Featured Articles

Development of Methods for Visualizing Customer Value in Terms of People and Management

Haruko Nagaoka
Toshiyuki Nakamura
Tadasuke Nakagawa, Ph.D.
Maiko Kaneda

OVERVIEW: The era of the IoT will make it possible to collect data from a wide variety of devices at a level of granularity that was inconceivable in the past, and many companies see this as an opportunity for improving their business and creating new business opportunities. In this current period of transition, however, not only are there few business workplaces from which sufficient data can be collected and stored to enable its use for management and business analysis, workplace analysis is also impeded by human factors, such as people's values and emotions, which are not available as electronic data. This article describes a method for identifying business challenges that can provide accurate visualization from limited data and a method for analyzing the structure of user requests that can express user needs based on people's values. This paper also presents a case study of the use of these methods in an urban development project for the Tenjin district of Fukuoka City.

INTRODUCTION

AS the Internet of things (IoT) becomes a well-established part of our world, it has become possible to collect data from devices in the business workplace at a level of granularity that was inconceivable in the past. This has prompted many companies to see this as a means for improving their business and creating new business opportunities. According to a survey of 1,125 Japanese companies conducted by the Japan Users Association of Information Systems (JUAS), more than 40% of respondents said they would use, or consider using, big data in some form over the coming three years. On the other hand, major challenges of achieving this include clarifying objectives, establishing systems and practices, and mastering and choosing the associated technologies[(1)].

Although data on things, money, and information is used in business to make sense of management and operations, at this point in time it is rare for such data to be collected and stored in sufficient quantity for it to be of immediate use, including cases where data is unavailable because it is the property of some other organization. Workplace analysis is also made more difficult by human factors, such as people's values and emotions, which are not available as electronic data, a main factor behind the challenges listed above.

To deal with this, General Electric Company (GE) has devised a way of collecting data needed for analysis. This involves analyzing data from hundreds of sensors in an aircraft engine and providing it to an airline[(2)]. The airline provides the data to GE because of the accompanying benefits, which include fuel savings that stem from changes in aircraft handling based on this data. GE's immediate customer is the aircraft manufacturer and its end-customer is the airline, hence GE is also able to build a relationship with the end-customer by supplying valuable services.

Meanwhile, Google provides an interesting example of how to obtain information about people. Google announced its Brillo operating system (OS) for IoT devices in May 2015. It includes a development environment for device control that is suitable even for such energy-efficient products as light bulbs. While the convenience of using Brillo to control indoor devices will likely lead to rapid adoption of the OS, there have also been media reports about its potential, once implemented, for using device status data to track people's movements in detail[(3)].

To obtain information about the workplace or marketplace, it is important to create an environment in which customers and other users can see the benefits, as in the examples above, and to establish a means for collecting data. While Hitachi already

offers a workplace analysis service[4] and management impact assessment service[5], since the required data is often collected by using methods such as workplace surveys or workshops, one of the challenges is the time it takes to collect this data in the case of customers with whom Hitachi has yet to build a sufficiently close relationship, or in the case of business-to-consumer (B-to-C) services that target a diverse range of people. This article describes a precise method for identifying business challenges from even limited data and a new method for analyzing people's values, together with results from their use in practice.

BENEFITS AND DIFFICULTIES OF LINKING WORKPLACE ANALYSIS AND MANAGEMENT IMPACT ASSESSMENT

Hitachi has developed the NEXPERIENCE / Ethnography[4] and experience-oriented approach[4] methods for observing business workplaces and identifying problems that might otherwise be overlooked, and the NEXPERIENCE / Business Analysis (BA)[5] method for visualizing organization-wide challenges and their impact on management. Past work has included linking these methods with statistical techniques to identify things like market needs and workplace issues, their implications for management objectives, and what degree of impact they have on the business. This can bridge the gap that tends to arise between management and frontline staff, and has prompted feedback from customers who say they have discovered the reason for their past inability to reconcile actual results with calculations made from operational data, or that their management teams are finally able to understand the point of view of their frontline staff.

