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Special Feature

At the Frontline of Digital Transformation

Initiatives to Expand Business Through DX

SMKL (Smart Manufacturing Kaizen Level) for Smart Manufacturing Transformation

Addressing Community Infrastructure Issues with International Standards

Establishing New Workstyles Through DX — NEC Digital Workplace —

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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.

Initiatives to Expand Business Through DX

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Advanced Development Center, Engineering Division
& Solution Integration SE Department
OKI Electric Industry Co., Ltd.

Initiatives toward digital transformation (DX) are currently attracting wide attention in Japan and abroad. DX has been variously explained by various entities. In Japan, the Guidelines for Promoting Digital Transformation[*1] published by the Ministry of Economy, Trade and Industry in 2018 define DX as follows.

"Companies leveraging data and digital technology to transform products, services and business models based on customer and social needs, as well as transforming business, organizations, processes, and corporate culture to establish competitive advantage, in response to the drastic changes in business environment."

According to this definition, DX is an activity that establishes competitive advantage through the use of data and digital technology, and is premised on the transformation of business models. It also calls for the transformation of the business itself, the organization, the processes, and the corporate culture.

This article provides an overview of OKI's initiatives to expand business through DX, including some examples.

1. Promoting DX

Figure 1 shows the relationship between the progress of digitization and DX as envisioned by OKI. On the basis of digitization through the digitization of data, we will aim to achieve digitalization aimed at transforming business models, from digitization of business processes. DX is an activity aimed at the wide social implementation of these transformations. Behind the progress of digitization are the diversification of business models, the shift from entity-oriented consumption to situation-oriented consumption, the aging of various infrastructures, and the labor shortage. We are envisioning the deployment of IoT, AI, cloud, 5G, and Local 5G as digital technologies to bring about DX.

OKI is promoting DX with the goal of doubling sales in the DX domain in FY2022 compared to FY2019 and laying the foundation for business expansion through DX in FY2023 and beyond. The main strategies for our DX activities are as follows.

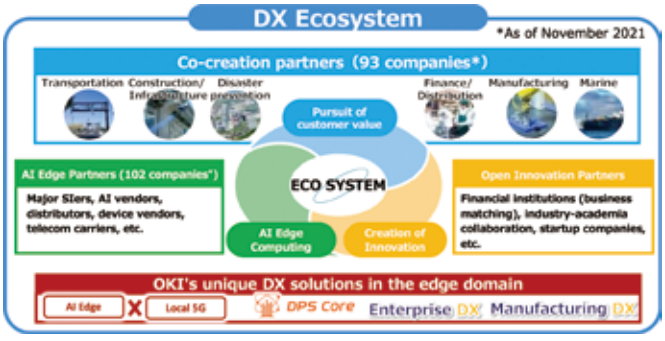
- External strengthening: Entering new markets through AI edge strategies, reinforcing the creation of new solutions, and enhancing existing solutions through IT modernization
- Internal strengthening: Nurturing human resources through organizational reforms, strengthening innovation capabilities, and improving productivity through business process reforms.

We believe these strategies can be applied to all companies promoting DX.

From these strategies, I will introduce the ecosystem initiatives that are being implemented as external activities. OKI leverages its technological strengths in AI edge and its relationships with co-creation partners, AI edge partners, and open innovation partners in various fields to promote the social implementation and business expansion of DX through OKI's unique DX solutions in the edge domain. We consider this as our DX ecosystem, as shown in Figure 2. As of November 2021, we have 93 co-creation partner companies and 102 AI edge partner companies.

Figure 1: Progress of digitization and DX

Figure 2: Figure 2. DX Ecosystem



*1 https://www.meti.go.jp/policy/it_policy/investment/dgc/dgc.html
(Guidelines for Promoting Digital Transformation was succeeded to the Digital Governance Code 2.0 with the Digital Governance Code in 2022)

In July 2021, OKI was certified as a Digital-Transformation-Certified Operator by the Ministry of Economy, Trade and Industry, acknowledging it as a DX-ready company that is poised to achieve new growth in the Society 5.0 era. The Digital Transformation certification system is a system under which the government certifies companies that comply with the basic requirements of the Digital Governance Code[*2] based on the Act on Facilitation of Information Processing. The certification was granted in recognition of our group-wide efforts for digital transformation and information dissemination, including the unique innovation activities based on the Medium-Term Business Plan 2022 and the shift to smart factories. Figure 3 shows the process for acquiring certification as a DX-Certified Operator. It also shows an overview of OKI's initiatives as a Digital-Transformation-Certified Operator.

Figure 3: Acquisition of certification as Digital-Transformation-Certified Operator

2. DX Domains

Figure 4 shows the DX domains that the Solution Systems Business Group is engaged in. Our activities are organized into three domains: public solutions, enterprise solutions, and platforms. Under these, the company aims to establish competitive advantage particularly in transportation, disaster prevention, construction/infrastructure, marine, finance, distribution, and manufacturing, as the focus areas. Going forward, we plan to further expand these DX domains by entering new markets and creating new solutions.

As a concrete example of DX, I will introduce our initiatives in smart factories. Figure 5 shows an example of Virtual One Factory initiatives. Each factory had been individually optimized to produce equipment in a specific domain. However, in response to the recent changes in the supply chain, such as the need for business continuity during disasters and pandemics and for responding to demand variability due to economic fluctuations, etc., it has become imperative to construct an optimal production system as a whole, wherein individual factories can complement each other. Therefore, taking this as an opportunity to address the aging of the system as well, we are working to create smart factories that operate collectively and virtually as "One Factory."

Figure 6 shows an example of our manufacturing DX initiatives. Shown is a new production process for implementing the virtual One Factory. The factory edge platform utilizes IoT and AI to digitalize on-site data in order to digitalize the know-how of skilled engineers and improve productivity and quality.

Figure 4: Domains for DX initiatives in the solution system business

*2 https://www.meti.go.jp/policy/it_policy/investment/dx-nintei/dx-nintei.html
*3 VICS is a registered trademark of the Vehicle Information and Communication System Center.

