

# Experience Design to Realize Value for Life in Smart Cities

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*OVERVIEW: Hundreds of smart city projects are currently underway around the world. However, many of these projects are still in the conceptual or planning stage. The term “smart city” is generally interpreted as meaning “a next-generation city that is conscious of the environment and makes efficient use of energy and other resources by drawing on the power of IT.” In the conceptual and planning stages, discussions are focused on how to deploy IT and urban infrastructure technologies. In addition to these considerations, Hitachi is conducting advanced research that exploits experience design to bring forth value in smart cities, and has established a valuable framework and approach for planning and study.*

## INTRODUCTION

NEEDLESS to say, the ultimate value that smart cities should seek is the same goal shared by humankind: sustainable development. The form of a city for realizing this value is the smart city, “a next-generation city that is conscious of the environment and makes efficient use of energy and other resources by drawing on the power of information technology (IT).”

Figs. 1 and 2 show the relationships between stakeholders in a smart city from the standpoint of experience design. These figures summarize the results of a variety of studies and analyses conducted by Hitachi on the basis of the most basic concept in experience design: “Showing experience value from stakeholders’ point of view on a time axis.”

This article describes Hitachi’s efforts to realize value for life in smart cities through experience design.

## SUSTAINABLE DEVELOPMENT

By analyzing and organizing the concepts of smart cities on the basis of experience design, Hitachi has established the following planning and study framework/approach for realizing a sustainable society.

### (1) Stakeholders

The primary stakeholders in a city are its consumers, companies, and government. These stakeholders also relate to the city from a variety of perspectives. All of these stakeholders work together toward the shared goal of sustainable development in accordance with their own roles, and they seek to enjoy its benefits. The public infrastructure of smart cities supports the establishment, maintenance, and development of dynamic relationships and coexistence among these stakeholders.

Fundamentally, the target of experience design is “the experiences of natural persons.” However, when dealing with something as complex as a city, we can make an exception and apply the ideas of experience design to smart cities. Companies and the government are treated as stakeholders.

### (2) Experience value (by stakeholder)

(a) Consumers: optimal balance of “eco” and experience

The public infrastructure of smart cities, with an optimal balance of environmental (“eco”) values and experiences, provides the following two types of support for consumers. Firstly, it confers the beneficial experience value of a secure, convenient, and prosperous urban lifestyle, a form of value that makes consumers want to continue living in the city. It also enables the urban lifestyle to be compatible with environmental protection. Secondly, the public infrastructure of smart

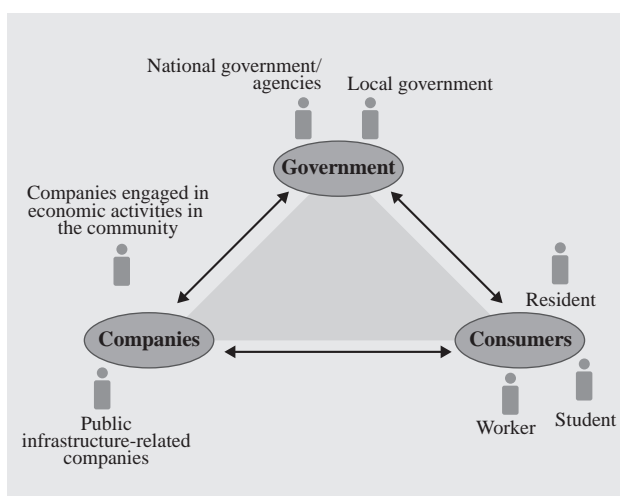


Fig. 1—Smart City Stakeholders.

To create experience value, it is critical to undertake a broad study of the benefits, costs, and risks to stakeholders.

