

# IoT and Open Innovation

**SHIN, Seiichi\***



The word Internet of Things (IoT) is becoming very popular. It refers to the concept of connecting every single object with the Internet. This is exactly the same as the concept of ubiquitous computing that was popular around the year 2000.

However, things have changed in the decade and a half since then, in terms of our technological environment and social environment. For example, the Internet protocol (IP) has been upgraded from version 4 to 6. This means that the IP addresses for distinguishing objects have changed from 32 bits to 128 bits. Specifically, whereas only 4 billion objects in the whole world could be distinguished in the past, it is now possible to distinguish 39-digit number of objects in the decimal system. This is an outrageous number, since a trillion is 13-digit number, and a quintillion is 19-digit number. Come to think of it, roughly assuming the current population of the world is 10 billion people, if each of these people has 100 objects connected to the Internet, then we were lacking IP addresses with version 4 while it is more likely to make the IoT a reality with version 6.

Another change in the environment is that analog TV broadcasting came to an end in July 2011 in Japan. The Image quality has been dramatically improved as the signals have become digitized. In fact, the efficiency of radio wave usage has been improved more than the size of improvement in the image quality. As a result, there is some vacancy in the frequency that is the so-called platinum band that it is easier to connect to and that makes large-capacity transmission available. This is called white space, and this vacant 700 MHz zone has been allocated to intelligent transport systems (ITS). This has led to a possibility of realizing practical application of vehicle-to-vehicle and vehicle-to-road communication. This is one of the reasons why self-driving vehicles have become a popular topic in recent years.

As you may already know, Japan is rich in innovation. Karaoke and instant noodles were invented by Japanese people, and they are changing the lives of people around the world. The basic technology related to the IoT is also in Japan. However, it is highly ques-

tionable whether we have the capability to expand it to the entire world.

The significant difference with “ubiquitous” that was often referred to at the beginning of 2000 is attitude toward open innovation. Ubiquitous technology was an enclosure type of technology. Ubiquitous computing enabled connection with products provided by some specific companies only, and this led to consumers not understanding such technology very well. On the other hand, the IoT is based on the concept of open innovation in which absolutely anyone can participate. Openness is ensured not only in the vertical direction between the data provider, analyzer and service provider, but also in the horizontal direction between anyone who wishes to participate, at all stages.

Other participants may be friend or foe. We will need a different mindset and a different system from when openness was ensured only among our allies, but it seems that people have yet to develop an awareness of this.

For the engineers in the 20th century, drawings were their lifeline. They were never to be disclosed to those in other companies. However, for open innovation, sharing these drawings is the starting point. In other words, the drawings are made open to all. Some may be upset, considering this situation to be like being naked in front of a large audience. However it is not. What we need to pay attention to is TPO (Time, Place and Occasion). Of course, in some cases, we may appear naked, but in other cases, we may be wearing a jacket, or may be wearing a small piece of underwear only. In those cases, we need to wear nice underwear. In other cases, we may need armor or a coat. Whether such provisions are registered as intellectual property will become the touchstone as to whether we can survive in this open age of the IoT.

The story still continues. In this open age, the age of the IoT, it seems that there will be no border between professionals and amateurs. Prosumers (where producers and consumers are combined) as predicted by Alvin Toffler in “The Third Wave” have emerged.

The professionals of nowadays design and produce products with the help of computer-aided design (CAD) systems and manuals. Professionals of the 20th century are deeply concerned that the skills of the professionals in the 21st century have deteriorated. Come to

\* Professor, Graduate School of Informatics and Engineering,  
The University of Electro-Communications

think of it, products of the 21st century are composed of a vast amount of software in addition to numerous electrical and mechanical components. They are also sold while meeting various requirements regarding not only their performances, but also their cost, mass-production suitability, safety and environment friendliness. No designing, production, procurement or purchasing can be made without the aid of computers. That is the nature of the age we are living in.

On the other hand, amateurs can also design, produce, procure and purchase products as long as they

have the aid of computers. The combination of CAD systems, 3D printers and the Internet will let us realize a dream where factories merge into households. We are living in 2016, and a long time has passed since the turn of the 21st century. We are in a totally different time from the 20th century.

Amateurs create equipment, amateurs gather data, and amateurs provide services; that is open innovation. Preparing an environment that enables this situation is what the professionals need to do.





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