Figure 5: Example of Virtual One Factory initiatives

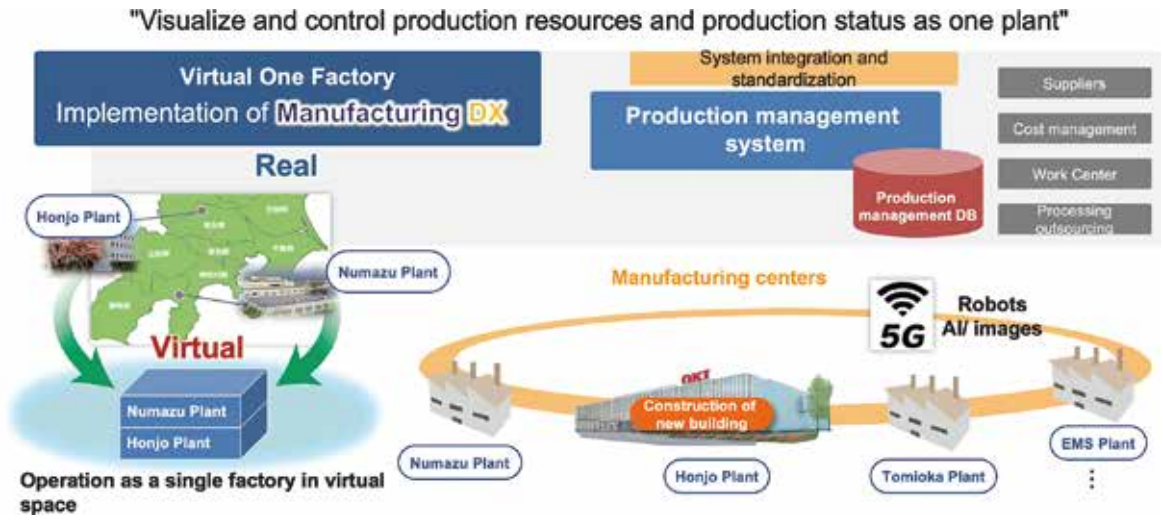
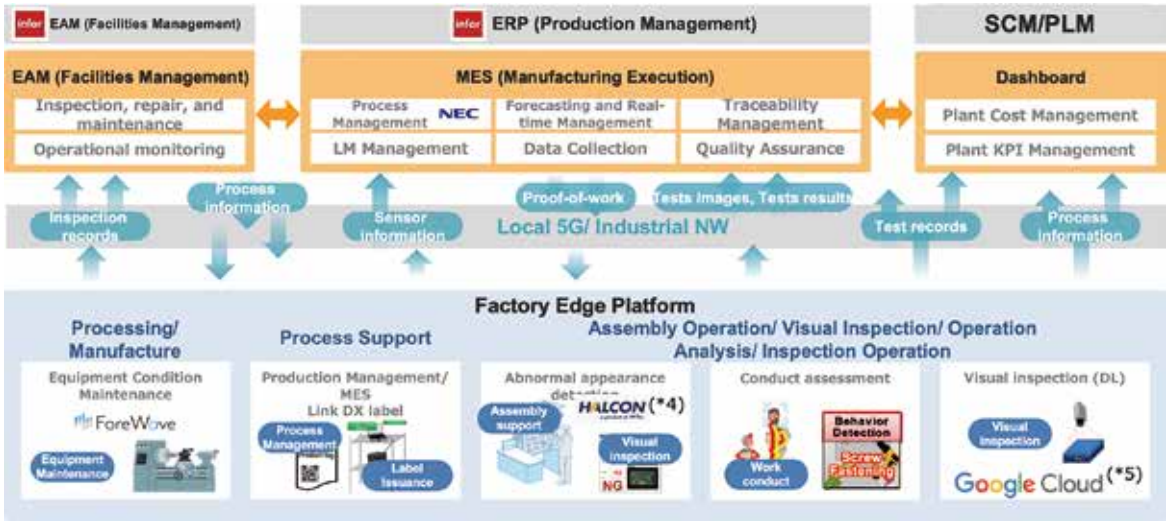


Figure 6: Example of Manufacturing DX initiatives



Also, using advanced networks such as Local 5G will make it possible to flexibly construct production lines for high-mix manufacturing and to visualize production status through high-security and high-speed transfer of image processing data. Going forward, we will deploy solutions for smart factories based on success stories of our manufacturing industry process reforms.

OKI constructed a new building at its Honjo Plant as the first step toward making its factories smarter. In the new building, which was completed in July 2022, IoT/AI and local 5G were introduced to the production and assembly sites to digitally visualize on-site data and know-how and improve productivity, quality, and technical capabilities. In addition to making the production system smarter, the company is also working on creating a Zero Energy Factory (ZEF) with the aim of making the entire factory smarter and environment friendly. We aim to reduce energy consumption not only in the office buildings but also in the entire factory, including the production facilities.

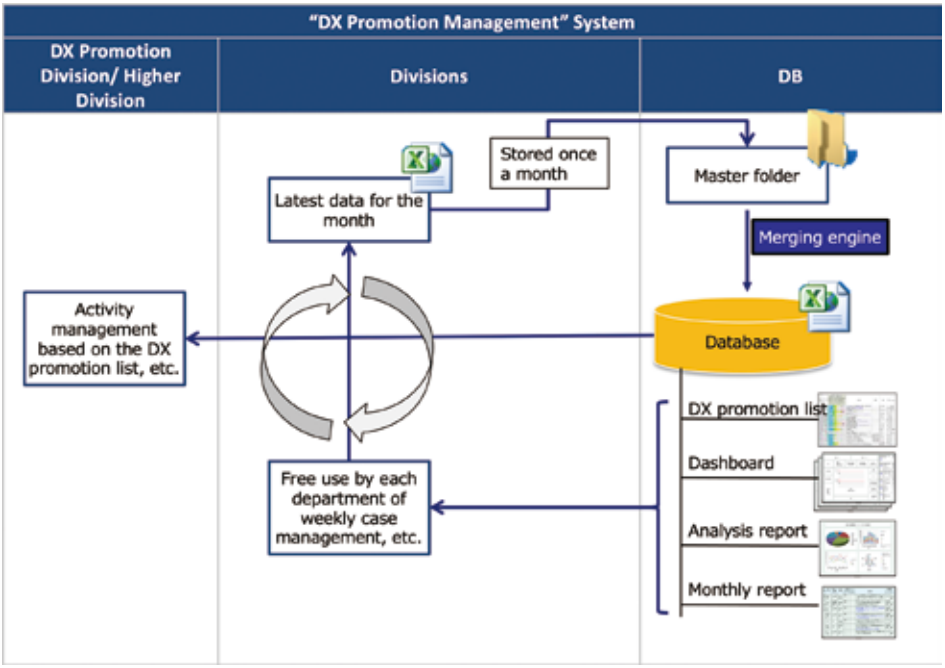
3. DX promotion management

We have set up a DX Expansion Task Force within the Business Group to manage DX promotion activities, while sharing information and coordinating activities with other departments within the company (Marketing & Sales Group and Innovation Promotion Center). Figure 7 shows the management of DX promotion.

For the management of DX promotion, a common format

*4 Halcon is a registered trademark of MVTec Software GmbH.
*5 Google Cloud is a trademark or registered trademark of Google LLC in the U.S and other countries.

Figure 7: Management of DX promotion



is specified as the "dashboard" for the management of activity information, and a method is being tried to manage data created and updated by each business division into a database. Constructing a database in a common format enables flexible analysis of activities. Also, the centralized management of the database facilitates information sharing between departments, leading to the creation of new solutions through cooperation between departments. Likewise, this management approach is expected to lead to operational and cultural reforms in each division.

We believe that DX is almost synonymous with digital innovation, and efforts to expand DX are equivalent to initiatives aimed at innovation using digital technology. In this management approach, we have adopted the five innovation processes of "identification of opportunities," "creation of concept," "proof of concept," "development of solutions," and "introduction of solutions" into a process management that is linked to the innovation management system (IMS), which we have been implementing across the entire company since 2017. These activities are aimed at the full-scale introduction of ISO56002. OKI's "Yume Pro" IMS, which is ahead of ISO56002, focuses on the social issues raised in the SDGs, and will be used to reform the above-mentioned business processes and business models[*6].

4. Future initiatives

Above I have introduced initiatives for business expansion through DX, the key points of which are "innovation activities," "co-creation partnership," and "expansion of DX domains." As the two pillars of the expansion of our DX business, the company plans to "enter new markets/create new solutions" and "strengthen existing solutions" through external strengthening such as by ensuring competitive advantage through the use of digital technology and by reforming business models. The company also plans to carry out internal strengthening through transformation of business processes, organizations, and corporate culture.

In addition, we will actively disseminate information to expand our DX business, focusing on introducing DX case studies and co-creation cases, and on online promotion. Figure 8 shows an overview of the AI Edge Conference & Solutions Contest held in December 2021. The event is a competition of ideas and technologies to solve social issues in various industries using OKI's AI edge computer "AE2100," and is one of the company's initiatives aimed at business expansion through DX.

Figure 8: AI Edge Conference & Solutions Contest

*6 https://www.oki.com/jp/press/2020/12/z20092.html

SMKL (Smart Manufacturing Kaizen Level) for Smart Manufacturing Transformation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1. Introduction

The trend toward digital transformation has been gaining momentum in recent years, and smart factories implemented by the Industrial Internet of Things (IIoT) are attracting attention for their importance to digital transformation in the manufacturing industry.

