exemplary common solutions. In an uncertain world, I think it is important to understand where you stand in regard to the vast and multifaceted comments directed arbitrarily at will. It is very difficult to scrutinize and discern facts in the midst of divergent and untruthful information; even so, you can learn many things. For example, you may discover certain issues that we must solve as carriers and providers of information and telecommunications.

One of the major conditions for being recognized as a global researcher is that your achievements are technically superior. In addition to following the basic style of researchers, namely, communicating the excellence of your research and technology at academic conferences and in papers, you should

always be aware of your contribution to society. While being recognized by experts for your technology, talk to the general public about the world in which that technology is implemented with words such as, “My technology can create such a world in the future.”

### **Interviewee profile**

#### **■ Career highlights**

Shinya Tachimoto joined NTT in 1990 and worked on the development of switching systems at NTT Exchange Systems Research Laboratories. He had a key role in NGN system development and network integration testing and was also responsible for developing mobile network service applications at NTT DOCOMO. He became a manager of the Second Division (currently Technology Planning Department) at NTT holding company in 2000, senior researcher at NTT Network Service Systems Laboratories in 2003, senior manager at the Core Network Development Department of NTT DOCOMO in 2009, project manager at NTT Network Service Systems Laboratories in 2014, and the vice president, head of NTT Network Service Systems Laboratories in 2018. He has been in his current position since July 2020.