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Special Feature

Promising ICT Solutions for the New Normal After COVID-19

Image Recognition and Facial Authentication Solutions as Measures for COVID-19

Real-time Detection of the "Three Cs" with Image Analysis "COVID-19 AI Image Analysis Solution"

Non-Desk work DX with Connected Worker: Attracting attention around the world in the new COVID-19 era

Corona Tracer®: Preventing expansion of workplace clusters

Making SNS and other Digital Spaces more Safe and Sound

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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.

Image Recognition and Facial Authentication Solutions as Measures for COVID-19

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1. Introduction

Since the expansion of the COVID-19 pandemic, there are fewer opportunities for human contact, and we have needed to adapt to new types of lifestyle. In many fields, this is resulting in accelerating use of machines to automate work that was formerly done by people.

The camera modules found in smartphones and other devices have become both generic and inexpensive, and performance has leapt forward in recent years. With a single smartphone, the camera and communication modules can be used easily, together with image recognition technologies on the cloud. As such, image recognition technology has reached a stage where it can be used practically as a technical element in replacing human work with machinery.

In March, 2020, NTT DOCOMO also began provision of our 5th generation mobile communications system (5G), which features high speed and capacity, low delay, and massive connectivity. 5G will enable video transmission with higher capacity than ever before, so solutions combining 5G communication and image recognition technology are expected to appear.

This article introduces NTT DOCOMO's image recognition platform, the "EasyPass powered by SAFR" face-recognition solution and the "AI Temperature Measurement Solution," as a potentially effective measures against infectious disease.

2. NTT DOCOMO Image Recognition Platform

In May, 2020, NTT DOCOMO began providing our "NTT DOCOMO Image Recognition Platform"[1]. This platform is a cloud service that makes it easy to use our image recognition AI.

Previously, application of image recognition AI solutions required much work and specialized technology, including annotation work creating the data used to train the image recognition AI, generating the trained model, and building the image recognition engine. The NTT DOCOMO Image Recognition Platform automates these processes, from creating the training model to building the image recognition engine, so lead time for introducing solutions can be reduced significantly. Developers can focus their efforts on developing the application or system that will use the image recognition AI, rather than on the image recognition AI component (Figure 1).

One example using the NTT DOCOMO image recognition technology was to automate inspection of mobile phone base stations for rust using aerial images taken by drones. NTT DOCOMO has mobile base stations in approximately 50,000 locations and the work of inspecting them is time consuming and dangerous. Automation of inspection work contributes to improved work environments and reduced costs. An example of using the image recognition engine to detect rust areas is shown in Figure 2. The state of rusted areas can be checked from base-station images taken by the drones. As a result of this automation,

Figure 1: NTT DOCOMO image recognition platform overview

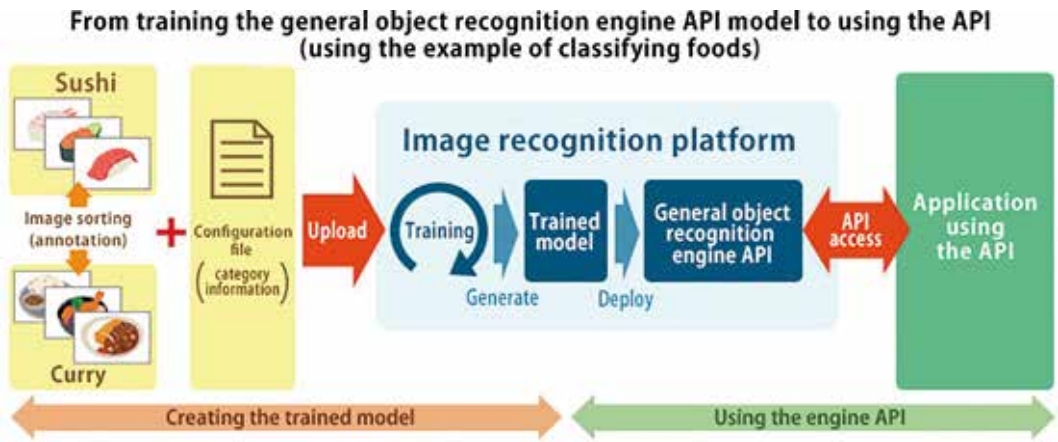


Figure 2: Detection of rust

the time required to inspect each base station can be reduced by approximately 100 minutes. The technology is to be used for inspecting base stations at approximately 1,500 locations, which should eliminate more than 2,000 hours of work[2].

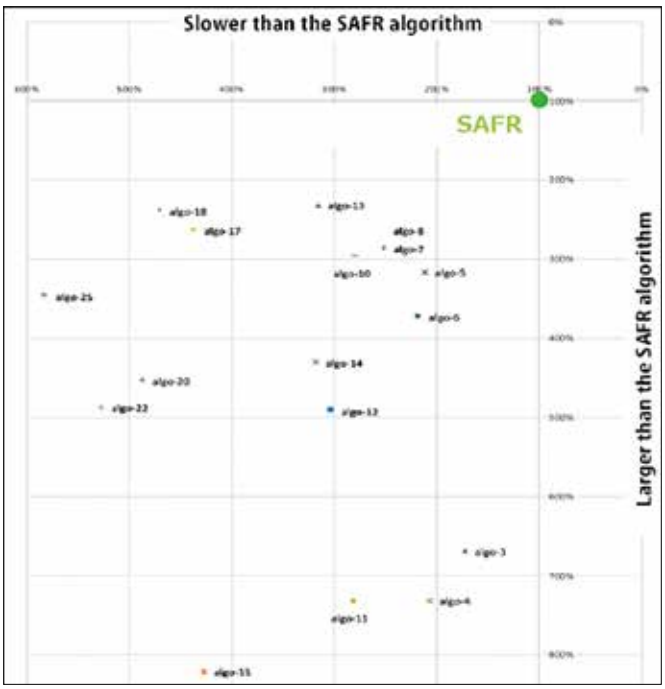
3. COVID-19 Solution using Face Authentication

3.1 The SAFR® Face Authentication Engine

The SAFR face authentication engine provided by Real Networks Inc. is image recognition software that authenticates users quickly and accurately using a face image. NTT DOCOMO has recognized the technical superiority of SAFR and its applicability in mobile solutions, and has used it as the facial recognition engine in various face authentication solutions. It has also obtained good results for recognition accuracy and speed in the Face Recognition Vendor Tests (FRVT) organized by the USA National Institute of Standards and Technology (NIST) [3]. According to SAFR developer, Real Networks Inc., it was the fastest and most light-weight among algorithms achieving recognition accuracy of 96% or greater in FRVT 1:1 recognition tests conducted in FY2019[4]. Compared with other highly accurate algorithms, SAFR was twice as fast as the average and 35% smaller than the next-smallest algorithm (Figure 3). Thus, SAFR achieves a good balance in the tradeoff between recognition accuracy and computational cost, and does not require expensive computation devices, so it is very practical. In the FRVT Wild category, which focuses on recognition of subjects that are unaware of the camera including profile images, SAFR was shown to be extremely fast and accurate as an algorithm for recognizing images in live video. In addition to being highly evaluated in the FRVT Wild category, SAFR also has development environments for smartphones, including iOS and Android SDKs, so it is very attractive for NTT DOCOMO's solutions business and we are introducing it into various solutions.

With the spread of the COVID-19 pandemic, SAFR also

Figure 3: Comparison of recognition speed and algorithm size



added support for recognition of users while wearing masks in April 2020[5]. To recognize faces obscured by masks or other objects, the AI recognizes the parts of the face that are not obscured. The ability to perform authentication without requiring masks to be removed is extremely useful under conditions of the COVID-19 pandemic. According to Real Networks internal testing, SAFR achieved 98.85% accuracy recognizing subjects wearing masks in the Wild category.

Figure 4 shows a case of face authentication while wearing a mask.

Figure 4: Facial authentication while wearing a mask

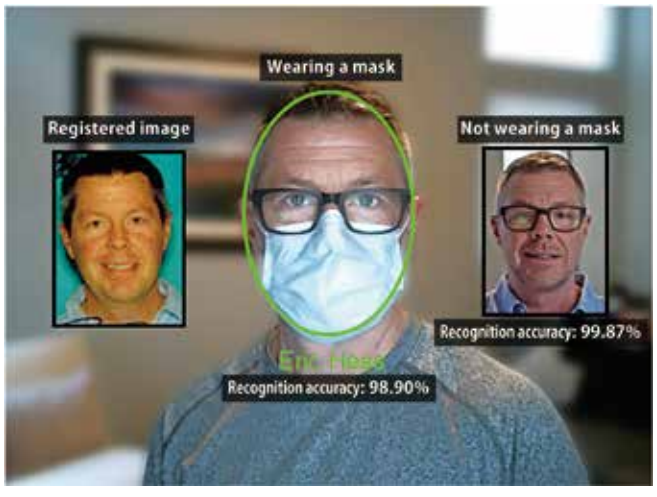
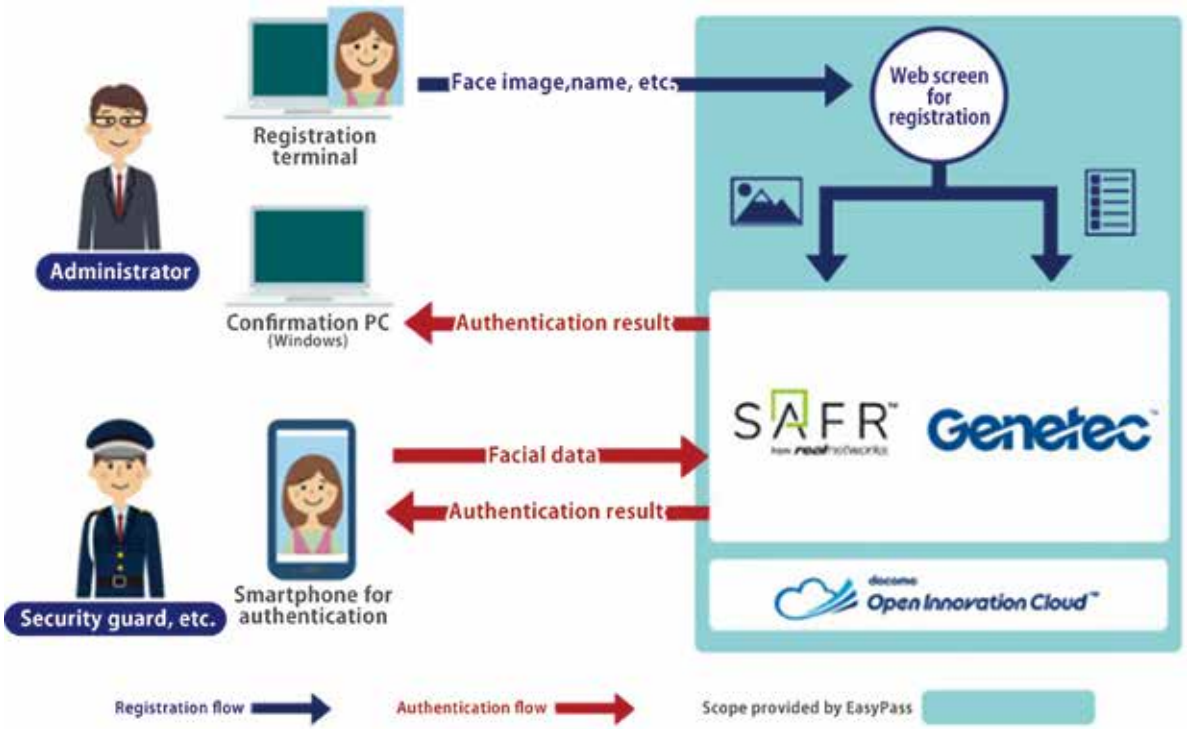


Figure 5: EasyPass overview



3.2 EasyPass powered by SAFR

In May, 2020, NTT DOCOMO began providing the "EasyPass powered by SAFR" service ("EasyPass")[6]. An overview of EasyPass is shown in Figure 5.

The EasyPass solution achieves access control with simple, fast and highly accurate face recognition by simply installing the EasyPass application on a smartphone. It is expected to be used by providing security personnel with a smartphone, which will be used to check those entering and leaving a facility by simply having them face the smartphone camera.