Using various kinds of information in digital form enables smart factories to make the interconnections among manufacturing processes smarter and optimize the value chain. Although many companies are aware of the enormous value that smart factories can create, surprisingly few are making steady progress toward smarter factories.

However, there are many challenges in the path toward smart factories, including advanced automation, software-based management, and the establishment of platform-based ecosystems. It is thus necessary to deploy IIoT technologies to appropriate places in manufacturing and coordinate them to ensure a reasonable return on investment (ROI) while achieving continuous improvement.

Given that situation, companies are seeking methods for evaluating current ongoing IIoT initiatives and methods for continuous optimization based on Plan Do Check Action (PDCA) and return on investment (ROI). We also believe that it is essential for companies to understand the maturity level of IIoT.

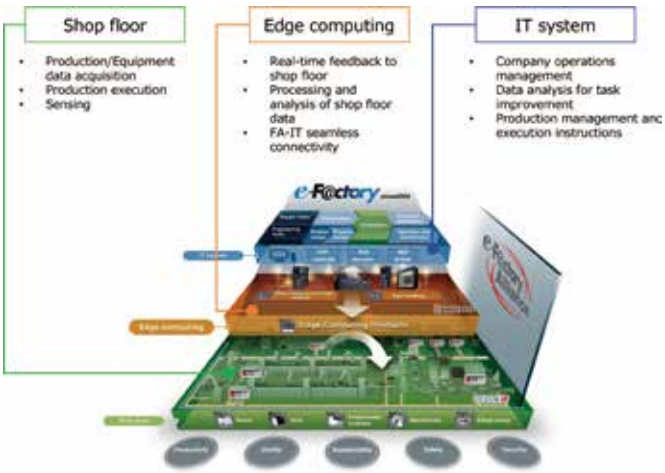
To address those issues, we position maturity assessment as an important approach for companies in the promotion of IIoT and define a path to establishing smart factories using maturity assessment.

2. Maximal use of digitalization in smart factories

IIoT will have application in all aspects of the manufacturing world opened up by digital technology. The move towards smart factories has begun; big data collected from shop floors is being used to improve the productivity and quality of facilities and work, and digital technology is being used to link supply and engineering chains.

To cope with such changes, the e-F@ctory (Figure 1) provides an integrated factory automation (FA) solution that supports total cost reduction across the supply chain and engineering chain and improving its corporate value by handling flexible manufacturing through coordination of workers, machines, and IT toward the objectives of implementing and optimizing smart factories, beginning with the shop floor. The e-F@ctory provides a product lineup for linking the shop floor and the IT system to enable seamless networking from the FA side to the IT side and promote optimization based on the level of maturity of the shop floor and analysis of big data.

Figure 1: The e-F@ctory Integrated FA solution



3. Smart factory that enables continuous optimization

The smart factories based on the e-F@ctory solution that we have seen so far are multidimensional, comprising a combination of many IIoT technologies. For example, bringing together multiple innovative technologies, such as big data analysis, artificial intelligence, and robotics, provides the perfect means of optimizing the value chain.

While a smart factory is a very complex endeavor, it is a prime motivator of business success by creating new value. Here, companies need to answer "what," "when," "how cost effectively," and "to what level" questions as they move forward in their smart factory journey. Companies also need to visualize the maturity level of IIoT adoption and use that as a basis for determining ROI.

SMKL (Smart Manufacturing Kaizen Level) evaluates the level of maturity of IIoT using Key Performance Indicators (KPI) specified by the ISO 22400 international standard and identifies problems and plans for optimization for individual companies. It also indicates the ROI of improvement proposals and goes into means of promoting step-by-step progress toward smart factories

to achieve continuous optimization.

3.1 Definition of SMKL

SMKL (Smart Manufacturing Kaizen Level) is a simple assessment of IIoT maturity based on a matrix of five levels of maturity and four levels of management (Figure 2). The maturity levels are data collection, visualization, analysis, optimization, and prediction (Table 1). The management levels for discrete manufacturing are defined as installation and workers, workshop, factory, and supply chain (Figure 3).

Figure 2: Definition of SMKL

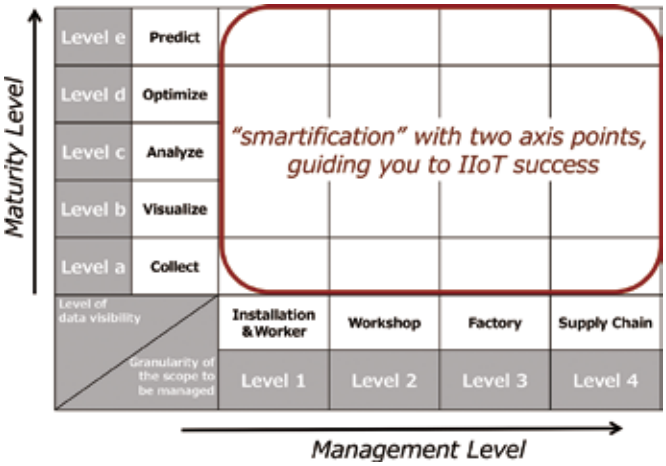
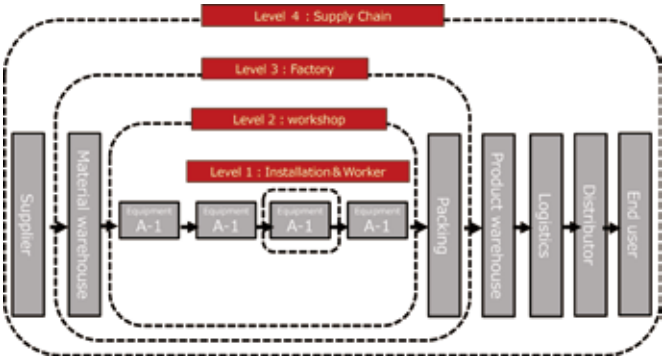


Figure 3: Management levels



3.2 Application of SMKL

The steps of using SMKL are illustrated in Figure 4. In the first step, the KPIs are selected according to the management targets which are set by the SMKL users (managers, production managers, workers, etc.). Then, the KPIs are used to determine the current SMKL ("current point" in Figure 4) and the differences between the current values and the target values in the SMKL matrix are denoted. Possible implementation procedures for achieving the targets are also confirmed. Next, ROI is used to determine the feasibility of each implementation, and appropriate targets and implementation procedures are set (Figure 4). Afterwards, the details of the implementation procedures are checked by the stakeholders (such as factory

