

Featured Articles

Application of Service Design and Vision Design by Collaborative Creation in Urban Development Business

Takeshi Minemoto
Asako Miyamoto
Mariko Doi
Atsuko Bando
Shigeki Hirasawa
Yutaka Sano
Shigeru Matsumura

OVERVIEW: The problems and challenges in cities, such as supplying renewable and fossil-fuel energy, shrinking populations and aging, and the increasing concentration of industries and talents, are becoming intensified and diversified. Hitachi has been engaging in a vast number of projects to provide a comfortable lifestyle, society, and city with consideration of the environment. As part of the Kashiwa-no-ha Smart City project of Mitsui Fudosan Co., Ltd., Hitachi has supported the system development by applying service design to the visualization of energy in the city. The image of services in the future was studied at Hitachi by utilizing vision design, which anticipates overall city planning for future extension. The tasks included conducting collaborative creation with customers from creating a vision in anticipation of future events to providing services; creating value for each city, the surrounding areas, residents, visitors, and business entities; and studying optimized technology implementation. The purpose is to contribute to cities in order to accelerate the Social Innovation Business.

INTRODUCTION

THE problems and challenges in cities, such as supplying renewable and fossil-fuel energy, shrinking populations and aging, and the increasing concentration of industries and talents, are becoming intensified and diversified. Hitachi has engaged in a vast number of projects to provide a comfortable lifestyle, society, and city with consideration of the environment.

The Kashiwa-no-ha Smart City project has attracted much attention from both inside and outside of Japan. Mitsui Fudosan Co., Ltd. and Hitachi developed and deployed the Kashiwa-no-ha area energy management system (AEMS) to realize an environmental-symbiotic city⁽¹⁾. Further discussion and study with stakeholders will be required for the planned development of streets and facilities in the future.

This article explains how service design was applied to visualizing energy in the city, how vision design was employed for future community services, and the significance of collaborative creation in studies.

SERVICE DESIGN IN SMART CITY IN THE NEAR FUTURE

Hitachi's Research & Development Group is supporting technology development by applying

service design from the conceptual phase of the urban development business. The most important activity is to maximize the value of a city from the perspectives of both users, such as residents and visitors, and businesses, such as workers and operators. Hitachi has been involved in this solution development since the concept proposal phase in 2011.

Concepts behind Kashiwa-no-ha Smart City

The Kashiwa-no-ha Smart City project is based on three concepts: an environmental-symbiotic city, a city for creating new industry, and a city of health and longevity. This safe, secure, and sustainable city was achieved through a partnership between the public sector (government organizations), private sector (businesses), and academia (universities).

The aim of an environmental-symbiotic city is to realize a city in which both people and the environment can co-exist by solving several issues related to the environment and energy. Hitachi conducted collaborative creation with customers to achieve optimization of energy use and area-shift through the construction of an AEMS as a core technology for realizing the environmental-symbiotic aim as well as generating energy, saving energy, and storing energy. The factors of "community" and "health" were also captured as part of the "energy"

