Experience Design: Theory and Practice

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NEW VALUES FOR SURVIVING COMMODITIZATION

JAPAN'S manufacturing industries have maintained an advantage in the global market by improving their ability to provide high-quality products based on advanced technology and maximized efficiency. However, the global market has been changing dramatically over the last 15 years. Therefore, companies throughout the world, not just those in Japan, need to drastically shift their strategies to keep up with these changes because intensified global competition has accelerated the commoditization[a] of products and services. A commoditized product is difficult to differentiate from others, and is subject to price competition. Even if the manufacturer adds many functions to the product and seeks to improve its performance, it is unlikely that the company will make a profit as other companies will soon catch up. This means that companies need to move away from the product-centered approaches of the past and instead learn how to add value in ways that go beyond the product itself[1],[2].

This has led to the concept of "experience" meaning subjective values that extend beyond functionality and convenience. This is seen as an approach that can overcome the challenges of price competition that comes from commoditization.

WHAT IS EXPERIENCE?

The concept of "experience," as used in this article, originates from two sources: marketing and user interface design.

Experience in Marketing

The concept of "experience" in marketing became widely known when *The Experience Economy*, written by B. Joseph Pine II and James H. Gilmore, was published in 1999[3]. During the process of economic development in the 20th century, major portions of the economy shifted away from agriculture, forestry, and fisheries (primary industries) toward product manufacturing (secondary industries) and then service industries (tertiary industries). Pine and Gilmore predicted that the next step in this process will be the emergence of the "experience economy." As the fourth in this sequence of economic values, experience values attract and engage customers by supplying products and services that deliver memorable events. This is the key to surviving commoditization[3]. According to Pine and Gilmore, a customer's state of mind and circumstances affect how he or she feels about an event they experience, therefore no two people can have the "same experience," even though they have experienced the same event. This means that the factors affecting how a customer reacts to a product or service include not only its characteristics and quality, but also the customer's own expectations, feelings, and other psychological states, and also the physical and social context in which they experience the product or service. In other words, experience is a subjective value, not an objective value. Around the same time, B.H. Schmitt and J.F. Sherry also pointed out the importance of experience in marketing[4],[5],[6].

Experience in User Interface Design

The concept of experience was introduced to user interface design by D.A. Norman, a "user experience architect" who left university and joined Apple Computer Inc. in the 1990s. He was also believed to be the first person to use the phrase "user experience" (UX) in the title of a publication. Thereafter, the concept was introduced to various fields, including user interface design, web design, and usability engineering. Nowadays, the term UX is widely known in the information technology (IT) field in particular.

Various scholars have proposed different definitions for UX. For example, E. Law, and his colleagues, surveyed at total of 110 researchers and practitioners

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(a) Commoditization

The process by which manufactured goods from competing suppliers cease to have any meaningful differences (in terms of factors such as their functions, quality, and brand). If products are commoditized, consumer purchasing decisions are made mainly on price. Commoditization tends to lower the price of products and puts pressure on corporate profits.

TABLE 1. Results of Survey on User Experience Definition.
When a total of 110 researchers and practitioners were surveyed using a questionnaire that offered five different definitions, the following two definitions gained strong support.

Definition most supported by researchers	Paul Hekkert (Professor of Industrial Design department at Delft University of Technology) User Experience is the entire set of effects that is elicited by the interaction between a user and a product, including the degree to which all our senses are gratified (aesthetic experience), the meanings we attach to the product (experience of meaning), and the feelings and emotions that are elicited (emotional experience).
Definition most supported by practitioners	Nielsen Norman Group (US usability consulting firm) User Experience encompasses all aspects of the end-user's interaction with the company, its services, and its products. The first requirement for an exemplary user experience is to meet the exact needs of the customer, without fuss or bother. Next comes simplicity and elegance that produce products that are a joy to own, a joy to use. True user experience goes far beyond giving customers what they say they want, or providing checklist features.

working in the field about which of the five major definitions of UX they felt was most appropriate. The results showed roughly equal support for four of the five definitions[7]. However, when the data was analyzed in terms of the attributes of the respondents, a clear division of opinions was found between those who worked in research, on one hand, and those who worked in a corporate environment and utilized UX in product development, on the other. Table 1 shows results of the survey[8][9].