Table 1: Maturity levels

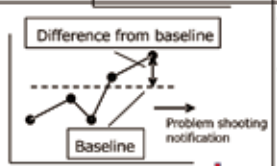
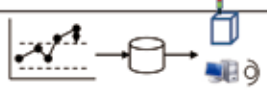
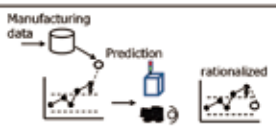
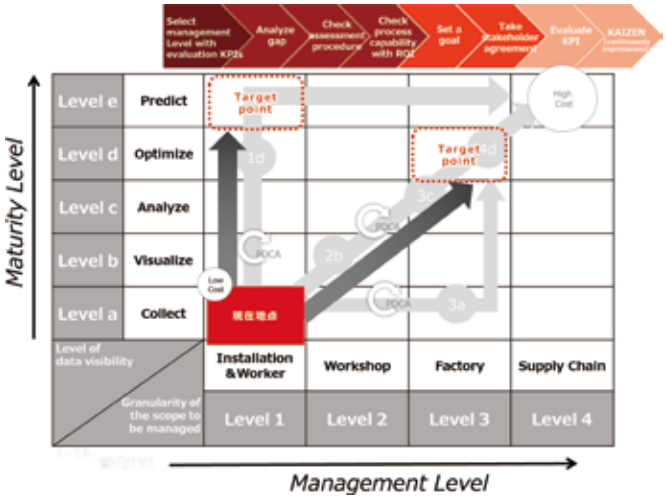
Maturity Level	Description		Example
Level a Collect	Manufacturing data, installation or work status are collected and stored in an electrical way automatically or manually with simple input action.		·Database ·CSV file
Level b Visualize	Charts or tables are automatically generated based on collected and/or stored manufacturing data along with management objective.		·List description ·Graph description (histogram, trend etc.)
Level c Analyze	Charts and tables describing the comparison of a target performance with as-is status with variance are automatically generated according to the maturity level. For example, manually analytics at worker can be exempted.		·Manufacturing operation management ·Trouble handling
Level d Optimize	KAIZEN instrument is automatically feedback to management objectives to solve the performance difference that specified in maturity level.		·AI powered KAIZEN
Level e Predict	Manufacturing data is automatically categorized with analytics that make predictions about future outcomes. Based on the prediction, management objective can be integrated and rationalized overall.		·Equipment predictive maintenance ·Manufacturing operation simulation based on equipment allocation ratio

Figure 4: SMKL application



managers, production managers, etc.) and a consensus decision is reached. In the final step, the SMKL target levels ("target points" in Figure 4) are achieved by continuous optimization based on SMKL assessment.

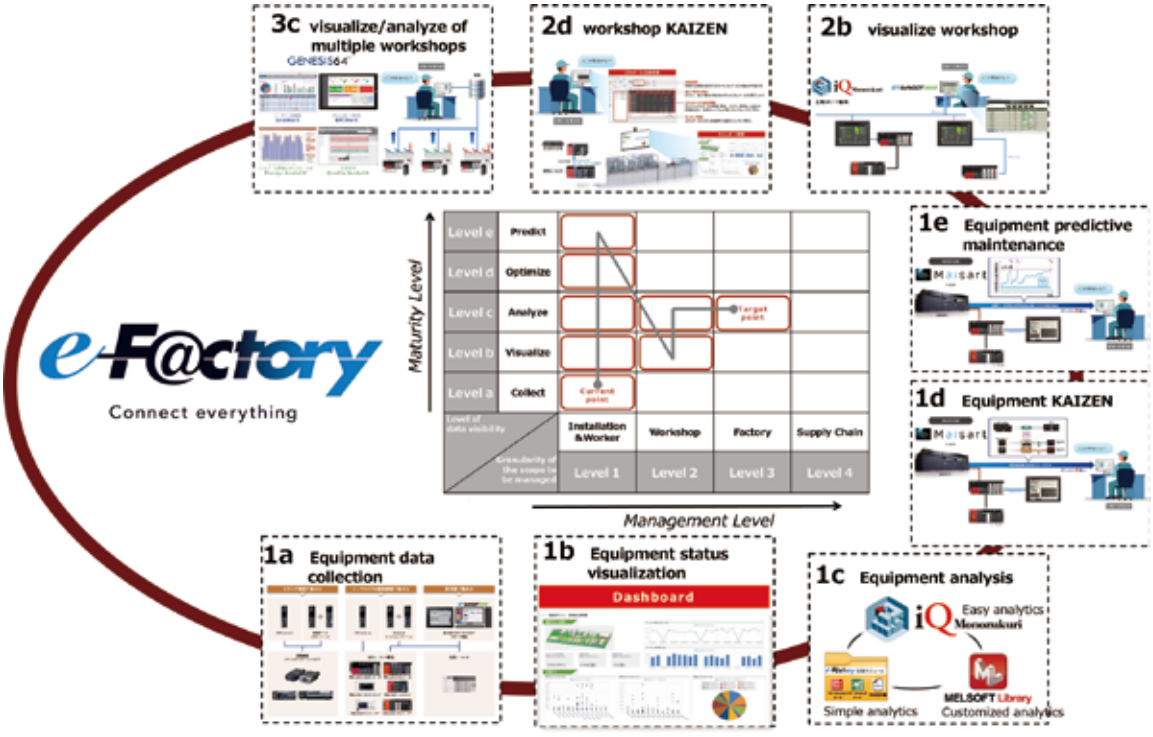
SMKL can be used to promote adoption of IIoT by individual companies and assess the direction of adoption to enable continuous investment decisions. Doing so will enable implementation of the right IIoT products at the right time, promising faster and more effective optimization compared to conventional approaches.

4. Case study

The effort towards carbon neutrality in manufacturing has become increasingly important in recent years. The 2021 White Paper on Manufacturing raises an urgent need for a transition to green manufacturing by introducing digital technology. As a means of promoting energy conservation by improvements in operations, achieving energy efficiency and efficiency in the optimization cycle through energy management and use of IIoT, and integrated control technologies for production management and energy management have been attracting attention. However, a problem for the executives of many manufacturing companies is the difficulty in making investment decisions for lack of knowledge of their current level of energy management and what solutions are appropriate for improvement. Here, we provide an example of applying e-F@ctory for energy management and describe how optimization using SMKL achieves energy conservation.

As a means of promoting energy conservation by operational optimization using IIoT, we are taking a step forward in the evolution from conventional optimization of individual facilities in a factory toward overall optimization of the entire factory as an integrated system of linked facilities. Accordingly, the

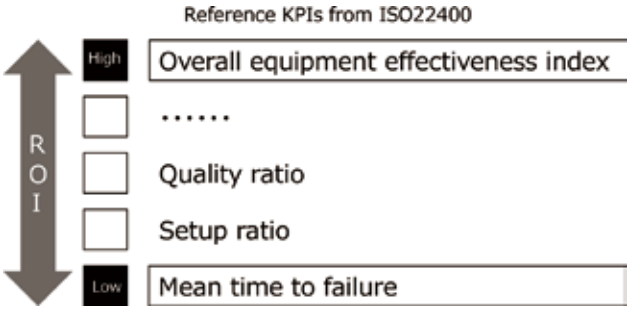
Figure 5: SMKL example application: Assessment of energy conservation (specific energy consumption)



assessment example of using SMKL shown in Figure 5 targets three management levels: Installation & Worker, Workshop, and Factory. Each management level is assessed for all maturity levels from Collection (Level a) to Prediction (Level e). After completing the Level e assessment for Installation & Worker, the visualization and analysis steps for a Workshop and Factory are easily accomplished. The assessment criteria and examples of the related IIoT technology for each SMKL in this case study are listed in Table 2.

Specific energy intensity is a widely used KPI for energy conservation. The machine availability rate is also an important assessment point. Differences in cost effectiveness associated with choice of KPI related to specific energy are presented in Figure 6. Factory managers can begin with KPI that have high cost effectiveness with the objective of achieving a future energy-efficient smart factory through adoption of IIoT and stepwise improvement of SMKL. Machine designers can refer to the selected KPI to determine the current SMKL. The upgrading criteria indicated by SMKL can also be considered in decisions on improving existing facilities and introducing new facilities. Production managers can use the defined managed items and management target levels in the execution of PDCA (Plan-Do-Check-Act) cycles to achieve their goals.