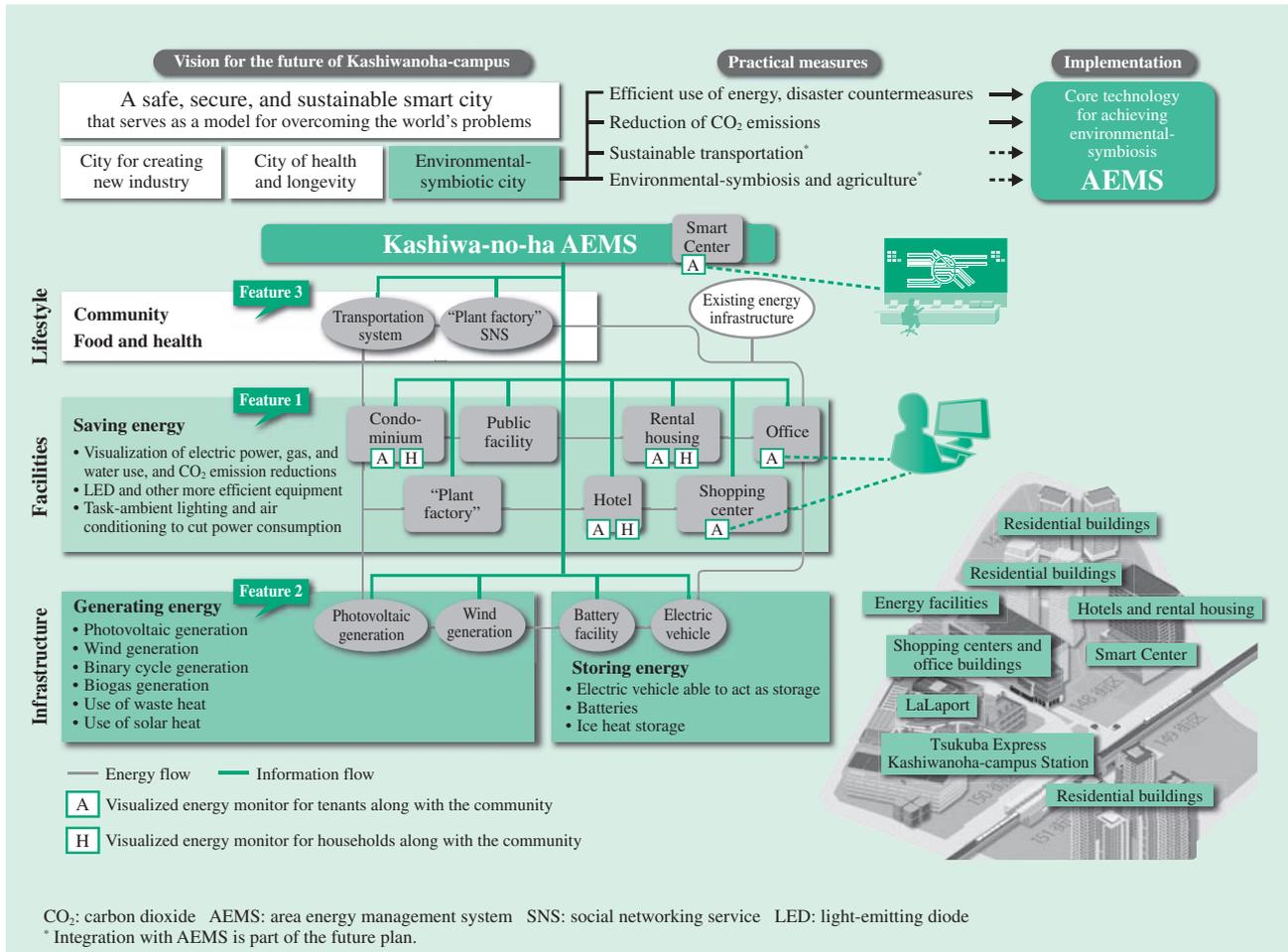


Fig. 1—The Role of Kashiwa-no-ha AEMS as Practical Means for Implementing Future Objective of Transforming Kashiwa-no-ha Smart City/Kashiwanoha-campus into an “Environmental-symbiotic City.”

The AEMS consolidates collection and management of data on energy use in the area to predict community-wide demand. Overnight power is utilized along with photovoltaic and wind power generation to charge batteries, and this power is then supplied to the community. The AEMS also minimizes peaks in demand for electric power and ensures that full use is made of renewable energy sources despite the weather-dependence of their output. It provides a means of visualizing energy for the city.

for management. As a result, everyone in the city will care about an environment that encourages them to do something about it. Kashiwa-no-ha has become a center for connecting people and facilities in the city with the aim of “growing and developing a smart city” (see Fig. 1).