E. Law and his colleagues held a subsequent workshop at the Dagstuhl Seminar in 2010, and went on to summarize the results in their *User Experience White Paper*[10]. The definition of UX was also included in the revised ISO standard for human-centered design (ISO 9241-210) in 2010. The shared features of these two documents are as follows:

(1) UX represents the values that users recognize in a product or service over time, before, during, and after their use (or purchase) of the product or service concerned.

(2) UX is affected by not only the characteristics of the product or service itself (appearance, functions, performance, and so on), but also the user's inner state (attitudes, skills, expectations, feelings, and so on) and the user's social and physical context.

Experience Design at Hitachi

Taking account of the reviews described above, Hitachi defines "experience" as follows based on the practical considerations of product and service design.

(1) Experiences (user or customer experiences) are the subjective values that the user perceives in a product or service, such as a product that conveys a sense of "extreme comfort," "never-before-seen surprise," "intellectual excitement," or "complete sense of security," which are all irreplaceable. These values are experienced over time in each stage of the product or service lifecycle: from the point of making the purchase decision through to using the product or service after purchase, maintaining the product or service, and purchasing a replacement.

(2) Experience should be considered in terms of the characteristics of users and products or services, as well as the situations in which they are used. Experiences are multi-dimensional and relative phenomena that cannot be evaluated by a single measurement scheme, such as "good or bad" or "55 out of 100 points."

(3) Delivering experiences requires an iterative process: (a) analyze the user's existing requirements and latent needs, (b) design solutions and draw a scenario of how solutions will work for users over time, (c) work with developers, engineers, and users to validate effectiveness, and (d) redesign the products or service if necessary.

EXPERIENCE DESIGN APPROACH

Hitachi believes that its extensive work on designing "experiences" from a user's perspective, primarily in home appliance design, will help to enhance the value of products and services in various industries, such as electric power systems, healthcare, transportation, and IT. Since the 1990s, Hitachi's Design Division has sought to expand its use of the "experience" approach. Furthermore, since 2002, the division has been striving to improve and develop the fundamental technology of experience design and establish a methodology by reviewing past activities[11]. Three elements are fundamental to experience design: a human-centered design process, workshops for developing and visualizing creative ideas, and creating scenarios of the future.

Human-centered Design Process

Human-centered design seeks to provide users with high-valued experience when they use the product or system[12].

One problem with using conventional processes to create high-experience products is the difficulty of obtaining an accurate understanding of how users feel about the products and how they see things. This is because engineers have too much technical knowledge about their products and services. Designers have become so proficient that they can no longer perceive or understand the areas that are apt to cause difficulties[13].

One approach to creating highly satisfying products is for the designers to listen to users' needs in the planning phase and design their products accordingly. That is, to identify problems by collecting user complaints and conducting interviews to determine the sources of user dissatisfaction. In most cases, however, a user's opinions are based on an unsatisfactory experience in a certain situation, and changing the product to satisfy their complaint may only create new problems that arise in different situations. Users are not necessarily able to express the entirety of what they really want.

Human-centered design is aimed at solving these problems by iterating the processes of "understanding and specifying the context of use," "specifying the user requirements," "producing design solutions to meet user requirements," and "evaluating the designs against requirements." Specifically, it involves first observing and interviewing typical users to understand each user's characteristics and the situations in which they use the product or service. Based on these findings, the next step is to define a "persona" (that represents a group of users) with a specific background, including a detailed description of their characteristics and circumstances. From this, a chronological story is developed to imagine what will constitute a satisfying experience for this persona when they are using the product or service for some purpose. The design specification capable of transforming this story into reality is determined. Finally, a prototype is built based on the specification for an iterated process of verification and improvement to make sure that the product or service really does deliver the intended experience to the user.

Experience design aims to provide high-quality experiences to users, but it cannot create the experiences itself. Therefore, it is imperative to iterate both the process of researching users and their circumstances, and the process of redesigning the product or service so that it can be tested to confirm whether it provides the experience intended.