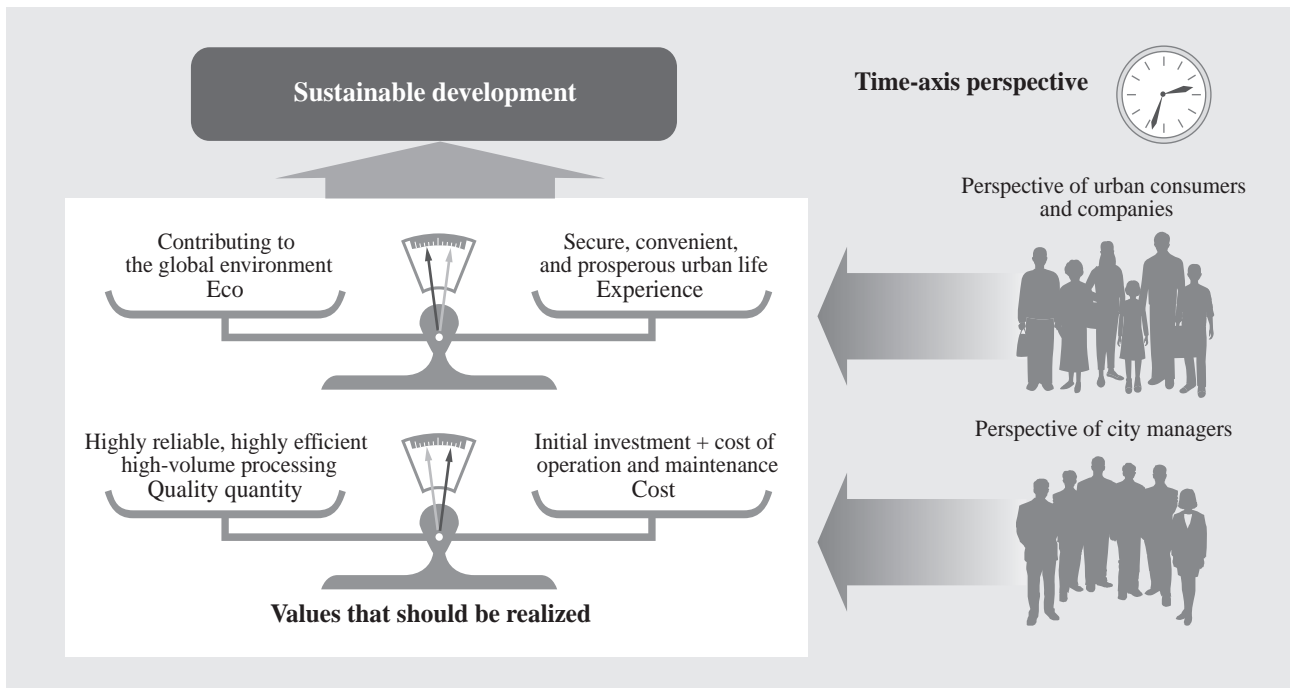


Fig. 2—Sustainable Development in Smart Cities.

Sustainable development in smart cities requires a time-axis perspective. This requires building a public infrastructure that can sustain the “optimal balance of eco and experience” that meets conditions such as changing population, economics, social environment, and geographic restrictions, and realizes sustainable development.

cities provides plenty of opportunities and options to consumers who wish to contribute more actively to protecting the global environment.

(b) Companies: optimal balance of “eco” and business operations

The public infrastructure of smart cities provides the following two types of support for companies. Firstly, it enables business operations with a high level of economic rationality, which increases the desire to invest in the community. It also enables the continuity and development of these companies to be compatible with environmental protection. Secondly, this public infrastructure provides plenty of opportunities and options to companies that wish to contribute more actively to global environmental protection.

(c) Government: optimal balance of just-enough public infrastructure and cost

Besides supporting (a) and (b) above, the public infrastructure of smart cities is implemented at a cost that is optimally compatible with both the central government’s environmental policies and the local government’s finances.

(3) Time axis

A city’s population, economic trends, and social demands, and its consumers’ lifestyles and needs, change greatly over time. Also, external factors and restrictive conditions (such as available resources)

may vary greatly depending on the city. The public infrastructure of smart cities makes possible the continuation and sophistication of the balance described in sections (1) and (2) above by taking into consideration these factors and variations.