Figure 6: SMKL example application: KPI used in assessment of specific energy consumption

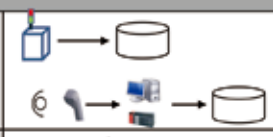
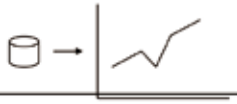
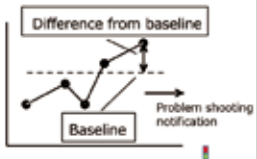
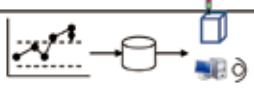
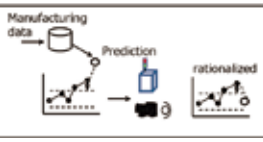


5. Conclusion

IIoT initiatives that are appropriately tailored to the business of the individual company are essential to achieving a smart factory. Data-driven IIoT requires collection of various types of data from the shop floor, and digital transformation of the entire supply chain and engineering chain requires a high level of investment and time before optimization is actually achieved. Nevertheless, the SMKL described in this paper can be used to guide the promotion of IIoT in companies, so acceleration in achieving smart factories can be expected.

To further invigorate the future IIoT market, we will also work on openness and international standardization at the IAF (Industrial Automation Forum) and promote development of products and solutions that can be mapped to the SMKL matrix with the objective of contributing to the digital transformation of the customer's organization and global development of the IIoT market.

Table 2: SMKL example application: Criteria used in assessment of specific energy consumption

Maturity Level	Description		Example
Level a Collect	Manufacturing data, installation or work status are collected and stored in an electrical way automatically or manually with simple input action.		·Database ·CSV file
Level b Visualize	Charts or tables are automatically generated based on collected and/or stored manufacturing data along with management objective.		·List description ·Graph description (histogram, trend etc.)
Level c Analyze	Charts and tables describing the comparison of a target performance with as-is status with variance are automatically generated according to the maturity level. For example, manually analytics at worker can be exempted.		·Manufacturing operation management ·Trouble handling
Level d Optimize	KAIZEN instrument is automatically feedback to management objectives to solve the performance difference that specified in maturity level.		·AI powered KAIZEN
Level e Predict	Manufacturing data is automatically categorized with analytics that make predictions about future outcomes. Based on the prediction, management objective can be integrated and rationalized overall.		·Equipment predictive maintenance ·Manufacturing operation simulation based on equipment allocation ratio

Addressing Community Infrastructure Issues with International Standards

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1. Introduction

As a tool for creating and expanding markets, international standards have a certain enforcement power as well as the power to enable "rules changes" for resolving social issues. Examples include domestic laws that are linked to international standards and the Technical Barriers to Trade (TBT) Agreement[1] of the World Trade Organization (WTO). The setting of indicators for evaluating services specified by international standards and the procurement requirements that are conditioned on those indicators can also serve as a form of enforcement of rules changes.

In line with promoting digital transformation (DX), Fujitsu is moving forward with the smart city concept as a digital means of resolving community issues. In contrast to conventional 'hard' approaches such as widening roads to reduce congestion, the smart community represents digital approaches, such as using ICT technology to construct a regional transportation system that offers users the optimum means to reach their destinations.

As part of this effort, we introduce here an initiative for addressing community infrastructure issues with digital measures based on international standards of rules-making[2]. The main objective of the initiative is to assess community infrastructure with indicators set according to international standards and propose improvements to local governments and other authorities based on the assessment. The initiative is also intended to encourage local governments in Japan and other countries to adopt digital measures and change the rules for resolution of community issues and improvement of infrastructure. This is a shift away from the price-oriented assessment trend in ASEAN.

2. Development of international standards related to infrastructure export strategy

Regarding international standards in line with government infrastructure system export strategy[3], Fujitsu has had a leading role in the development of international standards for the infrastructure of smart communities, for which a huge demand is expected. It has conducted demonstration projects and promotions in collaboration with related organizations and companies in Japan and other countries.

2.1 Background

In 2015, the World Bank, Asian Development Bank, and the Japan Ministry of Land, Infrastructure, Transport, and Tourism, and other institutions predicted a cumulative demand for infrastructure in the tens of trillions of dollars by 2030. The United Nations Sustainable Development Goals (SDGs) were also announced in that year, which explicitly target sustainable (smart) infrastructure development.

However, orders for Japanese infrastructure systems have been slow in ASEAN, possibly because Japan's "high-quality infrastructure"[4] has not been valued in a cost-competitive business environment.

2.2 International standards for assessment of smart community infrastructure

To enable objective assessment of a "high-quality infrastructure" that is resilient, inclusive, and provides sustainable performance, efforts have begun on international standardization of the items used to assess "smart community infrastructure" in support of smart cities. In 2012, ISO established TC 268/SC 1[5, 6] with Japan as the Secretariat, and published ISO/TS 37151 (Smart community infrastructures – Principles and Requirements for Performance Metrics)[7] in 2015. That international standard (or technical specification, to be precise) facilitates buyer modeling in the international procurement of smart community infrastructure for energy, water, waste, transportation, and ICT, etc. (Figure 1). It provides common metrics in assessing performance, making the intentions of providers and buyers easy to understand.

The fourteen needs defined by ISO/TS 37151 are arranged in relation to residents, community managers such as governments and infrastructure operators, and the environment (Table 1). The actual metrics are selected according to the purpose of the community. For example, increasing the availability of rail transportation to provide round-the-clock operations might be convenient for residents, but the operational efficiency of railway operators will decrease, maintenance costs will rise sharply, and there will be a contrary effect on mitigating climate change. Striking a balance is the smart approach when such conflicts exist.

2.3 International standard for assessment and improvement methods

ISO 37153 (Smart community infrastructures – Maturity Model for Assessment and Improvement)[8] was developed and published in 2017 as a next step to provide guidance for assessment and improvement from the viewpoint of sustainable communities development as set forth in the SDGs. A prominent feature of

Figure 1: Common metrics for providers and buyers

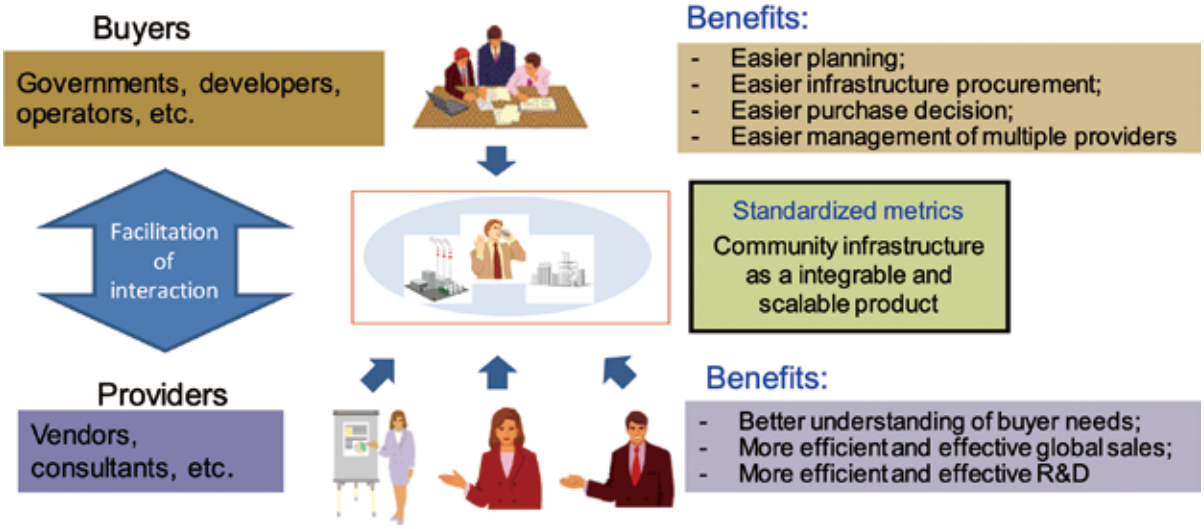

Table 1: Fourteen needs defined by ISO/TS 37151

Aspects	Needs	Example
Residents	Availability	Regional, population coverage
	Accessibility	Easy for seniors to use
	Affordability	Affordable pricing
	Safety and security	Information security
	Quality of service	Capacity and scale of services
Community managers	Operational efficiency	Interoperability
	Economic efficiency	Lifecycle cost
	Performance information Availability	Information exchange with citizens
	Maintainability	Appropriateness of maintenance
	Resilience	Recovery capabilities
Environment	Effective use of resources	Energy consumption efficiency
	Mitigation of climate change	Amount of GHG emissions
	Prevention of pollution	Amount of pollutant emissions
	Conservation of ecosystem	Amount of green space

ISO 37153 is that assessment levels (values) can be expressed from 1 to 5, as in a school report card, so that non-experts can easily understand the results of an assessment (Figure 2).

