Interview with Ken Sakamura, Ph.D., Dean of the Faculty, INIAD, Toyo University

Education for Ubiquitous Network Society — Toyo University's Big Project

By *Japan SPOTLIGHT*

In the northwestern part of Tokyo, in a residential area called Akabanedai, a solemn-looking, futuristic intelligent building appeared in April 2017. Designed by well-known architect Kengo Kuma, entering the site gives the feeling of being in the future or in a science fiction film. This is a campus of the Faculty of Information Networking for Innovation and Design (INIAD) founded by Toyo University, one of the largest Japanese private universities. It aims to train human resources for what we call a "ubiquitous network society" in which anybody can be connected to a computer network anytime, anywhere.

Japan SPOTLIGHT was privileged to interview Ken Sakamura, dean of this newly established faculty of Toyo University and emeritus professor of the University of Tokyo, a distinguished computer architect. He is a leader and founder of the "TRON" project (The Realtime Operating System Nucleus), a computer architecture project aimed at creating a Highly Functionally Distributed System to computerize everything in your daily life.

(Interviewed on Dec. 8, 2017)

Introduction of INIAD

JS: Could you tell us about the background of INIAD and its ultimate goal?

Sakamura: The origin of Toyo University was as a "Private School of Philosophy" founded by Enryo Inoue, the first graduate from the Philosophy Studies School of the Literature Department of the University of Tokyo in 1885. The age when he was active, spanning the end of the Edo Era (1603-1867) and the Meiji Era (1867-1911), was a time when Japan was undergoing transformation from a traditional feudalistic society to a modern one, greatly influenced by new ideas and teachings coming from the West. In this period of transformation, strongly pushed by this wave of Westernization, government leaders increasingly felt the need to establish national universities where young elite Japanese students would be able to learn these Western ideas. The University of Tokyo was founded by the Meiji government in 1877. Less than 50 students were admitted in its first year. Inoue was one of those elite students and the only one in the Philosophy Studies School of the Literature Department. Most of the graduates from the University of Tokyo then chose to work for the government, but a few of them chose to engage in education. He was one of those graduates and at the age of 29 he founded the "Private School of Philosophy".

Ken Sakamura, Ph.D., Dean of the Faculty, INIAD, Toyo University

His firm conviction was that we should think about things logically. And in Inoue's mind, this scientific thinking was equated with "Philosophy". This respect for science rather than religion was also a growing trend in the world. In the West, during the age of transition from medieval times to the Enlightenment, general thinking could largely be classified into two groups: one based on theology and the other on anything else, most notably emerging nascent modern science. While many considered the Earth flat under the influence of some early Christian writers, other people disputed this by saying that the Earth is a sphere circling the Sun. The latter group of people were recognized as scientists later. In Inoue's view "Philosophy" stood with scientists in this search for the truth by reason and logic. Inoue, the founder of Toyo University, supported this scientific attitude.

In 2017, I got involved in founding a new faculty for the era of IoT at this university. The Faculty of INIAD opened in April. With the development of AI and IoT, business and life styles are significantly changing, and a university is no exception. Our INIAD project was

aimed at restructuring of all learning regardless of the classification of humanities and natural sciences to meet the needs of an IT society. In addition to these two categories, art and design have been added to create four courses all based on computer-based fundamentals.

What we consider most important in this faculty are computer science and networking, and above all communication skills. In our time, it is impossible for one single person to achieve a solution to any issue in business or society. Whenever you try to create a product you will need engineers to design it, people for its marketing, experts for the commercialization of the product, and even experts on sales promotion for the product, experts for the packaging to be used in its distribution, and so forth. We will need to integrate all this knowledge and efforts by communication and networking in a common language to achieve our goals. The common language to be used must be a knowledge of computer programming. INIAD will be a venue for practical education to provide this knowledge and raise those competencies to enable students to create a product or business and solve any issues arising.

Fundamental Ideas Behind Education at INIAD

JS: Is INIAD ultimately aiming to train human resources to adapt to IoT and a ubiquitous network society?

Sakamura: Yes. We are trying to raise human resources who would be able to think about solutions to the challenges in business or urban development, for example, or other application fields by using a computer. We are not aiming to create computer programmers.

JS: Do you assume then that the graduates from this faculty will not necessarily be working in IT business in the future but possibly elsewhere?

Sakamura: Yes. Of course, there are some who will be IT engineers, but our priority is to raise human resources capable of solving their own issues in their specialties by using a computer.

