Efforts Toward Organizational University Collaborations

Terufumi Shinomiya[†]*, Takashi Ikegawa, Katsumi Iwatsuki, Akihiko Hashimoto, Yasuyoshi Okada, and Eriko Sano*

Abstract

NTT Service Integration Laboratories is striving to create organizational collaborations with universities across a wide range of academic disciplines in order to carry out joint research projects and human resources exchanges more efficiently and effectively. In this article, we introduce the framework for university collaboration and the content of activities. We also introduce specific examples of such collaborations.

1. Introduction

Societies today cannot help but be drawn into a maelstrom of rapid globalization, drastic changes in the business landscape, and fierce competition on a global scale. To respond to the rapid changes in social needs and diversification, it is necessary to partner organizations capable of thinking in different ways and perform research and development (R&D) that incorporates such thinking. In Japan, academic-industrial collaboration—linking companies and universities—in R&D and exchanges of human resources took a great leap forward as a result of the establishment of national university corporations in 2004, which drew the government's attention [1]. NTT is also working to create organizational R&D collaborations with universities [2].

To research and develop basic technologies in order to create new forms of communication and their supporting networks and to actively engage in advanced basic research with a ten-year outlook, NTT is engaged in R&D collaborations with universities across a wide range of disciplines. We have great expectations for diverse results by achieving open innovations. The fruits of these innovations will be profitable not only from a technological standpoint but also from a social standpoint and will make possible R&D that integrates disparate fields. For universities, such collaborations present a win-win situation for improving research and educational activities.

In this article, we introduce our framework for university collaboration and the content of our activities. We also introduce specific examples of such collaborations.

2. Levels of collaboration

NTT has a long history of collaborating closely with universities to conduct joint research. However, such collaborations have been based on individual-to-individual relationships among fellow researchers. Thus, it has been hard to grasp the overall state of organization-to-organization activities. Moreover, because the points of contact were unclear, problems emerged, including a lack of continuity in the collaborations, difficulties with collaborations across multiple fields, and researchers having to shoulder the burden of contract negotiations related to joint research.

To solve such problems, we began efforts toward collaborations with universities on the organizational level, and these have resulted in various joint research projects and human resources exchange. Our efforts center on signing comprehensive organization-to-organization contracts and creating collaboration committees consisting of executives from both NTT and universities to serve as the core of the

† NTT Service Integration Laboratories
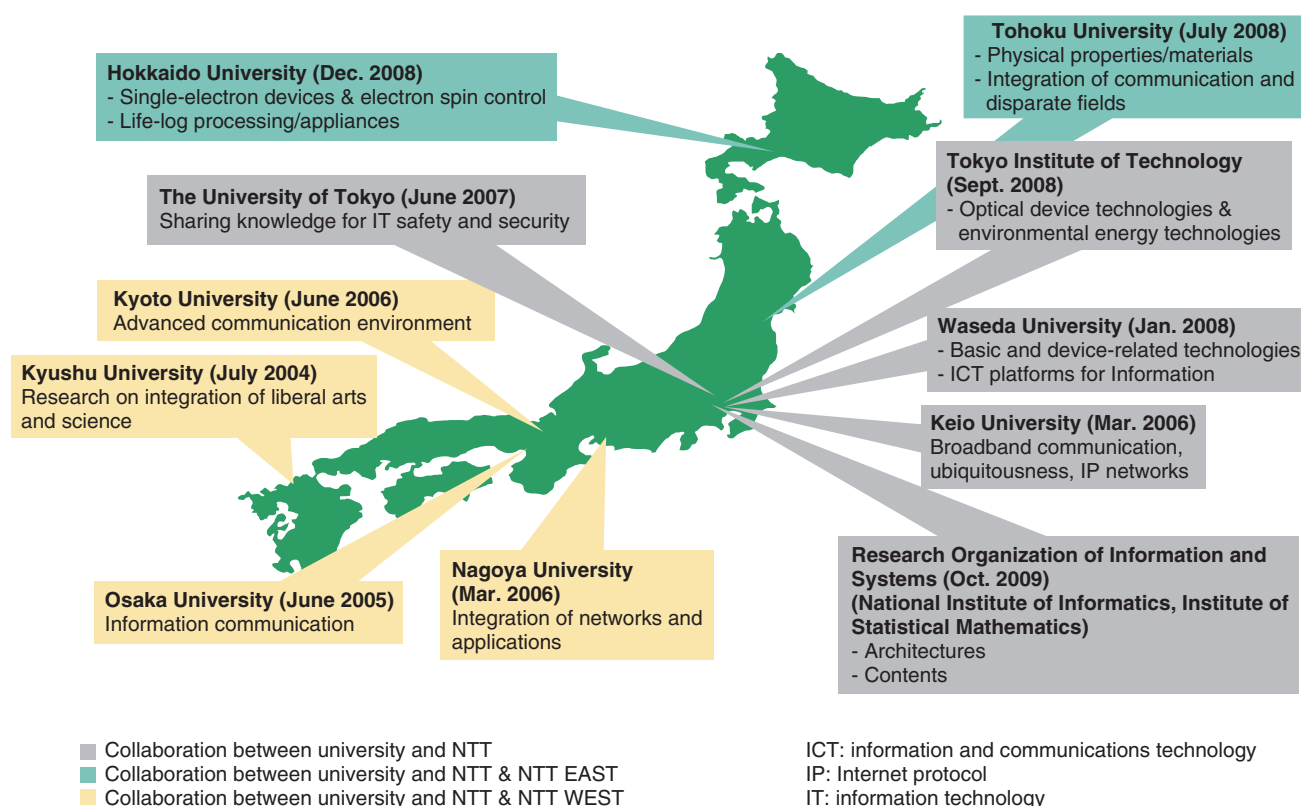 Musashino-shi, 180-8585 Japan

