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New Year Messages

From the Minister of Internal Affairs and Communications, Secretary-General of ITU, President of ITU-AJ

Special Feature

Business Innovation with state-of-the-art AI

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About ITU-AJ

The ITU Association of Japan (ITU-AJ) was founded on September 1, 1971, to coordinate Japanese activities in the telecommunication and broadcasting sectors with international activities. Today, the principle activities of the ITU-AJ are to cooperate in various activities of international organizations such as the ITU and to disseminate information about them. The Association also aims to help developing countries by supporting technical assistance, as well as by taking part in general international cooperation, mainly through the Asia-Pacific Telecommunity (APT), so as to contribute to the advance of the telecommunications and broadcasting throughout the world.

Reflections on the Start of the New Year 2020

TAKAICHI Sanae
Minister of Internal Affairs and Communications

I wish you a Happy New Year.

In September last year, I was reappointed as Minister of Internal Affairs and Communications after a break of two years and one month. I am determined to work hard to address the issues that affect everyone in Japan by organically combining this ministry's wide range of policy resources, and this year I will continue to put every effort into carrying out my duties to the best of my ability.

Last year, tremendous damage was caused by a series of natural disasters including typhoons and heavy rainfall. I would like to express my condolences for the people who lost lives in these disasters and offer my heartfelt sympathy for those who were affected by them.

I believe that protecting the lives and property of citizens is our country's most important mission, and I will be sure to take safety and security into consideration in the planning and implementation of various policies. In addition, I will continue to develop new policies where necessary from the viewpoint of consumers.

To realize local communities that can benefit from technological innovations such as 5G, IoT and AI in the fields of medicine, welfare, education, local transportation, tourism, agriculture, forestry, fisheries, disaster prevention, administration service, and so on, we will promote the development of better ICT infrastructure and usage environments. To that end, we will promote early nationwide deployment of ICT infrastructure including 5G and optical fiber, and we will work on initiatives such as Local 5G that develop regional 5G utilization.

Also, by steadily enforcing the Telecommunications Business Act and SIM unlocking guidelines, which were revised last year, and by ensuring the appropriate conditions and fees for MVNOs (mobile virtual network operators) when using the network of MNOs (mobile network operators), we will promote fairer competition in the mobile market and the provision of mobile services that are easy for users to understand and more affordable. With regard to the rules of competition in the telecommunications sector, we will take necessary measures, including system development in accordance with the report submitted by the Information and Communications Council at the end of last year.

For people to safely enjoy the benefits of information and communication technology while ensuring sustainable economic and social development, it is vitally important that we ensure the security of cyberspace that underpins our society. We will steadily implement security risk measures including 5G and IoT, further strengthen the development of human resources for security, and develop safe and secure environments for the use of ICT.

In addition, based on discussions at the G20 and with Japanese organizations, we will play an active role in international collaboration initiatives in the ICT field, such as fostering international consensus on AI principles and data distribution. We will also actively contribute to studies being conducted at the Headquarters for Digital Market Competition to improve the business environment for digital platform providers. Furthermore, to enhance industrial competitiveness, we will promote Research and Development and standardization of cutting-edge information and communication technologies including quantum technology and AI as well as simultaneous translation.

Meanwhile, in order to implement digital government, it will be necessary for government agencies themselves to work on business reforms by increasing the use of ICT at both national and regional levels to improve the quality of administrative services and the efficiency of business. In addition to improving the government's information system environment that ensures information security, we will make things more convenient for Japanese citizens by reviewing the entire conventional business process including the digitization of administrative procedures. We will also consider how information systems and forms can be standardized between local organizations, and we will study security measures that facilitate further advances in cloud utilization while delivering greater efficiency in the operations of local organizations.

Finally, allow me to wish you all the very best for the year ahead.

1st January 2020

Working together in 2020: New Year's message from the ITU Secretary General

Houlin Zhao
Secretary-General
International Telecommunication Union

It is my pleasure to take this opportunity to greet ITU's friends in Japan as we approach the New Year, a year full of promise for the global ITU community.

Firstly, let me thank the ITU Association of Japan (ITU-AJ) for its continued support to ITU, as well as the government of Japan for its significant financial support, and the many Japanese companies that are sector members of ITU and provide us with so many technical experts that contribute significantly to ITU's output and activities.

As countries around the world use the power of information and communication technologies (ICTs) to help accelerate progress towards the UN Sustainable Development Goals (SDGs), I often encourage them to follow Japan's example, as a global leader of connectivity initiatives, and focus their efforts on promoting infrastructure, investment, innovation and inclusivity.

As the United Nations specialized agency for ICTs, ITU relies on the collaboration of its 193 Member States and over 900 industry, academic and other members to manage spectrum and satellite orbits, develop relevant international standards for technologies and services, and promote good governance and best practices to create an enabling environment for investment in the infrastructure and services that will accelerate progress towards the SDGs.

Together, we lead the work on many new innovations to ensure that they are green, efficient, secure, cost-effective and available to everyone, everywhere.

ITU is at the forefront of developments such as artificial intelligence, smart cities, digital currency, the Internet of Things, new television, and 5G standards.

In this effort, ITU tackles issues covering digital literacy, gender, accessibility, health, security and financial inclusion.

ITU also helps build the ICT skills to enable young people and others capitalize on the benefits and job opportunities of the digital age.

Despite this progress, however, nearly half the world's population remains unconnected and therefore unable to benefit fully from the digital revolution.

This is why ITU has to redouble its efforts, and so as we start a new year I encourage all our friends and partners in Japan to continue your excellent collaboration with ITU and help us bring affordable connectivity to everyone. Only then will the 2030 Sustainable Development Agenda be achieved.

I wish you all a peaceful, healthy, and happy 2020!

New Year Greeting

Toshiyuki Minami
President
The ITU Association of Japan

Happy New Year!

As some of you may know, I took over from Toru Fukuoka as president of the ITU-AJ last December. I'm looking forward to working with you all during my term of office.

This is the first New Year of the Reiwa era, and there are a lot of exciting developments on the way. In the spring, commercial 5G services using the long-awaited next-generation communication standard will be launched in Japan, opening up a new era of high-speed, large-capacity, low-latency, multi-connection communication. This is expected to bring about a significant leap forward towards the advent of Society 5.0 (the "super-smart" society).

In addition, the world's eyes will be focused on Tokyo during the 2020 Olympic and Paralympic Games in the summer. This will give us the opportunity to show off Japanese technology and culture to visitors from all over the world.

As these major technological innovations and social events take place, the ITU-AJ will continue to keep abreast of global trends.

From October to November last year, the World Radiocommunication Conference 2019 (WRC-19) was held in Egypt, where revisions were made to the Radio Regulations (RR), including the definitions of international procedures relating to frequency usage, technical standards for radio facilities, and radio station operation methods. Our association supported the APT Conference Preparatory Group for WRC-19 (APG19-5), which was held in Tokyo, and provided the Japanese secretariat with on-site assistance in Egypt.

In September, the ITU Telecom World 2019 conference was held in Hungary. Five companies participated in the Japanese pavilion, and six companies took part in the panel lunch. Each of these companies reported that this opportunity to demonstrate their technologies and services enabled them to forge ties with senior officials around the world and with companies in other countries.

On May 17, we held a ceremony to celebrate the 51st World Telecommunication and Information Society Day. At this event, Yasuhiko Ito (formerly of KDDI), who was for many years an active player in international standardization at the ITU-R, received an MIC Minister's Award. Also, Masako Wakamiya received an ITU-AJ Special Achievement Award in recognition of her mastery of ICT technologies such as PCs and programming, and her efforts to develop the use of this technology by the elderly. A total of 14 people received ITU-AJ Accomplishment Awards and 22 groups received ITU-AJ Encouragement Awards. My warmest congratulations go out to all of them.

Our training initiatives for telecommunication personnel in developing Asian countries (JICA and APT training programs) and performative seminars using hands-on training to improve international negotiation skills were also well received.

In November this year, the World Telecommunication Standardization Assembly (WTSA-20) will be held in India to approve research topics for the next study session, appoint chairpersons and vice chairpersons for each SG, and to approve ITU Recommendations. Also, the ITU Telecom World 2020 conference will be held in Vietnam. I am looking forward to the program of events we have scheduled for this year, and to hearing your requests and comments.