The framework and approach established here have become the basis of the vision and concept of smart cities presented by Hitachi on its website and at exhibitions. They are also used as the framework when supporting Hitachi’s upstream design of smart cities (meaning the conceptual and planning stage).

### “ECO” LIFESTYLE

Seeking to realize a sustainable society, Hitachi has set out its priorities for global environmental protection in its Environmental Vision (see Fig. 3). The vision’s three basic components are “Prevention of Global Warming,” “Conservation of Resources,” and “Preservation of Ecosystems.”

From the standpoint of experience design, the technologies and solutions for achieving this environmental vision can be divided into those that directly contribute to accomplishing the vision’s goals, and those that support behavioral patterns and lifestyles that contribute to accomplishing the vision’s goals. This classification and representative examples are shown in Fig. 4.

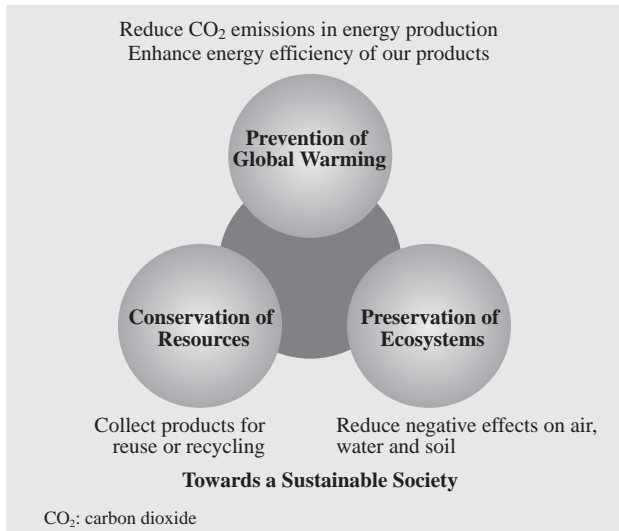


Fig. 3—Hitachi Environmental Vision.

Based on its environmental vision, Hitachi is working to realize a sustainable society by promoting global production that reduces the environmental burden of products throughout their life cycle.

Hitachi has been undertaking the comprehensive and systematic development of technologies and solutions that directly contribute to realizing its environmental vision, such as renewable energy and sewage treatment. It is also studying the deployment

of these technologies and solutions in ways that help achieve an overall optimal balance. Meanwhile, separate technologies and solutions, such as car sharing and home energy management systems (HEMSs), which support behavioral patterns and lifestyles that contribute to realizing the Hitachi Environmental Vision, are in the early stages of development and testing. Hitachi has commenced research into “eco” lifestyles that utilize experience design so that it can investigate and develop technologies and solutions that support behavioral patterns and lifestyles that fulfill a comprehensive and systematic vision of the environment.

The first effort of this research drive is the development of “I Am Being Ecological.” This is a collection of findings developed by Hitachi, Ltd.’s Design Division that explore users’ fundamental values in order to clarify the meaning of the experience values to be provided. Similar to “24 Chapters of Happiness” (a booklet summarizing 24 elements that make up experience value, with examples provided), which is being used in solution development, “I Am Being Ecological” summarizes keywords and suggestions to keep in mind when conceiving “eco” experiences and the solutions that realize them. Like “24 Chapters of Happiness,” this project uses the