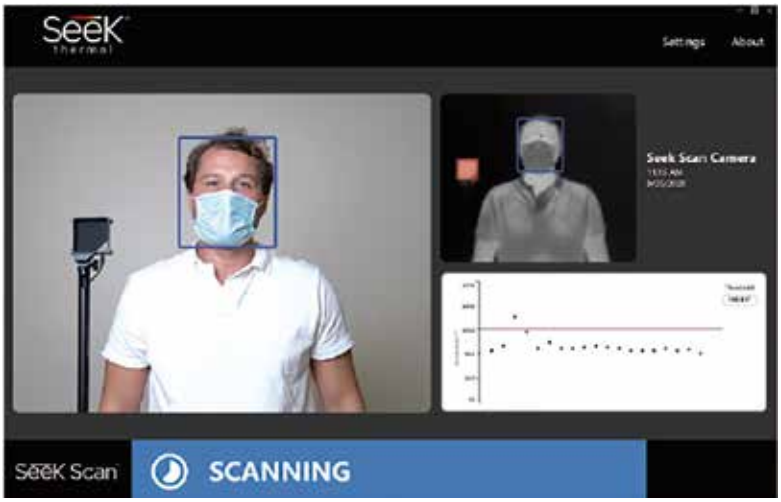
EasyPass is both convenient and extensible through integration of SAFR face authentication with Genetec® Security Center Synergis™, which is a Video Management System (VMS). It can be implemented with smartphones and mobile networks, so it requires no installation of cameras or communication lines or other construction, minimizing preparation time required to introduce the system. It also has various operational benefits from using smartphone devices, such as the ease of replacing any faulty devices.

In one company that has introduced EasyPass, security staff at entrances previously checked photo IDs of those entering and leaving, which resulted in line-ups and congestion at the beginning and end of the workday. These conditions also created security risks such as potential for impersonation or error by security staff. After EasyPass was introduced, security personnel only had to visually check the authentication result on the application, reducing the time required to less than one second (Figure 6).

EasyPass is extremely useful as a way to deal with COVID-19, for enterprises enforcing this sort of access control. Since EasyPass does not require removal of masks for authentication, it can reduce the risk for security personnel, of infection from those entering and leaving. According to analysis of COVID-19[7], doubling

Figure 6: Authenticating a driver using EasyPass

Figure 7: Temperature measurement using Seek Thermal



the distance between people halves the risk of infection. With the earlier operating model, visual checks required distances of approximately 1 m, while this solution allows distances of 2 m, so we can say the solution reduces risk by half.

3.3 AI Temperature Measurement Solution

In November, 2020, NTT DOCOMO began providing our AI Temperature Measurement Solution[8]. By integrating the SAFR face authentication engine, a temperature measurement device from SeekThermal Inc., and communication tools such as Microsoft Teams, it provides a solution that includes non-contact staff authentication and temperature measurements together with reporting and management. Although remote work is becoming widely established, it is still difficult to completely eliminate the need to visit company offices. Many companies are requiring temperature measurements of those visiting their offices, which is burdensome for both those coming to work and for administration.

For commercial facilities with many visitors, one COVID-19 counter measure is to screen visitors by taking their temperature when they enter. According to a September 2020 report from the USA Centers for Disease Control and Prevention, trial calculations indicate that approximately 40% of patients are asymptomatic, so taking temperatures when people arrive is not a perfect measure, but from a psychological perspective for those visiting a commercial facility, it does raise awareness that the facility is screening for people with a fever. This type of solution that takes consumer psychology into consideration is also necessary for enterprises as they continue economic activity in our new way of life.

Note that the temperature measuring device used for this solution is the Seek Scan from Seek Thermal Inc. It is used together with a black-body standard to calibrate the thermo-sensor, giving it excellent characteristics able to take temperatures with only 0.3 degrees of measurement error. A SeekScan screen is shown in Figure 7. The red square appearing in the thermal image on the right is the black-body standard, showing how the standard temperature is constantly being measured.

4. Conclusion

Technology has a large role in dealing with changes in our lifestyles due to the spread of the COVID-19 pandemic. Solutions using image recognition to check for the three C's (Closed spaces, Crowded places, and Close contact) or for masks can be expected to spread in the future. With demand to replace human work with machinery, image recognition AI is a technology element that is developing remarkably, replacing human eyes and brains, but a simple and user friendly framework is needed to apply these latest technology elements in solutions. NTT DOCOMO is providing frameworks on the cloud, such as the DOCOMO Image Recognition Platform and the SAFR face authentication engine, that enable these advanced processing technologies to be used easily from a smartphone or Web browser. We also have our 5G Open Partnership Program, which is a base for partner enterprises to collaborate with NTT DOCOMO, or with each other, to create valuable solutions. Combining these initiatives, NTT DOCOMO and these partner enterprises will create solutions for societal issues in the future.

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Real-time Detection of the "Three Cs" with Image Analysis "COVID-19 AI Image Analysis Solution"

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1. Introduction

Efforts to stop the spread of COVID-19 and restore stable economic and social life continue. Negative impacts on the entire market are huge, and annualized GDP is expected to drop 20% or more. However, there are also industries that have prospered during the pandemic, and solutions needed for the "New Normal" are flourishing, with demand for online meeting and SaaS business tools for remote communication and remote work, robotic technologies for remote operation and automation, and services such as online shopping and delivery for at-home consumers.

With a mission to "Solve social and customer issues and create new business and a new society using advanced technology," Ridge-i Co. Inc. has provided unique AI solutions in wide-ranging fields and has had much success* with AI image analysis, focusing particularly on deep learning.

The majority of our members are either practitioners and researchers in machine learning, or from strategic consulting firms, pursuing ideas from a broad perspective (hence "Ridge") through knowledge synergy among specialists from various fields.

* One example of success in development is a technology to automatically colorize black-and-white video, developed in collaboration with NHK Art Inc. In collaboration with Ebara Environmental Plant Co. Ltd., we also developed a deep learning system to recognize garbage features. It has been in use for over one year as part of an "Automatic garbage identifying AI crane" at a waste incinerator facility operated by Funabashi City. We also have several initiatives using AI to analyze satellite data, including a land-slide analysis AI developed under contract with JAXA, and SAR image analysis for the major oil spill that occurred near Mauritius, as reported on Yahoo! News and other major media. We have been awarded the Fourth Space Development and Utilization Grand Prize by the Minister of Economy, Trade and Industry (METI) for our utilization of advanced technology to solve societal issues.

In this article, we discuss our "COVID-19 AI Image Analysis Solution," which is able to detect the three C's: "Closed spaces," "Crowded places" and "Close-contact settings"; from camera images in real time. We developed and released it in only two weeks after the state of emergency was declared in April 2020. We discuss its features and future prospects, as well as future requirements for AI technology and organizations.

2. Background to "COVID-19 AI Image Analysis Solution"

On April 7, 2020, when many countries were just beginning to implement measures such as social distancing to prevent the spread of novel coronavirus infection, seven prefectures, including Tokyo, declared a state of emergency. On April 16, our Chief Research Officer (CRO), Yoshitaka Ushiku and I met to discuss for the first time whether there was anything we could do. That was when the concept for "COVID-19 AI Image Analysis Solution" took shape. The next day, we met with our research engineers and decided on an architecture, and our engineers volunteered to take on parts to be worked on in their spare time. Development was completed on May 1st, and the whole solution was released on that day. All work from conception to release was done in approximately two weeks.

3. Measuring closeness, crowdedness and crowd size from camera video

The "Video Analysis AI Solution for COVID-19," released in May 2020, is an AI solution that accurately detects the number and location of people in network cameras in almost real-time, and analyzes the distance between people, the degree of crowding, and the flow of people in crowds. It consists of the following three elements.

In addition, we offered a course on AI fundamentals (4) to help participants make effective use of their home time during the major holidays under the emergency declaration and to deepen their knowledge of AI and machine learning.

(1) Crowd counting, density estimation, and time-series measurement of passers-by (for street cameras, commercial facilities, and tourist facilities)
(2) Close-contact alerts (for offices, hospitals, shops, etc.)
(3) Person tracking and Re-ID
(4) AI fundamentals lecture, free-of-charge on YouTube

(1) is a system that analyze video from cameras in the street or commercial areas, displaying congestion conditions as a heat map and counting passers-by and the size of groups in the video in near-real-time. It can also show a graph of the results, which shows the number of passers-by over time. Currently, a demo of the crowd-size counting module is available on YouTube, used to analyze real-time video from areas of Hamamatsu City in Shizuoka Prefecture (see link at the end of the article). This has

been operating continuously since May, using AI functions that analyze images from cameras installed at fixed locations in the city. It locates passers-by and areas with congestion in the video, displaying data on the web page as a heat map or as a graph of daily and hourly traffic.

The camera stream is processed by an AI installed on the cloud, and the analysis is achieved with almost no delay from the live video.

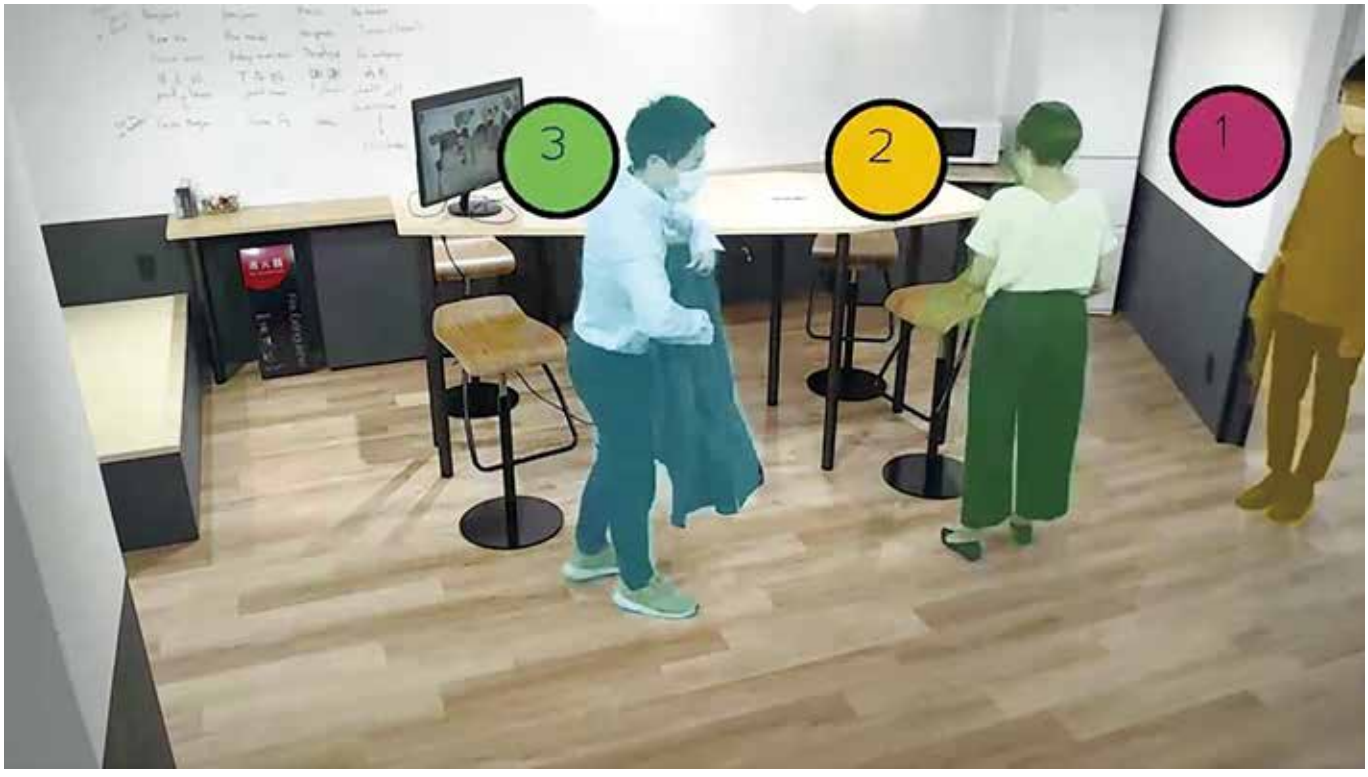
Currently, the system is accurate enough for practical applications in large facilities such as stadiums, commercial facilities, or public offices with many people coming and going. In the future, we intend to also support night-time operation, and we are also already preparing to provide versions that run well on Android and edge devices.