This year, we will continue to carry out various activities aimed at bridging between the Japanese government, our supporting members and the ITU.

I wish you every success in your endeavors this year.

WRC-19 Closing Plenary

Business Innovation with state-of-the-art AI

— AI business conditions and issues from AI use cases collected by SC42/WG4 —

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1. Introduction

In recent years, there is increasing activity toward using artificial intelligence (AI) in industry. In October 2017 at its general assembly, ISO/IEC JTC1, which handles international standardization related to information technology, resolved to establish a new subcommittee on AI, JTC1/SC42 (Artificial Intelligence). The objectives of SC42 are to provide a foundation for developing standards related to use of AI, for standardization committees within and outside of JTC 1, and to explore new standardization themes related to AI[1]. This article reports on the current state of activity by SC42 working group 4 (WG4) (Use cases and applications), collecting AI use cases, well as AI business development conditions and issues in the world in light of these use cases.

2. Current state of SC42/WG4 activities

2.1 SC42 and WG4 (Use cases and applications) activities

The objectives of JTC1 are to develop, maintain and promote international standards for IT and ICT, and the role of SC42 is standardization in the domain of AI. More concretely, it has two activities: its first duty is to create proposals for AI-related standards, centered on the standardization programs of JTC 1, but it also provides guidance to JTC1, IEC, and ISO on developing standards for application of AI.

With the current, increasing activity toward application of AI in industry, issues are emerging related to reliability, biases, guidance, and ethics in AI, and there is increasing need for international standardization related to these areas. Working Group 4 (WG4) was established to collect representative AI use cases, to facilitate discussion of these issues, and the use cases that it collects will be provided to working groups and liaisons discussing these issues.

2.2 Publication of ISO/IEC TR 24030 and use-case collection

For the AI use cases, scenarios using AI were collected and classified by type based on how AI is used and the structure of the data, to help in utilizing AI. Use cases are also intended to be used and analyzed in order to facilitate discussion of abstract issues in terms of concrete scenarios, and to clearly identify stakeholders using AI in wide ranging fields.

WG4 will carry on the work of its predecessor, Study Group 3 (SG3), of collecting examples of practical uses of AI, in other words, use cases. Between June 2018 and October 2019, more than 80 use cases were provided by experts from countries participating in WG4. These use cases will be provided as discussion materials to SC42 and liaisons, and as decided at the 2nd General Meeting of SC42 (October 2018), a collection of use cases will be published as a technical report (TR), to widely share the state of AI system use around the world. The document, "ISO/IEC TR 24030 Information technology—Artificial Intelligence (AI)—Use cases," is being developed and publication is scheduled in 2020.

3. Use case collection and analysis of current conditions

3.1 Approach for collecting use cases

WG4 first created a use case submission template through repeated discussions. Details of use case descriptions are structured in three parts.

1. Basic information [Required]: A general overview of the use case, including use case application domain,

development model, status, narrative, KPI, stakeholders, AI system attributes, social concerns, etc.

2. AI Operation information [Optional]: Description of each process, from building (training) the AI system to practical use, and the data required for each process.
3. Reference documents [Required]: Credible reference materials such as academic papers, product manuals and patent documents that increase the quality and credibility of the use case. The content of this section can be used to analyze the current state and characteristics of AI use in each industrial field, and to clarify the data and processes needed to use the AI system.

3.2 Current AI use considering distribution of use cases

3.2.1 Fields of use

To reference and analyze the use cases more efficiently, WG4 discussed and studied the industries using AI systems, created a list of 24 fields as shown in the table[2][3], and introduced a mechanism to allow the field-of-use to be selected in the use-case template. The table shows the distribution of fields of use among the collected use cases. The highest ranked fields were Manufacturing (19%), Healthcare (16%), Transportation (7%), ICT (7%), and Education (6%). On the other hand they were not able to collect any use cases for seven of the fields: Construction, Defence, Energy, Knowledge management, Legal, Low-resource communities, and Media and entertainment. In addition to the use cases for which the usage-field could be defined clearly, for 13% of the use cases it was difficult to define the field in terms of those described above.

For the fields with many use cases, it is possible to extract AI system usage characteristics. For use cases in the Manufacturing field for example, we found that many of the applications were related to improving product quality, such as detecting defective parts in the manufacturing process, or inspecting products in use for faults. Many of the use cases in the health care field were to provide accurate information needed for diagnosis efficiently, to help doctors in making their diagnoses. In transportation, many of the use cases were to control traffic signals or self-driving construction vehicles, to achieve safety, efficiency, and to conserve energy. In this way, analysis of the use cases has clarified that the benefits of AI systems to stakeholders and how they are used have characteristics that are specific to each industry.

WG4 is continuing to seek collaborations with organizations that can provide use case in fields that have not yet been covered. Now we look at issues with collecting use cases in some of these not-yet-covered fields. Use cases must be described based on authentic public information, so it is difficult to collect use cases for which the data cannot be published, or which has not been published as a research paper, patent or other document. One would assume that in most countries, most of the use cases in the defense field have information that cannot be published.

Besides the above, there are also biases in the industrial fields of the companies that have participants in SC42 WG4, and also in fields that AI businesses are emphasizing in each country, so we can expect this to result in biases in the use-case application domains. For example, use cases produced in Europe included many in manufacturing and transport fields, while developing countries tended to provide a wider range of cases. Thus, while developed countries are implementing and applying AI in existing industries, it appears that developing countries are applying AI to create new industries.

Table: AI system use-case distribution

Field of use	Proportion
Manufacturing	19%
Healthcare	16%
Transportation	7%
ICT	7%
Education	6%
Security	5%
Work and life	5%
Fintech	4%
Digital marketing	4%
Public sector	4%
Retail, Mobility, agriculture, social infrastructure, home/service robotics, maintenance and support	2% (each)
Logistics	1%
Construction, Defence, energy, Knowledge management, legal, low-resource communities, media and entertainment	0% (each)
Other	9%

3.2.2 Status

Aggregating the status of collected use cases, we found that 39% were proof-of-concept (PoC), 31% were operating, and 29% were at a prototype stage. PoC represents 39% of cases, so we can see that in many cases use of the AI systems has not gone beyond proof-of-concept, regardless of the fact that AI is being applied in many types of business and the need is increasing in all fields. It suggests that even now, AI systems have still not advanced to doing practical work.

AI systems have features such as output that is data dependent, indeterminate, and cannot be explained, so procedures generally used to ensure quality during procurement, such as defining, testing and review, cannot be done. As such, before they can perform practical work, long periods of PoC execution for each use cases is essential, collecting data, identifying issues and resolving them. This may be the reason that many current AI systems have not proceeded beyond a PoC stage.

Currently, from results surmised from such conditions during the first phase of collecting use cases, it is easy to imagine that there will be more AI use cases in the future, but it is also clear that many issues are arising with systems being developed, before they can begin practical work (i.e. enter production, or be put in service). The collected use cases also included cases in which a specialized explanation was given for a particular algorithm, or machine learning was built-in to part of the overall system, mixed into a conventional IT system. This highlighted the ambiguity in the term "AI."

Considering the current state of collecting use cases, it is not difficult to expect that use cases for AI will increase further in the future. As we have nearly completed the collection of use cases, we expect that the field of applications will expand further. The work of WG4 will not stop at simply collecting examples, but will continue, eliminating duplicates, continuing to collect valuable use-case examples, and improving the content in both quantity and quality.

4. Issues with future expansion of AI business considering collection of use cases

We also expect that discussion will proceed quickly in fields where work or study has not yet started, such as quality assurance.

Various fields where study or work in AI has not yet begun have been considered, as mentioned earlier, such as security, quality assurance, data quality, reliability of interactions with users, and guarantees regarding various biases. Study of these various fields is certainly not limited to just SC42, and an issue currently considered to be of the highest-priority is the fact that fields in which a certain amount of standardization has already been done by other SCs need to be reexamined and checked, and it is clear that the domain requiring study, including business issues, continues to expand. This article discusses three areas of study that require attention.