In the example presented in Figure 2, the blue dashed line represents the target levels and the red line represents the assessment results (current levels) for a particular community. This feature enables the stakeholders in smart community development (local governments, consultants, vendors, and service operators, etc.) to discuss improvements on the basis of a common understanding of the current state of the community.

ISO 37153 specifies the principle of assessing the state of community infrastructure on a five level scale (1 through 5) by using a maturity model that references CMMI[9, 10] (Figure 3). In a smart community infrastructure, each of the fourteen needs is identified by one or more metrics, and each metric is assessed by the five reference levels of ISO 37153 to obtain the current levels (Figure 2). By setting the target levels among stakeholders in advance, the chart in Figure 2 makes it possible for them to see at a glance the divergence of the current levels from the target levels.

ISO 37153 also describes an assessment and improvement process that uses the maturity model. The standard successively applies the PDCA cycle for continual improvement of community infrastructure, as shown in Figure 4. By applying this cycle, it is also possible to construct a smart city in a stepwise way from a small start.

Figure 2: Example results of community assessment by the method of ISO 37153

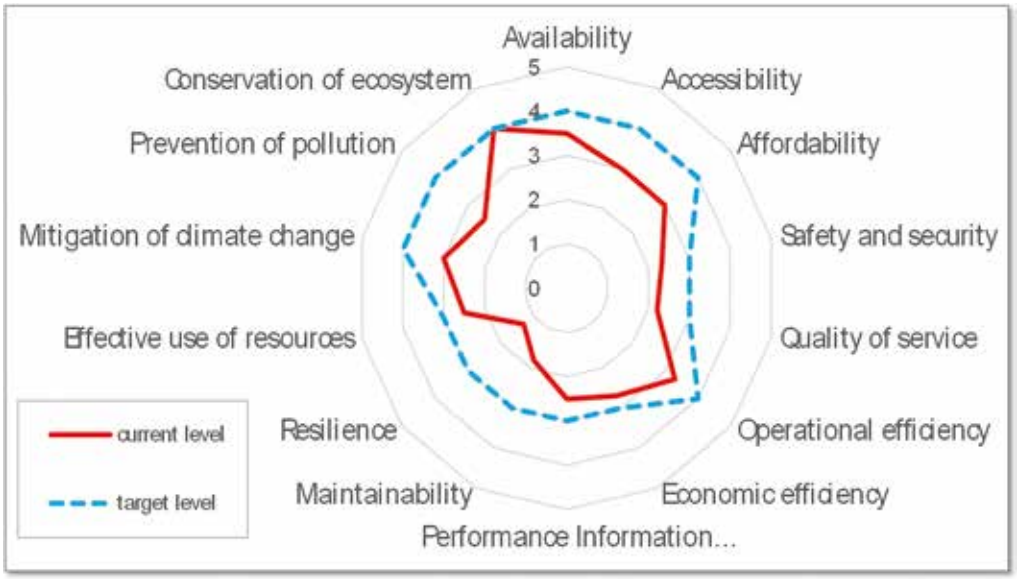

Figure 3: Basic concept of ISO 37153

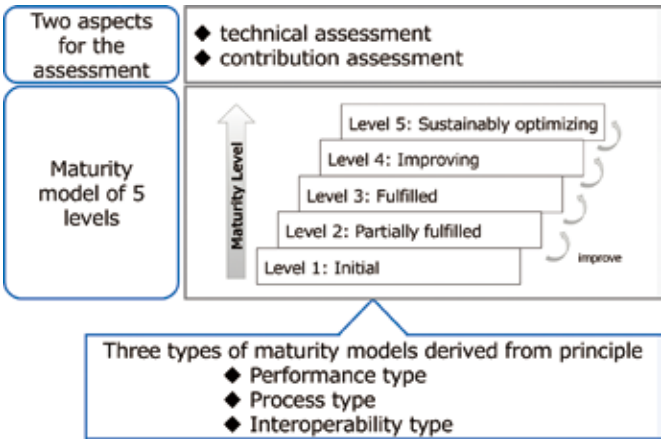

Figure 4: Step-wise smart city development using the PDCA cycle

3. Use and dissemination of the developed international standards

3.1 Demonstration projects and promotion

Fujitsu participated in demonstration projects in Japan and other countries between 2017 and 2019 to promote widespread adoption of the developed international standards ISO/TS 37151 and ISO 37153. In addition, Fujitsu conducted numerous promotional activities, including one at the 2018 ASEAN Business and Investment Summit in Singapore[11].

ASEAN national governments' understanding of the benefits of objective assessments of community infrastructure conducted in conformance with international standards made it possible for Fujitsu to conduct these activities in ASEAN countries.

Demonstration projects in which Fujitsu participated:

- FY 2017 [NEDO]: Study of infrastructure assessment method trends and application in relation to smart cities (Bekasi, Indonesia)[12]
- FY 2017 [Japan Standards Association]: Assessment of ISO 37153 applicability to Kawasaki City[13]
- FY 2018–19 [Japan Ministry of Internal Affairs and Communications]: Contracted study of assessment indicators and assessment processes for smart city construction in Vietnam (Da Lat, Vietnam)[14]
- FY 2019 [Japan Smart Community Alliance]: Study of infrastructure assessment method trends and application in relation to smart communities (Jakarta, Indonesia)

3.2 Issues in using international standards

The projects were demonstrated using the international standards with the support of the Ministry of Economy, Trade, and Industry, the Ministry of Internal Affairs and

Communications, and local universities. Moreover, the business studies were repeatedly conducted and the following points were clarified.

(a) Linking to digital measures

After assessment of the smart community infrastructure by the method specified in ISO 37153, the point becomes whether or not the proposed improvements can be linked to appropriate digital measures.

(b) Trade-off between assessment accuracy and cost

Using the method specified by ISO/TS 37151 to develop assessment indicators and obtain levels for them from scratch is labor intensive and expensive[12]. However, many cities in Japan have comprehensive plans, and costs can be decreased considerably by using the assessment indicators and values which had been already obtained from those plans[13]. It is thus possible to make the trade-off between assessment accuracy and acquisition cost by considering the means of acquiring the assessment levels in light of the purpose of use.

3.3 Application to smart city business

Fujitsu is using ISO 37153 in its consultation work and business negotiations in the second smart city boom that began with the release of the Integrated Innovation Strategy 2019 and other factors[15].

Our current smart city business takes into account what we learned from the demonstration projects described in section 3.1 and the points described in section 3.2. The following describes the consultation process: First, we collect data to be used in an evaluation by an ISO 37153 method by conducting thorough interviews with the clients, e.g., a local government. Then, we analyze the data and conduct objective assessments based on ISO 37153. After that, we discuss the results with the clients and propose improvements using digital measures.