Study Process for Energy Visualization Display

To engage in an unprecedented project for managing city energy, service design was applied to the study of capturing a method of visualizing energy from the organization of values of multiple users. An effortless and sustainable scheme is required for people to act voluntarily through the Kashiwa-no-ha AEMS without feeling any burden from participating in energy saving activities. Thus, the contact point between users and

the Kashiwa-no-ha AEMS and the connection with energy was organized, and the information to be communicated and how to present it was studied. The activities are summarized by six steps.

(1) Organizing value

Methods of presenting visualizations with an effective appeal to users by organizing the values of stakeholders such as residents and business entities was studied.

(2) Visualizing value

Ideas were studied using visualization methods from a technology perspective to realize the values of targeted stakeholders.

(3) Applying technology

The functions of the AEMS were organized and studied from the specifications based on the display design that was created in the study of ideas.

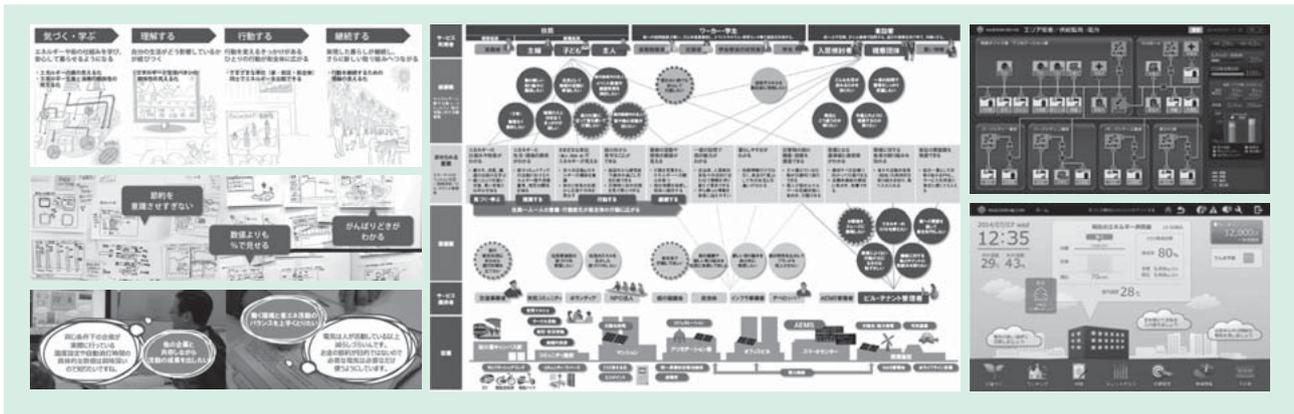


Fig. 2—The Process for Designing the Displays of the Energy System with Visualized Energy Use to Explore the Values Examined in Residences for Developing the Actual System, Applying Technology, Conducting Surveys with Stakeholders, and Advancing Values. A study into energy visualization was conducted based on the collation of things like changes in activities and attitudes at Kashiwanoha, communication, and the roles played in the community by housing residents, visitors, building users, and others. In the work on identifying value, in particular, what was helpful for studying the displays was the use of a stakeholder map to define the relationships between people, goods, and the environment and the identification of values for everyone involved with the community.

(4) Understanding relationships

Direct observation of the environment and the use of energy facilities was conducted in the station center area of the Kashiwanoha-campus.

(5) Bringing out values

The required features were reorganized based on the information about users' needs and the local environment that were obtained from observation. This time the detailed planning of "Kashiwanoha AEMS as a center of connection for a growing and developing city" was concluded, including specifications based on future concepts such as information displays for transportation that were not part of the project.

(6) Brushing up visualization display

The final proposal regarding the details of the display design was completed through all the activities. At the same time, guidelines for making designs that are compatible with home energy management systems (HEMS) was generated by collaborating with other companies. The aim is to make the residents and workers recognize activities related to energy in Kashiwanoha (see Fig. 2).