The first area is that of liaising and cooperating with other SCs and WGs. We are working to increase liaising and collaboration with WG2 (Big Data) and WG3 (Trustworthiness), which are also within SC42, and also with other SCs representing security issues. AI technology is producing significant paradigm shifts, suggesting that existing technologies need to be reexamined with respect to AI. There are currently 5 WGs within SC42, and collaboration is tending to grow exponentially, not only with liaison work and collaboration between WGs, but also including collaboration with other SCs, and even discussion among representatives of various countries within an SC. To issue a new work-item proposal requires complex and diverse work from WGs: investigating trends, checking examples and introducing technologies to each other; as exemplified by WG4. This requires a huge amount of work and time invested in negotiation by representatives from each country and WG members.

The second area is discussion of the life cycle and development processes for AI. Various topics are being discussed, such as:

(1) Are there differences between development processes for conventional general-purpose systems and AI? Are there completely new development processes for machine learning systems?

(2) Does "AI life cycle", include everything from the development process and start of operation till retirement of the system?

(3) Is there a concept of AIOps, similar to DevOps

It will be important to monitor trends in these areas in Japan and other countries in the future. Regarding AI development processes in particular, we expect a wide range of study, examining issues such as how they will be linked with existing standards for software and system development processes, and what sorts of differences are there in terms of process models, but from the use cases collected by WG4, we surmise that general purpose and common AI process lifecycles have not yet become established. Within WG4, the intention is to collect additional information regarding the overall life cycles with each use case, such as applicable development processes and after operation begins. We believe that the collected examples will be valuable information for deeper, fact-based discussion of processes and life cycles in the future.

The last area of discussion is AI Quality.

Currently, WG3 (Trustworthiness) is in discussion over an extremely wide range, including conventional biases, unpredictability, ethical issues, testing, and evaluation and it has obtained some results related to robustness and controllability of

AI systems. On the other hand, Human-Computer Interaction (HCI) topics are being discussed actively as areas of study in the future, under the title, "Challenges related to the use of AI Systems." This is regarding tertiary AI quality issues beyond machine learning algorithms and data quality, such as psychological factors with users of AI systems and the "Fraudulent Factor" with respect to AI systems. In the future, we expect various, previously sporadic AI quality elements to be classified and synthesized.

On another note, a feature of the WG4 use cases was that many were not completed and remained in a PoC state. The authors believe that the source of this phenomenon of "PoC suspended" and "PoC starved" projects is that there are AI quality elements for which we have not yet found an overall classification, synthesis, or definitive individual solution. Also, in discussion of AI quality, although we are gathering many examples, we are currently still not able to generalize from these concrete examples. This could be another reason why the discussion of AI quality is slow and not making progress.

Taking a more macroscopic perspective, discussion of appropriate AI quality cannot be realized in the future with simple rivalry and competition between countries. We expect this domain will require much more international cooperation, because it will require a broad range of thought and consideration based on fact and on the ethics, religion, race and commercial practices in the various countries. Without pushing cooperation more than we are now, by collecting examples of AI quality in a bottom-up approach, AI industries may not have a future. Collection of use cases by WG4 is part of that effort, and we believe it will be increasingly important in the future.

5. Conclusion

This article has reported on activities in WG4 of SC42, collecting AI use cases, and the state AI business development in the world and related issues, in light of these use cases. In October 2019, the year before the Olympics, the annual general meeting of SC42 was held in Tokyo. Some 150 people from 30 countries visited to discuss standardization activities for the future of AI. At this general meeting, there were individual discussions in each WG, but a Joint Working Group was also held jointly with multiple WGs, and we expect intense debate on various strategies for important crossroads that will control future trends in AI, including New Work Item Proposals (NWIP) carried forward from the two previous general meetings (Sunnyvale, USA and Dublin, Ireland). We expect that countries that are able to distance themselves early from the path taken in earlier standardization activities, competing for dominance or seizing initiative, will find it easier to make larger contributions to standardization of AI. However, it is impossible to predict which countries will cooperate with each other on standardization, and in what fields they will cooperate, throwing us into a world of AI wars. It is certain that discussion on topics such as AI lifecycle and AI quality, as mentioned earlier, will follow the peak of such discussion, and will greatly affect future trends in standardization. Such important decision points will be something to watch in Tokyo.

The future of AI is moving in leaps and bounds before our eyes, from one minute to the next.

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Cover Art

This picture is a scene from the Kabuki play, Genji moyô furisode hinagata. In this play, Naritayama Fudô Myôô (upper middle) is supported by his attendants Kongara Dôji (right) and Seitaka Dôji (left) while he rescues Hiranoya Tokubei from the sea.

Utagawa Toyokuni III
(1786~1865)

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Data Driven Innovation through Collaboration with Enterprise Partners

Yusuke Fukazawa, Masato Yamada, Kenji Shinoda
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Service Innovation Department, NTT DOCOMO, INC.

1. Background

Recently, with our aging population and innovation in work practices, many enterprises are working to improve workplace operational efficiencies. In workplace operations, there are cases when decisions are made based on big data collected in the past, and there is potential to increase efficiency through digitization. As digitization proceeds, it may also be possible to reduce the time required for beginners or foreign laborers to reach a certain level of experience, and to improve retention rates.

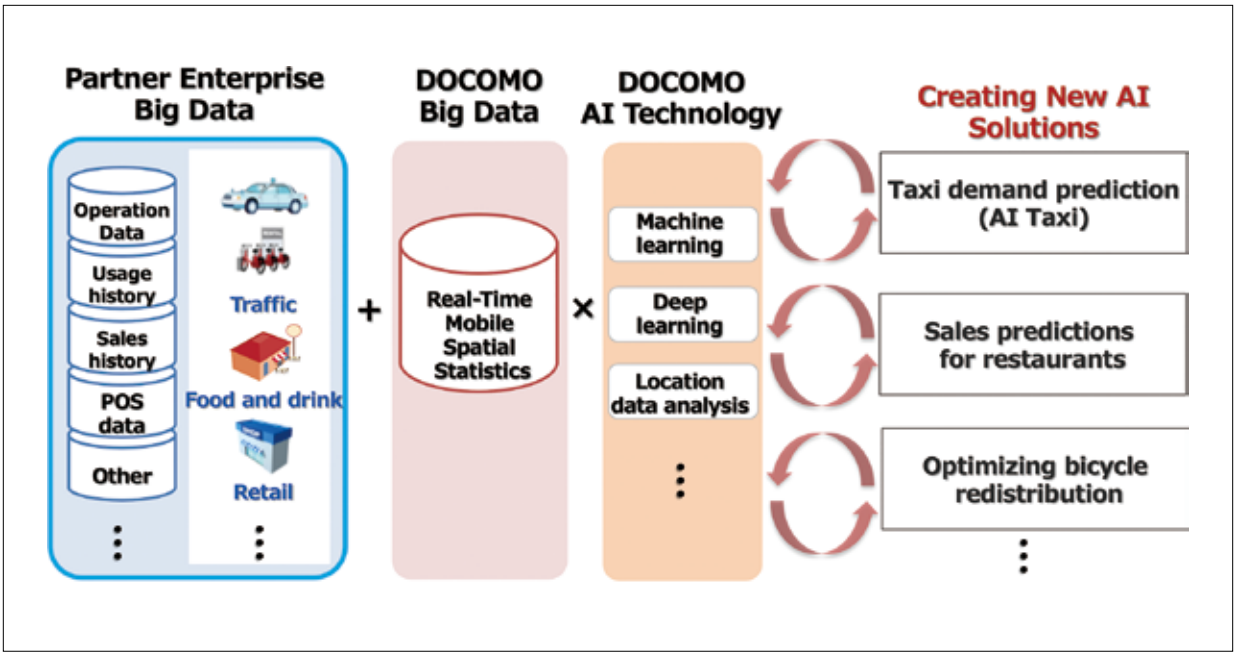
At NTT DOCOMO Inc. (DOCOMO), we are promoting initiatives in data-driven innovation through collaboration with enterprise partners, combining big data from partner enterprises with Real-Time Mobile Spatial Statistics[1] and applying the latest AI technologies as shown in Figure[2]. For example, the AI Taxi service predicts future demand for taxis, combining ridership history data from Tokyo Musen Cooperative Association with Real-Time Mobile Spatial Statistics data. This effectively digitizes know-how regarding demand for taxis from experienced drivers[3]. It enables even inexperienced drivers to know where demand is high, and to achieve a certain level of ridership results. Using AI Taxi as a showpiece, DOCOMO is now promoting solutions to issues in society through partnerships in the food and drink and transportation industries. In this article, we discuss a case of co-creation with Saizeriya Co. Ltd., in the food and drink industry[4]. We also discuss a case in the transportation industry with DOCOMO BIKESHARE, INC.[5].