(2) assesses the separation of people in more closed environments such as offices, hospitals, or shops; in order to detect and alert the user when people get too close, or when congestion occurs as the density of people exceeds a certain level. For example, in an office with a large number of staff moving around, if the distance between them becomes less than 1.5 meters (the distance can be set freely), an alert is issued in real time. It is also possible to notify by sound or vibration. In particular, the distance between people is measured with high accuracy by capturing the position of each foot using AI for posture estimation and person detection.

(3) performs person tracking and re-identification, identifying each person by analyzing their face, bone structure, clothing, walking style, etc. without a need for prior registration of users. The mechanism assigns a unique ID to each person when they first appear on the camera image. Once this ID has been assigned, it will be applied to that person even if they leave the image and reappear later. As such, the technology can be used to authenticate that it is the same person (Figure 1). This person tracking function could be used to check a person's past movements from camera video if, for example, they are diagnosed with COVID-19, to identify who they were most in contact with or locations requiring careful disinfection. This could also prove itself useful in order to perform procedures more efficiently after an infection is detected.

By using the kind of solutions that we provide, it is possible to detect and avoid "dense" situations in various environments in real time. In particular, since they are based on camera image analysis technology, they have advantages over mobile base station data (Mobile Spatial Statistics), which operates on a coarse mesh, and can cover indoor environments where GPS is weak. They can also

Figure 1: Person tracking and Re-Identification AI. Assigns IDs without prior registration. Assigns ID by making use of features such as posture, body type, etc. so that the same ID is assigned even after the subject puts on a jacket.



determine whether masks are being worn through image analysis. We have already had inquiries from public offices, retail chains and automobile dealerships and we are conducting trials with some of them.

Our fourth initiative (4) is unique as a solution. On the assumption that the number of on-line students will increase because they are spending more time at home, we have been offering basic AI training lectures free-of-charge on our YouTube channel since May. The lectures cover a curriculum conceived by our CRO, Yoshitaka Ushiku, to provide an overall grasp of AI. They include ten basic-lecture videos following the history of machine-learning development, from the birth of AI to the present. This course is also used as a tool to build a correct common understanding of AI with our customers.

4. AI technologies used in the solution

Our COVID-19 AI Image Analysis solution's strengths are its exceptional accuracy and inference speed in each of the technical elements, as well as how they are integrated. The main technical elements used in the solution are described below. While each of them alone could be considered AI, we refer to combinations of multiple elements as a single solution.

- Pose estimation Deep Learning
- Human Detection Deep Learning
- Human attribute classifier Deep Learning
- Human and Object Tracking Technology
- High-speed, stable video stream processing
- Crowd Counting Deep Learning

Our AI development for posture estimation and person identification is at the top level in the world in academic benchmarks, and in particular, our proprietary deep learning method for posture estimation has achieved SOTA (State of the Art) in public benchmarks (as of June 2020).

A single deep learning is rarely enough to solve a real-world problem, but by combining multiple deep learning models, users can experience an end-to-end AI solution.

5. New social challenges from the COVID-19 pandemic

One thing we felt keenly in creating this "COVID-19 AI Image Analysis Solution" was the importance of preparing systems such that technologies can be provided immediately when needed. To solve immediate needs, quality is of course necessary, but speed is required above all else.

As mentioned in the introduction, our mission is to "Solve social and customer issues using advanced technology and create new business and a new society," but practically speaking, given limited resources and unexpected troubles, it has been more difficult to work concretely based on this mission than we imagined. There are other companies with similar missions, but it seems that most of them were not able to maneuver under the declaration of emergency and its effects, or to adjust for remote work and other measures. We also had planned projects just before the declaration of emergency, which changed drastically because of it, and we were forced to respond quickly. However, taking action under such conditions is the hallmark and raison d'etre of a venture company, and we managed to overcome these problems by a good margin.

In addition, in order to respond quickly to unpredictable situations, it is important to create robust elemental modules and technologies such as the ones mentioned earlier, so that we can combine them flexibly to provide an AI that can answer specific problems. Beyond just advanced development skills, the ability to understand real-world problems, divide them in elemental components and translate them into technical requirements is also crucial.

Even if we see what needs to be done technically to solve the problem, it can be difficult to reach the decisions necessary to execute it. In this case, our CRO, Yoshitaka Ushiku, and I went ahead based on our own judgment, but we could not have succeeded without our volunteers' support. We strongly felt the importance of our mission and our organizational culture. It was important to decide roles quickly and pursue multiple tasks simultaneously without waste of time, not only by top-down decisions but also by parallel and organic decisions taken at all levels of hierarchy.

The four solutions we provided this time are not the ultimate solutions to problems, but they have provided an excellent opportunity to challenge the technologies and the organizational culture we have cultivated over four years. I think the greatest assets we have gained are a greatly increased awareness of our development processes, of what sort of AI technical elements can be modularized to provide functionality quickly and with flexibility, and the real experience of creating a solution within a period of only two weeks.

6. AI technology requirements and company qualities required in the future

After the announcement of the solution, we received not only inquiries from commercial facilities, but also requests for interviews from various media groups, including NHK. It was particularly impressive that we were asked not only about the details of the functions and technology, but also about why we decided to create such a solution.

Six years have already passed since the tertiary AI market in Japan began gaining notice in 2014. With a large amount of AI

ventures in the market, it is difficult for a company to shine based on its AI technology alone. The market also has a reputation that many projects do not go beyond the PoC stage, resulting in mixed feelings of hope and disappointment. According to material published by the Ministry of Economy, Trade and Industry (METI) in March 2020, 97% of AI related projects are abandoned before completion, which is quite surprising. We have summarized the obstacles faced by some representative projects below (Figure 2).

Considering the level of maturity of this market, companies that have been developing AI thus far will need to make drastic changes. They are already expected to provide not only promising AI prototypes, but also successful integrations that can be used in practice.

Social and business needs are also changing prompted by the COVID-19 pandemic, but the New Normal has not settled yet. Under such conditions, we must assume that there are still no precedents for some user needs or how to address them, and ventures must find agile solutions quickly, by experimenting quickly and not being afraid of failure.

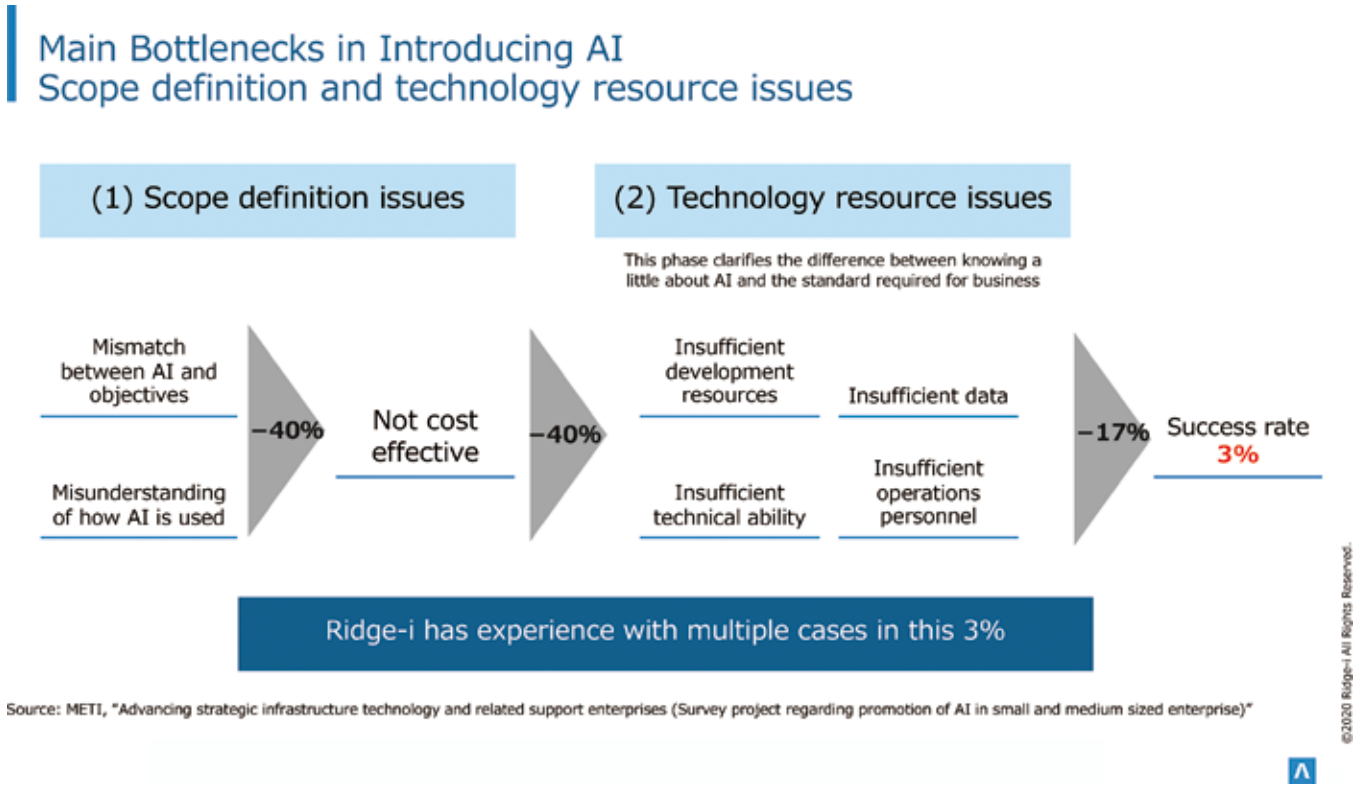
In the New Normal, the need will likely increase for solutions characterized by keywords such as remote monitoring, remote operation, semi-automation, and location-free. AI technology will be a necessary element of such solutions, but many problems in robotics, communications, edge inference, sensing and other fields cannot be solved with AI alone, making it increasingly important to have partnerships with enterprises in various other fields.

The qualities that a company must have in such an environment include (1) ability to sense and adapt flexibly to new needs in society, (2) rapid development, deployment capabilities and technical assets to respond quickly to urgent issues, (3) design and technical capabilities to go beyond planning to successfully deploy their solution and produce results, and (4) ability to collaborate with partners in solving problems rather than only acting alone.

At Ridge-i, we plan to maximize the AI technology assets and personnel that we have cultivated to provide solutions that produce major benefits for our customers, replacing the negative impacts brought on by COVID-19. We encourage partner companies and individuals to contact us, to propose and implement solutions for the New Normal together.

Related Links
Ridge-i Inc. https://ridge-i.com/
Hamamatsu City, Kajicho-dori, Live demo of counting crowd numbers
(Ridge-i YouTube Channel) https://www.youtube.com/channel/UCTBaJrfibBNosxCVEjPnYWw

Figure 2: Bottlenecks to introduction of AI. 97% of AI projects are abandoned uncompleted.



Non-Desk work DX with Connected Worker: Attracting attention around the world in the new COVID-19 era

Jun Kuchii
Chief Operating Officer/ Futurist
Fairy Devices Inc.

1. What is Connected Worker and how is it advancing Non-Desk work DX?

Even though the level of skill required and workload are increasing, most manufacturers and infrastructure industries continue to face the challenge of workforce shortages. On the other hand, automation using robotics is not progressing fast enough. Robots are skilled at handling fixed tasks, but they cannot work with the flexibility that people can. For some tasks, such as bulk materials handling that people can do easily, even as a part-time job, most attempts to implement them with robots have not been practical.

Robots are also expensive, so it is difficult for all but the largest companies, such as automobile manufacturers, to adopt them. Under these conditions, digital technologies that are able to reduce the workload for on-site workers and multiply the added value created by several times have begun to attract attention.

An example of such technology, which uses digital devices that on-site workers can wear to receive AI and IT support, improve their skills and implement DX, is a solution that we call "Connected Worker."

Connected Worker can improve the standard of on-site work to that of an experienced technician through use of various digital supports including: (1) remote support from an experienced technician, (2) automatic collection of data during work (automatic creation of reports, etc.), (3) collection of work-site data, generation of hazard alerts, (4) training and manual updates based on past work data, and (5) work support using data and AI.

Connected Worker is starting to be introduced to achieve complex goals such as "improving work productivity," "managing worker health and safety," and "preventing work errors and omissions," for on-site work that is intolerant of error, such as in high-tech materials facilities, chemical plants, oil refineries, and electrical power plants.