Features of Energy Visualization and Display Design

The development of the display design for the Kashiwanoha AEMS as a system was conducted for "visualizing the city's energy."

(1) For smart center energy managers

The energy manager will monitor and manage the entire city's energy and disaster prevention functions, which is an unprecedented new role. The display

configuration is for professional use with dynamic representations that respond to energy changes. Through this design, the status of the city's energy can be seen early enough for visitors to understand the activities that are going on in Kashiwanoha.

(2) For office users and business tenants

The workers in the area can access energy-use information for the city and for tenants from their workplaces and homes. By engaging in energy saving activities while working, the effort of each person will produce results for the whole city. The display combines the city's status and energy information for tenants, and was designed to be intuitively understandable. This makes everyone feel that they are part of the Kashiwanoha community and that it is part of their daily lives and work. This leads to continued use of the system.

Evaluation of Service Design Activities

The display of the Kashiwanoha AEMS that was studied through these activities has been exhibited in the Kashiwanoha Smart City Museum, which opened in May 2013 in front of Kashiwanoha-campus Station, per customers' requests. This exhibition started before the system construction. The technologies, facilities, and structure of this near-future city, and its lifestyle, can be experienced by companies, local government stakeholders, and citizens. This project has become well known to many people.

Furthermore, Mitsui Fudosan and Hitachi jointly received a 2013 Good Design Award in the urban development category. A large exhibition panel,

a display for demonstration, and documents that explained the relationship between urban development and energy through the two companies' collaborative activities were prepared for the screening. The comments from the jury included "this makes it possible to share energy information that is difficult to visualize and I expect it will become a guideline for future urban development."

Operation of the Kashiwa-no-ha AEMS officially started in April, 2014. In July of the same year, Gate Square in the center streets area and the Smart Center facility of the Kashiwa-no-ha AEMS were opened. The smart city has begun its journey.

VISION DESIGN FOR A FUTURE SMART CITY

Hitachi has been conducting demonstration projects in healthcare independently of the energy industry. However, when a study involves the near future, the project technology can easily be expected to involve advanced expertise in technology. On the other hand, the second stage of the Kashiwa-no-ha Smart City project is planned to expand urban development to the north of the area. In this situation, an overall study is required. Thus, the vision design methodology for Kashiwa-no-ha was applied to studying the ideal urban image as it is anticipated to be 10 years from now.

Utilizing Methodology in Kashiwa-no-ha Smart City Project

Hitachi's Research & Development Group utilizes vision design to study the ideal image of the future. It generates content that qualitatively infers people's values in the future by intensive research into social trends from a politics, economy, society, and technology (PEST) perspective⁽²⁾. This time, the project is required to illustrate a future image and a service outline in a determined area. The methodology for the project⁽³⁾ is combined with service design to study "Kashiwa-no-ha Smart City Vision." A feature of this combined methodology is that it enables the development of a future image with an understanding of the area and the distinctive service outline by sharing the research information with all stakeholders. This has allowed the project to study its directions without concerning itself about an unpredictable future.

Study Methodology Process for Ideal Image of an Area in the Future

There are four steps in this project methodology, which conducts two workshops with the stakeholders to analyze information and create the vision and service outline.