2. Collaboration with Saizeriya

An important aspect of operating food and drink establishments is predicting demand: when and how many customers will arrive. For example, employee shift schedules, amounts of ingredients, and when to start preparing food can vary greatly based on the level of demand. Predicting higher demand than actually occurs can result in increased staffing costs and food waste. Predicting lower demand than actually occurs can result in longer wait-times for customers, shortages of ingredients, and lost opportunities for customers and orders. As such, predicting customer arrivals is extremely important for operation of such establishments. However, it can fluctuate due to combinations of many factors, such as the weather, characteristics of the location, and nearby events, so it is very difficult to predict demand accurately, even for an experienced person.

In collaboration with Saizeriya, NTT DOCOMO created a supervised machine-learning model that predicts hourly restaurant

Figure: Data Driven Innovation through Collaboration with Enterprise Partners



sales, using training data including past sales data from Saizeriya restaurants, Real-Time Mobile Spatial Statistics and weather characteristics in the areas around each restaurant, and actual sales data as ground truth. We also developed a model emphasizing the real-time features, to increase the accuracy of demand predictions during high-demand periods[6]. This enabled demand to be predicted more accurately during high-demand periods than was possible with Saizeriya's previous model. In preparation for trials in actual restaurants, we built a tool that can be used in Saizeriya restaurants to visualize demand predictions. The visualization tool provides visualizations of prediction results created two weeks earlier, the previous day, and the previous hour. We intend the prediction values from the previous two weeks and previous day to be used by staff for managing shifts. On the other hand, predictions for the previous hour use recent, nearby Real-Time Mobile Spatial Statistics and weather data, so we can expect them to more accurately predict sudden fluctuations in demand, and to be used to grasp unexpected sudden busy times and to help prepare ingredients and other aspects. We conducted a trial at Saizeriya restaurants using this visualization tool from November 2018 to March 2019.

3. Collaboration with DOCOMO BIKESHARE, INC.

Recently, bicycle sharing has been expanding around the world, to relieve crowded traffic congestion, and reduce the burden on the environment. In Japan, DOCOMO BIKESHARE, INC. is also taking the lead, expanding bicycle sharing in various regions. Use of this service has increased sharply between FY2011 and FY2018, from approximately 40,000 uses to 8.1 million uses. With bicycle sharing, users can borrow bicycles at cycle ports in key locations, and return them to any cycle port when they are done. To enable users to borrow and return the bicycles when they want to, it is necessary to understand when and where there will be demand to borrow or return them before hand, and to redistribute them from ports with strong demand for returns, to ports with strong demand for borrowing. If this redistribution is done based on incorrect borrowing estimates, cycle ports where demand is high will run out of bicycles, and opportunities for users to use them will be lost. Cycle ports where demand for returns is high will also overflow with returned bicycles, degrading the surroundings and obstructing traffic. At the end of September 2019, DOCOMO BIKESHARE, INC. had approximately 760 cycle ports and 7,700 bicycles in Tokyo, and optimizing redistribution of bicycles had become an urgent issue.

As such, in collaboration with DOCOMO BIKESHARE, INC., NTT DOCOMO created a supervised machine learning model that predicts demand for borrowing and returning bicycles, using training data that includes past borrowing and returning data from DOCOMO BIKESHARE, INC., real-time population statistics and weather characteristics in the areas around each cycle port, and actual cycle-port borrowing and returning data each hour on the day as ground truth. We built a visualization tool that uses the demand prediction model to generate a redistribution plan, and presents it on a tablet terminal. Since November 26, 2018, we have conducted trials using this tool to perform redistribution work in several wards of Tokyo and in the Sapporo area.

4. Conclusion

This article has introduced collaborations with partner enterprises, creating new value using NTT DOCOMO's Real-Time Mobile Spatial Statistics and the latest AI technologies. Real-Time Mobile Spatial Statistics provides an understanding of the movement of people in real time, and we have shown its potential in improving operational efficiencies in actual establishments in the restaurant industry and in the transportation industry. In the future, we will verify the results of the trials, and also promote partnerships in other industries such as retail and logistics.

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Current status and future prospects of Smart Agriculture

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Kubota Corporation

1. Introduction

Agriculture around the world faces many common issues, such as reduced availability of arable land due to climate change and soil degradation, and reductions in the number of farm workers, especially skilled workers. Besides improving productivity, there is also a need for sustainable food production that is safe, secure, and has a low environmental impact. As a way of addressing these issues, precision farming (PF) has been actively studied in the West since the 1990s. For example, it is becoming essential for producers to improve their profits by making use of technologies such as auto-steering devices that use global navigation satellite systems (GNSS), yield maps produced by combine harvesters with yield monitoring functions, and satellite imaging for soil analysis and crop yield prediction.

Farming in Japan faces similar issues, and at Kubota we are developing next-generation farming technologies to resolve them, including Smart Agriculture technology based on ICT and IoT (autonomous and unmanned farm machinery for data-driven Japanese-style precision farming and super labor savings). In this way, our aim is not only to sell and service agricultural machinery, but also to provide total solutions that benefit the entire value chain.

This paper describes the current status and future vision of Smart Agriculture at Kubota, and discusses the possibility of using big data analysis and AI in order to achieve further advances.

2. The significance of Kubota's work on Smart Agriculture

(1) Current situation and issues of Japanese agriculture

Japanese agriculture currently faces many challenges and has reached a major turning point. For example, between 2000 and 2015, the number of commercial farms in Japan almost halved, falling from 2.3 million to 1.3 million. The average Japanese farmer is now over 67 years of age, and it is predicted that the number of farmers will decrease by half over the next decade.

On the other hand, there are a growing number of farming groups and people whose main business is agriculture (i.e., professional farmers), and their farms have increased in scale by assimilating smaller lots that belonged to people who have left farming. The government has taken various steps to increase the proportion of farmland owned by professional farmers from its current level of 56% to 80% by 2023. Since 2018, the long-standing policy of reducing acreage for rice cultivation has also been abolished, forcing Japanese farmers to finally become independent.

In this situation, we have to tackle the following challenges to ensure the sustainable development of Japanese agriculture:

(a) Japanese agriculture should stand independently as an attractive business.
(b) The agricultural working environment should be reformed to release farmers from heavy work and encourage young people to enter the business.
(c) Rural areas, including mountainous regions, should be revitalized and should develop and maintain multifunctional roles of agriculture.

(2) The challenges faced by professional farmers, and Kubota's efforts

Increasing the scale of farming operations presents many challenges to professional farmers and farming corporations who support Japanese agriculture, as outlined below.

[Challenges faced by professional farmers]

(a) Problems in managing multiple farm lots
  (i) Lowering of yield and quality
  (ii) Management of an increasing number of workers
(b) Labor savings and workload reductions, reduction of production costs
(c) Offering products with higher added value (branding)
(d) Human resource development (transferring know-how)
(e) Development and expansion of sales channels

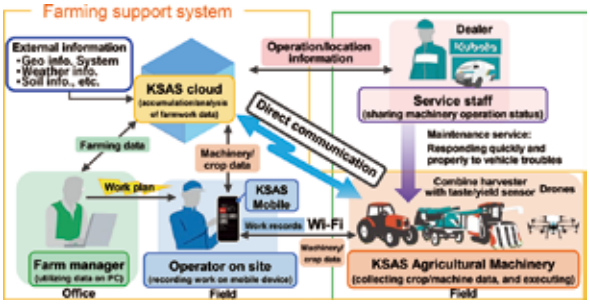
To make Japanese agriculture more attractive and profitable, it will also be necessary to visualize the entire agricultural system and build mechanisms within the food value chain whereby farmers only produce products that are required by the market at the time of need and in the desired quantities (i.e., minimizing waste). To achieve this, it is essential to develop and popularize smart agriculture systems based on ICT and IoT technology.

3. Using data for precision farming

(1) Kubota Smart Agri System (KSAS)

KSAS is a new support system for farm management and services that was developed by Kubota. It allows farmers to implement a profitable PDCA management style by using agricultural machinery and ICT to gather and utilize information about work activity and crop data (yield and taste). As shown in Figure 1, the overall structure of this system comprises KSAS agricultural machinery equipped with wireless LAN hardware and direct communication units, KSAS Mobile equipment that workers can use to record their work and relay other information, and a KSAS cloud server system that stores and analyzes

Figure 1: The overall picture of the current KSAS



information.

