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**
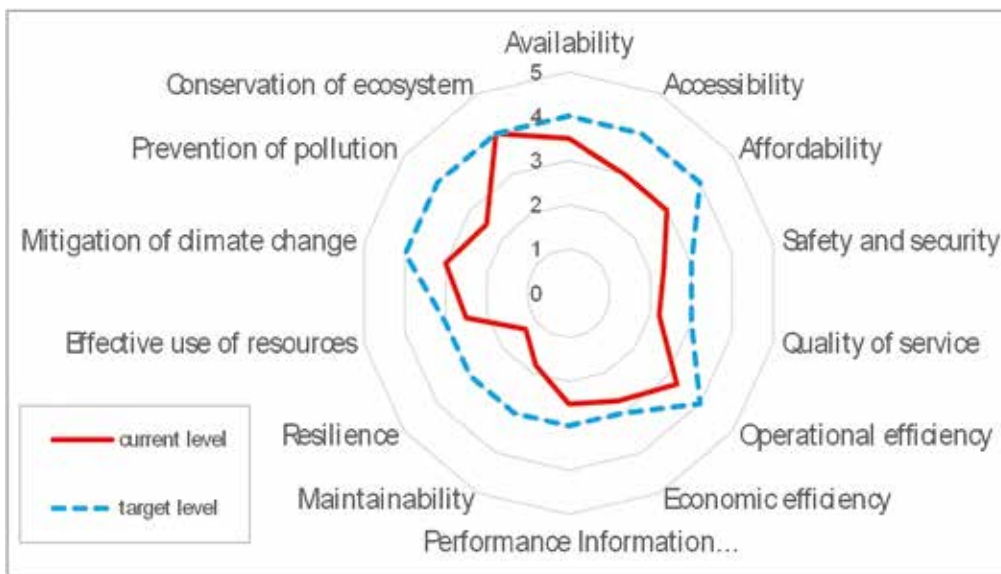
■ **Figure 3: Basic concept of ISO 37153**
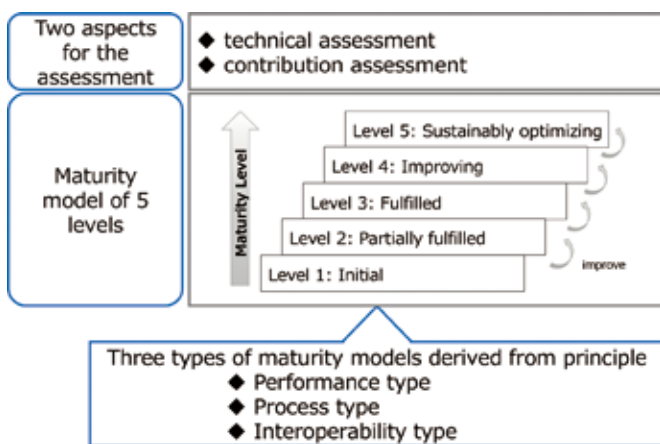
■ **Figure 4: Step-wise smart city development using the PDCA cycle**

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)

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