Creation of a Simple Evaluation Model (Draft) for the Effects of Smart Cities

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1. Introduction

NILIM created a "Simple Plan Evaluation Model (Draft)" (hereinafter, "Evaluation Model (Draft)") as a tool that provides a reference for staff of local governments and others who will be engaged in "smart cities" in the future, when those persons predict the effects of introducing new technologies, that is, the effects of the smart city. The purpose of this tool is to make quantitative rough calculations of the expected effects of solving urban problems when local governments, etc. study directions for solving urban problems by introducing new technologies, and to support decisions on the types and quantities of new technologies to be introduced. This article presents an outline of the "Evaluation Model (Draft)".

2. Background and Purpose of Evaluation Model (Draft)

Efforts to realize "smart cities" that utilize IoT and other new technologies to solve urban problems by promoting national government model projects, etc. and sharing know-how on the Smart City Public-Private Partnership Platform are steadily increasing in all areas. However, many local governments still are not carrying out initiatives, and nationwide horizontal development has become an issue.

The results of a questionnaire survey [1)] of local governments and companies that NILIM carried out to grasp the issues for implementing smart cities revealed that the cost (initial cost, operational cost, profit structure) is the largest obstacle to the introduction of new technologies, for both local governments and companies, and this is common problem regardless of which new technology is to be introduced. When a local government that has not yet embarked on a smart city initiative decides to start one, it must be able to quantitatively predict and evaluate the cost-effectiveness of new technologies during both the planning and implementation stages. This ensures that the benefits gained from resolving specific urban issues are appropriately balanced against the initial and operational costs of those technologies. To support this process, NILIM created the "Evaluation Model (Draft)."

3. Overview of the Evaluation Model (Draft)

(1) Features

While there are various examples of smart city projects, in the Evaluation Model (Draft), the applicable new technologies for the 6 main urban problems shown in the following **table** were set considering the following two points: "Many needs have been expressed by local governments, and the technology has high general applicability" and "Existing efforts are comparatively advanced, and information on their effects is easily available." Information on each of these combinations of urban problems and applicable technologies was collected by interviews on advanced initiatives of local governments, etc.

Table: Targeted "Urban problems" and "Applicable technologies," and "Examples of Key Performance Indicators (KPI)"

Urban problem	Applicable new technologies	Examples of KPI
Support for persons with transportation/shopping difficulties	Self-driving car, on-demand transportation, delivery drone	Service coverage rate, amount of shopping cost reduction
Supply of tourism/central city information	Digital signage, integrated app	Daily number of views, visitor increase rate
Promotion of citizens' health activities	Incentives and provision of health data via app	Daily use frequency, increase in number of steps taken
Protection of elderly people/children	Camera network, BLE tag, GPS tag	Reduction of search time, area coverage rate
Supply of disaster information	Integrated app, dashboard	Daily number of views
Real-time grasp of river/water channel condition	Water level sensor, river camera	Reduction of time required for on-site checks

Based on information on the effects, etc. obtained by initiatives, examples of the Key Performance Indicators (KPIs) for the effects of introduction were set, and the Evaluation Model (Draft) was created. The concepts of the Evaluation Model (Draft), cases that form its basis, points to note, etc. were arranged as "Commentary." In addition, the unit effects for the number of units of the new technologies (e.g., number of vehicles, drones, etc.) were estimated, and a "Simple Calculation Sheet" was prepared as a tool that enables a rough calculation of the effects of introducing new technologies using those unit effects.

(2) Composition and content of the Commentary and Simple Calculation Sheet

① Commentary (see figure)

In the Commentary, "Method of evaluating introduction effects," "Examples of evaluations for examples of initiative," "Points that affect the appearance of effects," etc. are arranged for the items in the **table** on the preceding page, and reference information for the selection of the new technologies to be used in solving urban problems is provided.

For example, when assessing how to reduce the burden of routine shopping on citizens, we created a model that evaluates cost savings achieved through self-driving cars, on-demand transportation, and drone delivery services. The model assumes that, before these services were introduced, citizens relied on taxis to reach the nearest supermarket.