A farming support system and machinery service system operate on top of these components with the aim of providing value in the following ways:

[Farming support system]

(a) Producing tasty rice with high yields

(b) Producing crops in a safe and secure manner (ensuring traceability)

(c) Allowing farmers to work more efficiency and transfer their cultivation know-how

(d) Providing stronger foundations for farm management (cost analysis and reduction)

[Machinery service system]

• Reducing downtime during the busy season by providing quick and appropriate services based on the location, operation and error information provided by agricultural machinery

[PDCA agriculture based on data]

The combine harvester, which plays one of the most important roles in the current KSAS system, is equipped with a load cell and a near-infrared spectroscopic analysis sensor that perform real-time measurements of not only the weight of rice in the grain tank, but also its protein content and moisture content, which are the main substitutional characteristics for the taste of rice. Every time a rice field is harvested, this measurement data is transmitted to a cloud server together with the combine harvester's operating data. Hitherto this transmission was performed via a KSAS mobile device, but since 2019 it has been performed by direct communication.

With this system, the farmer can use a PC in the office to see at a glance the data stored on the cloud server, including work records and the dispersion of yield/flavor in each individual lot (left side of Figure 2). By combining this information with the results of soil analysis, it will be possible to implement soil improvement measures tailored to the characteristics of each lot, and to create fertilizing plans for the following year. This planned fertilizer application data can be transmitted to KSAS rice transplanters and tractors via their operators' mobile phones. On receiving this information, KSAS agricultural machinery

Figure 2: PDCA cycle by KSAS

can automatically meter the dosage of fertilizer, so even a novice operator can easily fertilize over a hundred rice fields.

In this way, by repeatedly iterating through a cycle where data gathering leads to work planning, followed by cultivation/harvesting, and then by more data gathering, it is possible to make continuous improvements to both the yield and taste of crops by optimizing the use of fertilizer and the allocation of human effort. This corresponds to a PDCA approach to agriculture based on the use of data that has not previously been applied to Japanese agriculture (Figure 2).

During a three-year trial in Niigata prefecture and other parts of Japan, this approach was found to boost yields by 15% and deliver an end product with a better and more stable taste. Furthermore, farmers were able to sell premium quality rice at a higher price due to its superior taste, and were able to stabilize the quality of their product and sort it according to its moisture content to reduce the drying costs.

This KSAS system is highly rated by users, who have reported achieving greater field management efficiency and better rice quality and yield. Over the roughly five-year period since the service began in June 2014, approximately 1,860 farming systems have been set up at over 8,000 subscribers (including service systems) with a total registered area of 78,000 ha (average 42 ha) covering 357,000 lots (average 190 lots).

(2) Future developments in KSAS (possible use of AI)

Step 1 (Figure 3) is to realize PDCA type agriculture by establishing data links with every item of agricultural machinery in an integrated rice farming mechanization system. We will also promote research and development aimed at the implementation of Steps 2 and 3.

As farmland consolidation has been promoted by the government, resulting in lots that are larger in area, it is becoming increasingly important to manage dispersion within an individual lot. Therefore, for Step 2 we are working on enabling more precise cultivation by developing agricultural machinery systems that enable sensing of soil and growing environments, growth conditions, and yield dispersion in the field and enable more precise cultivation as listed below (see Figure 4).

1 Combine harvesters with precise taste/yield sensors became commercially available with the launch of Kubota's WRH1200 general purpose combine harvester in April 2018, and since January 2019, we have been selling the DR series of head-feeding combine harvesters.

2 Remote sensing is undergoing monitoring tests throughout Japan in 2019.

Figure 3: KSAS Step 1(in service)

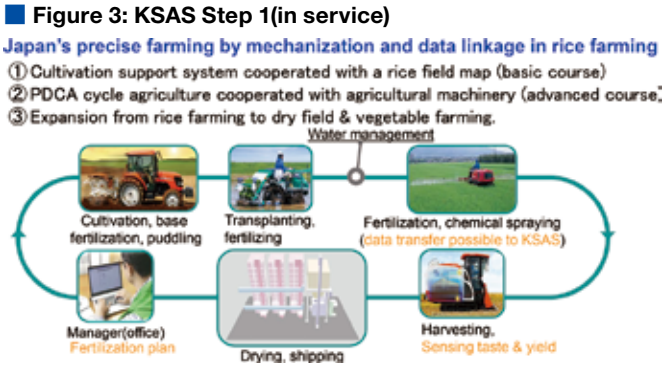
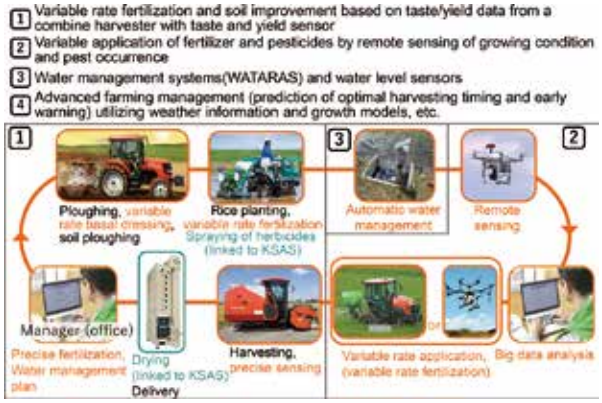


Figure 4: KSAS Step 2



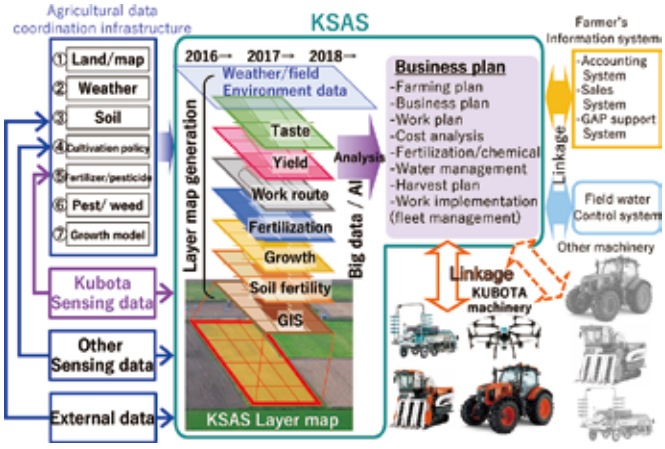
3 WATARAS, our farm water management system, was released in 2018. In the future, we plan to link this system with KSAS.

4 We plan to establish links with the WAGRI agricultural data collaboration platform.

As part of these efforts, it may be possible to use AI in fertilization design, which is currently performed based on diverse sensing data and customer experience. For example, AI could suggest how much fertilizer to use based on taste/yield data obtained by a taste/yield-sensing combine harvester, or it could judge the crop's stage of growth based on remote sensing images or the like and adjust the amount and timing of topdressing accordingly. By adding other information such as weather forecasts, this technology could even be applied to AI-based automation of water management and prediction of optimal harvest times.

For Step 3, with the aim of building an advanced farming support system, in addition to the functions of Step 2, by using AI to analyze and process big data obtained by collaborating with information systems used by farmers (such as accounting and sales systems) and external data (such as market information and information from distribution networks), we plan to push forward the evolution of advanced farming simulator technology that can support business planning and cropping using the most suitable crops in order to maximize the profits of arable farmers. In addition, we hope to be able to support the creation of optimal work plans detailing where, when and by whom which item of machinery should be operated in order to maximize efficiency. (Figure 5)

Figure 5: KUBOTA'S future plan of Smart agriculture and KSAS Layer map



By making KSAS as useful as possible for farmers, we hope to increase the number of farmers that use this system. To this end, it is essential to utilize and collaborate on public and private data such as farmland data & maps, weather information, soil analysis results and growth models, and it is also important to collaborate with other agricultural machinery and information systems. For this reason, we are participating in the Agricultural Data Collaboration Platform Council (WAGRI) and are working on the implementation of a common infrastructure for agricultural data. Through the work being carried out at WAGRI, we hope to be able to make use of the findings of research organizations such as the National Agriculture and Food Research Organization (including the use of AI to predict pest infestations).