However, the use of these methods with customers has raised the following two issues (see Fig. 1).

(1) The limited amount of information that can be obtained from customers with whom Hitachi has yet to build a sufficiently close relationship makes it difficult to highlight things like challenges or the benefits of improvements in a short timeframe.

(2) As people's values change due to factors such as location and timing, there is a limit to how well the needs of end-customers can be determined using past analysis methods based on static demographic data such as gender and age.

In response, Hitachi has developed methods for overcoming these problems and has verified their practicality in actual use.

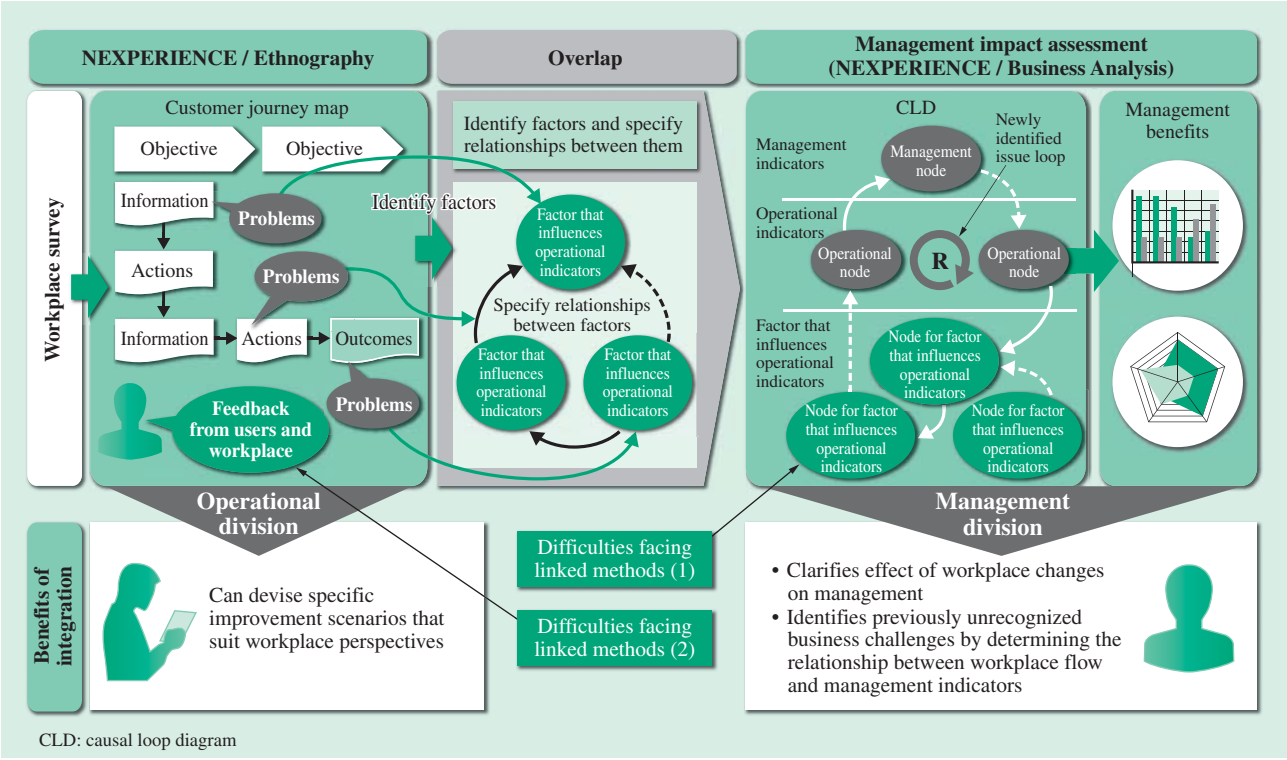

Fig. 1—Benefits and Difficulties of Linking Workplace Analysis and Management Impact Assessment Methods.
While the use of linked methods bridges the gap between workplace and management views, collecting the information required for situation assessment can prove difficult in some cases.