Workshop for Developing and Visualizing Creative Ideas

What makes it possible to realize a design that can dramatically enhance the user experience? The key to this breakthrough is "communication." First, those existing or latent problems that most concern the user can be identified from the investigation of the user's characteristics and usage situations. A design can then be developed that overcomes these concerns and provides the user with a satisfying experience. In this phase, the developers hold workshops to review and share the issues of concern from their various different perspectives, which include themselves being users of the system being developed. The workshop includes the use of concept visualization methods that can be used as a basis for generating creative ideas.

Specifically, the "experience table" technique described later in this article is used to visualize the facts collected in the user research stage. This table presents the user's behaviors and experiences in chronological order. Another method is "stage prototyping," one example of which is the use of actual-scale mockups with dummy equipment and furniture to provide a realistic environment in which the people involved in the development can review the issues of concern and their objectives. Next, an ideal experience scenario ("To-Be" scenario) is created to represent the best-case experiences that that product or service should be providing to the user, along with ideas for how to bridge the gap between this ideal and the existing reality. Finally, the "business *origami*" technique, which is also described later in this article, is used to visualize and finalize the scenario.

The creative workshop focuses primarily on the perspectives of end-users, on flexible thinking, and on visualization. It places less emphasis on objectivity, completeness, and logic.

In recent years, conducting such workshops has become increasingly important in building a true consensus, especially in smart city and other areas of Hitachi's Social Innovation Business that involve multiple stakeholders.

Designing Scenarios of the Future

It is common for products and services created by Hitachi's Social Innovation Business to still be in use five or 10 years later. The study of experience needs

to identify both the current situation and what users will value in the future, so that these can be used to discuss how people's values will change, what sort of life will be regarded as prosperous by people in the future, and what they will be looking for in their products and services. This process can then be used to create scenarios of an ideal future.

Hitachi has made frequent use of movies and other techniques to design scenarios of future lifestyles, the effectiveness of which has been demonstrated in terms of new contracts won and trusting relationships established and deepened with customers. However, while the process of designing these future scenarios currently depends on the intuition and creativity of individual designers, the complex factors involved in designing scenarios of how society might look further into the future (such as in 10 or 20 years' time) means that systematic methodologies will be needed. Hitachi's response to this challenge is described in the article entitled "Methodology Research and Development for Designing Future Experience" in this edition of *Hitachi Review*.

TECHNOLOGIES AND TOOLS FOR USE IN EXPERIENCE DESIGN

Hitachi uses various techniques (methods, tools, and conceptual frameworks) for the three approaches to experience design discussed above. The following section describes some of these techniques.

Ethnographic Research

Ethnography is a social science methodology. Ethnographic research is conducted to observe how users behave with a particular product or service, and analyze collected data against factual data in order to generate an overview of the behaviors concerned. It can also reveal values that are presupposed by users and their latent needs. Frequently, what users say they are doing does not match what they are actually doing. Also, researchers who have investigated user complaints about particular systems have found that many users simply accept their dissatisfactions without speaking up about how they feel. Ethnography is an effective technique for revealing users' latent needs and clarifying the critical issues relating to their work and interaction with the system (see Fig. 1). The technique leads researchers to find solutions for the issues.

Experience Table

Hitachi's initial work in experience design involved developing narrative scenarios for how products and services can provide users with delightful experiences. It found that scenarios could be clarified by writing a story that described how the behaviors and feelings of a user with a specific profile changed over time, as they used the product or service. The problem with this approach, however, is that scenario writing is not a collaborative activity, making it unsuitable for group brainstorming. Instead, what was done in practice was to take a scenario written by one person and review it as a group. Also, the effectiveness with which such a scenario can illustrate its characters' emotions and impressions depends on the skill of the writer. This led Hitachi to develop and introduce a design tool called the "experience table" that allows project teams made up of planners, designers, and user researchers to participate simultaneously in scenario building.