4. Conclusion

Fujitsu has been working with stakeholders in Japan and other countries on development of the ISO/TS 37151 and ISO 37153 rules-making international standards and is using them in proposals for digital measures to address community infrastructure issues. ISO 37153 enables objective assessment of community infrastructure. The sustainability of communities as defined by the SDGs can be increased by assessing their infrastructure and proposing improvements based on digital measures that bring the levels of the current state closer to the target levels. We will continue to make efforts toward the objectives of changing the rules for addressing infrastructure issues such as encouraging local governments in Japan and other countries to adopt digital measures, and to shift away from the cost-oriented basis for assessment in ASEAN countries. We would like to build up a track record of accomplishments in addressing community infrastructure issues with digital measures in our efforts to expand the ICT market.

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Cover Art

Osumi Sakura shima, from Famous Views of 60 Provinces

Utagawa Hiroshige (1797-1858)

Source: National Diet Library, NDL Image Bank (https://rnavi.ndl.go.jp/imagebank/)

Establishing New Workstyles Through DX

— *NEC Digital Workplace* —

Masako Imanishi
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1. Digital transformation of workstyles

A great reset of workstyles is now needed: from "work conduciveness" to "job satisfaction." Aiming to create workstyles that enable employees to demonstrate higher performance, NEC is promoting new workstyles that combine real and online and pursuing workstyle DX to create workplaces that generate business.

NEC aims to create social value by "creating workstyles to enable everyone to play an active role," "creating an exciting daily life for everyone," and "creating experiences that go beyond time or distance." "NEC Digital Workplace" contributes to making this a reality.

In the midst of the global scale digital shift of society triggered by the COVID-19 pandemic, companies are expected to have the flexibility to respond to changes in the way their employees work. I will talk about the challenges companies face to ensure flexibility and NEC's services related to workstyle DX that will help companies address these challenges.

2. The global digital shift is changing the way people work.

With the unabated spread of COVID-19, there have been many instances around the world where the movement of people and things have been physically cut off due to restrictions on going out and moving around, lockdown of cities, and closure of borders.

Meanwhile, the volume of Internet traffic in Japan has increased by 49% compared to before the COVID-19 pandemic, and demand for semiconductors for data centers increased in the United States, pointing to the rapid digital shift of society.

This digital shift has brought about significant changes in individuals, society, and the economy.

Personal values have changed, while security and safety in the digital space have become imperative in society. Looking at the economy, we see cross-industry restructuring and global alliances taking place at an increasing pace. The digital shift will continue to bring about various changes around the world. In response, companies must have the flexibility to adapt to these changes. They can achieve this through the use of DX technologies such as AI, robots, and 5G.

The digital shift in society will also have a significant impact on the way individuals work. In her book "The Shift: The Future of Work is Already Here," Linda Gratton, who also served on the advisory board for the U.K. government's "100-year Life Plan," claims that there will be three changes in the way people work in 2025.

The first is a shift from generalist human resources with wide-ranging knowledge to "continuous specialists" with a high degree of expertise. Second, there will be a need for innovation in collaborations with colleagues and partners, rather than a solitary competition for individual achievements.

The third is a shift from the idea of "working for consumption" to the idea of "being passionate about work itself." NEC has already taken steps to respond to these changes.

3. An environment that fosters "job satisfaction" as well as "work conduciveness"

NEC has been promoting various initiatives related to cultural transformation since 2018. Among these are office reforms, introduction of the super-flex system, and establishment of telework environment. As a result, our telework rate as of August 2021 has reached 85%, with 31,000 web meetings being held each day, pointing to major changes in the way our employees work. Results of employee surveys also show that the degree of workstyle satisfaction has improved significantly.

These initiatives, however, focus only on "work conduciveness," pointing to the need to also delve on initiatives that enhance employee's sense of "job satisfaction," going forward. To create an environment in which "working itself becomes a wonderful experience," we must carry out a shift in the work of employees into higher value-added work that robots and AI cannot perform.

By letting robots and AI, as much as possible, perform standardizable tasks, employees will be able to focus on advanced management decisions and creative work. This should enable employees to feel a sense of "job satisfaction" to a much higher degree. Therefore, it is imperative to analyze and utilize various data, not only technologies such as robots and AI.

From this perspective, NEC has launched the "NEC Digital Workplace" as a corporate infrastructure for proactively utilizing data in addition to technology. We will aim to solve social issues while enabling our employees to work autonomously to demonstrate their creativity and produce better results. The concept of "NEC Digital Workplace" is to serve as the foundation for becoming such a company. As the roadmap to achieve this, NEC hopes to establish workstyles that take health and

psychology into consideration, based on safety and security under the impact of COVID-19, and ultimately nurture a workplace where individuals and organizations can grow significantly.

4. Services that NEC provides to establish new workstyles

Among the services provided through NEC Digital Workplace, I will explain in particular those that are related to AI utilization, AI human resource development, data-driven management, and initiatives for human resource transformation.

■ AI Utilization

NEC Digital Assistant

With the uptake of telework among companies, sometimes detailed operations, like coordination of meetings, expense settlement procedures, and personnel-related inquiries, cannot be carried out smoothly, adversely affecting the performance of primary tasks.

The AI chatbot "NEC Digital Assistant" enables employees to make chat-based requests for AI to perform such detailed operations. Since AI learns the chat interactions, it can make optimal recommendations and give accurate answers in response to variously worded questions.

■ Development of AI Human Resources

NEC Academy for AI

After the COVID-19 pandemic, companies have been increasingly faced with the need to deal with curtailment of existing businesses and to implement further measures in response to digitalization and the shift to online activities. However, the lack of highly skilled professionals and know-how has become a bottleneck.

"NEC Academy for AI" is a service provided by NEC to give back to society by offering the training methodologies NEC has developed in the field of AI.

The service classifies the target personnel into four types: Coordinator, Consultant, Expert, and Architect, and develops programs for each type. One of the features of the service is that it does not only support the acquisition of knowledge, but also conducts follow up on dealing with practical barriers that may arise later.

■ Data-Driven Management

Workstyle Visualization & Reform Support Service

When implementing new workstyles, existing rules sometimes do not fit the reality. However, it is difficult to obtain internal consensus on measures based on individual perceptions and opinions. In such cases, supplementation with quantitative and objective data would be necessary.

In the "Workstyle Visualization & Reform Support Service," experienced consultants conduct quantitative analysis of issues based on Office 365 log information to formulate a transformation roadmap. Flagging human resources considered as "high performers" enables analysis of their differences with other employees.

Utilization of Causal Analysis Technologies (AI, etc.)

While the evolution of technology has made it possible to collect a variety of data, utilizing large amounts of data often lead to problems related to the time required for analysis and variations in interpretation.

Using a causal analysis solution, for example, enables automatically generating and presenting causal structures after analyzing causal relationships, logic of things, and contextual

■ **Figure 1: NEC Digital Workplace**

structures hidden in data, which cannot be understood by looking at correlations alone.

This technology is attracting attention because it can be applied not only to the analysis of products and services, but also to the analysis of employee engagement.

Pattern Data Utilization Platform

As the life cycles of products and services are getting shorter, the traditional flow of introduction after a long design process can lead to delays in market entry.

To prevent these delays, NEC provides a "Pattern Data Utilization Platform" with only the minimum number of functions. The system can be expanded any time depending on the situation, enabling quick deployment of new businesses.

Business & Data-Driven Agile Partner Service

As mentioned above, all areas of business are being carried out at faster speeds, and corporate budgeting trends are changing.

The inability to speedily deploy business with conventional budget formulation, wherein budget is allocated from the previous fiscal year and used up in the following year, has become a problem. There are thus more companies raising funds in a more agile way.

The "Business & Data-Driven Agile Partner Service" was launched after examining what NEC can do as an IT vendor to address these customer issues.

The service organizes the KGIs/KPIs of the customer's business and incorporates the specific functions that are actually necessary to improve the KPIs into the design, before proceeding with development. The process usually requires advanced IT and business skills for determining the functions necessary to achieve KPIs, but the service makes it possible to also provide the human resources equipped with the necessary skills.