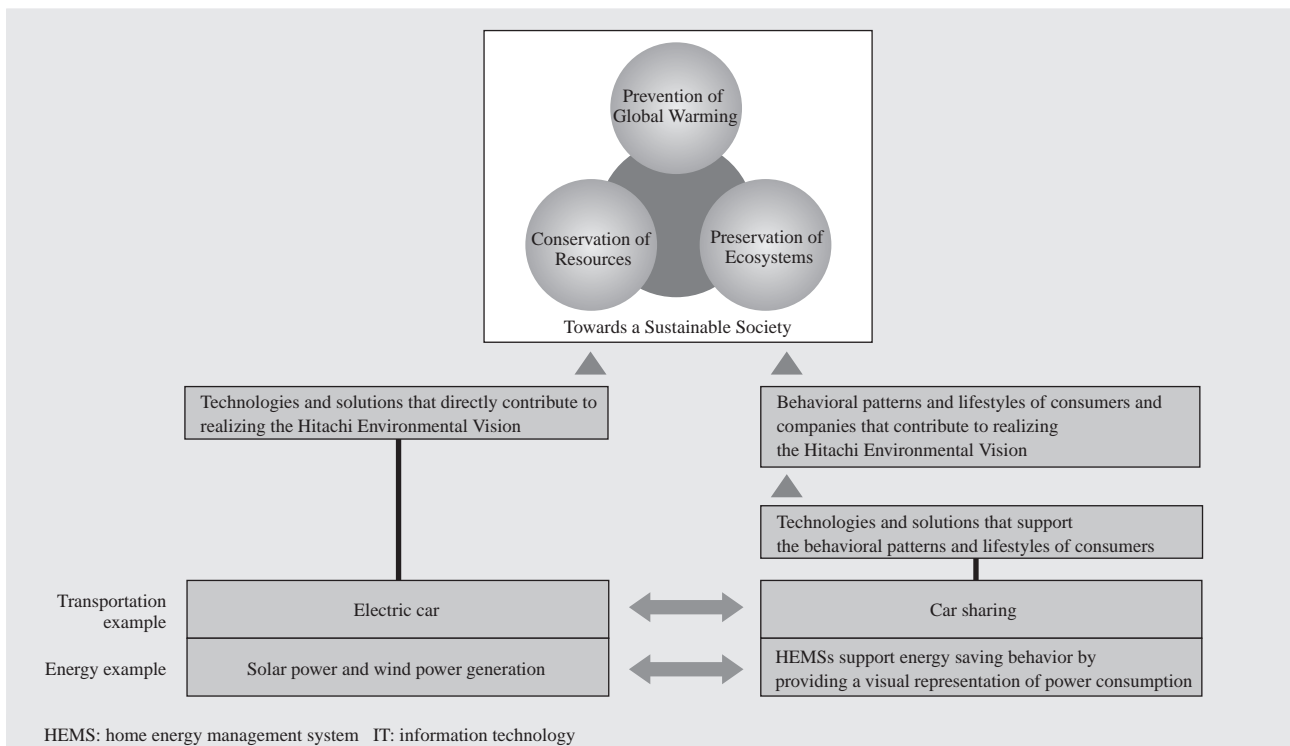


Fig. 4—Solutions for Protecting Global Environment (Experience Design Standpoint).

Supporting the lifestyles of consumers and businesses in ways that help protect the global environment is also a critical goal for utilizing IT in smart cities.

methods of experience design to study what kinds of experiences (that is, what did we do?, what kinds of feelings did it invoke?, and what was the experience?) make us feel that we have contributed to protecting the environment (being “eco”). A current, tentative version is shown in Fig. 5. “I Am Being Ecological” is being developed as a conceptualization tool, just like “24 Chapters of Happiness.” It is not intended to be comprehensive or logically complete.

The six keywords in “I Am Being Ecological (tentative version)” are listed below. These can be thought of as representative “eco” experiences from a consumer’s point of view. From the standpoint of experience design, the public infrastructure of smart cities should seek to utilize IT and a variety of solutions so that when consumers act to gain “eco” experiences, they are supported by “being able to take actions comfortably,” “being able to take actions without stress,” “having actions occur automatically,” and “having sufficient opportunities and choices.”

(1) Well-balanced, in moderation

This keyword means that the quantity, quality, and timing of items and services are well-balanced and in moderation for their needs.

(a) Well-balanced air-conditioning (quantity): Over-cooling is avoided when using the cooler and

over-warming is avoided when using the heater. Also, to avoid waste, the air-conditioning system can turn itself off in areas where no one is present.

(b) Well-balanced use of water (quality): Reclaimed water and rainwater can be used for water sprinkling and vegetation irrigation.

(c) Well-balanced transportation (timing): Because consumers can use a public transportation system with right timing, gasoline expenses that are incurred from the use of family cars can be kept down.