Figure 1: Value provided by Connected Worker

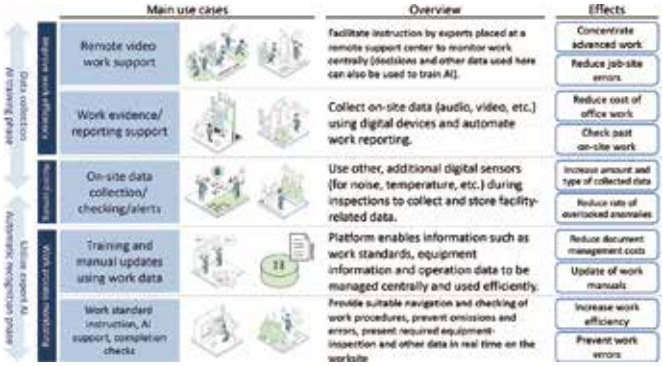
2. Non-Desk work DX achievable with Connected Worker

Currently, particular benefits from implementing Connected Worker are: more efficient business travel, because the on-site worker can receive remote help working together with an experienced technician on technical tasks; and more efficient completion of non-core tasks during daily work, such as decision-making, creation of reports, and collection of evidence and other on-site data.

I expect many readers have had the difficult experience, as I have, of introducing DX or AI, such as information in real documents that are not converted to digital data, or huge amounts of data which require a tremendous workload to cleanse.

Introducing Connected Worker enables you to improve business travel and non-core work efficiencies, while also collecting data.

Figure 2: Connected Worker use cases and effects



Figures 3, 4 and 5 show use cases of DX in on-site operation of a factory, a construction site and for maintenance, respectively. We have found that it can also be effective in logistics, warehousing and transport domains. For example, by assigning a speech recognition digital device to long-distance truck drivers, they can interact with the fleet management system while driving, within the scope of what is permitted legally.

Figure 3: Connected Worker use case in a factory

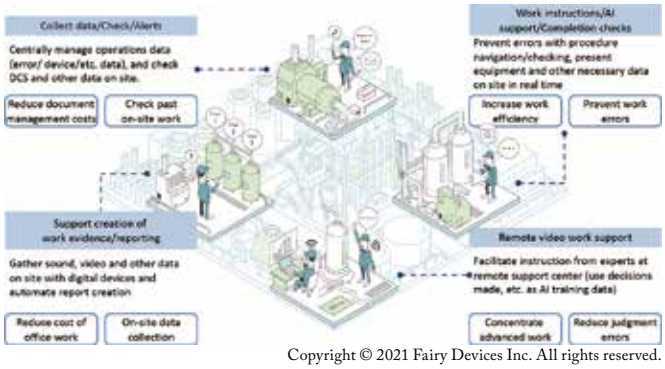


Figure 4: Connected Worker use case on a construction site

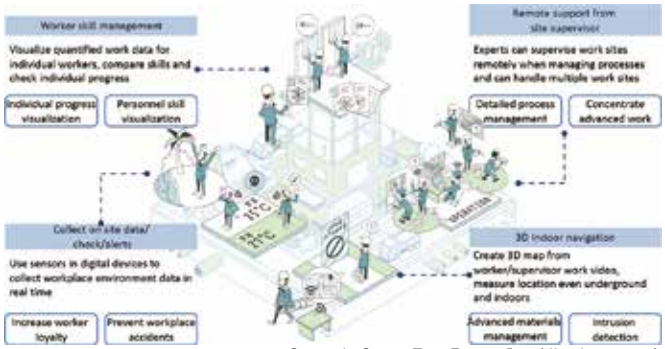
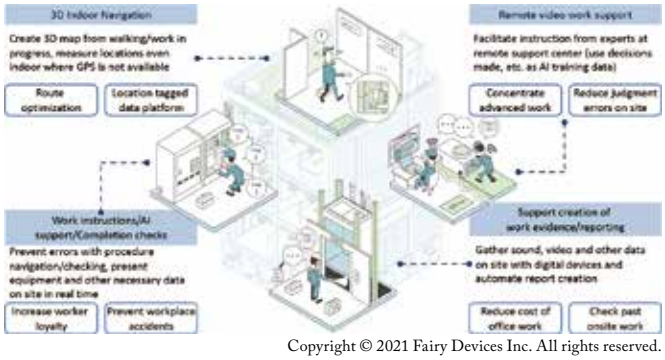


Figure 5: Connected Worker use case for maintenance



* Refer to the following for use case details.
https://fairydevices.jp/cws

3. Why is Digital Transformation (DX) needed in the first place?

I admit that for most readers I am preaching to the choir, but in recent years, the declining population has resulted in labor shortages. In the 2020s in particular, more skilled technicians are retiring each year, and the shortage of personnel is expected to make it increasingly difficult to maintain operations in factories and other infrastructure. This is one of the major reasons why DX is needed in the workplace.

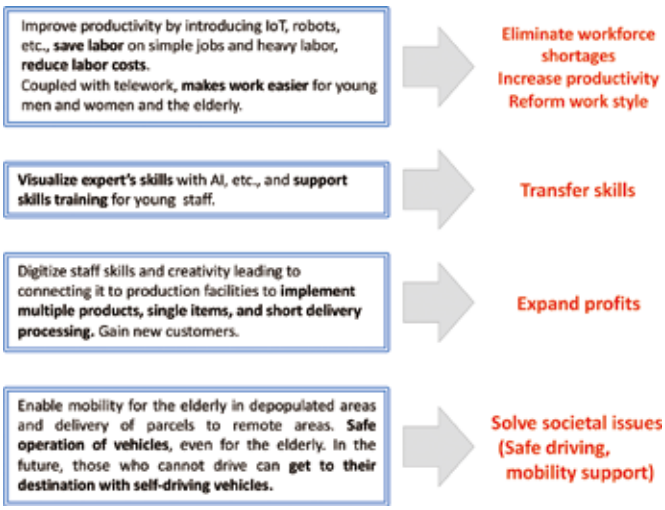
A shortage of workers is emerging in over 90% of enterprises in manufacturing industries and for more than 30%, this has already affected their business*1. In infrastructure industries requiring qualified technicians, such as electrical power, a shortage of electrical safety workforce numbering in the thousands is expected by around 2030*2.

On the other hand, factories and infrastructure are getting more complex and advanced, so it is expected that technologists working in the field will require even more advanced judgment and knowledge in the future than they do now.

In other words, to maintain its GDP and highly developed infrastructure, Japan will need to increase both the quality and the number of technologists in the workforce.

The government has advocated a "Connected Industries," approach to address this situation, promoting DX in all industries. IoT and Digitalization have been promoted for several years, and Connected Industries expands these ideas, using digital technologies to create better working environments, to pass on techniques, skills and knowledge, to increase productivity and even to try to solve societal issues*3.

Figure 6: Examples of the benefits of Connected Industries (*3 from P19 of the METI document)



*1 METI, "The shortage of personnel in manufacturing industries and the utilization of foreign personnel," (July 12, 2018).
https://www.meti.go.jp/press/2018/07/20180712005/20180712005-2.pdf
*2 METI, "Electrical Safety Personnel/Technology WG," (November 25, 2019).
https://www.meti.go.jp/shingikai/sankoshin/hoan_shohi/denryoku_anzen/hoan_jinzai/pdf/20191125_report.pdf (in Japanese)
*3 METI, "Kanto Bureau of Economy, Trade and Industry IoT and Robot Project and FY2019 Policies," (February 2019)
http://kantou.mof.go.jp/content/000226631.pdf (in Japanese)

4. Why is Connected Worker attracting attention for implementation of DX?

To implement DX requires building a "digital twin," optimizing in a digital virtual space, and then feeding it back into execution in real space.

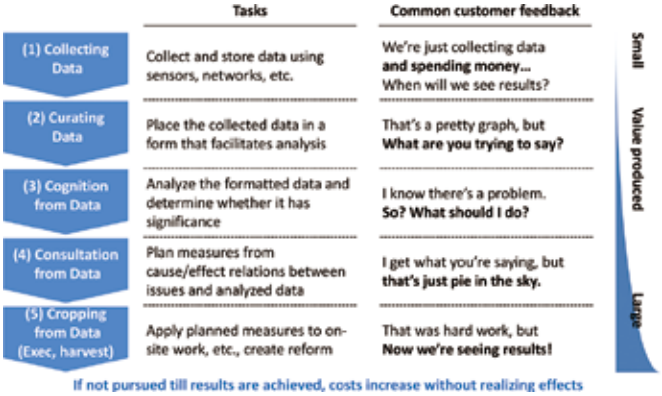
However, this path to implementation is not an easy one.

To achieve valuable DX with a digital twin requires a long process involving the following activities: (1) "Collecting" data, (2) "Curating" data into a shape that can be used, (3) "Cognition" analyzing data and deriving inferences, (4) "Consultation" to derive measures to optimize for efficiency from the obtained inferences, and (5) "Cropping," to finally implement the measures and reap the benefits of more efficient work.

To reach the final execution phase requires the worksite to bear the burden of collecting data, and costs for the enterprise continue. For ICT vendors like us, who are handling the effort, maintaining the system infrastructure is a 24-hour-a-day task, which amounts to rebuilding a society.

We have conducted earlier DX initiatives using IoT and other devices and found that there was not enough data created by human activity to achieve efficiencies through digitalization. Achieving such efficiencies requires DX of the whole business and without doing so, it will not be possible to reap much value for management. For this reason, we have now begun to focus on using Connected Worker in various places, to digitalize the people involved as well.

Figure 7: The 5 C's of DX implementation



5. Rapidly increasing demand for Connected Worker due to COVID-19

In the midst of the great confusion caused by COVID-19 around the world, Connected Worker has begun to attract global attention. A significant reason is that, due to COVID-19, it has become more difficult to send skilled technicians for operation or maintenance of advanced machinery that requires hands-on work.

In particular, companies in developed countries often operate special facilities or factories in developing countries overseas, and such operation requires many skilled technicians. Originally, skilled technicians would be dispatched from Japan to the location to provide technical support, but this has become difficult due to entry restrictions and measures to maintain safety. As such, methods to achieve DX while providing support in the developing country from the developed country have become necessary.

The demand for digitalization measures using the "1.(1) "Remote support from an experienced technician" with Connected Worker have increased due to COVID-19. This is the idea of enabling skilled technicians to telework.

Figure 8: Digitalization of devices and of people

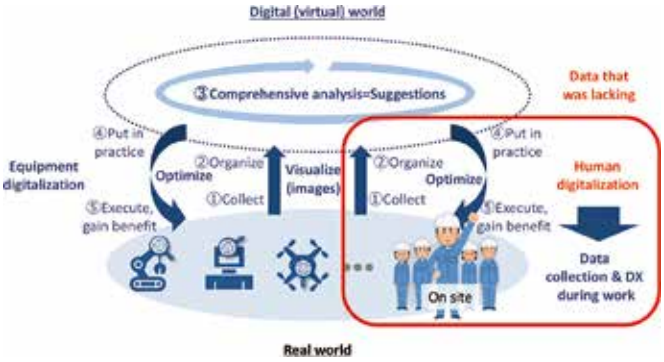


Figure 9: Three workplace issues caused by COVID-19

6. Our initiatives related to Connected Worker

At Fairy Devices, where I am COO, we had requests to implement speech recognition in a factory, which prompted us to focus on this type of issue in on-site work, and continue testing on work-sites.

However, most wearable devices are made based on consumer oriented use cases, for entertainment such as games and other indoor uses, so it has been very difficult to introduce them into real work sites.

In particular, we often encountered issues with head-mounted devices such as fatigue or physical strain due to the weight, or the screen not functioning as required outdoors.

For these reasons, we decided to commit to developing our own hardware. The "THINKLET®" device that we developed is designed to be worn on the shoulders which is different from

prior Connected Worker devices that were in a glasses format. We selected this design because wearing a glasses-type digital device weighing several hundred grams on one's head can result in headaches and other physical strain, while even a small person can carry weight on their shoulders easily, even up to 5 kg. Humans feel less bodily strain when they carry objects on their pelvis or trunk through their shoulders.

We also designed the device with special attention to hands-free operation and a simple UX, comparable to operating a TV remote control.