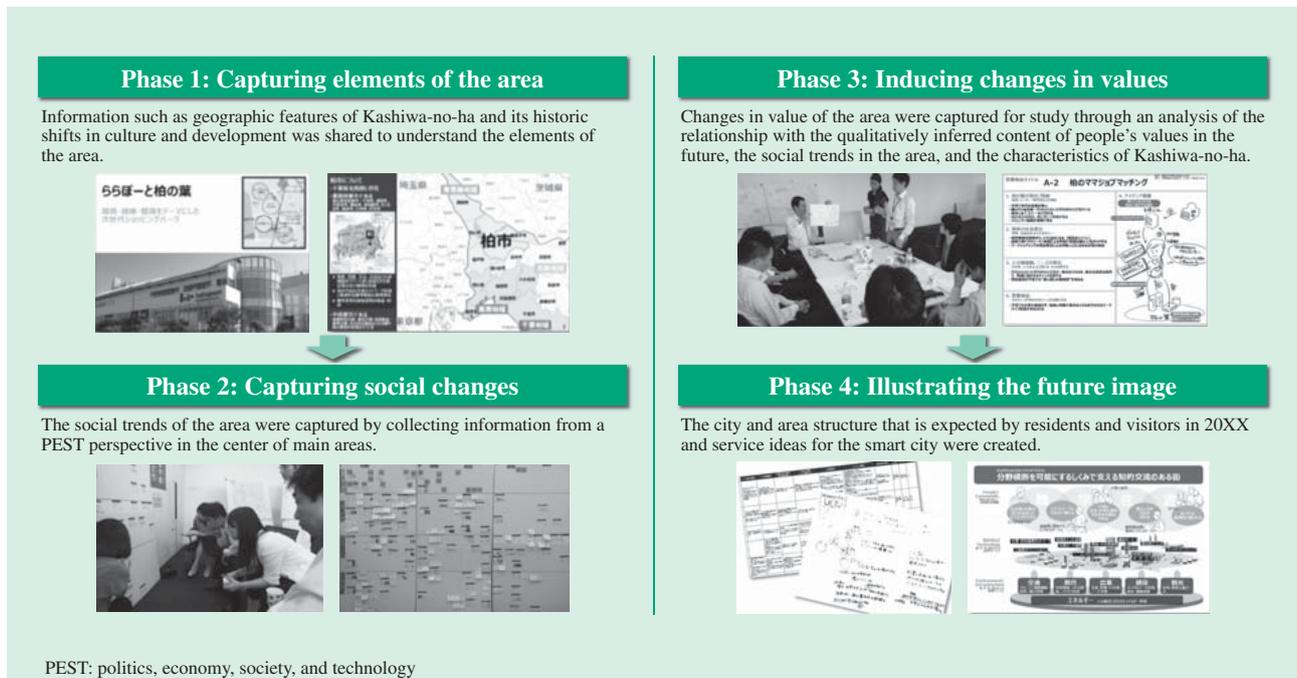


Fig. 3—The Study Process Using Techniques for Considering Future Vision for Community.

A "service image" that conforms with the vision and changes in community values can be created through a study with stakeholders that starts with preliminary preparations and extends over four phases, and collating the work done at the workshops.

(1) Capturing elements of the area

Information such as geographic features of Kashiwa-no-ha and its historic shifts in culture and development was shared to understand the elements of the area. Document research, direct area observations, and interviews with local residents were conducted to analyze the current conditions. After obtaining the appropriate data, workshops were conducted to share information with all the stakeholders to extract the issues.

(2) Capturing social changes

The social trends of the area were captured by collecting information from a PEST perspective in the center of Kashiwa-no-ha and other main areas. Many PEST cards were produced. The change keywords were extracted from those PEST cards with a timeline in workshops.

(3) Inducing changes in values

Changes in value and the distinctive features of the area were captured for study through an analysis of the relationship with the qualitatively inferred content of people’s values in the future, the social trends in the area, and the characteristics of Kashiwa-no-ha.

(4) Illustrating the future image

The city and area structure that is expected by residents and visitors in 20XX and service ideas for the smart city were created. The detailed image of people’s values in the future for an anticipated time was formulated using content based on qualitative inferred (see Fig. 3).

Future Image of Kashiwa-no-ha

The study produced eight current conditions, future value changes, a vision, and service images.

The value changes and ideal image of the city from the perspective of Kashiwa-no-ha residents and users 10 years in the future were illustrated as a lifestyle design. The conceptual proposal was composed as a basis for discussion and collaborative creation (see Fig. 4).