(2) “What a waste!”

This keyword means taking care so that life can be lived with minimal resources. The feeling of “What a waste!” is prevented.

(a) Don’t throw it away: Consumers can easily understand how something can be recycled. When an item is no longer needed, it can be recycled anytime.

(b) Don’t own it: Because cars can be shared and a variety of items can be conveniently rented, consumers can make do without owning items that they rarely use.

(c) Use it up: Formulating a plan of purchasing, storage and consumption of food becomes easier, which means food can be used without waste.

(3) Don’t pollute

(a) Air: Modes of transportation and types of energy that minimize air pollution can be used.

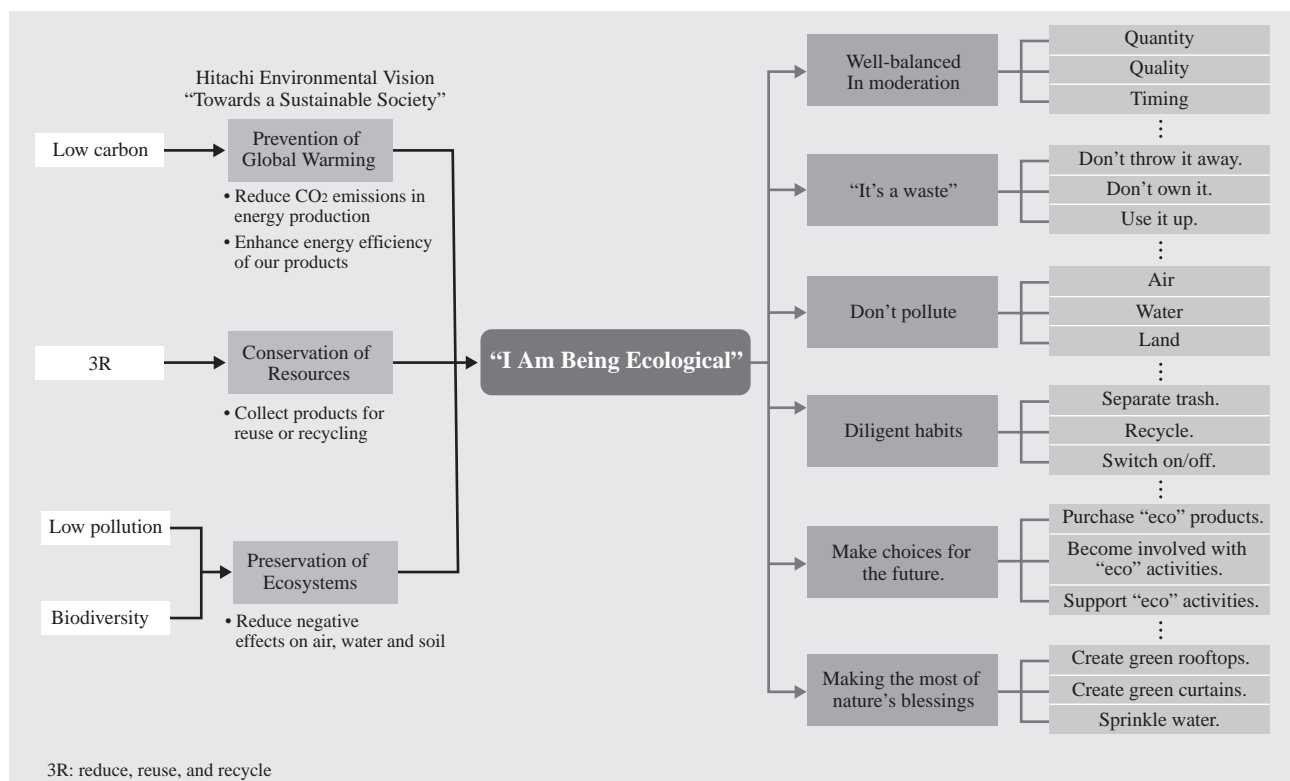


Fig. 5—"I Am Being Ecological" (Tentative Version).