■ Initiatives to Transform Human Resources

Support Service for Developing a Framework for Human Resource Transformation

As the demand for human resources is shifting from generalists to specialists, there is a pressing need for companies to take relevant human resource measures, such as securing digital talents and introducing job-based management.

In NEC's organizational human resources assessment, experienced consultants study the client's strategic systems and measures in the human resources domain, identifies the issues to address, and supports the creation of a roadmap for transformation. Clarifying the competencies that are essential to the job (= job description) through the service will enable maximizing existing human resources, as well as securing the needed external human resources.

5. NEC's services help customers accelerate their workstyle DX and expand their business.

In addition to the services mentioned above, NEC is developing other services that leverage the strengths of various technologies, such as security, zero trust, cloud shift, and 5G.

Companies need to be able to respond quickly to the major changes taking place worldwide. NEC provides strategic consulting services for HR organizational transformation and other needs, as well as DX services that fully leverage AI and automation technologies supporting data-driven management. We are committed to contributing to the acceleration of workstyle DX and business expansion of our customers.

■ Figure 2: NEC Digital Workplace Offering Menu

Safe, secure telework ●Virtual Desktop ●Cloud-based Virtual Desktop	Workplace with strong teamwork ●Support for workstyle visualization & reform ●Local 5G managed services ●Local 5G system integration
Telework Security/Zero Trust ●Security risk assessments ●Support for development of security policies ●Support for computer security incident response and procedures ●Support for maintenance of secure development/operation system and process ●Support for IoT system security design ●Cloud security platform ●Risk hunting ●Security risk management ●Cloud security measures for Microsoft 365 ●NEC Cyber Security Stadium Exercises	Zero contact to prevent spread of infection and safeguard workplace ●Digital : identity verification web Resource visibility and tracking ●Cloud model for body temperature measurement & face recognition and identification Transparency and confidentiality in digital society ●Management strategy support based on data utilization ●Support for planning introduction of data utilization platform
Cloud shift ●Multi-cloud operations ●Public Cloud Connection ●Development support for cloud-based integrated ID management and planning policy	AI use and automation to focus on complex tasks ●NEC Academy for AI ●NEC digital assistant Diversification of services provided ●Contact center services (Genesys Cloud)
Fusion of real and online ●Business & data-driven agile partner ●Support for standardization of sales procedures and planning introduction of sales force automation (SFA)	Autonomy & diversity ●Development programs for human resources ●Support for workstyle transformation Physical/mental support ●Emotion detection

= A Serial Introduction Part 3 = Winners of ITU-AJ Encouragement Awards 2022

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.

Takashi Harada
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Fields of activity: ITU-T SG20, Infrastructure monitoring

Activities for standardization of infrastructure monitoring

I am very honored to receive this prestigious ITU-AJ Encouragement Award. I am most grateful to ITU-AJ and all who have given me guidance and encouragement.

Activities on ITU-T SG20 in this field started in 2019. At the beginning of the proposal, there was no discussion about infrastructure monitoring in international standardization. First, we introduced a practical demonstration of infrastructure monitoring in Japan as use cases for smart cities. This was very well received by the participants as it was a new perspective, and it was accepted as a use case for smart cities. The following year, we began working on a recommendation for a reference model and requirements for a civil engineering infrastructure health monitoring system. After about two years of discussion, the recommendation Y.4214 was established in February 2022.

During studies for the recommendation, there were comments that careful discussion was necessary, since maintenance and management of civil engineering infrastructure is related to regulations in each country. I feel that this result was only possible thanks to the great cooperation and support of Mr. Toru Yamada (NEC; SG20 Vice-chairman), the Japan delegation from MIC and Japanese companies, and Mr. Marco Carugi (Huawei, China; SG20 Q2 rapporteur).

For Japan, which has a large amount of civil engineering infrastructure and a shrinking workforce, it will be increasingly important and urgent how digital technology is applied to the inspection and the maintenance of civil engineering infrastructure in the future, to promote efficiency and labor saving. I will do my best to promote standardization activities in this field and disseminate the results of our activities.

Kazuhiro Hoya
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Fields of activity: ITU-R WP6B, WP6C, W3C, CTA WAVE project

Standardizing for programme production and exchange

I am pleased to receive this encouragement award from the ITU-AJ and am very thankful to the association and everyone who has provided guidance and support. I will continue working on development in the telecommunications and content industries.

Japan is a world leader in implementation of ultra-high-definition television broadcasting and has wide-ranging knowledge involving peripheral areas such as programme production and exchange. In this case, we have brought information regarding identification of required bit rates for programme production using the HEVC codec into amendment of certain ITU-R recommendations, namely BT.1203 and BT.2073, which are documents related to specifying bitrates for certain purposes in production. The information was obtained through the drafting of the ARIB standard, “Common media file format for UHDTV program exchange”, which brought about a new approach using subjective evaluation to specify these parameters for high-quality, high-bit-rate video materials and packages. I hope that this work will contribute to penetration of ultra-high-definition video in domains beyond broadcasting. For this contribution, I received much support from everyone working on standardization at ARIB, for which I am also very thankful.

Takanori Maegawa

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Fields of activity: ICT promotion in Vietnam and emerging nations.

Contributions to improving education environments and developing the ICT market in Vietnam

1. Contributions to improving education environments in Vietnam

The government in Vietnam is promoting reform of education using ICT, with requirements such as "Digitizing school lessons," "Support for home study from schools using telecommunications," and "Using telecommunications to eliminate regional education disparity between urban and regional areas." For this, we provided an ICT education support system platform and content, which contributed to improving education environments in Vietnam.

2. Establishing a base for software development in Vietnam

Contributions promoting bridge-building and business development between Vietnam and Japan, improving skills of IT technologists and developing the ICT market in Vietnam.

Specifically, I used the deep understanding of local commercial culture gained while residing in Vietnam. I trained local IT technologists regarding commercial culture, work flows, quality control methods, etc. used in Japan. Through development trial projects using low-code, I established standard development schemes (organization, documentation forms, communication methods, etc.).

I hope to continue to contribute to developing the ICT market in Vietnam in the future.

[Message to readers]

Please do not hesitate to contact us if you are interested in software development or ITO business.

Shinji Yoshida

Ex. KDDI Foundation
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Fields of activity: APT Capacity Building Programme

APT technical training forced to change by the COVID-19 pandemic

First, I would like to say how thankful I am on receiving an ITU-AJ Encouragement Award. I would also like to extend my heartfelt appreciation to everyone at ITU-AJ and to all concerned for their valuable guidance and cooperation in my past activities.

From 2017 to 2022, from among the various international cooperation projects that serve as a pillar of KDDI Foundation activities, I was mainly engaged in ICT technical training commissioned by the Asia Pacific Telecommunity (APT) and held in Japan. During this time, the training mode underwent a great change from group training to online training due to the COVID-19 pandemic.

In group training conducted up to FY2019, trainees would come to Japan, and after spending about two weeks attending classroom lectures and making inspection tours of related institutions, they would take back the results of their training to their respective organizations.

However, from FY2020 on, trainees could not come to Japan, and as a result, training switched to an online format in which trainees were asked to view video recordings of lectures on an e-learning system. Additionally, in training conducted in FY2021, some lectures were conducted live.

This year, with the easing of entry restrictions, the KDDI Foundation has been commissioned by APT to conduct hybrid training that combines group training consisting of hands-on seminars and inspection tours in Japan with at-home online training. This presents a new challenge to the KDDI Foundation, but preparations are proceeding based on its past experience in implementing programs. It is our hope that this form of training that combines the good features of both group training and online training will be highly evaluated by trainees and APT.

通巻百三十八号

The ITU Association of Japan

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