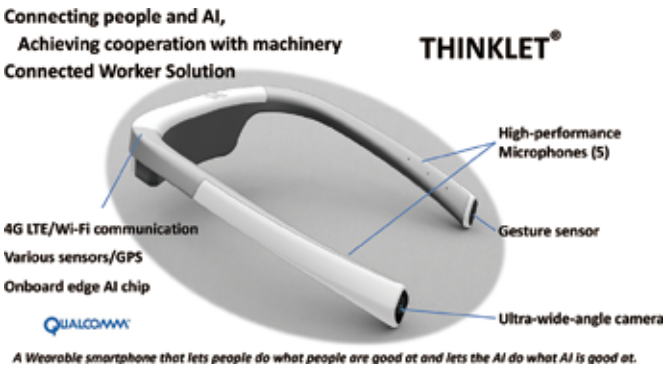
As a result, we were able to realize a shape that enables digitalization of work without significant burden on on-site workers, either physically or from changes in work practices.

Figure 10: Issues with head-mounted devices

7. "THINKLET®" features that accelerate Connected Worker adoption

"THINKLET®" has four particular features.

Figure 11: Introducing the Fairy Devices Ltd. "THINKLET®"



(1) THINKLET® is basically an ordinary Android smartphone inside, but it has no display and is in a form to be worn on the shoulders. Since it has no display, it is extremely lightweight and we were able to keep power consumption very low. As we mentioned earlier, since it is worn on the shoulders, the physical strain on the neck is greatly reduced compared with head-mounted and glasses-type devices.

(2) It uses high-performance microphones, so even in a factory it can be used with speech recognition and AI, or for creating work records.
In fact, devices such as transceivers and pagers have been in sites such as factories before. However, for most sites it has not been possible to use speech recognition because the sound quality was poor, and it was difficult to hear what was said, even for a human. THINKLET® uses several high-performance microphones, onboard edge-AI processing and beam forming. This enables speech to be heard clearly in the workplace. We have also implemented speech recognition for noisy environments, which was difficult in the past. This speech recognition works in environments with noise of 80 db and greater, so AI can be used in factory environments.
By enabling speech recognition with noise, work records that were previously only done after returning to the office can be created, and detailed evidence can be collected and delivered while still on site.

(3) Use of an ultra-wide-angle camera enables the experienced technician to provide remote support, as if they were on-site.
In the past, when the on-site worker needed help, experienced technicians used a two-way radio or similar device to provide support, but this had difficulties. If the on-site person said "The green lamp is flashing," for example, there could be more than one green light in many cases. The THINKLET® has an ultra-wide angle camera mounted on the front, which can capture the on-site worker's field of view and working area. With this camera, the remote expert can evaluate the situation, as if they were there, and give appropriate instructions.
The images captured by this camera also can be used for FairySLAM technology, which creates a 3D map from the video taken by the camera. This enables it to obtain location data even inside a facility where other location information such as GPS cannot be used.

(4) Speech recognition and gesture sensors enable it to be operated with both hands free.

Figure 12: THINKLET® Solution screen concept

In contrast with office work, on-site work often requires holding tools with both hands or wearing gloves for protection, making it difficult to operate a keyboard or touch panel with the finger tips. This is another reason it has been difficult to popularize digital devices for work sites.
THINKLET® has been designed to be operated while using both hands for work, and is equipped with speech recognition and gesture sensors. A worker can operate a drill with both hands and ask the AI to read out from a manual, take a picture or double check the work.

(5) Hardware configuration is customizable for the usage and requirements of the site.
The description above is of the basic configuration. THINKLET® has also been designed to be customizable for the desired use and requirements, with optional features such as converting to a stereo camera by substituting the gesture sensor for a second camera, or adding lights or MR goggles that are linked to the main unit (which we developed in-house). This allows it to support various on-site needs.

8. Implementing "Second Brain," for realizing workplace DX

As mentioned earlier, in the past DX proceeded based on data from on-site facilities and equipment. However, factories and other worksites do not operate with just machines, and generally there was a shortage of data regarding the non-regular work done by people.

THINKLET® is a wearable AI that stays close to the user on their shoulders, with accurate speech recognition and first-person-view video data recording through an ultra-wide-angle camera. Thus, it is able to collect "human Big Data" to an extent which is not possible with fixed microphones and cameras.

It can also use LTE and other high-speed communication, so beyond providing remote work support with video, it can be used to implement "on-site support solutions based on analyzed data," and "skills transfer by an AI expert technician for worker support."

We have defined four levels of DX that can be implemented for such solutions.

DX Level 1: BPR and data acquisition through work digitalization

The costs incurred are not only for collecting data, the digital devices can also be used for useful work support functions such as providing remote support with video, and automating creation of work reports using speech recognition, by which work can be digitalized to reduce the on-site workload.

Thus, while performing regular work as usual, work efficiencies are increased and at the same time non-routine data created by workers at the site will be collected automatically and naturally.

DX Level 2: Digital work support (using data)

Using the human-created non-routine data collected in DX Level 1, including detailed work evidence with the conditions and

Figure 13: THINKLET® customization options

judgments or tacit knowledge that has been revealed, processes that were difficult previously become possible, such as skills transfer, improved training, evidence-based status evaluation, and knowledge management.

Examples include proposing possible causes in a situation where the pressure in a pump is lower than normal, or deriving techniques that skilled workers do subconsciously by comparing videos of their work with that of average workers and then using them to update work manuals.

DX Level 3: Digital work operation reform (using AI)

To build excellent AI, it is essential to train it with an appropriate amount of fresh, precise and accurate training data, but generally it is difficult to obtain enough such data.

It has previously been difficult to gather work data from regular day-to-day work, surrounding conditions, judgments by skilled technicians, and so on, but if we could make this possible and use the data for training, it should be possible to build an AI suitable for that work.

The result would enable some of the work to be automated or optimized by the AI, such as checking completion of work or recommending responses to inquiries from on-site and personnel could concentrate on work that can only be done by a person.

DX Level 4: Digitalization and work integration (collaboration with AI and machinery)

This is the level that most players in the AI market aspire to in the future, and would create a world with people getting help from AIs through digital devices, like having your own personal fairy; like Tinkerbell in Peter Pan or Vivien in the Knights of the Round Table.

We recommend trying not to reach Level 4 or Level 3 in one leap, but to achieve DX in small areas with Level 1 or Level 2.

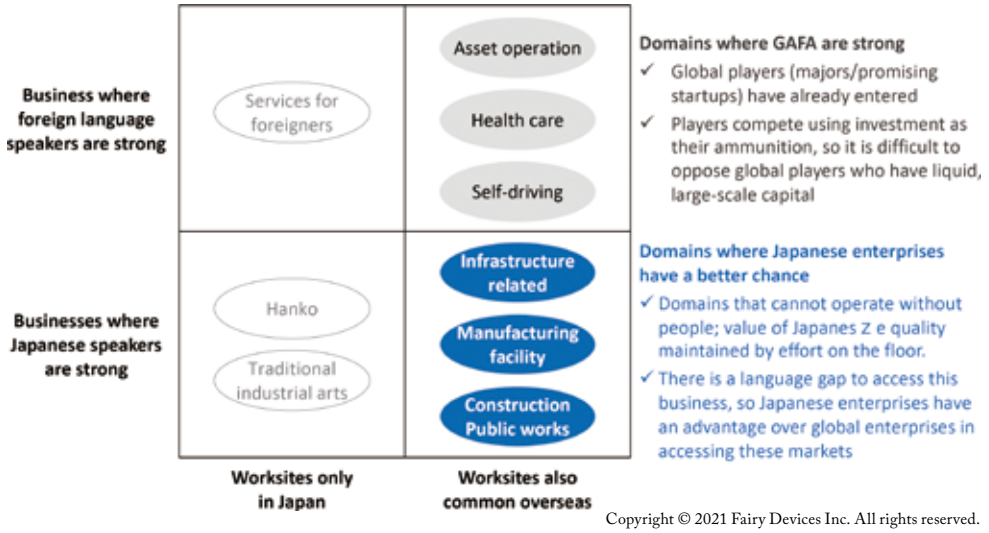
9. Creating a bright future for Japan with DX of workplace knowledge (OT)

Even with the remarkable progress in technology, it is still people who are making the decisions in the workplace.

Japan has many excellent people with much workplace knowledge and this is the basis for quality. I originally worked at an American enterprise, and we often had inquiries about exporting the advanced social infrastructure operations in Japan. There were some cases for which we realized the export to foreign countries, but the operational knowledge was usually confined to the Japanese language and not digitalized, so in most cases it could not be exported.

If an "expert technician AI" can be built using such worksite knowledge, it would clearly be useful for increasing added value for Japanese enterprises, facilitating efforts such as rapid setup of overseas factories and acquiring foreign currency by creating solutions from in-house technologies or maintenance practices. We believe, with such knowledge confined to Japan which is helpful for similar workplaces in foreign countries, that by pursuing DX in areas that are difficult to access by major foreign players, we can build a future in which even Japan, with its declining population, can make earnings in other countries. Fairy Devices is working continuously to develop technologies and realize workplace support AI for on-site workers

Figure 14: Areas that Japanese venture companies can target using AI



Corona Tracer®: Preventing expansion of workplace clusters

Jun Matsumura
Representative Director
CTO, IoT-EX Inc.

1. Introduction

The SARS-CoV-2 coronavirus that causes COVID-19 is reported to be spread mainly through contact with infected air droplets, and the spread can be controlled effectively by severing the paths of such infection. Formation of clusters can be prevented by "contact tracing," which involves quickly identifying any close contacts and notifying them when an infected person is found.

Conventionally, contact tracing has been done mainly by telephone, asking questions, checking and giving instructions. This method takes time and effort to identify patients and becomes more difficult as the number of patients increases. With the recent spread of smartphones, efforts to accelerate contact tracing using mobile applications have begun.

In South Korea, a mobile application was developed using the location services smartphone feature (a standard feature that integrates data from GPS, base station locations, Wi-Fi, the compass, etc.), which linked with several systems that collect personal information to track the movement history of infected people. Currently published information includes age, sex, workplace, approximate home address, convenience stores used, and modes of transport used. Names are not published, but associates in the same cluster are, and there have been reports of individuals being identified through SNS and attacked. Such incidents have been used to show the difficulty of maintaining privacy while dealing with infection risk.

Another mobile application called "Trace Together" was developed in Singapore using a short-distance communication technology called Bluetooth Low Energy (BLE). The application enables rapid contact tracing and notifications by keeping a 21-day log of people who were in close proximity and also had the application installed on their smartphones. This application uses the phone number for notifications, so it is considered to use individual-identifying information.

Since late March, 2020, our group and several others in Japan (such as Code for Japan) have also developed contact tracing applications. At the time, "Trace Together" in Singapore had about a 10% usage rate, was initially only available for Android devices, and had to be run in the foreground. Apple severely limits background applications over concern for privacy and battery life, so dealing with these restrictions caused difficulty in Japan, where iPhones have a large market share.

Amid these efforts, on April 10, 2020, Apple and Google jointly announced their support for government and insurance agency efforts to prevent the spread of infection, including a contact tracing framework that uses Bluetooth Low Energy (BLE) and not location services features. This enabled iOS devices, not only Android devices, to also have applications that run continuously in the background.

2. Issues identified during development and resolutions

We initially analyzed conventional contact tracing methods using telephones and identified the following five necessary tasks: (1) Collection of contact information, (2) Storage of contact information, (3) Reporting from infected persons, (4) Identification of close contacts, and (5) Notification of closely contacted persons. We then studied how these could be implemented and determined the scope of manual work that could be systematized effectively.

We first conducted tests to verify collection of contact information using BLE, which indicated that there was much noise and attenuation due to pillars, walls, clothing, and people's bodies, so that it was not possible to estimate distances (such as "within 1.5 m") from the strength of signals. Thus, we determined that if the signal was relatively strong, those persons would be considered under close contact.

We then decided that contact information would be stored in the application. Mobile applications use a sandbox architecture, so that a third-party application cannot see data stored in another application. Only identification numbers, which cannot be associated with an individual, would be sent to the cloud. If all data were sent to the cloud immediately, real-time monitoring would be possible. Even if data from a given application is processed to not identify individuals, the data could be linked with information collected by other applications from the same developer on the same smart phone, enabling them to identify individuals. How to handle the risk of identifying individuals when linking to the cloud was a concern when developing a service.

Apple and Google published a mechanism for contact tracing with sample code and specified that it would support one application per country. This mechanism was then built into the OS itself, so that the logic for collecting and storing contact information could not be changed. The mechanism has an Exposure Notification function to indicate when the user has been exposed to risk of infection.