This reference guide shows lifestyles that contribute to environmental protection from a consumer's point of view.

(b) Water: Because an environment is established where used water can be processed and reused, consumers can use water without worries. Laundry and dishes can be washed with minimum water pollution.

(c) Land: Consumers can choose products that are produced with minimum pollution of the land.

(4) Diligent habits

(a) Separate trash: Consumers can easily understand how a variety of waste items should be separated. They can separate them often without mistake or delay.

(b) Recycle: It is easy to understand what can be recycled and how. When an item is no longer needed, it can be recycled anytime.

(c) Switch on/off: Systems such as air conditioning and lighting are automated or can be controlled externally so that they can be switched off with certainty when not needed.

(5) Choose for the future

Consumers use more environmentally conscious products and services because of the priority they place on the future (their children's future), even if at present they sacrifice convenience and face somewhat higher costs.

(a) Information: Because sufficient information about more environmentally conscious lifestyles, products, and services can be easily obtained, consumers can think about what choices to make for the future, and can continue doing so until they are completely satisfied.

(b) Opportunities: Sufficient options are provided and made easily available when consumers think about choosing more environmentally conscious products and services (such as car sharing or renewable energy)

(c) Involvement: There are sufficient information and opportunities to take part in activities to protect the global environment (such as planting trees or recycling) so that consumers can become proactively involved.

(6) Making the most of nature's blessings

By making the most of nature's blessings, such as creating green roofs, making green curtains, and sprinkling the ground with water, consumers can live comfortably while significantly curbing their consumption of energy.

## LIFESTYLE REFERENCE GUIDE

Hitachi is working on the creation of a smart city lifestyle reference guide in order to provide suggestions relating to the development and commercialization of technologies and solutions for realizing and supporting experience and "eco" lifestyles in smart cities. This

reference guide maps the experiences (including "eco" experiences) that diverse consumers living in smart cities in the future can obtain onto a variety of life scenes. At present, the Design Division has nearly completed this task of organizing these experiences into several hundred life scenes.

Fig. 6 shows a map of experiences in the typical life scenes of "working," "living," "mobility (traveling)," and "studying and playing."

This lifestyle reference guide is also being utilized in the creation of materials (websites, exhibits, and presentations) for explaining Hitachi's vision for the smart city and its technologies and solutions in an easy-to-understand manner.

## SMART CITY PROJECTS IN EMERGING ECONOMIES

While smart city activity is taking place around the world, numerous large-scale projects in emerging economies such as China and India are of particular note. Smart city projects in which Hitachi is participating include the Tianjin Eco City and Guangzhou Knowledge City projects in China, and the Delhi-Mumbai Industrial Corridor Project in India.

Implementing experience design in emerging economies requires the resolution of the following dilemma.

(1) Because the experiences that people seek vary depending on their characteristics, including their culture and their economic and social conditions, experience design requires a deep understanding of the local environment and it is desirable for projects to be carried out by local people who empathize with the experiences being sought.

(2) However, newly emerging economies lack people with knowledge of and practical experience in experience design.

Hitachi, Ltd.'s Design Division implemented a trial project with the goal of developing practical techniques to overcome this dilemma and to carry out experience design in emerging economies. It also sought to provide useful knowledge for existing smart city projects in which Hitachi is involved.

The Design Division selected the Smart City Solutions for Guangzhou Knowledge City project for the trial. Of all the smart city projects and related solutions being undertaken in China, this project has the strongest affinity with experience design. The Design Division chose safe and secure living in Guangzhou Knowledge City as the theme of its experience design.