DEVELOPMENT OF NEW METHODS FOR COLLABORATIVE CREATION WITH CUSTOMERS

This section describes two methods for overcoming the challenges described above: (1) identifying business challenges, and (2) user request structure analysis.

Identifying Business Challenges

This method is able to correctly identify business challenges from even a limited amount of information. The process facilitated by the NEXPERIENCE / BA method referred to above involves obtaining management and operational data from the customer, representing it using a modeling technique called a causal loop diagram (CLD), and identifying the challenges through consensus with the customer. The CLD of the business structure takes the form of a directed graph network, with the management indicators, operational indicators, and the factors that influence them represented by nodes, and the cause-and-effect relationships between these nodes are represented by links. Unfortunately, because the items that appear in a CLD range from those considered important by the customer to trivial items that arise in routine operations, the number of nodes can be high and the CLD is often difficult to understand or interpret at first glance. In response, Hitachi has made the following two improvements (see Fig. 2).

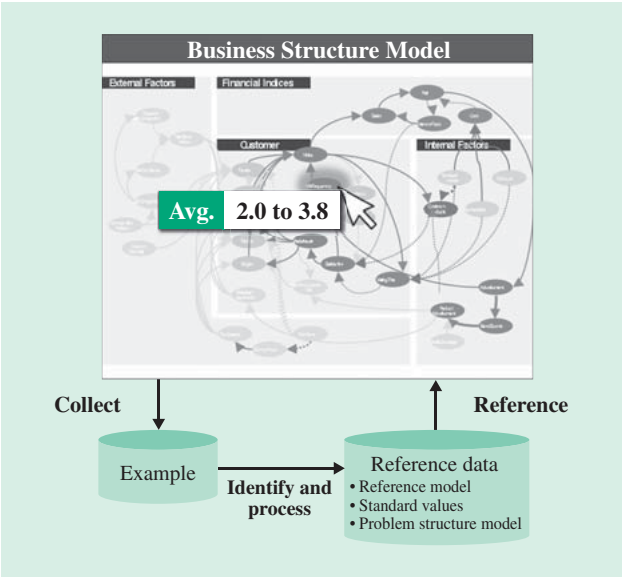

Fig. 2—Overview of Modeling Tool Functions and Example Screen.
The screen displays customization suggestions and reference information based on past examples.

(1) Reference function for industry-specific benchmarks and case studies

The method provides pre-defined reference CLDs for specific industries that are customized for the customer to enable analysis. To support this customization, Hitachi developed a function that searches past case studies to provide reference information, such as nodes that are likely to have cause-and-effect relationships that match the cause-and-effect relationships of existing nodes in the CLD, and mean values for the industry.

Presenting a list of possible nodes augments the customer's thought process and facilitates the customization of the model. The function also presents mean values and trends for commonly used indicators in each industry, such as daily in-process inventory turnover in the case of manufacturing, to facilitate the consulting process of assessing the customer's situation.

(2) Function for highlighting sub-graphs of specific structures

This function is used to show sub-graphs from the CLD that represent specific structures that are likely to cause problems. By allowing importance and other attributes to be specified for each node in the CLD (for instance, whether they are controllable or what business function they belong to), the function can highlight sub-graphs that contain specific nodes. This helps identify discussion points and makes the model easier for the customer to understand by highlighting specific parts as needed to clarify presentation.

By facilitating the addition of extra information and, providing the ability to use a benchmark CLD as a starting point and customize it for the customer using even a limited amount of information, these functions enable the analysis of business challenges in a customer-specific CLD and the visualization of management impact.

The benefits for the customer are that analysis results are available quickly and that they can make discoveries and generate new knowledge through a consulting process that they do not find burdensome. The more the method is used in practice, the greater the portfolio of reference data becomes, thus Hitachi intends to build up its experience with this method so that it can better respond to customer concerns.