4. Automation for super labor savings

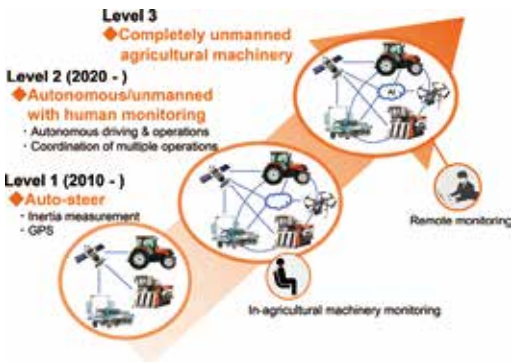
(1) Automatic/unmanned agricultural machinery

In addition to KSAS, which uses data to improve the efficiency of cultivation process management and farm management, we are also researching and developing autonomous and unmanned agricultural machinery based on robot technology with the aim of achieving further increases in the efficiency of work such as tilling and reaping that has already been mechanized, so that precise work can be performed with super labor savings. The Ministry of Agriculture, Forestry and Fisheries defines three levels of automated and unmanned technology (Figure 6), and Kubota is also working on the following themes:

Level I auto-steer technology uses the Global Navigation Satellite System (GNSS) to perform automatic steering. Kubota was the first Japanese manufacturer to offer large-scale commercial tractors (130–170 hp) for upland farming with auto-steering functionality (RTK-GNSS), starting with the M7 series released in the spring of 2015.

Since the fall of 2016, we have also launched rice transplanters equipped with go-straight functions. Existing auto-steering equipment was bulky and expensive, but by developing our own control mechanism combining an inexpensive sub-meter GPS (D-GPS) and an IMU (inertial measurement unit), we were able to implement a compact, low-cost auto-steering system. As a result, even a novice operator can plant rice seedlings with the same precision as a veteran, making the task much less stressful. This system has not only received high acclaim from purchasers, but has also received a Nikkei Excellent Product and Service

Figure 6: Autmation level of agricultural machinery



■ **Figure 7: Autonomous agricultural machinery**

Award and a Japan Top Ten Product Award. We are currently developing this function so that it can also be used in small and medium tractors. Furthermore, in December 2018, we launched a combine harvester with an automatic driving assist function (WRH1200A).

Level II corresponds to autonomous or unmanned machinery under manned monitoring, and includes cooperative work involving unmanned and manned machinery. Demonstration tests have shown that this level of autonomous and unmanned operation improves on the efficiency of conventional operations by around 1.5 times. Kubota has pioneered developments in this field, and in the fall of 2017, we started test marketing of a level II autonomous tractor (the SL60A Agri Robo Tractor; Figure 7, center). By using a high-precision GNSS system called RTK-GNSS, which we manufacture ourselves, this made it possible to perform automatic driving with a single unmanned tractor, cooperative driving with a pair of manned and unmanned tractors working together, and automatic steering of a manned tractor. As safety features, this tractor has a laser scanner and ultrasonic sonar to stop reliably when it detects humans and obstacles, and a system that constantly monitors the surroundings with four cameras. As a result, it complies with the autonomous agricultural machinery safety guidelines prescribed by the Ministry of Agriculture, Forestry and Fisheries.

(2) Future plans for the evolution of autonomous and unmanned agricultural machinery

With regard to the evolution of autonomous and unmanned agricultural machinery, we first aim to complete Level II. In addition to the tractors that have already been launched, we are also developing autonomous combine harvesters and rice transplanters, and we are making further advances in farm automation, including the autonomous operation of work at field boundaries, and expansion of the range of applicable implements by enhancing the control systems. When doing so, safety awareness is essential. We believe that the use of AI will be the key to identifying humans and animals in crops, detecting obstacles in the dark, recognizing boundaries, and so on.

At the same time, we are preparing to provide compatibility with the quasi-zenith satellite system promoted by the Japanese government. We expect it to become more widely used if it is possible to reduce the cost of receivers and achieve 5–6 cm accuracy without requiring a base station.

Next, Level III corresponds to completely unmanned machinery with remote monitoring, where the aim is to perform unmanned work in multiple fields, including driving on farm roads. To achieve this, it will be necessary to make further developments in farmland infrastructure, including farm roads and safety systems, and to install high-speed communication infrastructure (such as 5G) to increase the speed of monitoring and control. If tractors are completely unmanned, then they must be capable of driving on roads with their implements attached. This requirement raises issues besides technological developments, such as relaxation of the Road Traffic Law. Thus, achieving Level III requires not only research and development, but also the creation of standards and infrastructure in cooperation with the government and industry organizations.

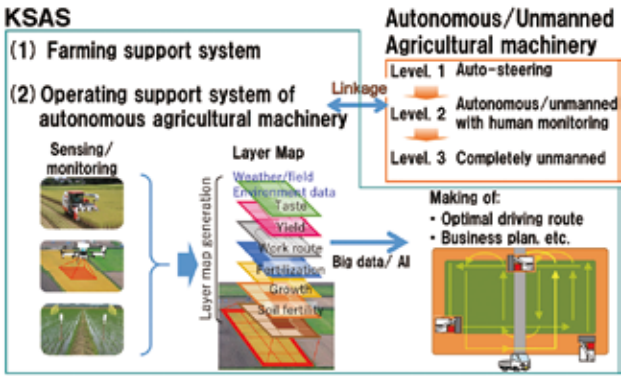
In single operations, autonomous and unmanned agricultural machinery are of limited effect. For this reason, Kubota has constructed an operating support system for autonomous agricultural machinery. As shown in Figure 8, this system is linked to KSAS to enable the optimal operation and management of multiple agricultural machinery, including those that are not fully autonomous. We are also working on the construction of a mechanism that supports the planning of optimal driving routes for multiple machinery, and can collect, monitor and use information from autonomous machinery.

5. Conclusion

As shown in Figure 9, our purpose in developing the smart agriculture discussed in this article is to establish an integrated smart agriculture system covering every aspect of farming in rice and other crops, open-field culture and fruit growing. In this way, we hope to continue addressing the challenges faced by farmers in Japan. We also hope to make a contribution to solving global agricultural challenges by developing KSAS primarily for rice farming and large-scale upland farming in Asia.

References
- 2015 Agriculture and Forestry Census (Ministry of Agriculture, Forestry and Fisheries), 2016/2017
- Smart agriculture research group web page (http://www.maff.go.jp/j/kanbo/kihyo03/gityo/g_smart_nougyo/)
- Agricultural Data Collaboration Platform Council (WAGRI) web page (https://wagri.net/)

■ **Figure 8: Cooperation between KSAS and Autonomous agricultural machinery**



■ **Figure 9: KUBOTA's aim and value of Smart agriculture**

Latest Trends in Utilization of AI for Network Operations and Management at TMForum

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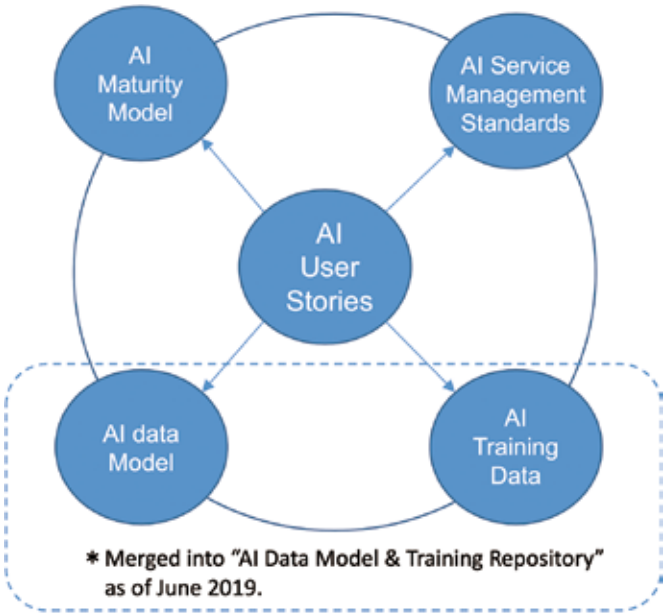
1. Introduction

In current business conditions for telecom operators, commoditization, particularly in the area of connectivity, is perceived as a challenge, but beyond simple competition between telecom operators, participation by enterprises from other fields, has increased rapidly in the past two or three years, with IT enterprises joining open-source community, and even agriculture and manufacturing enterprises participating with telecommunications technology standardization organizations like the 3GPP. As such, we can expect many, diverse new services to be implemented as 5G and IoT technologies spread in the future. To meet the needs of each of these services, networks will need to be flexible. However, maintaining operation automation is becoming increasingly complex due to the increase in managed resource components (e.g.: server, operation system, hypervisor, and network functions). An urgent issue for telecom operators is to implement "Automated operations tasks for maintenance and operations," to reduce the costs of operations and facilities for these services in the future. The TMForum, which promotes standardization of a network operations and management framework for telecom operators, initiated the Open Digital Architecture (ODA) project in September, 2017, to create architectural reference models for next-generation operations support systems (OSS) and business support systems (BSS). Around the same time, discussion of using AI for network operations and management also became more active at the TMForum, and discussion began on the need to consolidate operational knowledge on how to manage AI training data sets for each of the function blocks in the ODA architecture, and for a repository for storing this data.