Fig. 2 shows an experience table generated for a project that was developing a system for over-the-counter banking services. The horizontal axis represents time and the sequence of phases. The upper half of the table depicts the flow of bank staff experiences, and the lower half depicts the flow of customer experiences. In each phase, the customer wishes to accomplish a different task. Arriving at the bank, the customer may only want to obtain some information, but having expressed this request they may subsequently want to know more in order to resolve some uncertainty. Likewise, the value that the bank staff should provide to the customer varies from phase to phase. Welcoming a customer who visited the bank, the staff aims to relieve any

Fig. 1—Conducting Ethnographic Research.
The people on the right and left are researchers who are observing and recording the behavior of the worker in the center.
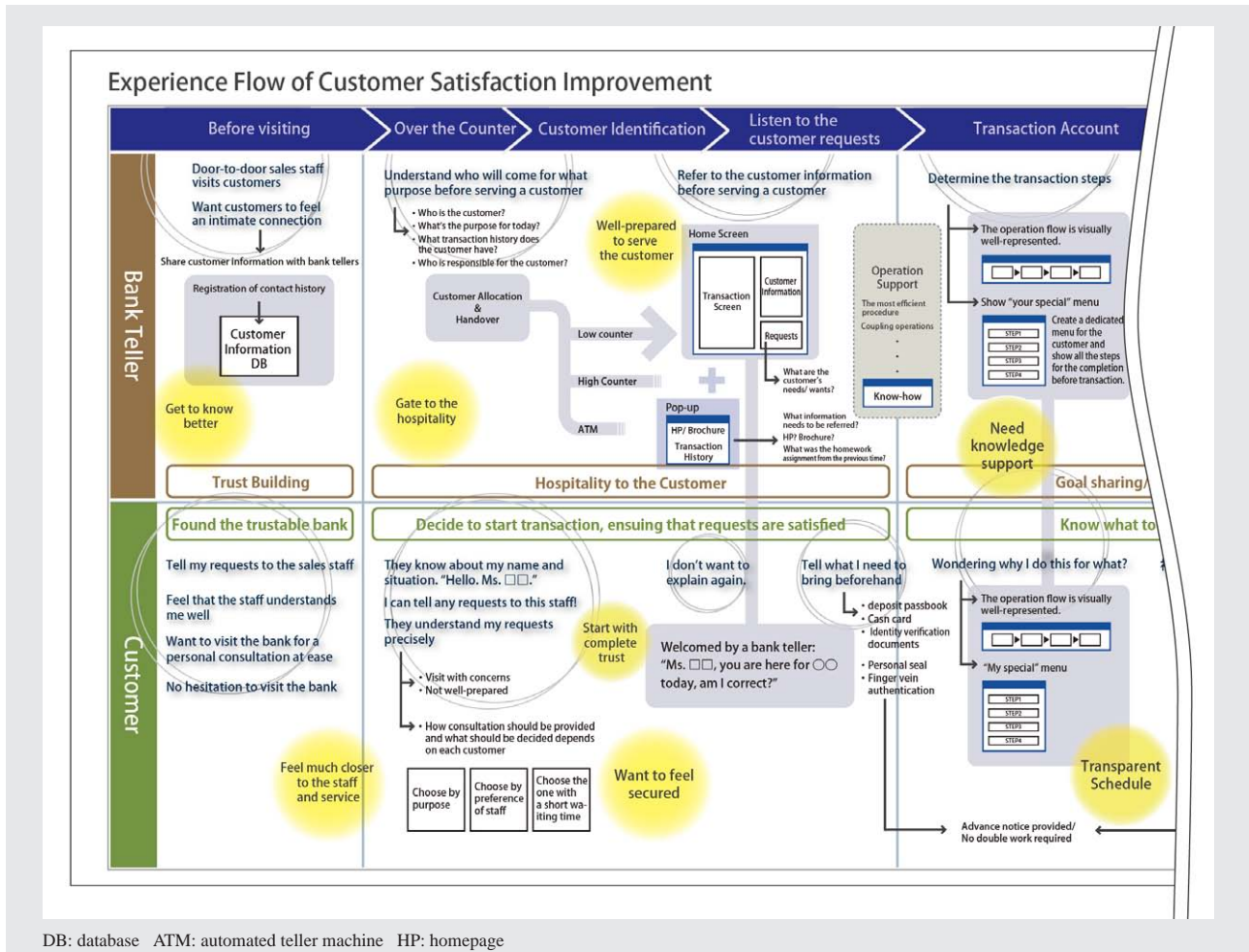
Fig. 2—Experience Table.
This experience table was created for the development of a next-generation system for over-the-counter banking services. With the aim of providing a high-quality experience for customers, it depicts the sequence of interactions between a bank teller and a customer who is seeking assistance and wants to consult the bank about finance or investment.

customer anxiety. When processing documents after the customer has specified the transaction they want performed, the aim is to impress the customer with the speed of service.