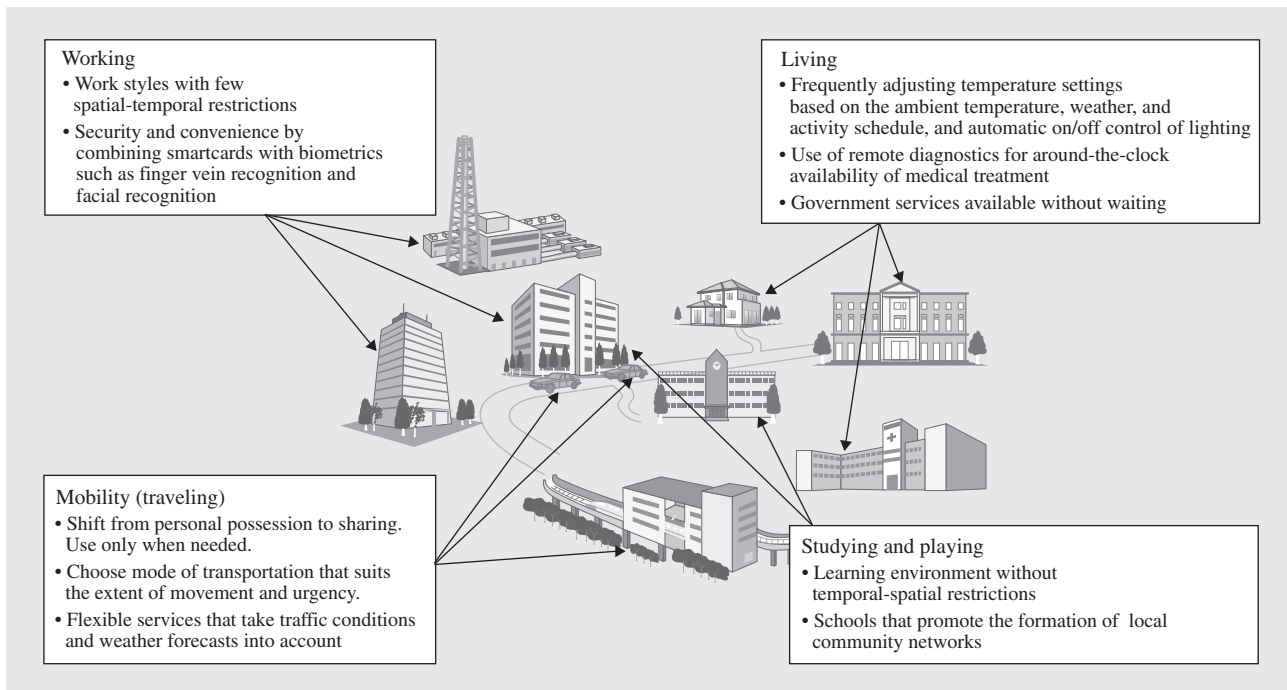


Fig. 6—Example Lifestyle Reference Guide for Smart Cities.

The lifestyle reference guide is used to communicate the smart city vision and to identify specific solution needs.

This trial project was carried out principally by experience design specialists from the Design Division. The Design Division also received support from graduate students working under Professor Makoto Watanabe at the Chiba University Graduate School of Engineering (five Japanese students and five exchange students from China). The students were studying experience design and belonged to Professor Watanabe's lab. The project also set guidelines for the effective use of specialist Chinese companies for specific aspects of experience design, such as interviews with stakeholders. Fig. 7 shows an overview of the structure and processes of the trial project.

In order to carry out the study effectively, the following two methods were used to integrate knowledge of experience experts and knowledge from Chinese exchange students who understand their people's characteristics, culture, and economic and social conditions from a design standpoint:

- (1) To provide sufficient preparation, a hypothetical study was carried out in a workshop in Japan. This workshop was grounded on research results obtained by a local research firm in Guangzhou City.
- (2) Field work was conducted locally, and the information on actual conditions shared among the participants. Afterwards, an experience table was finalized at another workshop, and improvements were made to the solution ideas.

Fig. 8 shows a scene from the local workshop.

The results of the trial project showed that the composition of personnel (skill mix) and basic methods of advancing the project were sufficiently effective and practical. Meanwhile, numerous issues concerning individual techniques were discovered. The plan going forward is to keep conducting trial projects in stages in order to apply the knowledge gained to actual experience design projects in emerging economies.