With regard to the characteristics of users, an image of the technologies, services, environment, and infrastructure that support working, studying, living, and recreation in the area was produced by capturing the values of future residents and users, who may include families or visitors from outside Japan. In particular, the captured visions for transportation, education, agriculture, health, and travel have become features of the Kashiwa-no-ha AEMS as

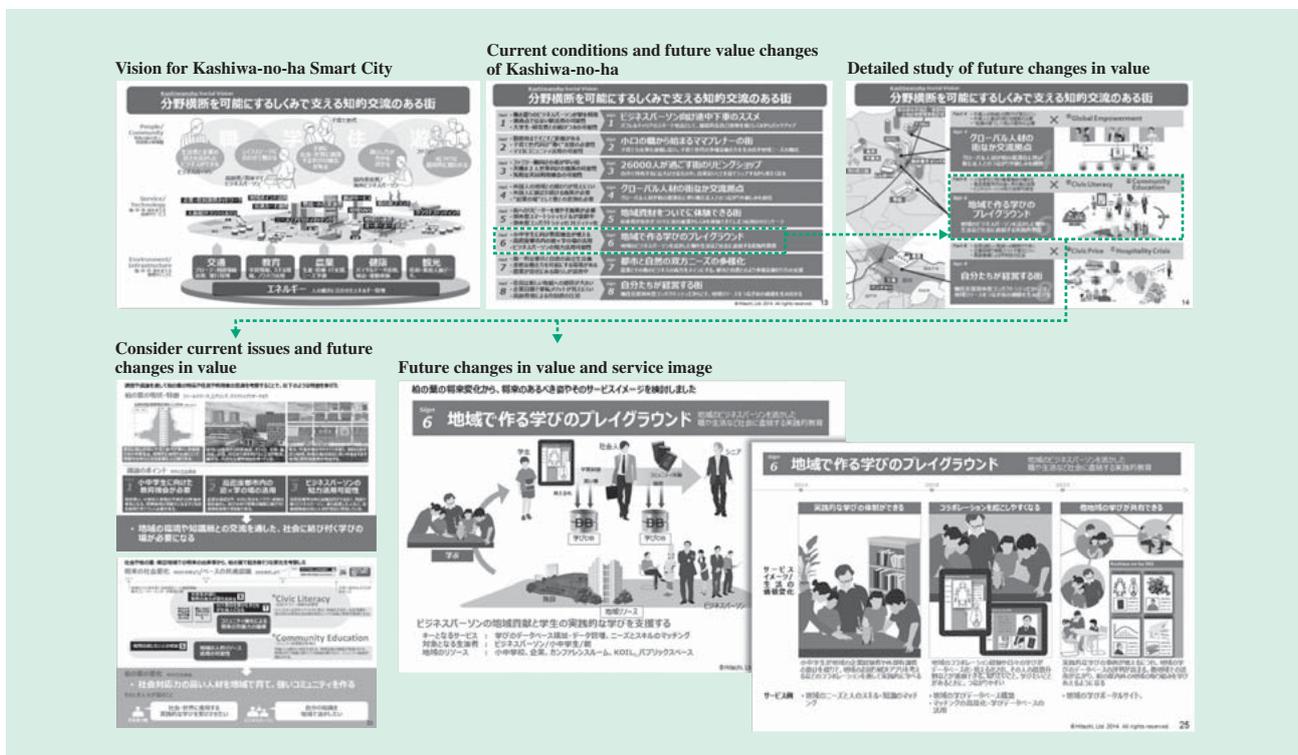


Fig. 4—The Smart City Vision and Service Image for Kashiwa-no-ha.

It is possible to identify how values will change based on a consideration of current issues and future changes in values, and to present a detailed service image that also expresses interrelationships. Collated in conceptual proposal, this material can then be used in future studies.

well as the platform for energy management that includes people's movement. From this study, the direction can be determined in detail by illustrating the service image based on the created future vision. The importance of this activity was that its scheme was understood by Hitachi staff and that it expanded their understanding with regard to study for the future.