In this way, the experience table presents a clearly defined "To-Be scenario" for the system that reflects the perspectives, expectations, and feelings of the stakeholders. It allows project members to collaborate on scenario creation by providing a comprehensive and panoramic view of the series of interactions that make up an experience.

Another advantage of creating scenarios from a consensus of developers and users with different perspectives is that it is especially useful in large system projects where members are prone to lose sight of the initial requirements (the "To-Be scenario") as the project proceeds. This is because, while it is common for team members to focus excessively on the detailed specifications, the experience table, having been created and shared by everyone involved, reminds them of the ultimate scenario that they are aiming for, regardless of where in the project they currently are. Recognizing the value of this, Hitachi uses the experience table as a crucial platform for presenting chronological representations of the concepts and visions that underlie a product or service.

Business *Origami*

After acquiring an understanding of current user experiences using research methods such as ethnography, researchers have to face the challenge of how to develop new services. An important aspect of this is to use a customer-oriented approach to the reconstruction of the existing value chain. It is always difficult for stakeholders to give up old value chains that prioritize their convenience in any system

development or service distribution. Accordingly, business *origami* was developed and introduced to support the customer-oriented construction of services[14].

Business *origami* is a design tool that gathers participants with different opinions around a table for a lively discussion of a new value chain, and involves placing *origami* models of people or buildings on the table to present an overview of stakeholders' interests and concerns. The method includes a facilitator whose role is to encourage participants to look at the situation from a service-oriented perspective and identify what features are missing. Participants are also encouraged to consider the overall picture and proactively contribute ideas to the discussion (see Fig. 3). In comparison to discussions around a whiteboard, which are apt to be dominated by the person writing on the board, business *origami* discussions around the table greatly enhance the involvement of all participants.

Hitachi Style

To provide an enriched experience through a product or service, it is necessary for designers to specify the objective they hope to achieve by offering a particular experience to users, as well as to create specific stories and scenes that show how this objective will be accomplished. In the case of an express train, for example, the customer experience will be different depending on whether they are traveling for pleasure with someone close or merely commuting to work. Possible emotions associated with the experience might include excitement, comfort, or the trip being a memorable event. Hitachi is involved in a wide range of businesses, with products and services that interact with users in a variety of settings, from the home to offices and public facilities. To respond to this diversity, Hitachi has created its own design philosophy called "Hitachi Style." This philosophy was developed firstly by analyzing users' expectations and what it would take to provide an ideal user experience. Next, Hitachi products and services are reclassified from a customer's perspective (which is different from Hitachi's business categories). Lastly, the design approaches suitable for these new classifications are identified and then grouped under the following categories:

(1) Hobby gear: an attractive design that provides pleasure in daily life with advanced technology
(2) Life component: a design that supports daily life through home appliances with utility and beauty
(3) Professional partner: a design that satisfies high-

Fig. 3—Using Business Origami.
Project members use origami models of people and buildings as props for holding active discussions with the aim of constructing a customer-centered value chain.

level professional requirements critical for daily work
(4) Natural support: a design that provides public utility through efficient infrastructure to make our daily life go smoothly
(5) Practical tool: a comprehensive design that achieves a specific goal
(6) Experience highlight: a design that provides great fulfillment in daily life by offering extraordinary experiences
(7) Symbolic infrastructure: a design that embodies the concept of the core technology that runs society

These categories provide directions on how to represent products and services, and on how to design user experiences (see Fig. 4).

ARTICLES IN THIS EDITION OF HITACHI REVIEW

The previous sections have discussed the definition of user experience and the different approaches and techniques used in experience design. This section provides an overview of the articles in this edition of *Hitachi Review*.