Fig. 1. Universities and research institutes in organizational collaborations with NTT. Fields of joint research are listed under the partner's name. Dates in parentheses are contract-signing dates.

collaborations. In July 2004, we signed the first organizational collaboration with Kyushu University. Since then, NTT has signed agreements with ten universities and one research institute, as shown in **Fig. 1**. Moreover, NTT EAST and NTT WEST, which are intimately connected with regions outside Tokyo, have forged close relationships with three institutions.

The planning and operation of an organizational collaboration is the responsibility of the collaboration committee, which is composed of collaboration managers and research representatives from both parties. The committee has a shared awareness of the R&D being tackled and the human resources available for exchange and creates collaborative relationships that span a wide range of disciplines.

To strengthen and further expand joint research projects that have past connections, we are working on creating new collaborations between departments that have not collaborated before; we are also creating integrative collaborations that span multiple laboratories. We are doing this through matching conducted

from a wide perspective on the basis of the needs and seeds of each party. In the area of human resources exchange, we are working on accepting student interns and establishing new occasions for technological exchanges through the participation of a wide range of departments, while being aware of sustained development.

The issues associated with conventional collaborations, their drawbacks, and the goals and methods of organizational collaborations are shown in **Fig. 2**. The forms of collaboration and the contact department on the university side may differ depending on the university. However, for NTT R&D, the unified point of contact for all organizational collaborations is NTT Service Integration Laboratories.

3. Achievements

By utilizing the special features of each university and complementing each other's strengths, we have conducted joint research and human resources exchanges in various areas centered on the field of
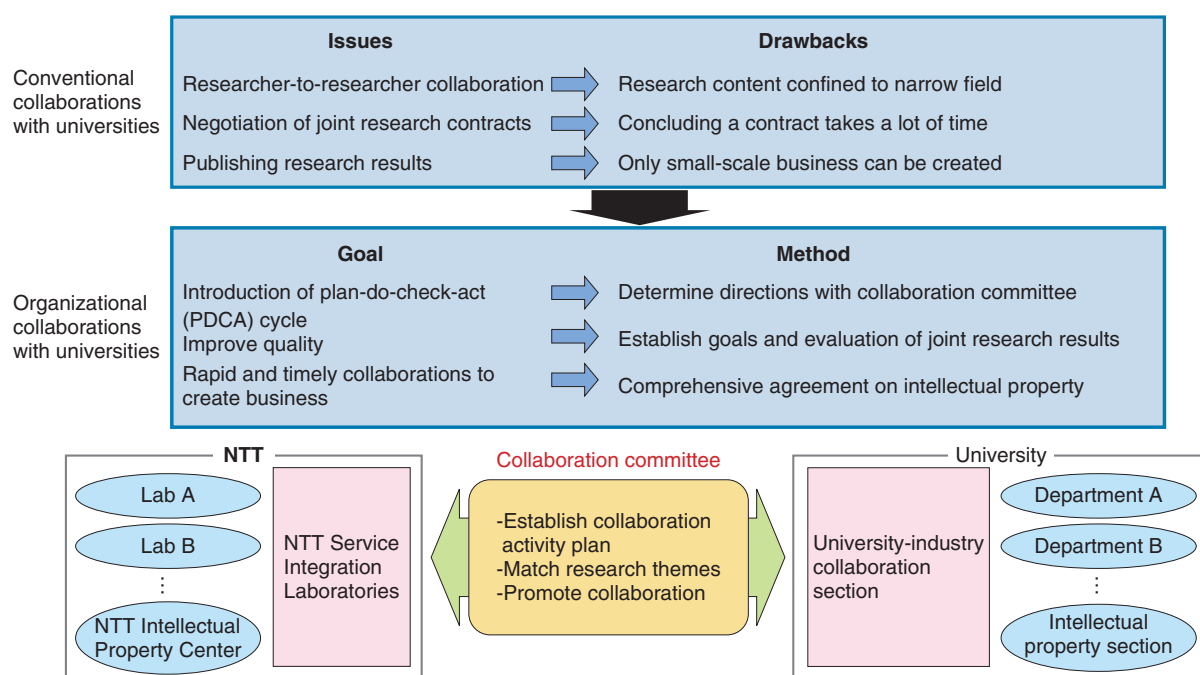
Fig. 2. Advancing organizational collaborations with universities.