User Request Structure Analysis

The method uses questionnaires to obtain an in-depth understanding of what people want, and helps generate ideas for services based on those needs. Developed by Hitachi, the method divides users into clusters

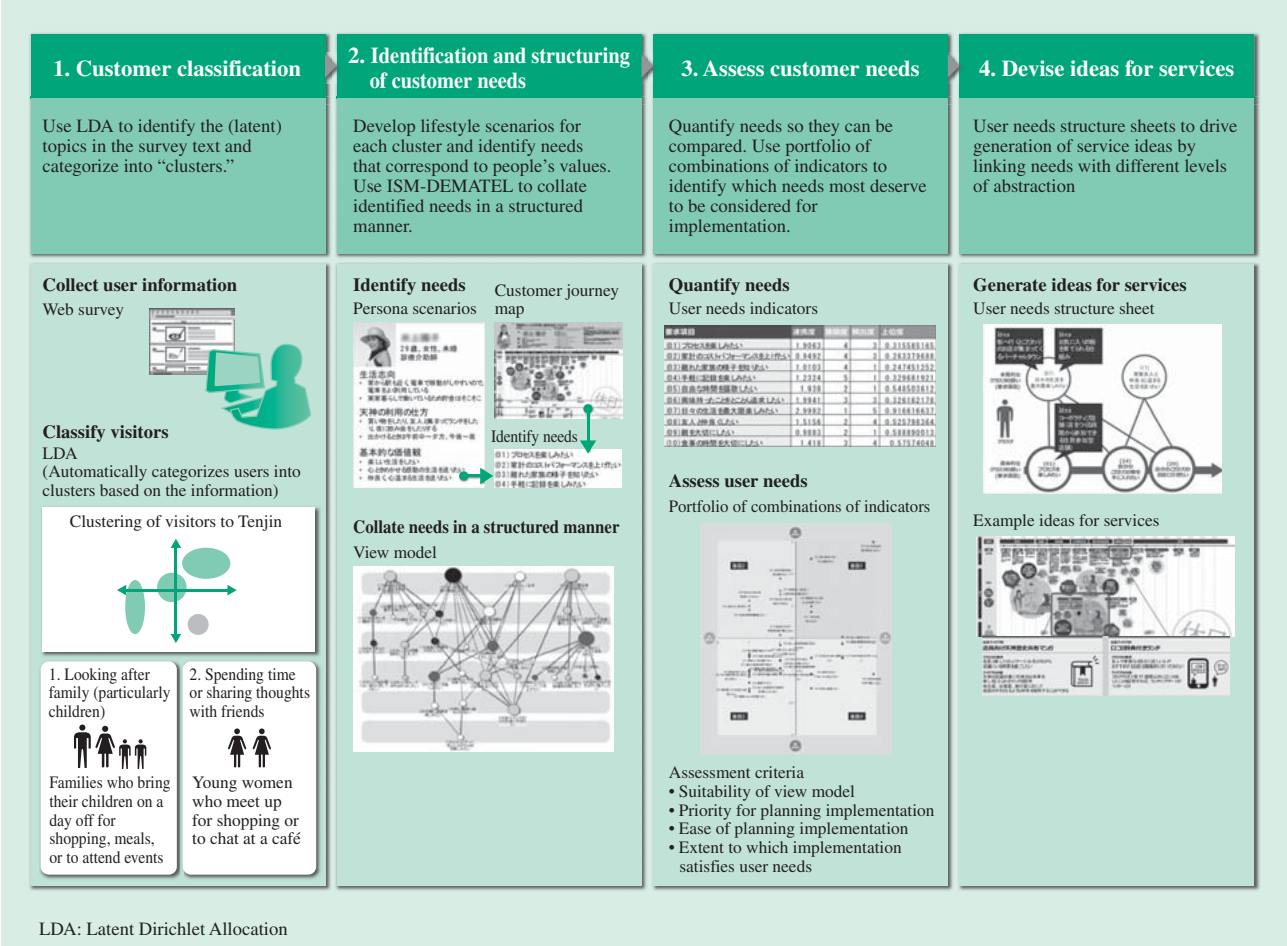

Fig. 3—User Request Structure Analysis.
The method collates user needs in a structured manner and performs an analysis to come up with ideas for services that match the identified values and deliver a high level of satisfaction.