The above process resulted in a new "AI & Data Analytics" project, established in February 2018, which is currently active in four work streams: "Service Management Standard for AI," "AI Data model & Training Repository," "AI Maturity Model," and "AI User Stories" (Figure 1). This article gives an overall view of AI-related activities at TMForum, and introduces some specific AI-related initiatives in each of these work streams. It concludes by touching on some future prospects.

Figure 1: TMForum "AI & Data Analytics" project work streams



2. AI related initiatives at TMForum

2.1 Service management standards

At the February, 2019 TMForum meeting, the first edition of the document "IG1184: AI Management Standard" from this work stream was released[2]. The document defined an AI management lifecycle and described the requirement of data models and interfaces for each of the phases: Development, Commissioning, Operation, and Decommissioning. It also describes an ODA mapping, and best-practices rules.

In the future, they plan to create a document that systematically organizes the AI data life cycle following the DAMA-DMBOK[3] framework for data model definitions. However, issues have been raised regarding completing this document as a practical reference, including the need for Proof-of-Concept (PoC) and for standard formats from a business perspective.

2.2 AI Data Model & Training Repository

The TMForum has defined a data model standard called SID, but recently there has been an increase in AI and IoT-related "catalysts" (projects to demonstrate feasibility of advanced use cases from several telecom operators and vendors, facilitated by TMForum) and proposals for new data entities are expected, so this work stream was established.

At the February 2019 meeting, when defining data entities for each process in the AI management life cycle, as shown in Figure 2 below, each group decided on use cases and studied them to clarify the extent of issues that will require further study. KDDI is participating in the group handling Document Anonymization

use cases. Such cases involve using AI rather than people to remove personal information from collected information before archiving it, as required by GDPR to protect confidentiality of personal information. Major issues requiring study in such cases were discussed, included the following.

- What level of accuracy (%) is required?
- If AI is applied to the decision of whether a text constitutes personal information, what level of accuracy should be permitted?
- There will be a need for operators to provide feedback to improve accuracy. How can issues related to such costs be resolved?

At this meeting, also discussed was the state of catalyst activity and how the SID information model framework, which the TMForum is standardizing, can be modified to be better suited for AI. On the other hand, there were a total of 12 AI-related catalysts at the 2018 TMForum meeting, so by summarizing this knowledge in the future, we will promote creation of an AI training-data model reference and continue to discuss creation of data models that maintain compatibility with the operations and management system interface rules (Open APIs) being standardized by ODA and TMForum.

2.3 AI maturity-level model

After the September 2018 TMForum meeting, this work stream began activity to define an outline of steps for introducing AI, taking the role of analyzing the structure of telecom-operator AI strategies and providing benchmarks for understanding the plans and goals of their short and long term strategies. As of today, they have created a scoring sheet for understanding the strengths and weaknesses of companies in terms of six categories (Strategy, Culture and Organization, Engaged Party, Operations, Data, Technology)[4].

2.4 AI user stories/use cases

This work stream discusses potential use cases, and released the first edition of the document GB1002: Artificial Intelligence User Stories & Use Cases in February 2019[5]. Its current level of completeness is indicated by the fact that it does not yet describe any real examples, and only sets templates and topics for describing use cases. For reference, some use cases corresponding to network operations and management are given below.

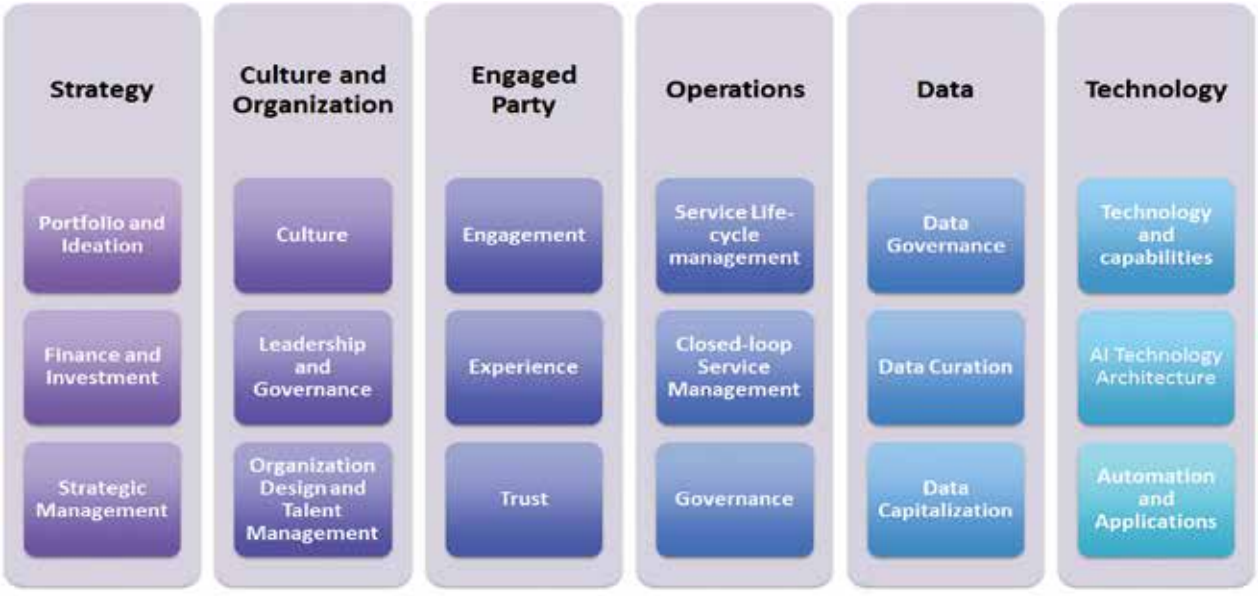
- "eTOM as a framework for CSP AI Applications": Consolidates the definition and granularity of enhanced Telecom Operation Map (eTOM), a telecom operation process framework for use of AI that is regulated by TMForum.
- "Infrastructure Management Domain Use Cases": Defines advanced use cases for network operations. Some concrete examples are as follows.
  - Reducing time related to troubleshooting and getting networks online.
  - Fault prediction and detection
  - Alarm monitoring and business-impact monitoring.
  - Service quality management

3. Conclusion

This article has summarized activities at the TMForum in various projects, from their initiation till now, as trends in use of AI for network operations and management. In the future, these projects will promote activity in two additional related work streams: "Data Governance," and "Data Lifecycle Management," as indicated in the latest meeting. This will initiate activities to organize data management processes, and is expected to result in practical data management rules for using AI in network operations and management at telecom operators.

References
[1] https://www.TMForum.org/resources/toolkit/ai-toolkit/
[2] TMForum", IG1184 Service Management Standards for AI R18.5.1", Feb. 2019.
[3] https://dama.org/content/body-knowledge
[4] TMForum, "GB1003 AI & Data Analytics Maturity Model R18.5", Feb. 2019.
[5] TMForum, "GB1002 Artificial Intelligence User Stories& Use Cases R18.5.1", Feb. 2019.

Figure 2: Structure of AI maturity-level model (Created based on figures in Ref. [5])



= A Serial Introduction Part 2 = Winners of ITU-AJ Encouragement Awards 2019

In May every year, The ITU Association of Japan (ITU-AJ) proudly presents ITU-AJ Encouragement Awards to people who have made outstanding contributions in the field of international standardization and have helped in the ongoing development of ICT.
These Awards are also an embodiment of our sincere desire to encourage further contributions from these individuals in the future.
If you happen to run into these winners at another meeting in the future, please say hello to them.
But first, as part of the introductory series of Award Winners, allow us to introduce some of those remarkable winners.