The article, "Interior Design for Gran Class of E5 Tohoku Shinkansen "Hayabusa": An Unprecedented Journey Experience," describes the design of a luxurious railway car intended to provide passengers with a special experience that they recognize as being worth a premium rate, and that they will want to repeat. The article reviews the design process, including its methodologies and how these are incorporated into the end product, and explains how the subjective values of passengers are identified and how the interior and services provided by the passenger car satisfy these values.
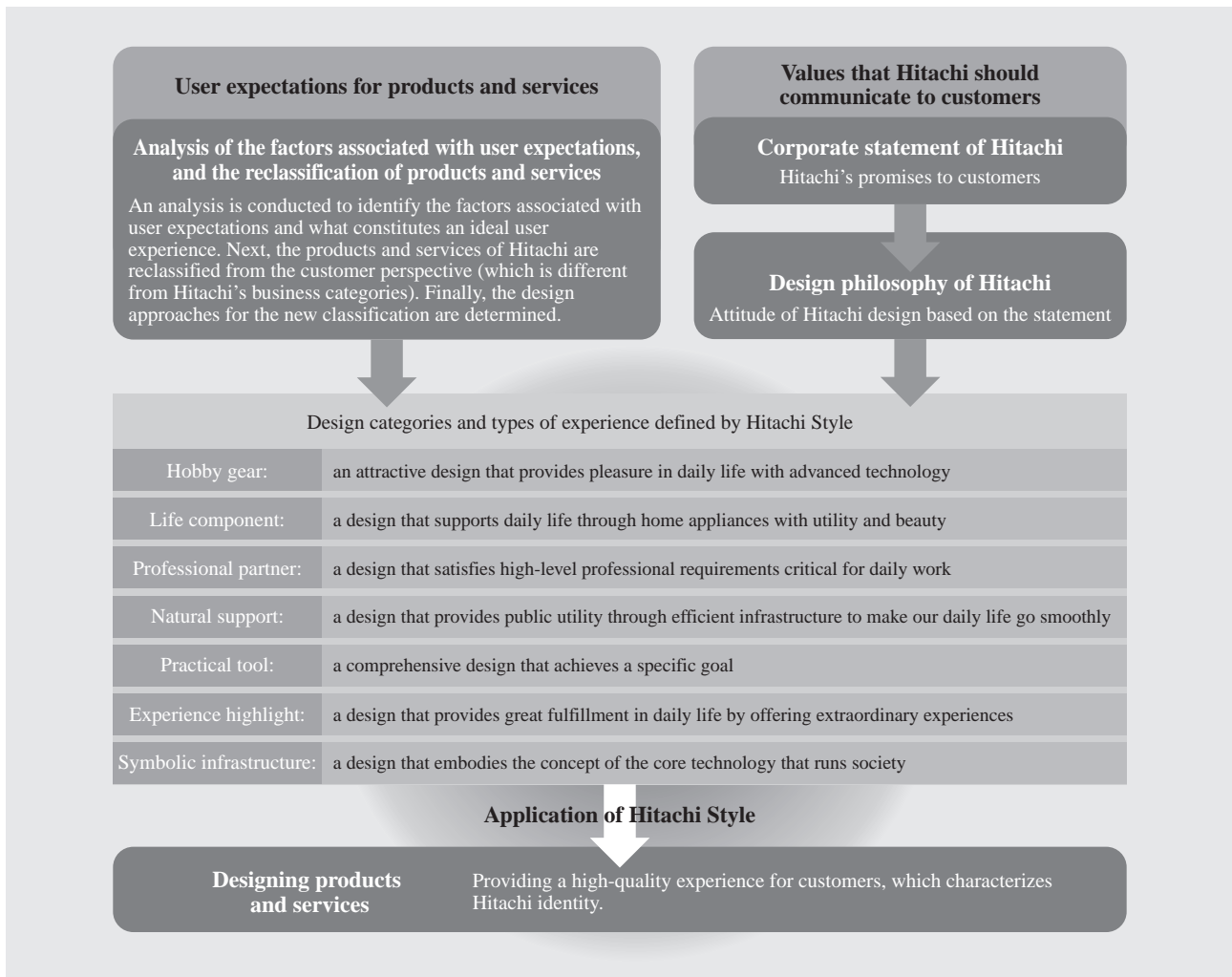
User expectations for products and services

Analysis of the factors associated with user expectations, and the reclassification of products and services

An analysis is conducted to identify the factors associated with user expectations and what constitutes an ideal user experience. Next, the products and services of Hitachi are reclassified from the customer perspective (which is different from Hitachi's business categories). Finally, the design approaches for the new classification are determined.