depending on their values and then identifies and categorizes their needs in terms of lifestyle scenarios for each cluster. The scenarios that correspond to customers' underlying needs are then determined, and user needs structure sheets are then used to drive the generation of ideas for services (see Fig. 3).

This method of analysis has two important features. The first is the use of Latent Dirichlet Allocation (LDA)[6] to characterize users. LDA has gained attention in recent years as a mechanistic technique for classifying natural language text. It uses a topic model to identify the latent subject matter of the text being analyzed with a high level of accuracy.

Along with the statistical analysis of demographic data, other well-known methods used in the past to characterize users include the use of "personas"[7]. Because these depend so heavily on the skills and subjectivity of the designer, however, the tendency is to come up with stereotyped personas that are influenced by the prejudices of the designer.

In contrast, LDA can generate user profiles mechanically from free-form natural language text written by the user. This provides objective user classification and profiling with minimal influence from the analyst's subjectivity, and can result in the identification of new clusters that were not previously considered (see Fig. 4).

The second feature of the user request structure analysis is the quantification of user needs so that their importance can be determined. Ways of identifying user needs include conducting surveys or holding consultations. In many cases, however, these methods only provide simplistic opinions or requests, with information having insufficient detail for use in considering services.

If a survey elicits an opinion that a neighborhood has too few benches, for example, without knowing the background it is not possible to decide whether the best course of action is simply to provide more benches or to add additional facilities that allow people to take

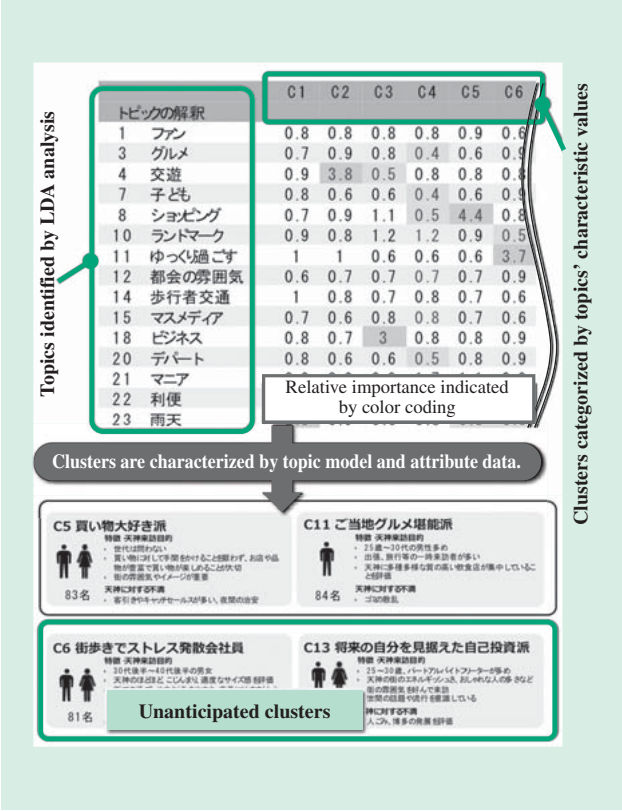

Fig. 4—Use of LDA Analysis to Categorize into Clusters. LDA is used to identify the topics in free-form questionnaire responses. These are categorized into clusters based on the topics' characteristic values and the clusters formed by linking in attribute data.