From the start, our group has intended to provide a contact tracing service for corporate administration (general affairs administrators in most cases) rather than for national or insurance agencies. Enterprises must take measures to prevent the spread of

Figure 1: Typical operations for administrators when an infected person contacts the company

infection as part of their labor health and safety efforts to begin with, and our solution is meaningful as part of such efforts, and checking contacts using our service can be a meaningful part of such efforts for companies required to do so. It could also be used to meet the needs of national and regional public organization as a measure against the spread of infection.

Enterprise managers (general affairs administrators in most cases) manage employee names and contacts as part of their work and use them as needed. We separated the system for collecting and storing contact information from the system for identifying close contacts and coupled them loosely to prevent real-time monitoring and to forbid access to contact information unless an infection occurs.

We also do not enter information related to infection into the system, but rather, an (infected) person's name and (incubation) period is specified, and a list of employees who might have had close contact is displayed.

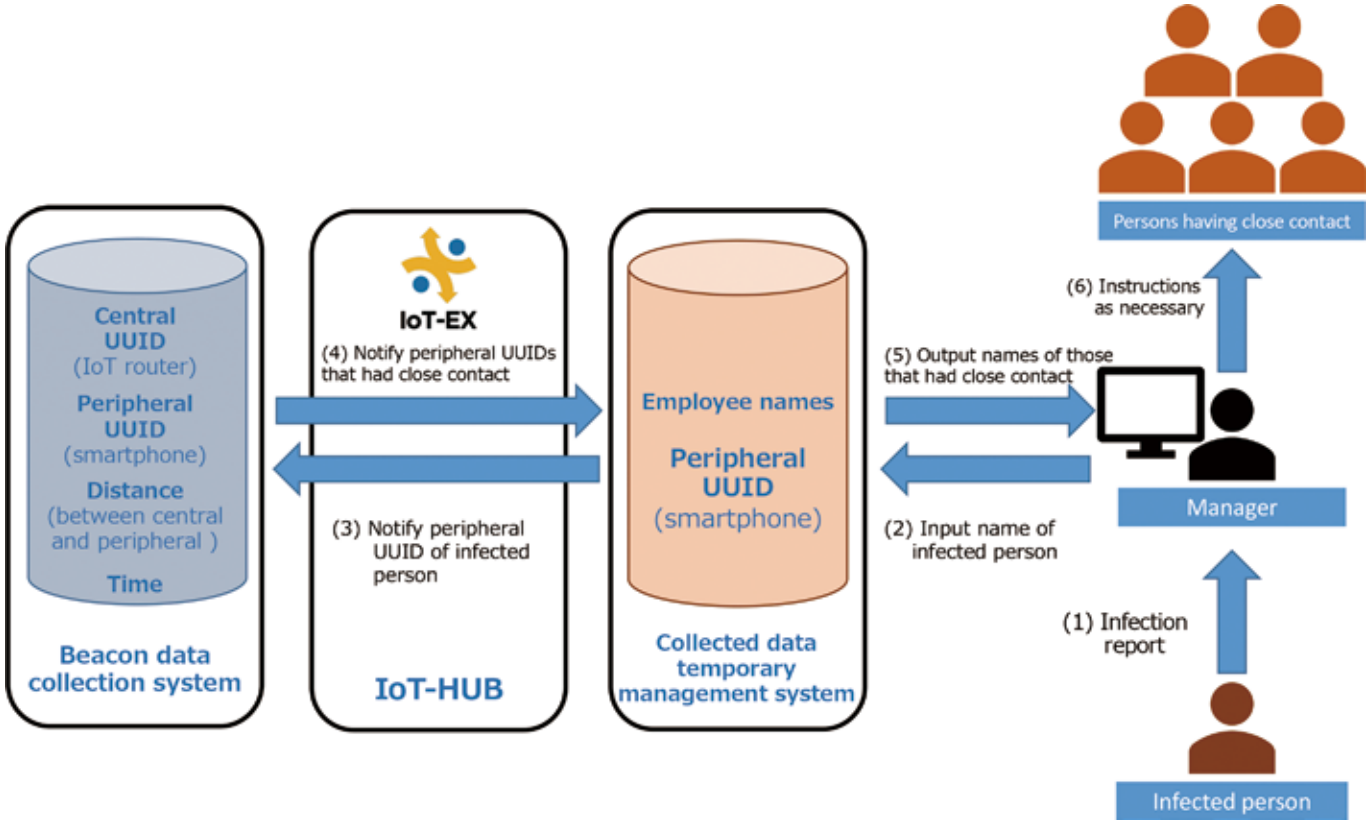
We have also prohibited linking of data stored in the system with any other system. This was made possible technically by using IoT-HUB, which we developed in collaboration with the University of Tokyo, Institute of Industrial Science, IoT Special Research Committee. Since IoT-EX Co. Ltd. is a registered telecommunications operator, which is regulated by the government, we are also prohibited from monitoring data on the cloud and must protect data privacy and security.

Enterprises are also using feature phones instead of smartphones in some cases. There is also the issue of handling visitors in addition to employees. To deal with such situations, we also added support for beacon tags and QR codes. With these additions, we also separated BLE operation for central and peripheral devices. Using beacon tag technology, it is also possible to handle children and the elderly, and with QR codes, we can also support schemes that have been used with feature phones, in which contacts are registered by reading a QR code and sending an empty email message. This technology also enables us to support situations such as event spaces.

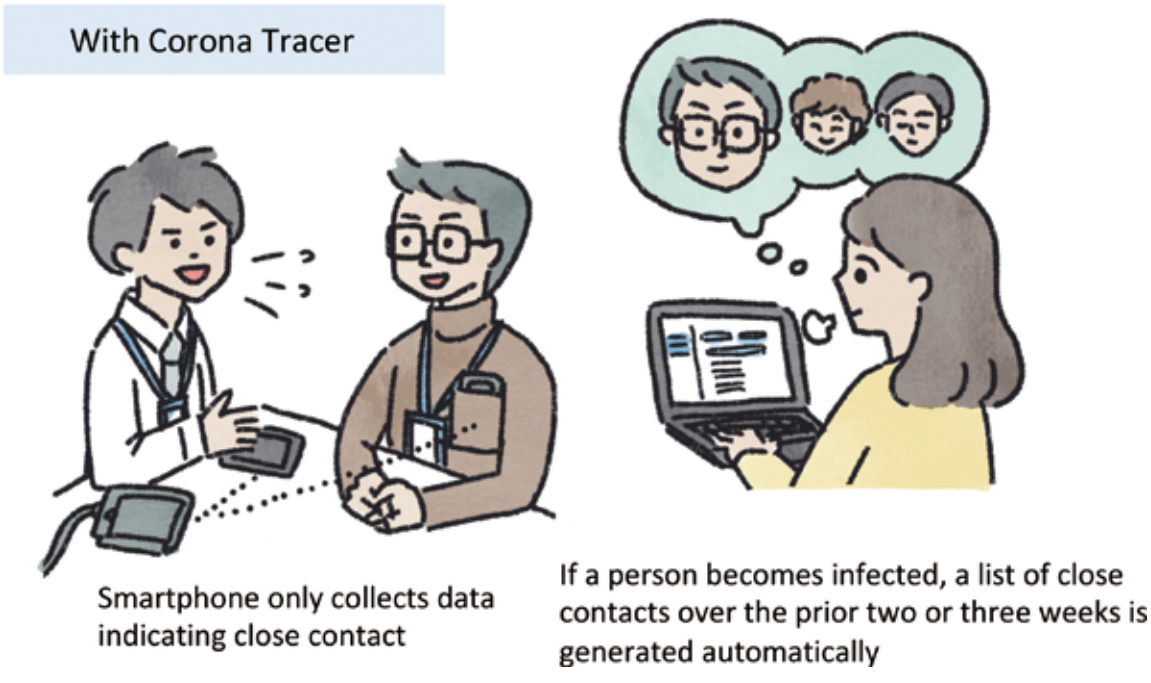
In the process of testing various beacon tags, we found that specifications for beacon tags are not uniform, and there are interoperation issues between different near-contact tracking systems (collecting and storing contact information). This can also be handled using IoT-HUB and applicable drivers. Specifically, by using a driver and a particular parsing feature of the IoT-HUB, no change to the application is required, and the devices can be supported right away, by just creating a format definition file for parsing (taking approximately 10 min.).

QR codes have also been adopted throughout Japan in recent years, but the mechanisms used are not consistent in each region, and we found out that there is no interoperability among them.

■ **Figure 2: Overview of the Corona Tracer system**



■ **Figure 3: Operation with Corona Tracer**



This can also be handled using IoT-HUB and drivers.

We also had requests to be able to check work attendance rates from companies using Corona Tracer, so we added the ability to do so from the contact information collection and storage system. The system provides attendance rates by department and for the whole company, and by adding a sensor data (PM2.5 and CO_2 levels) collection and storage system, we are able to determine whether the "Three C's" (avoidance of closed space, crowded places and close contact) are being handled or not.

Recently, facilities are being required to operate safety measures for visitors in spaces where many people gather and interact. We tested whether Corona Tracer would be effective in such cases, and found that with multiple central devices, a rough estimate of locations of people could be determined from the BLE base stations. This showed that we would be able to trace possible transmission by air droplets (person-to-person), as well as through contact with objects that other people had touched (person-to-object-to-person). We are continuing to test this measurement.

3. Conclusion

The "COCOA" contact checking application for Japan, which notifies people if they may have had close contact with someone infected with the COVID-19, was reported to have been downloaded 18.9 million times as of the morning of October 26, 2020, which is approximately 15% of the population. We are being required to put a new type of lifestyle into practice in our daily lives, to protect ourselves, our families, the people around us, our workplaces, and our region from the spread of infection.

Our group has focused particularly on the workplace, supporting new work styles, and we aim to provide a service that will be useful for enterprise administrators. There have been a variety of services offered for business continuity planning (BCP) for situations such as major earthquakes or a pandemic. We are offering "Corona Tracer®" to contribute to stopping the expansion of workplace clusters in enterprises. Most of the features introduced in this article are patented or patent pending.

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- Why Singapore's COVID-19 contact tracing application cannot be used in Japan as-is"
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Making SNS and other Digital Spaces more Safe and Sound

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1. Changes and Issues in "Human×Digital Space" with COVID-19

The COVID-19 pandemic has resulted in acceleration of digital transformation (DX). In business, non-face-to-face communication has increased, conducting meetings and customer interaction on-line, where physical distance is not an issue. Communication is moving from real to digital space. Use of online tools is considerable, both for B2B and B2C activities, and the importance of reputation in digital space is expected to increase even more in the future. As such, an understanding of how tone governs digital space is essential for decision making in enterprise management.

However, it is extremely difficult to understand tone accurately in digital space. It is possible to understand and verify tone to some extent by just gathering information with a search engine, but on SNS, where information can flow forcefully and energetically, it is difficult to grasp the tone correctly. This is because distortions of a speaker's intentions can accumulate, and after non-factual information has spread, it cannot be suppressed. This results in a particular risk of damage due to flare-ups or rumors on the Internet.

It is still fresh in our minds how there has also been an "infodemic" with the spread of the COVID-19 pandemic, causing fear and uncertainty for many people. For example, in Japan there was widespread speculation on SNS, that materials for masks would be diverted from Japan and import of materials from China would stop, which resulted in a shortage of toilet paper. In Iran, there was a rumor on SNS that drinking strong alcohol would kill the virus in one's body. Many people who believed the rumor drank strong alcohol containing methanol and died of methanol poisoning. To raise awareness regarding this infodemic, the World Health Organization (WHO) created new content on their COVID-19 Web site, with advice regarding superstition and anxiety and how to avoid being misled by unreliable information.

There have also been cases of widespread rumors, where posts were made with parts of a paper or someone else's post were quoted, cutting out and rearranged phrases to suit the biases of the poster. For example, information stating that "epigallocatechin gallate (EGCG), found in green tea, has strong anti-viral effect," degenerated into "is an effective treatment for novel coronavirus," and got distributed. In this case, the essence of the information was lost by the extraction and rearranging of wording.