Values that Hitachi should communicate to customers

Corporate statement of Hitachi
Hitachi's promises to customers

Design philosophy of Hitachi
Attitude of Hitachi design based on the statement

Design categories and types of experience defined by Hitachi Style

Hobby gear:	an attractive design that provides pleasure in daily life with advanced technology
Life component:	a design that supports daily life through home appliances with utility and beauty
Professional partner:	a design that satisfies high-level professional requirements critical for daily work
Natural support:	a design that provides public utility through efficient infrastructure to make our daily life go smoothly
Practical tool:	a comprehensive design that achieves a specific goal
Experience highlight:	a design that provides great fulfillment in daily life by offering extraordinary experiences
Symbolic infrastructure:	a design that embodies the concept of the core technology that runs society

Application of Hitachi Style

Designing products and services
Providing a high-quality experience for customers, which characterizes Hitachi identity.

Fig. 4—*Definition of Hitachi Style.*
The Hitachi Style means delivering a "Hitachi experience" that satisfies customers by integrating users' expectations of products or services with the value that Hitachi seeks to offer.

The article, "Design of Hitachi's Carbon-fiber-reinforced Plastic Head and Pipe and Easy Grip: A Vacuum Cleaner with a Lightweight Feel," describes how Hitachi went about designing a vacuum cleaner with a physically and psychologically "light" maneuverability. The lightweight feel makes the experience of vacuum cleaning more pleasant for users. While home appliances are sometimes thought of as having exhausted the possibilities for design enhancement, this article explains how a traditional design approach could still create vacuum cleaners with a new sense of beauty and utility in our daily life.

The article, "Applications and Benefits of Ethnographic Research —Case Study of Management System Upgrade for Power Plant Construction Site—" describes the use of ethnographic research to identify the underlying problems associated with construction and management at a plant construction site. The article explains how solution ideas were generated to improve the systems, and includes a detailed discussion of the effectiveness of ethnographic research.

Delivering an experience is not just about focusing on a user's direct interactions with the product or service concerned. The article, "Marketing Communication Support for Global Software Sales," describes a study that sought to identify what constitutes a high-quality user experience at the various points of contact with the customer. The study considered the sequence of steps performed by the customer, from collecting information from the Internet before purchasing through to downloading a trial version of the software, purchasing the software, and using and upgrading the software.

The article, "Development of Experience-oriented Approach to Information and Telecommunication Systems Business," introduces Hitachi's own

methodology for requirements development, which aims at providing a high-quality experience for system users during the upstream processes of system development. A characteristic of this methodology is that not only IT specialists, but also "designers" participate in the development process of system requirements, and use the different approaches and methods for experience design as described above. While a number of articles on features and benefits of this approach and methods were published before, the article, "Development of Experience-oriented Approach to Information and Telecommunication Systems Business" goes into greater detail about how they are applied in actual projects, and considers the most effective ways in which they can be used. It provides an example of how the scope of experience design extends to the planning phases of system development[15], [16], [17].

The smart city projects are integral parts of Hitachi's Social Innovation Business. The article, "Experience Design to Realize Value for Life in Smart Cities," illustrates how Hitachi is striving to create unique concepts for smart cities by studying their values from the perspective of experience design. It also presents specific measures for the design-oriented development of smart city solutions, along with prospects for the future.

The article, "Methodology Research and Development for Designing Future Experience," explores a methodology for plotting people's future experiences, which is an extremely challenging topic. Using smart city themes as an example, it explains a series of processes that are integrated into the methodology, starting with the collection of facts on social environment, followed by the analysis and interpretation of the structure of the value of experience pertaining to these themes, and concluding by depicting possible future social infrastructure and services.

DELIVERING BETTER QUALITY EXPERIENCES

Experience design begins with the discovery of happy moments that people experience in their everyday life. This edition has described examples of designs that deliver valuable experiences in various everyday situations, such as taking a special trip by train, taking a break from housework, or searching the Internet to purchase software for work.

To realize many more happy moments through social innovation, Hitachi intends to continue enhancing the study of experience design.

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