Evaluation of Future Image Study and Future Application

In July 2014, Hitachi established "Hitachi Collaboration Square Kashiwa-no-ha" as a strategic business location along with the opening of Gate Square in the center of Kashiwa-no-ha. This presentation has also used the methodology to accelerate collaborative creation by sharing the perspectives and needs of the city and residents in the future. Its press release announced that its aim is to create a global Social Innovation Business from Kashiwa-no-ha Smart City⁽⁵⁾.

In October of the same year, the generated vision for Kashiwa-no-ha Smart City was presented to Mitsui Fudosan and received several comments. The overall activity was well received with particular interest in the study conducted through a field survey to understand the area intensively and the generation of a vision by capturing changes in the future. After that, workshops were held for joint projects between Mitsui Fudosan and Hitachi based on the documents from this study.

CONCLUSIONS

Mitsui Fudosan Co., Ltd. and Hitachi have been treating Kashiwa-no-ha Smart City as a showcase for urban and infrastructure development in the future through the development of an energy network in a smart city centered on the Kashiwa-no-ha AEMS and through collaborative promotion in other business demonstration projects. Through the application of service design and vision design, the project has demonstrated the importance of utilizing core technology by illustrating images that form a platform for communities in cities and by connecting energy management systems to the future from the near future.

The high-density environment and technological applications required for urban concentration and compact cities brings possibilities for urban development both globally and in Japan. However, also inevitable is problem solving for disappearing cities in Japan due to the reduction of the population and increase in the number of elderly people, which are a popular subject in Japan.

The activity of collaborative creation with customers will be conducted by creating a vision in anticipation of the future for providing services as well as creating values for residents, visitors, and business entities in each city and their surrounding areas to study the application of optimized technologies. The aim of this is to make contributions to the city through an acceleration of Social Innovation Business.

We deeply appreciate the people at Mitsui Fudosan who provided valuable feedback on the sites when we were developing the Kashiwa-no-ha AEMS and studying the vision for this smart city.

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ABOUT THE AUTHORS**Takeshi Minemoto**

Customer Co-creation Project, Global Center for Social Innovation – Tokyo, Research & Development Group, Hitachi, Ltd. He is currently engaged in collaborative creation with customers, vision building, and service design in the urban development and transportation sectors. Mr. Minemoto is a member of the Japanese Society for the Science of Design (JSSD), Architectural Institute of Japan, and Professor Emeritus at Hosei University Graduate School.

**Asako Miyamoto**

Service Design Research Department, Global Center for Social Innovation – Tokyo, Research & Development Group, Hitachi, Ltd. She is currently engaged in the development of vision and service design methodologies.

**Mariko Doi**

Customer Co-creation Project, Global Center for Social Innovation – Tokyo, Research & Development Group, Hitachi, Ltd. She is currently engaged in collaborative creation with customers, vision building, and service design in the urban development and transportation sectors.

**Atsuko Bando**

Service Design Research Department, Global Center for Social Innovation – Tokyo, Research & Development Group, Hitachi, Ltd. She is currently engaged in the development of vision and service design methodologies.

**Shigeki Hirasawa**

Collaborative Business Development Center, Global Engineering Division, Social Innovation Business Promotion Division, Hitachi, Ltd. He is currently engaged in collaborative creation with customers and business development in the urban development and transportation sectors.

**Yutaka Sano**

Energy Business Development Department, Energy Solution Business Development Division, Energy Solutions Company, Hitachi, Ltd. He is currently engaged in business development in the energy sector.

**Shigeru Matsumura**

Buildings Solution Project, Business and Engineering Solutions Division, Social Innovation Business Promotion Division, Hitachi, Ltd. He is currently engaged in collaborative creation with customers and business development for smart cities.