As a result of the trial project, the Design Division also obtained a considerable amount of useful knowledge on the development of smart home solutions. As initially expected (as hypothesized at the initial workshop), there were no major differences in the major components of experience expected by the residents of Guangzhou City compared with Japanese residents in terms of safety and security. However, new knowledge was gained concerning the thoughts and expectations of communities, and relationships of trust between people. The knowledge obtained from this trial project is expected to be utilized in the development of smart home solutions by Hitachi's Information & Telecommunication Systems Company.

## CONCLUSIONS

This article has described Hitachi's efforts to realize value for life in smart cities through experience design. The smart city itself is a new global effort,

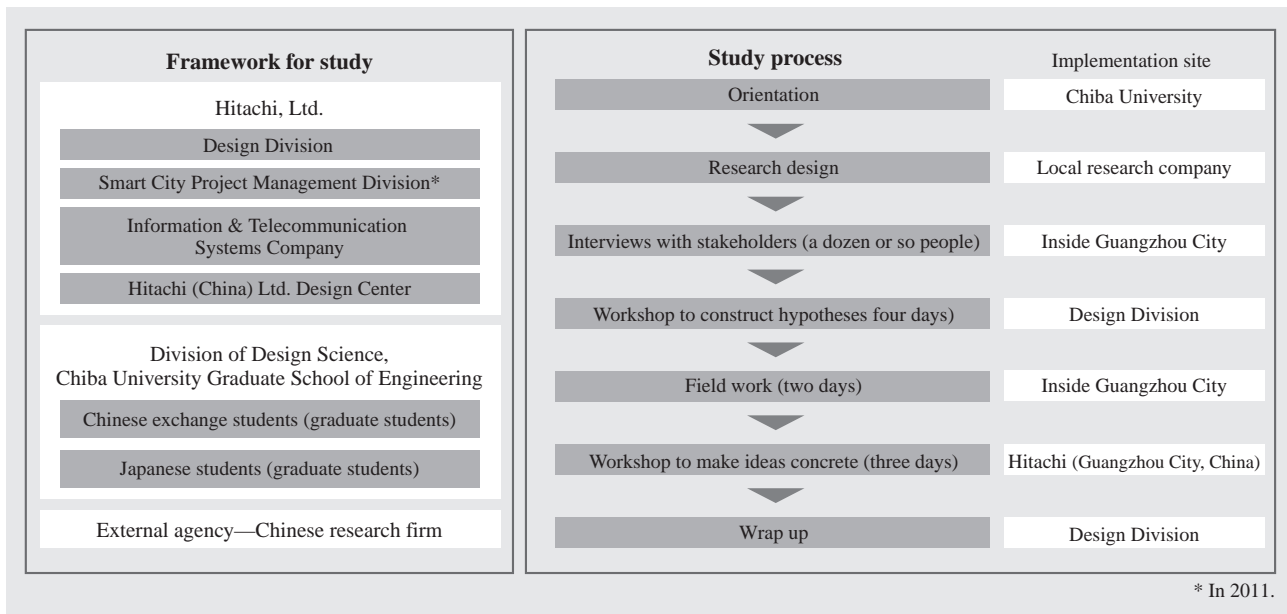


Fig. 7—"Safe and Secure City Experience in Guangzhou City" Study Project.

This study was carried out principally by Hitachi, Ltd.'s Design Division with support from the Chiba University Graduate School of Engineering and the then Hitachi Smart City Project Management Division.



Fig. 8—Scene from Workshop.

Workshops were held in Guangzhou City immediately after the two days of field work (on-site research).

and the application of experience design to smart cities has just begun. As a result of previous efforts, Hitachi is currently at the stage of establishing a useful framework and approach for the conception and planning of smart cities. The Design Division is creating keywords and references to inspire the conceptualization of the development of smart city solutions, and is carrying out trial projects. The knowledge gained from these trial projects will be applied to actual projects in emerging economies.

Going forward, Hitachi intends to utilize experience design to build smart cities that realize a high level of experience values by involving itself and utilizing its know-how in real-world projects.

## ABOUT THE AUTHORS



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