communications, including physical properties and materials science, leading-edge devices, IP (Internet protocol) networks and ubiquitousness, information and communications technology (ICT) (including information security), as well as higher-level themes such as audio/video and communications. We are also working on social concerns, including energy and the environment, disaster prevention, medical science, and agricultural science.

In FY 2010, more than 150 joint research projects were carried out through organizational university collaborations, resulting in more than 100 patent applications being filed and more than 200 papers being submitted to academic journals and presented at international conferences [3].

We are also committing ourselves to transmitting the achievements of our joint research projects to the public through press releases from NTT and our university partners (see **Table 1**) and by publishing books. As an example of the latter, we published the results [4], [5] of our research collaboration with Kyoto University's Disaster Prevention Research Institute in a book aimed at the general public [6]. Studies in disaster prevention have until now focused on protecting society against natural disasters, for example through anti-disaster technologies such as construction methods to improve the ability to resist

disasters. However, this book is premised upon the occurrence of disasters and focuses on effective implementation of relief and recovery and on technologies for minimizing the harmful effects of natural disasters. It calls for the creation of a *resilient society* by exploiting ICT. Such a society would have resistance to natural disasters and greater recovery strength.

Next, we introduce two examples of human resources exchanges.

3.1 Kyushu University COE Program

First, we were involved in two programs: (1) MEXT's 21st Century COE Program "Development of Dynamic Mathematics with High Functionality" (MEXT: Ministry of Education, Culture, Sports, Science and Technology in Japan; COE: Center of Excellence) conducted by Kyushu University's Faculty of Mathematics (2003–2007) and the graduate school reform support program "Training Program for Ph.D. and New Master's in Mathematics for Industry" (2007–2009) and (2) the Global COE Program "Education-and-Research Hub for Mathematics-for-Industry" (2009–2013) [7]. The curricula of these programs require an internship of three or more months by doctoral students. Since 2006, NTT has been accepting students every year as interns for such

Table 1. Press releases of joint research achievements.

Year	Date	Source(s)	Theme
FY2010	Mar. 15, 2011	Hokkaido University	Elucidation of physical constants in the control of electron spin: Accelerating R&D of next-generation electronic devices
	Nov. 2, 2010	NTT and Kyoto University	Development of error resilience technology that brings quantum computing a big step closer to reality: Enabling quantum computing by using electron gates with large errors
	Sept. 3, 2010	Kyushu University, Takarazuka, Kadokawa, and NTT WEST	Joint R&D for highly realistic sensations during live transmission with communication networks: Live transmission of Takarazuka Review with highly realistic sensations
	Sept. 2010	The University of Tokyo, Toyo University, NTT	Verification of divergence and security using "The International Comparative Survey on Concerns when Using the Internet": Clarifying characteristics of anxiety felt by Japanese users even when safe
	July 27, 2010	Nagoya University	Test release of MAGIC, an automatic English fill-in-the-blank test generation system: Promise of creative learning support
	June 29, 2010	Tokyo Institute of Technology	Direct generation of frequencies over 1 THz at room temperature: Developing the world's first electron device
FY2009	July 27, 2009	NTT and Tokyo Institute of Technology	Success in developing multifunctional 2-qubit (quantum bit) logic element: Realizing inversion of control logic and exchange operation with one electron
	July 17, 2009	Tohoku University, NTT EAST, and NTT	Testing for collaborative business of "Invented by Miyagi"'s new image resolution: Implementing a renewal opening ceremony for "HIKARI PARK"
	April 30, 2009	NTT and Kyushu University	Successful observation of temporal change in the shape of a receptor: Elucidating the structural change mechanism of ATP receptor
FY2008	Dec. 25, 2008	Keio University and NTT	Success in demonstrating multi-location teleconference with 4K ultrahigh-definition resolution: Creating a network cooperative industry using ultrahigh-definition video
	May 26, 2008	NTT and Osaka University	Test of the world's first teleportation-based quantum calculation: A breakthrough in making photon quantum computers