JS: Additionally, your point is that networking will be a key to success in society after graduation.

Sakamura: In an organization you cannot solve any issue in your business on your own but will have to reach a solution through team work. Furthermore, as Japanese society is aging with fewer children, we will need to collaborate with peoples worldwide. Communication only among Japanese may be limited in scope and international communication will give us a wider scope of solutions. We aim at
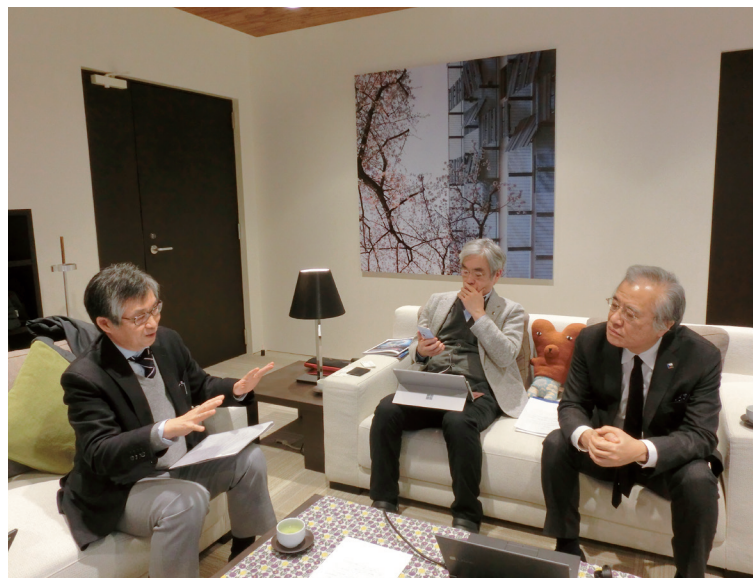
raising human resources who will be able to communicate internationally. Therefore we think highly of diversity. We assume that the proportion of students should be ideally 50-50 between Japanese and non-Japanese, between men and women, and between students just graduated from high school and those who have worked for a while since graduation.

At this moment, approximately 40 students are from overseas among the 400 students in total per academic year. There are around 20 students who speak only English among those foreign students. The percentage of female students is around 30%. Among undergraduates, there are very few students who have already worked for a while, but all the graduate students have had work experience. We have a program of joint study between undergraduates and graduates and I believe this collaboration could create new outcomes.

Furthermore, we established the collaboration Hub for University and Business (cHUB) and are trying to promote collaboration with not only companies but also with governments and regional authorities and NGOs.

INIAD Campus Building

JS: Your faculty's building is truly impressive. Could you briefly describe its essential characteristics?

Sakamura: Yes. The building at Akabanedai Campus called INIAD HUB-1 is an advanced intelligent building with 5,000 IoT devices in 19,000 square meters of space. I was the producer of the whole conceptual design and was in charge of its internal design and facilities, and the distinguished architect Dr. Kengo Kuma was in charge of the design of the exterior of the building.

We use the online system "MOOCs" (Massive Open Online Courses) for our faculty's education program. Lectures are distributed among the class as videos and small tests are distributed through the Internet. So discussions and demonstrations of computer software programs are a major part of classes at the school. Assuming that all students attend classes with their own computer, use of paper is completely done away with. There is no paper textbook and no whiteboard. Students' textbooks are all available on the Internet. We have a library without paper books at a media center, a symbol of our paperless building. You can look at one million e-books in this library. We have no message boards and all information is available on digital signage. You can get any message from the school, including cancellations or postponements of classes, on your smartphone.

In addition, all the corridors of INIAD HUB-1 have temperature sensors or human motion sensors connected with wireless networks. All doors and personal lockers are opened and closed by a person's ID card or a smartphone as an electronic key. Thus, this whole building itself is a training material of IT and also the laboratory for R&D. Also, in our INIAD Maker's Hub, there is a wide range of equipment and tools, such as assembling machines, industrial machines such as laser cutters, measuring instruments, and 3D scanners and printers.

JS: It is generally said that we cannot raise the quality of education unless the size of a class is small. In the case of INIAD, what is the proportion of teachers to students?

Sakamura: There are 400 students per academic year and in total 1,600 students. There are around 140 professors including non-permanent lecturers. A standard class is 35 students. More than 80% of the courses are organized to a standard size. There are very few large classrooms with a capacity for several hundred students that we see quite often at other universities. Since the students are

supposed to see the lectures in advance on the Internet, in class they work on discussions, tests and Q&A. In such a class, there are around three teaching assistants, so I think the ratio of teachers to students would be around 1 to 10. That is, I guess, very high. It is certainly true that we will need to reduce the number of students per teacher in order to raise the quality of education. We are thinking about replacing teaching roles to a certain extent by AI or computers to supplement teaching functions and reduce the number of students per teacher.