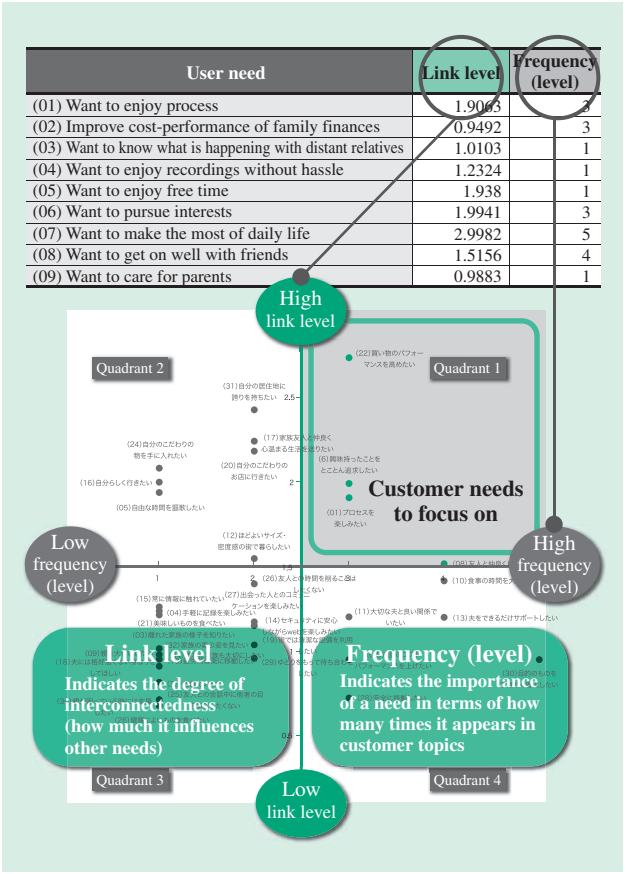

Fig. 5—Quantification and Assessment of Customer Needs. To identify what users really want, user needs are quantified to determine which customer needs to focus on.

their time looking around. In other words, there is no way of knowing how important the opinion is to users.

To overcome this, the method quantifies each need's "link level" (the degree to which the user need influences other needs) and "frequency (level)" (how frequently the need appears in scenarios), and designates needs that have high values for both of these indicators as having high importance. In this way, the method can identify the needs that are characteristic of each user, and determine which of these needs matter most (see Fig. 5).

EXAMPLE CUSTOMER COLLABORATIVE CREATION PROJECT USING THESE METHODS

This section describes an example project that uses the methods described above for collaborative creation with customers.

Hitachi participated in a service collaborative creation project with We Love Tenjin (WLT), an organization involved in urban development for the Tenjin district of Fukuoka City. The project used the methods described in section above with the aims of boosting visitor numbers to the district and improving satisfaction levels.

This included producing scenarios for how users used and thought about the district based on information obtained through analysis, and holding discussions with WLT on people's motivations for visiting the district, the likelihood of their making purchases, and which user needs have a strong potential for influencing neighborhood vitality (see Fig. 6).

It also included using user needs structure sheets produced with reference to these discussions to generate ideas for services. One example was using residents' desire to take pride in their neighborhood to come up with the basic idea of finding ways to foster an attractive neighborhood, and to combine this with specific user needs to drive the generation of ideas such as a cooperative store (a store that residents can participate in from its initial establishment) or having residents perform maintenance as they walk around the neighborhood (see Fig. 7).