programs. We have also been continuing to accept summer interns for the new master student development program and dispatching lecturers. Through its COE program activities, Kyushu University has established an internationally unprecedented Institute of Mathematics for Industry. This laboratory is Japan's third mathematics research institute, following the Research Institute for Mathematical Sciences (Kyoto University) and the Institute of Statistical Mathematics [8].

3.2 Keio University Symposium

In February 2011, the collaboration committee of Keio University and NTT held the symposium "Seeking to Realize Ubiquitous Innovations through ICT: From Creating Leading-edge Basic Technologies to Application" at Keio University's Mita campus [9]. Atsuhiro Goto, the director of NTT Cyber Communications Laboratory Group (now at Institute of Information Security) gave the keynote address entitled "The Promise of Academic-Industrial Collaborations: Creating New Services for the Optical Era" (see **Photo 1**). Next, researchers from Keio University and NTT gave six presentations in three areas—electronics and physical properties/materials science, networking, and human communication technologies, announcing the results of their cutting-edge research. There were over 170 participants from companies, research institutes, and government agencies as well as universities. A rich variety of presentations on a wide range of topics was given, from basic research to applications in the field of ICT, making the symposium an overwhelming success.

4. Collaborations with overseas universities

NTT is also exploring organizational collaborations with overseas universities. Recognizing that collaborations in Asia are growing in strength, we are proceeding with collaborations with universities in China, Vietnam, and India. Because there are issues such as differences in customs and laws, we are still at the stage of carrying out trials of offshore software development related to research rather than conducting R&D collaborations like those with domestic universities. The universities have favorably evaluated the acquisition of new research themes and the training of students. For NTT, the advantages are

promoting exchanges of human resources and reducing costs.

5. Conclusion

For efforts toward organizational university collaborations, it is critical to regularly commit energy to the creation of new research themes as part of the metabolism of an organization and to develop strong research themes that take account of business and social developments. It is also essential to widely and continually foster mutual understanding through exchanges of human resources. With NTT's organizational university collaborations, we are not only creating win-win relationships with universities, but also working to improve Japan's growth strategy and increase its international competitiveness and contribute to solutions to society's problems.

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Photo 1.   Keynote address.

Terufumi Shinomiya

Senior Research Engineer, Supervisor, Industry Academic Collaboration Group, Service Deployment Strategy Project for Business Promotion, NTT Service Integration Laboratories.

He received the B.S. and M.S. degrees in mathematics from Kyushu University, Fukuoka, in 1985 and 1987, respectively. He joined NTT Laboratories in 1987 and studied network performance of B-ISDN and IP-based networks. He also engaged in studies on communication quality for voice over IP. During 1997–2004, he was a Rapporteur of ITU-T SG13. Since 2007, he has been promoting strategic R&D collaboration between industry and universities. He received the ITU-T Certificate of Appreciation in recognition of his contribution to standardization activities and his excellent work performed in 2004. He is a senior member of the Institute of Electronics, Information and Communication Engineers (IEICE).

Takashi Ikegawa

Senior Research Engineer, Industry Academic Collaboration Group, Service Deployment Strategy Project for Business Promotion, NTT Service Integration Laboratories.

He received the B.E. and M.E. degrees in fine measurements and system engineering from Nagoya Institute of Technology, Aichi, and the Ph.D. degree in mathematical and computing sciences from Tokyo Institute of Technology in 1985, 1987, and 2008, respectively. He joined NTT in 1987 and has been involved in network protocol standardization with the International Organization for Standardization and in studies on network architecture with the Telecommunications Information Networking Architecture Consortium (TINA-C). He has been a visiting Professor at Kyushu University and is currently a part-time lecturer at Keio University. His research interests include performance modeling and analysis of communication protocols. He is a senior member of IEICE and a member of the Operations Research Society of Japan.

Katsumi Iwatsuki

Senior Research Engineer, Supervisor, Industry Academic Collaboration Group, Service Deployment Strategy Project for Business Promotion, NTT Service Integration Laboratories.