Competition Among Universities with Decline of the Young

JS: With the significant decrease in the population of young people in Japan due to the low birth rate, there would be more severe competition among universities to attract as many good students as possible. Do you think such competition will lead to enhanced university education in Japan?

Sakamura: We believe that from now on a Japanese university should be ready to teach Japanese culture and technology to overseas students rather than only to Japanese students. This is the same as American universities that accept many overseas students. I believe there are many young people who would be keen to learn about Japanese technology or philosophies, and it will be important for Japanese universities to attract such students from all over the world.

INIAD has allowed students abroad to take our entrance exam directly over the Internet. They can take a course in English and they can graduate from our school without speaking Japanese. But given that learning Japanese would be a positive experience for them in the light of understanding Japanese culture, we have made learning Japanese language an obligatory item. I believe we now have very good students coming from abroad in INIAD.

Photo: INIAD Toyo University

Entrance of INIAD, Toyo University

Photo: INIAD Toyo University

INIAD HUB-1 at Akabanedai Campus

JS: From which region are they coming?

Sakamura: A wide range of regions, such as ASEAN and Europe. As they can take an entrance exam for our school without coming to Japan, many of them are enrolled directly from their countries without learning Japanese at a language school in Japan. This is different from the case of acceptance of foreign students at other universities.

JS: English is a common language in international networking or collaboration. How important do you think would it be for those students from abroad to learn Japanese?

Sakamura: They would have no difficulty in learning in our school without any knowledge of Japanese, since all the courses are taught in English. However, those foreign students request a Japanese language course as their motivation to come to Japan is partly their interest in Japanese culture. So, without a Japanese language course, we would not be able to attract good students from overseas. In reality, students who have chosen Japan as their country to study in are working hard to master the Japanese language. Above all, they are young and their progress in the language is very rapid. Within one year, they master daily conversation and in two or three years they can discuss their specialty in Japanese.

In our school, we consider communication as the first priority. In this regard, talks in Japanese and English mixed are welcome. So, even though at the beginning they cannot communicate at all, after a while they will be able to communicate well with other students and the professors. This is exactly the same as in our international networking or academic meetings where we occasionally talk with each other in English with some French or German words in a country where the mother tongue is not English.

JS: In light of raising human resources for global activities, are you planning to look into collaboration with overseas universities?

Sakamura: Toyo University has so far done many collaboration projects with universities around the world and has been nominated as a selected university in the Top Global University Project by the Japanese Ministry of Education, Culture, Sports, Science and Technology (MEXT). The Top Global University Project was established by MEXT in 2014 for government support for the international activities of nominated universities. Apart from this, INIAD is planning to develop a path for international collaboration in the future on our own.

Small classrooms focusing on discussions at INIAD

Future Plans

JS: Could you tell us about your future plans, if any?

Sakamura: Yes. I think we will need to promote INIAD to a global audience. To do this, we are now trying to collaborate with a variety of international conferences and business firms. For example, in computer science, my specialty, we are thinking about collaboration with the Institute of Electrical and Electronics Engineers, Inc. (IEEE) to create an international standard based on our own TRON RTOS specification, or starting joint research with international IT firms such as Google or Microsoft. We are also participating in a Japan-EU joint research and development project on Smart City Innovation called "CPaaS.io" (City Platform as a Service – Integrated and Open) which is part of "Horizon 2020". The CPaaS.io members on the European side are the University of Berne in Switzerland, the University of Surrey in the United Kingdom, a German business firm, AGT International, and others. As regards my own project, TRON, we have already received many proposals for international collaboration. I believe we can promote our international activities much further.

In Japan as well, our school was selected as one of the projects in the "Education Network for Practical Information Technologies" (enPiT) set up by MEXT. We have also decided to start an education program for working adults to learn about the latest rapidly changing AI, IoT and other topics. In this project, Toyo University is going to work as a central agency in collaborating with the University of Tokyo, Yokohama National University, Nagoya University and Meijo University. I believe this will enhance lifelong education, a subject that our university's founder Enryo Inoue had worked on in the latter half of his life. **JS**

Written with the cooperation of Naoko Sakai who is a freelance writer.