② Simple Calculation Sheet

Using the unit effects estimated based on the information on typical initiatives provided by localgovernments, we prepared a Microsoft Excel sheet that allows users to make rough calculations of the expected effects (KPI) by inputting local information, assumed conditions, and the amount of introduction of the new technology which the user is considering introducing.

However, please note that results of calculations using this sheet are ultimately only reference values, because the sheet was created using data on a small number of cases, including some that are still in the demonstration experiment stage.

4. Conclusion

This Evaluation Model (Draft) ("Commentary" and "Simple Calculation Sheet") will be released to the public on the NILIM website, etc. in the future. In addition, the Evaluation Model (Draft) and the "Case Studies of Smart Cities(Introductory Volume)," [2] which has already been released, will be also revised when necessary due to the addition of case studies of initiatives and changes in the content in response to new technical innovations.

☞For more information

1) Wataru Katsumata, Eiko Kumakura and Hiroyasu Shingai (2021), "Survey on Demands for New Technologies towards Smart Cities to Solve Urban Problems – Questionnaire Survey for Local Authorities Having Use Cases and Demands and Companies Holding Smart City Technologies" Journal of the City Planning Institute of Japan, Vol. 56-3, pp. 1413-1420.
https://doi.org/10.11361/journalcpij.56.1413

2) "Case Studies of Smart Cities – Introductory Volume," available as aa PDF file at the public URL (website of the Urban Planning Department, NILIM)
https://www.nilim.go.jp/lab/jbg/smart.html

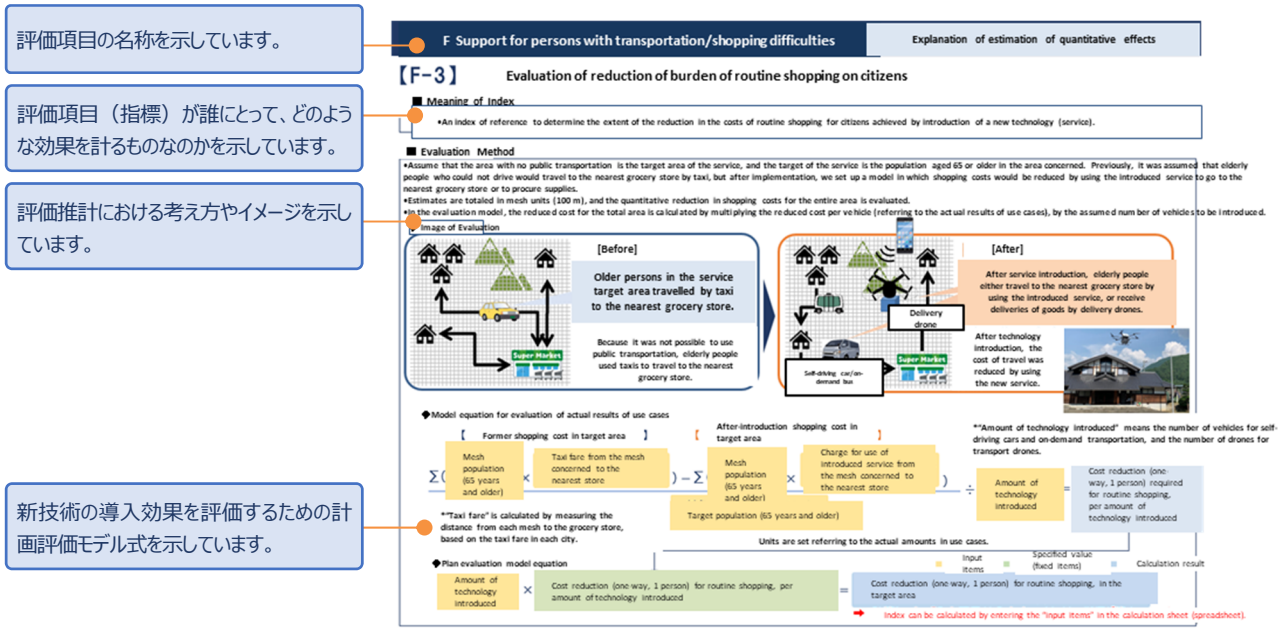

Fig. Image and use of the Commentary (partially excerpts from Commentary)