He received the B.E. degree in electronics engineering from Nagoya Institute of Technology, Aichi, and the M.E. and Ph.D. degrees in electronics engineering from the University of Tokyo in 1981, 1983, and 1986, respectively. In 1986, he joined NTT Yokosuka Laboratories, where he engaged in research on high-speed ultralong-distance optical soliton transmission, ultrahigh-speed nonlinear pulse transmission with optical TDM techniques, optical fiber sensors, and ultrafast electrical signal measurement. In 1996, he was transferred to NTT headquarters to promote strategic technology planning. Since 1999, he has been engaged in research on broadband metropolitan/access networks based on WDM technologies and millimeter-wave generation with micro/millimeter-wave photonics technologies, where he headed the Photonic Communications System Research Group in NTT Network Innovation Laboratories and WDM Access Group in NTT Access Network Service Systems Laboratories. In 2007, he moved to NTT Service Integration Laboratories, where he has been promoting strategic R&D collaboration between industry and universities. He has been engaged in coordinating many research collaborations and promoting some of them such as terahertz communication systems and sensors, broadband ubiquitous networks based on wired and wireless convergence/integration, and next-generation ICT services underlying the resilient society. He is the author or co-author of more than 150 papers and letters in technical journals and international conferences. He is active in the IEICE's Technical Committee on Microwave and Millimeter-wave Photonics. Some of his recent activities include Committee member of Asia-Pacific Microwave Photonics Conference 2012, TPC member of the 30th and 31st Progress In Electromagnetics Research Symposium (PIERS), and session organizer of "Microwave/Terahertz Photonics Technologies and their Applications" in PIERS (2007–2011). He received the Young Engineer's Award from IEICE in 1991, the APCC/IEEE ComSoc APB Joint Award in 2001, and the European Microwave Conference Prize in 2006. He is a member of IEICE.

Akihiko Hashimoto

Senior Research Engineer, Industry Academic Collaboration Group, Service Deployment Strategy Project for Business Promotion, NTT Service Integration Laboratories.

He received the B.S. and M.S. degrees in communication engineering from Tokyo Institute of Technology in 1983 and 1985, respectively. Since joining NTT Electrical Communication Laboratories in 1985, he has been studying computer graphics and three-dimensional remote-image input. He is currently working on an industry academic collaboration. He is a member of the Institute of Image Information and Television Engineers of Japan.

Yasuyoshi Okada

Senior Research Engineer, Industry Academic Collaboration Group, Service Deployment Strategy Project for Business Promotion, NTT Service Integration Laboratories.

He received the B.S. and M.S. degrees in mathematics of science from Tohoku University, Miyagi, in 1983 and 1985, respectively. He joined NTT Basic Research Laboratory in 1985. From 1985 to 1992, he studied artificial intelligence and a basic theory of computer science and also made a new theory "Graph Rewriting Systems" which lets one apply network reliability analysis. From 1993 to 1997, he was with NTT Telecommunication Networks Laboratories engaged in the development of a traditional network reliability design method and an initial Internet quality design method. From 1998 to 2000, he was engaged in the development of the OSPF protocol and the BGP protocol for a new commercial network. From 2001 to 2002, he planned and executed a joint experiment of the J-League Omiya Ardija and NTT Service Integration Laboratories aimed at developing applications in the optical fiber communication network. From 2003 to 2007, he worked in a service project to commercialize a product developed in the laboratory. He has been engaged in industry-academic collaboration since 2008. He is a member of IEICE, the Information Processing Society of Japan, Information Systems Society of Japan, and Japanese Society of Science and Football.

Eriko T. Sano

Senior Research Engineer, Service Deployment Strategy Project for Business Promotion, NTT Service Integration Laboratories.

She received the B.E. and M.E. degrees from the Department of Physics, Ochanomizu University, Tokyo, and the Ph.D. degree from the Faculty of Science and Engineering, Waseda University, Tokyo, in 1986, 1988, and 1999, respectively. She joined NTT Basic Research Laboratories in 1988 and studied the growth mechanism of III-V and III-VI semiconductors. From 1997 to 2001, she was with NTT AT as a Senior Manager in the Corporate Strategy Planning Headquarters. She qualified as SAP R/3 Certified Application Consultant "Controlling" in 1999. She has twelve years of experience in business development at NTT Research and Development Planning Department and NTT Service Integration Laboratories. She is a member of the Physical Society of Japan and the Japan Society of Applied Physics.