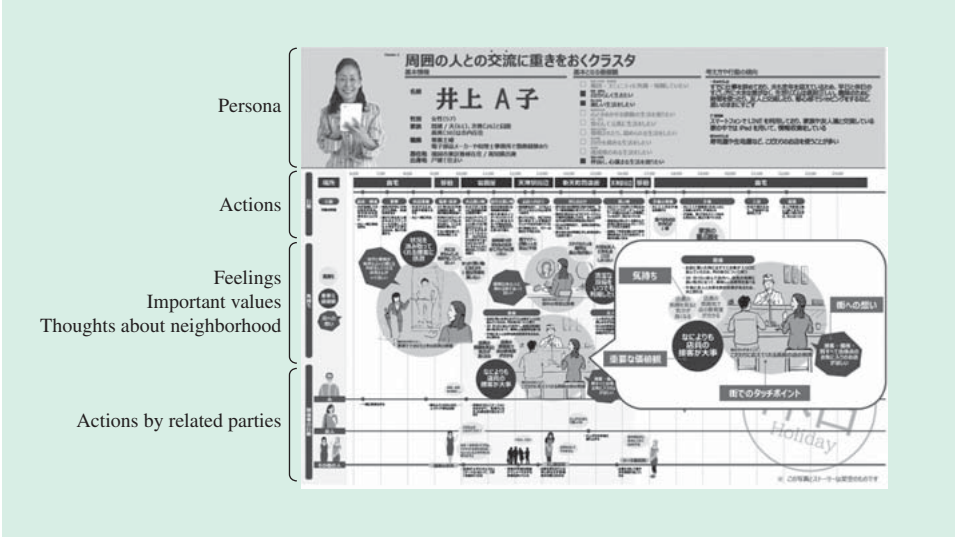

Fig. 6—Customer Journey Map. The "actions and touch points," "values," and "thoughts" about the neighborhood of visitors to Tenjin are expressed as a story of their day.

Commenting on their reaction to these ideas, WLT said, "Using values to come up with ideas for services was interesting. It makes us want to use methods like this to come up with services for ourselves."

In the future, Hitachi intends to continue using the methods described above to visualize the impact on the district of implementing the ideas for new services from the perspectives, not only of the people involved in urban development, but also of numerous other stakeholders including residents and retailers.

CONCLUSIONS

While there are high hopes for using data to create new businesses or other improvements, information that cannot be fully represented in electronic form often complicates decision-making. Hitachi intends to make further enhancements to its methods of identifying what is wanted by management as well as people's values, and to establish practices for collaborative creation with customers by generating service ideas and solutions that customers will find compelling.

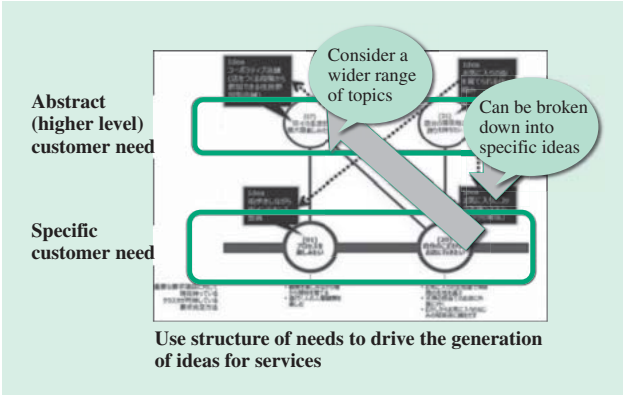

Fig. 7—User Needs Structure Sheet. The sheet is a way to forcibly expand the scope of idea generation or break down an idea in terms of the structure of customer needs.

ACKNOWLEDGMENTS

The work described in this article benefited from advice and support from everyone at We Love Tenjin. The authors wish to express their deep gratitude to everyone involved, particularly office manager Hiroyuki Iida and urban development director Tadaaki Fukuda.

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ABOUT THE AUTHORS

Haruko Nagaoka

Service Design Research Department, Global Center for Social Innovation – Tokyo, Research & Development Group, Hitachi, Ltd. She is currently engaged in research into business structure evaluation using modeling and simulation technology. Ms. Nagaoka is a board member of the Society for Serviceology, a member of the Institute of Electrical Engineers of Japan (IEEJ), and The Japan Chapter of the System Dynamics Society (JSD).

Toshiyuki Nakamura

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

Tadasuke Nakagawa, Ph.D.

Service Design Research Department, Global Center for Social Innovation – Tokyo, Research & Development Group, Hitachi, Ltd. He is currently engaged in the study of business structure evaluation using modeling technology. Dr. Nakagawa is a member of the IEEJ.

Maiko Kaneda

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