Communication on SNS occurs through the exchange of short messages, so brevity results in strong tendencies not to convey the intended meaning, for the meaning to change when only part of a sequence of tweets is quoted, and for information to become distorted in the process of transmission. Readers also skim through the huge flow of messages over time and can interpret messages incorrectly, without carefully scrutinizing the information. People today are exposed to huge amounts of information and are used to consuming information in summary, so it is not uncommon to just accept whatever information is received. Eltes is conducting analyses of information related to COVID-19. In this process we have learned that incorrect information that gets distributed on SNS often dies down due to fact-checked articles appearing in the media, but then it sometimes begins to spread again on bulletin boards and other media. In our diversifying digital space, a single fact check alone will not correct incorrect information, and there is a possibility that it will flare up again. Our analysis has revealed the problem that once incorrect information has spread it transforms successively in digital space and variations tend to increase.

The likelihood that information will be misinterpreted due to poor writing ability or poor reading comprehension is always high, so incorrect information is often repeated, moved and reissued in digital space. For these reasons, when information starts to disperse, it is increasingly difficult to follow in real time.

2. Danger that distortion in digital space will affect the real world

"DIGITAL2020: GLOBAL DIGITAL OVERVIEW" is a report analyzing the trends and tendencies of people around the world on digital, mobile and social media. According to the report, more than 4.5 billion people used the Internet, and users of social media had surpassed 3.8 billion people as of the beginning of 2020. This means nearly 60% of the global population is using the Internet, an increase of 7% compared to 2019. The average Internet user spends six hours and 43 minutes on line every day, so assuming they sleep eight hours a day, 40% or more of their waking hours are spent using the Internet.

The report also indicates that the time connected to digital space is increasing from year to year. The COVID-19 pandemic has spurred this on, and with fewer opportunities to meet face-to-face, we can expect people are more active collecting information online. Although digitization is making people's lives more convenient, it also brings new risks. In fact, as the amount of connection time has increased, the amount of slander and defamation on the Internet has also tended to increase. Cases of arrest or litigation due to malicious posts are becoming more and more common. Cases where thoughtless, slanderous comments

made anonymously have resulted in lost lives are also continuing to occur. Calls for morals in digital space are increasing daily.

The idea that digital space and real society is separate is a thing of the past. A person's personality and corresponding reputation in digital space has become inseparable from that in the real world, whether good or bad. Because of this, there may be increasing danger that when distortions appear in digital space, they will have effects in the real world as well.

This is not only a problem for individuals; it also applies to enterprises. Enterprise managers must make certain preparations for the risk of injustices characteristic of digital space. An important factor in doing so is the use of intelligence, the result of information processing and analysis, as the basis of decision making.

When slander, defamation or flare-ups occurs on the Internet, many people have a tendency to perceive it as though it is the prevailing attitude in society. However, such issues cannot be dealt with properly without correctly determining whether it really is a prevailing attitude or just that of a noisy few. Incidentally, during Japan's Warring States period, warring armies were known to use human figures to give the impression that they were stronger militarily. In a similar way, there have been many cases when a single person has created additional accounts on SNS and other platforms to spread slander and defamation, when actually it is just one or a small number of people. Rumors are like natural disasters and impossible to prevent before they occur. However, damage can be minimized by perceiving the matter correctly. To prevent the spread of negative effects in the real world, enterprises need intelligence, including that gained from monitoring digital space.

3. Eltes accomplishments in the domain of Internet flare-up and rumor damage control

Eltes has set a policy of "continuing to fight against digital risk," and as an organization of digital risk management specialists, we are developing various solutions to resolve digital risk. We support management of digital risk emerging as digital transformation (DX) of society progresses, including the expansion of services such as search engines, SNS and online banking, made possible by development of information and communications infrastructure technology and digital devices. For example, we provide comprehensive risk management solutions for enterprise social media operations, which have presented real risk as business environments have changed. We have provided digital risk management-related services to over 1,000 companies, including listed companies such as NTT DOCOMO, Mazda, and Suntory.

There are two main types of digital risk management. The first is "Social Risk Management." As the number of SNS users has increased, "incidents" have occurred frequently. The number of Internet flare-ups has increased annually since 2011. We develop support for social risk management to help prevent such incidents in three phases, which are: "Survey, analysis, and system building," in which we gain an understanding of potential risks and business improvements and decide rules; "Operations," in which we perform early detection of emergent risks and rapid initial response; and "Countermeasures," in which we support mitigation of such risks.

The "Survey, analysis, and system building" service involves collection and analysis of information on the Internet regarding the enterprise and its products and services, which we deliver as a report. We also provide a marketing analysis through comparison with competition and information collected regarding leaks, events and incidents occurring overseas. We first collect all articles on the Web related to our client enterprise. These are placed in categories such as positive or negative, according to pre-determined conditions. We also expose potential risks and issues like the detailed reputation of products and analyze future initiatives. These are also summarized in a report. We can also create operating regulations and manuals necessary for introducing a new, public SNS presence, or if social media policies were created several years earlier and are no longer suited to current conditions, we can support revising them and provide other follow-up on the organizational structure of SNS operations.

The main activity during the "Operations" phase is Web risk monitoring. We monitor the Internet 24 hours-a-day and 365 days-a-year for information including rumors regarding the enterprise or its products or services, risk of information leak due to the company's employees, and other particulars such as risk related to malvertising, pharmaceutical products or consumer protection. If urgent information is detected, we also consult regarding urgent notifications and how to deal with them.

For the final phase, "Countermeasures," we provide our Web Risk Monitoring clients with dedicated consultants, who seamlessly conduct a risk assessment for the matter when a risk is detected. The content that precipitated the crisis is analyzed for credibility and potential effect, and a profile of the source is prepared. For escalation after risk is detected, we can even provide support for crisis management public relations as needed, create press releases, train for press interviews and provide advice on handling the situation going forward. If the crisis grows, we also

provide consulting services to handle public relations for crisis management. To deal with search engine reputation, we can identify issues with how the enterprise, its products or services, are viewed on search engines, which is an important factor in forming reputation and users' brand experience. We also plan strategies to solve issues and achieve objectives, and design KPIs.

We now discuss some examples of enterprises that have introduced Web Risk Monitoring. Food products company, A Inc., was concerned that they would be associated with a flare-up on SNS regarding the food-products industry in 2016. They decided to use Eltes Web Risk Monitoring based on our "24 hour-a-day, 365 days-a-year risk detection system," and our "ability to provide rapid contact with dedicated staff." That is, the fact that we have been able to implement effective risk monitoring, and that human staff use their intuition in interpreting subtleties in posts regarding the company as they appear each day and in making decisions. Our monitoring service can also support matters other than risk, and not only when negative incidents occur. An example is collecting information regarding reactions after a commercial is broadcast.

Web Risk Monitoring is not limited to monitoring SNS regarding a company's products or promotional activities. Company B in the service industry uses it to detect potentially risky posts on SNS, but also to gather positive feedback from customers regarding service provision, which it uses internally to give recognition and commendations.

In addition to the Social Risk Management service we have been discussing, Eltes also has initiatives for enterprise digital risk counter measures, with two approaches to Internal Risk management. These involve cross-sectional analysis of logs, and analysis of behavior to detect internal behavioral risk.

4. Advanced flame-up/rumor damage control using AI

Eltes is introducing AI to our Web Risk Monitoring Service to improve quality. However, we are not depending entirely on AI. We hope to improve both service quality and efficiency by integrating the strengths of both AI and human operators. As such, we first used AI to implement a mechanism that classifies posts as either negative, neutral, or positive for our Web Risk Monitoring service, as a measure against flare-ups and rumors on the Internet. However, we had three main problems with this effort.

(1) A large amount of correct training data was needed to obtain correct classifications from the AI.
(2) Popular words and phrases come and go, so updates (maintenance) are necessary.
(3) Interpreting the meaning correctly from the text and context is very difficult.

To solve problem (1) we began work creating training data for an AI to classify posts as negative, neutral, or positive, based on the data that we had been collecting continuously since the Web Risk Monitoring Service began in 2011. To create the training data, we had to indicate which posts were obviously negative, or positive, but we found that even for the same post, there are cases when this decision would be different depending on the type of business or industry, so deciding what was "obvious" was not easy. It was relatively easy to collect posts that are "obviously" neutral, but it was much more difficult than we expected to prepare a large number of posts that were negative or positive. Our long experience providing services contributed greatly to creating enough high-quality training data.

For problem (2), that popular words and phrases come and go, we designed a solution involving human intervention. For example, use of the Japanese word, "ataoka" to mean "someone with a screw loose" became generally popular after being used by a comedian, and won 1st prize in the Insta-Buzzword awards announced by Petrel Inc. in the first half of 2019. Until several years ago, "ataoka" was not a recognized word, and that might be why the AI did not classify it as negative. Thus, there are trends in the language used on SNS, and such changes in language must be reflected constantly in the training data used by the AI to classify negative and positive posts. To handle this, we are using human sensitivities to capture the meaning and sense of words, and reflecting this accurately in our training data.

Finally, problem (3), correctly interpreting meaning from text and context, is difficult for AIs. Morphological analysis divides the text into small units to extract the meaning, but even a particle can completely change the meaning, so it is very difficult. For example, the phrase, "I like B better than A," in a post comparing two companies' products tends to be difficult to classify as negative, neural, or positive. Considering that currently AIs also have difficulty with posts that contain positive words but are negative (such as "I always wanted to go to that store, but unfortunately could not"), and posts that contain unusual expressions, we have these posts classified by people.

5. Eltes optimized digital risk countermeasure solution

The value of the Web Risk Monitoring Service is early

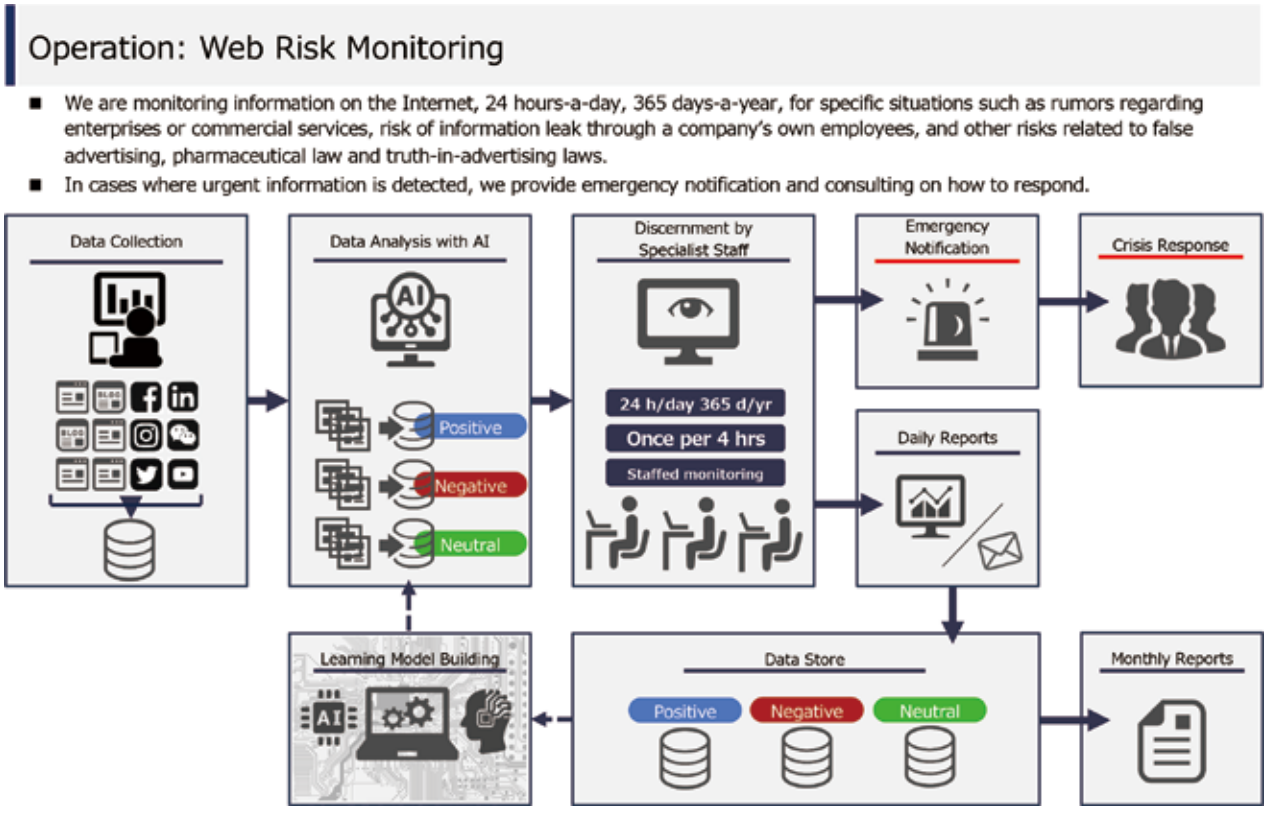
detection of posts that pose a risk. Put another way, negative posts will not go unnoticed. Although 80 to 90% of posts were classified as neutral even before AI was introduced, the problem remains that it is very difficult to interpret the meaning correctly from the text and context, and we found that it is difficult to leave Web Risk Monitoring entirely to the AI. As such, we created a workflow giving the role of screening for neutral posts to the AI, excluding posts that could be negative and are difficult for the AI, such as when the meaning is difficult to interpret from the text and context, and when they contain a mix of positive and negative words. Such posts are handled by a dedicated staff member.