Atsushi Kanno
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Fields of activity: Radio over fiber, ITU-T SG15, IEC TC103, APT/ASTAP

Radio over fiber: towards seamless convergence between wired and wireless systems

I'm greatly honored to receive the ITU-AJ Encouragement Award. I would like to express my appreciation to my colleagues at NICT and related institutes for their valuable help. Also, I would like to thank The ITU Association of Japan and all those involved.

I've been involved with ITU-T SG15, IEC TC103, APT/ASTAP for standardization of a radio over fiber (RoF) transceiver and its applications. RoF technology is utilized for transport of radio signals over optical fiber systems. RoF is commonly used to mitigate radio dead-zones such as underground areas, subways, and mountainous or valley areas. In fourth-generation mobile communication systems, digitized RoF systems are developed for the connection between baseband processing units and remote radio heads, known as the common public radio interface and for other standardized techniques. Nowadays, fifth-generation mobile communication systems (5G) require broad bandwidth and high data throughput for both radio sections and backend optical fiber systems. As such, implementation of a next-generation RoF system is needed.

On the other hand, RoF systems are also utilized for non-communication applications such as radar systems. My contribution to the ITU-T has been to form the technical specifications for the RoF system that is part of a foreign-object debris detection system for airport runway surfaces. With the IEC and APT, the transceiver specifications, evaluation methods, and application use cases are published as a standard and a technical report. I hope RoF will support 5G and beyond 5G systems for enhancing user experiences and establishing a safe and secure society.

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Fields of activity: NFV for mobile core network development

Introduction of NFV integrating cloud and telecommunication

I am grateful to receive this Encouragement Award from The ITU Association of Japan. I also appreciate the opportunity to develop network virtualization and finalize NFV standard specifications with many vendors.

NFV is a concept for operation of telecom equipment, consisting of dedicated devices and lines in a cloud and using COTS servers and SDN. I joined the NFV project in DOCOMO in 2014. It was extremely difficult to develop new NFV specifications for stable telecommunication and flexible cloud operation.

NFV is now at a stage where the standardization and implementation of the basic functions to be put on the cloud have been completed. I hope it will develop into a platform to further improve operational efficiency and accommodate various telecom devices. I will continue to lead NFV as an expert in operations.

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Fields of activity: ITU-R SG3, Radio propagation

Radio propagation model standardization activities at ITU-R SG3

I am very thankful to have received this Encouragement Award from the Japan ITU Association. In addition to The ITU Association of Japan, I would also like to express my sincere gratitude to all others involved for their guidance and encouragement.

I have been working with ITU-R SG3, which makes recommendations regarding radio propagation characteristics. When designing and building new radio communication systems, or discussing allocation of frequencies for new radio systems, it is important to study interference and frequency compatibility with existing systems. By creating and maintaining recommendations for radio propagation characteristics at ITU-R SG3, we provide support for such studies in other SGs. Recently in ITU-R SG3, there has also been active study of radio propagation characteristics in high-

frequency bands (~100 GHz) that are being considered for use with 5th Generation mobile communication systems (5G).

When revising or making new recommendations to cover high-frequency bands, it is essential to base discussion on measurement data. As such, NTT has taken the lead in conducting large-scale measurements in multiple high-frequency bands that have been difficult to measure, covering 800 MHz to 66 GHz and over distances of 1 km and greater. By conducting on-site standardization discussions based on this measurement data, we were able to complete the revision and creation of new recommendations as mentioned earlier, on schedule. Rather than work on the standardization in SG3 meetings, my involvement with ITU-R SG3 has been focused more on drafting measurement plans, conducting measurements and analyzing data, to obtain the data needed for discussion, and activities prior to participation in SG3 meetings. All of this work, including activity in SG3 meetings, is the result of contributions from many people, and not just my own. I would like to express my gratitude again, and I will continue to contribute to international standardization in the future, encouraged by this award.

Shinya Takeuchi

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Fields of activity: Integrated Broadcast-Broadband System, Multimedia broadcasting

Standardization of multimedia broadcasting and Integrated Broadcast-Broadband System

It is a great honor to receive the ITU Association of Japan Encouragement Award, and I would like to express my appreciation for the award to my colleagues at NHK, the members of ITU-R SG6 delegation, and all the people who have supported me.

My activity in ITU started in 2007 with contributions to producing a Recommendation of architecture for synchronized programme transfer with pull operation over IP networks at ITU-T SG9.

Since 2016, I have regularly attended ITU-R WP6B and ITU-T SG9. I have been responsible for the standardization of multimedia systems in broadcasting, and in particular, Integrated Broadcast-Broadband systems (IBB systems). An IBB system simultaneously provides an integrated experience of broadcasting and interactivity relating to media content, data and applications from multiple sources. Hybridcast is standardised as the IBB system in Japan and was launched in 2013. The data service for 4K/8K satellite broadcast services in Japan is also defined as an IBB system. Hybridcast specifications continue to make progress adding functionality of companion-device collaboration and multi-resolution video streaming coding with MPEG-DASH. Meanwhile, ITU-R WP6B is studying the harmonization of the IBB systems included in Recommendation ITU-R BT.2075 to ensure compatibility with IBB applications and interoperability across systems. My main activity is to develop a recommendation and reports related to IBB systems, reflecting such progress.

In other work related to multimedia broadcasting, I developed a report on closed-captions for digital broadcasting, adding information about ARIB-TTML, the closed-caption standard adopted for 4K/8K satellite broadcast services. I also contributed to producing a report of practical technical solutions for closed signing in digital television, which has been applied to IBB systems.

At ITU-T SG9, I contributed to development of a recommendation for an IBB system on CATV with consideration of work at ITU-R WP6B, as Associate Rapporteur of Q5/SG9.

My position has changed and my current work is to manage services and systems related to the standards to which I have contributed. In this capacity I have realized some of the difficulties in the relationship between developing services and TV receiver implementations. Through standardization activities, I hope to contribute to improving relationships among broadcasting industries, improving the match between service provision and receiver implementation.

Atsushi Takeda

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Fields of activity: ITU-R SG6

International standardization activities in ITU-R SG6

I am very honored to receive the ITU-AJ Encouragement Award. I would like to express my deep gratitude to the members of The ITU Association of Japan and all those involved.

I joined Fuji Television Network, Inc. in 1994, working as a program production engineer (video engineer, cameraman, technical producer). I was interested in the technological evolution of content and viewing experiences, and as a result I became involved in the task of standardizing broadcasting technology.

Since 2016, I have participated in ITU-R SG6 efforts to establish international standardization of broadcasting technology. At the meeting, there was discussion on various standardizations related to UHDTV (4K/8K) for implementation of the new 4K8K satellite broadcasting, which was launched on December 1, 2018 in Japan.

In 2016, the Association of Radio Industries and Businesses (ARIB) established a task group to clarify the bit-rate requirements for transmission of UHDTV (4K/8K) and HDTV video using the latest video compression technology, ITU-T Recommendation H.265 (HEVC). As a chief of the group, I conducted image quality evaluation experiments, and clarified these requirements. These results were reported at the ARIB and ITU-R SG6, contributing to the formulation of the domestic standard ARIB STD-B71 and the revision of ITU-R Recommendation BT.1872, which describe the user requirements for digital ENG. We were able to create international standards for the transmission of video materials when producing 4K/8K programs.

In 2018, I compiled use cases on technology for delivering 4K programs to viewers simultaneously with terrestrial broadcasting using an Integrated Broadcast-Broadband (IBB) system that combines broadcasting and broadband. For this, I contributed to revision of ITU-R Report BT.2267.

These contributions are due to cooperation from the Japanese delegation of ITU-R SG6, the Ministry of Internal Affairs and Communications, the Japan Broadcasting Corporation (NHK) and the Japan Commercial Broadcasters Association. I appreciate all the support and take pleasure in being able to participate as a member.

The deliberations on the ITU-R SG6 were handed over to my successor, but I continue to participate in domestic discussions on the subject. We will make every effort to contribute more than ever.

通巻百二十五号

The ITU Association of Japan

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