As a result, our human staff concentrate on subtle posts on the Internet that may involve our client and be related to flare-ups or rumors. Thus, we have built an environment in which human error is reduced and we can detect flare-ups and issue urgent notifications quickly, improving the quality of the service. We are also able to use positive and negative data judged by our human staff to train the AI, incorporating information about language trends and improving the accuracy of AI results.

The same post can have widely varying effect on the reputation of an enterprise, depending on the enterprise in question and trends in society. In addition to sending urgent notifications regarding posts that indicate risk to an enterprise, we also offer dedicated consultants that can support the enterprise in its initial response.

It is difficult to judge the effects on real society, of what is superficially just numbers and text in digital space. Distortions emerge in digital space due to the actions of people, and Eltes is fighting against the resulting digital risk. We are using our expertise to combine the strengths of both people and AI, and will continue the fight against digital risk as it continues to change.

Figure: Eltes Co. Ltd. "Web Risk Monitoring Service" Overview.
24 hour-a-day, 365 days-a-year monitoring of posts for various types of incident, crisis notification and consultation to deal with them when posts including risky content are detected.



FY2020 APT Workshop

— Development of fundamental network planning skills for E-application in regional community to bridge the digital divide —

International Cooperation Department
The ITU Association of Japan

As part of the human resource support programs operated by the Asia Pacific Telecommunity (APT), APT has been holding workshops to transfer Japanese technologies and services to business people and technologists in APT member countries, with funding from the Japanese government. The ITU Association of Japan has held workshops within these programs in an effort to reduce the digital gap for developing countries since 2017, such as introducing configuration of mobile phone base stations.

During the last fiscal year, a workshop was held on-line for the two weeks from November 30 to December 11, 2020, over nine days*1. The workshop was held online for the first time due to the Covid-19 pandemic. As such, classes were kept short, to two or three hours per day, to allow trainees time to concentrate efficiently on online lectures. The trainees included nine members from the six countries of Bhutan, Iran, Malaysia, Mongolia, Palau and Thailand.

The three objectives of the workshop program were as follows.

(1) To understand the issues in the participant's own country and to learn how to draft a concrete plan to overcome the digital gap in areas of the country.
(2) To understand the importance of having clear government policies regarding construction of networks.
(3) To acquire skills for proposing and evaluating solutions for the various issues in the participant's country, through presentations and discussion.

We provided support to participants in achieving these objectives.

On the first day of the workshop, each trainee gave a presentation of current conditions in pre-selected regions in each of their countries. They presented conditions resulting in the digital gap, including population and geographical conditions in each region and what sort of gap is occurring. Current conditions in Japan were presented by ITU-AJ Secretary General, Kazuhiko Tanaka. After the presentations, participants talked, asking and answering questions. This allowed them to gain a deeper understanding of conditions in each of their countries.

On the second and following days, lectures were given by Takuzou Fujii, formerly of Hitachi Kokusai Electric Inc., on concrete network configuration methods for resolving various issues, and drills were given for participants to learn through practice. Participants analyzed geographical conditions in various regions, studied ways to design networks suited for the regions, and ways to prepare the ICT services and environment that would be needed in each region.

On the fifth day, a lecture on the current state of 5G technology in Japan was given by NTT DOCOMO, one of the top telecommunications companies in Japan and the world.

On the last day, each person proposed solutions for issues they had presented on the first day. Participants presented an action plan for how the digital gap could be filled in, applying the skills they had learned in the workshop, considering the equipment and functionality to be used, maintenance approaches and the costs involved. After the presentations, participants discussed the proposals, exchanging ideas.

A notable aspect of this year's workshop was online group discussions. Previously, participants have come to Japan

Figure 1: Group photo 1

Figure 2: Group photo 2

*1 The weekdays, with one day off.

and participated face-to-face, but this year it was done fully on-line, and designed to utilize active learning (an approach in which students learn proactively rather than passively) throughout.

Figure 3: NTT_DOCOMO lecture

More concretely, participants studied beforehand, reading the text and doing exercises through e-learning, and then the on-line classes focused on question-and-answer and discussion. In this way, they were able to approach issues proactively and experientially.

We also utilized the breakout-room feature of the Zoom Web-meeting tool to divide participants into small groups, giving them a lot of time to share and discuss homework practice exercises with each other. Although these group discussions were on-line*2, there was extremely lively exchange of ideas. Through this daily routine, although they did not meet directly, the participants seemed to form a tight-knit group, accepting each others' differences.

The post-workshop survey indicated a high level of satisfaction, with almost all participants answering that the workshop was successful. We expect to conduct more APT workshops on-line in the future, so we hope to further increase the value of the training, incorporating results from this year so that it will be even more meaningful in the years to come.

Figure 4: Presentation 1 after practice

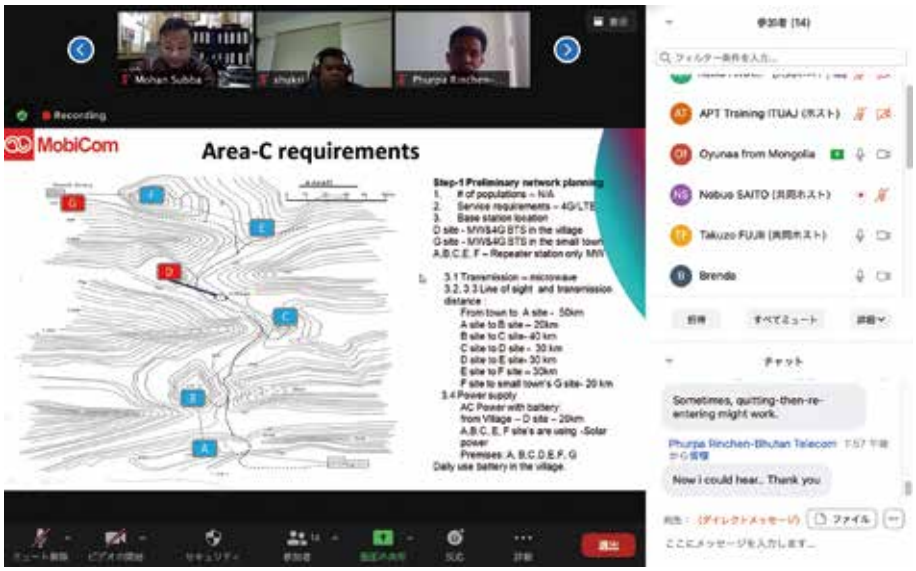
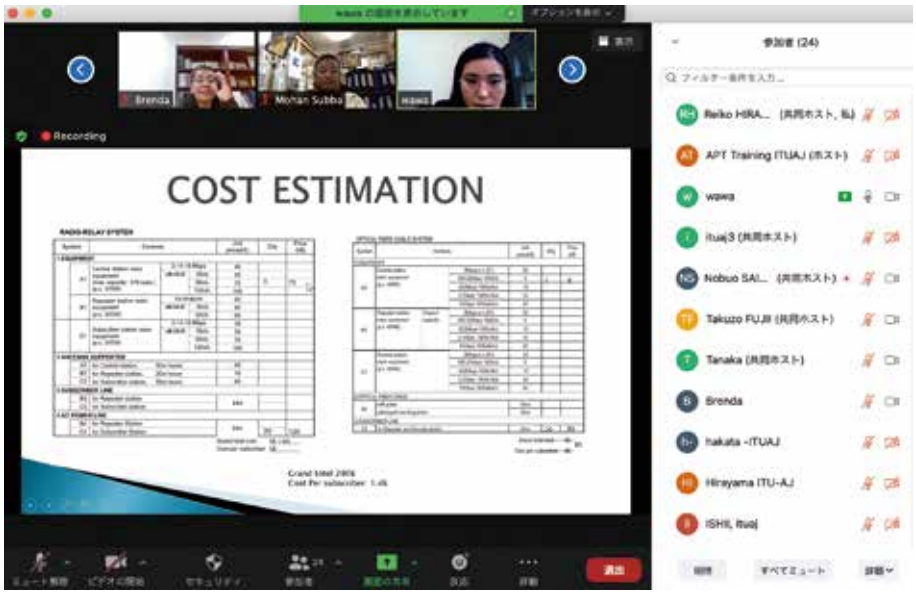


Figure 5: Presentation 2 after practice



*2 Or possibly ***because*** they were on-line. We want to explore this issue further.

= A Serial Introduction Part 2 = Winners of ITU-AJ Encouragement Awards 2020

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.

Morihiro Sakakibara
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Fields of activity: ICT Projects in Education

International Cooperation to Improve University Education in Myanmar

It is a great honor to be recognized with this ITU Association of Japan Encouragement Award. I would like to offer sincere thanks to the ITU-AJ and all those involved.

From FY2014 into FY2017, through a special contribution from the Japanese Government and multiple Asia-Pacific Telecommunity (APT) pilot projects operated in Myanmar to eliminate the digital divide, education and research cloud servers were installed at the University of Information Technology (UIT) in Yangon and a cloud network was built, which several IT universities could use through Internet VPN networks. As a result of participating in these projects, and even after they finished, I have been working with government and university-related people in Myanmar to promote the following three main policies, to expand cloud networks and build environments to promote their use.

The first was to add four more cloud servers, distributing the load among the major computer and technological universities, compensating for increasing load as more universities use them in the future. The second was to hold workshops in collaboration with APNIC (the organization managing IP addresses in the Asia-Pacific region) starting in FY2018, to improve networking technology used by university professors. The third was to give students an opportunity to improve their programming and development, planning and English presentation skills, and to hold application contests starting in FY2017 for all 46 universities under the Education Ministry that have IT-related faculties.

I learned many things through frequent visits to the area, asking about their needs, seeing, hearing, contacting, and understanding again and again. The process of solving such problems takes time and effort, but the joy of accomplishing them is very special. I hope to continue working with the people there in the future.

Hiroshi Dempo
NEC Corporation
hiroshidempo@nec.com https://www.nec.com/
Fields of activity: Network Function Virtualization

Contributions to NFV Standardization Activities

It is my great pleasure to receive this Encouragement Award from the ITU Association of Japan. I believe that it is a result of collaborative effort with people involved and I would like to offer my sincere thanks to them.

ETSI-NFV was established in 2012 to standardize virtualisation of network functions, and is a place where many technical organizations share their experiences. The NFV architecture designed at the birth of the community has frequently been referenced by many standardization organizations, and NFV deployments compliant with the standards can also be seen in service providers' production environments. It has been a valuable experience to be involved with the innovation process, from recognizing new technical value to popularizing them in the market.

My main achievements can be seen in the area of network infrastructure. I contributed to technical documents describing a collection of use cases and architecture, in which multiple NFV environments are interconnected over wide area networks. I also contributed to Interoperability test reports in ETSI-NFV and Optical Internetworking Forum, providing verification of interactions between NFV and network infrastructure based on Transport SDN API specifications. These experiences led me to further recognize that devices from different vendors can be managed without vendor-specific knowledge, which clearly highlights awareness of the significance of technical standards. Moving on with my involvements I became newly motivated to work on data modeling for NFV resources as an ETSI-NFV rapporteur. The achievements have been reflected in a specification on the ETSI-NFV portal.

Encouraged by this award from the ITU Association of Japan, I hope to continue contributing to 5G/ 6G technologies and the computers and communications industry.

通巻百三十一号

The ITU Association of Japan

定価　一冊　一、六五〇円（本体価格　一、五〇〇円、消費税　一五〇円）　年間購読料　六、六〇〇円（本体価格　六、〇〇〇円、消費税　六〇〇円）