Overview of Research toward Realization of Intelligent Society

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Fujitsu Laboratories carries out research and development for the realization of Intelligent Society, which provides people with a securer and more affluent life by making use of information and communications technology (ICT). In research on using big data, Fujitsu Laboratories is working on leading-edge technologies including spatiotemporal data processing, complex multi-series data analysis and dynamic optimization. These technologies use advanced ICT to analyze massive amounts of data such as social media and sensor information gathered from the real world. They help achieve prediction, optimization and other sophisticated decision support systems. Fujitsu Laboratories is also researching "social innovation," which is intended to discover and create affluence and value for individuals and society, by observing and analyzing people, organizations and communities. It is also developing machibata.net, a new social medium that helps individuals and groups engaged in community development to cooperate with one another. By integrating these types of research, Fujitsu Laboratories intends to offer social solutions to complex social problems that are difficult for individuals and independent enterprises to solve, such as energy and security issues. In this way, it aims to realize a truly affluent and secure Intelligent Society.

1. Introduction

Since the Great East Japan Earthquake that occurred on March 11, 2011, proposals for reconstruction plans have been presented at various levels in the country including the government's The Reconstruction Design Council.[1] To summarize them, the society that Japan should aim to realize in the future is a resilient and sustainable one that responds to structural changes of economic society such as aging, population decrease and globalization while taking regional diversity into account.

Human-Centric Intelligent Society, which is Fujitsu's medium- to long-term vision, targets a future society that provides people with a securer and more affluent life by making use of information and communications technology (ICT). It realizes social and business innovation together with customers by making use of values created from human wisdom, behavior and environmental changes.

This paper describes Fujitsu Laboratories' activities toward the realization of the Intelligent Society.

2. Entire picture of research for Intelligent Society

Figure 1 shows an entire picture of the research on Intelligent Society. We aim at achieving "social solutions" to complex social problems that are difficult for individuals and independent enterprises to solve, such as medical care, energy and security issues. For details of the specific solutions on which we are working, refer to "Approach to Social Solutions" contained in this magazine.

Fujitsu Laboratories carries out two types of research to come up with such solutions. One is

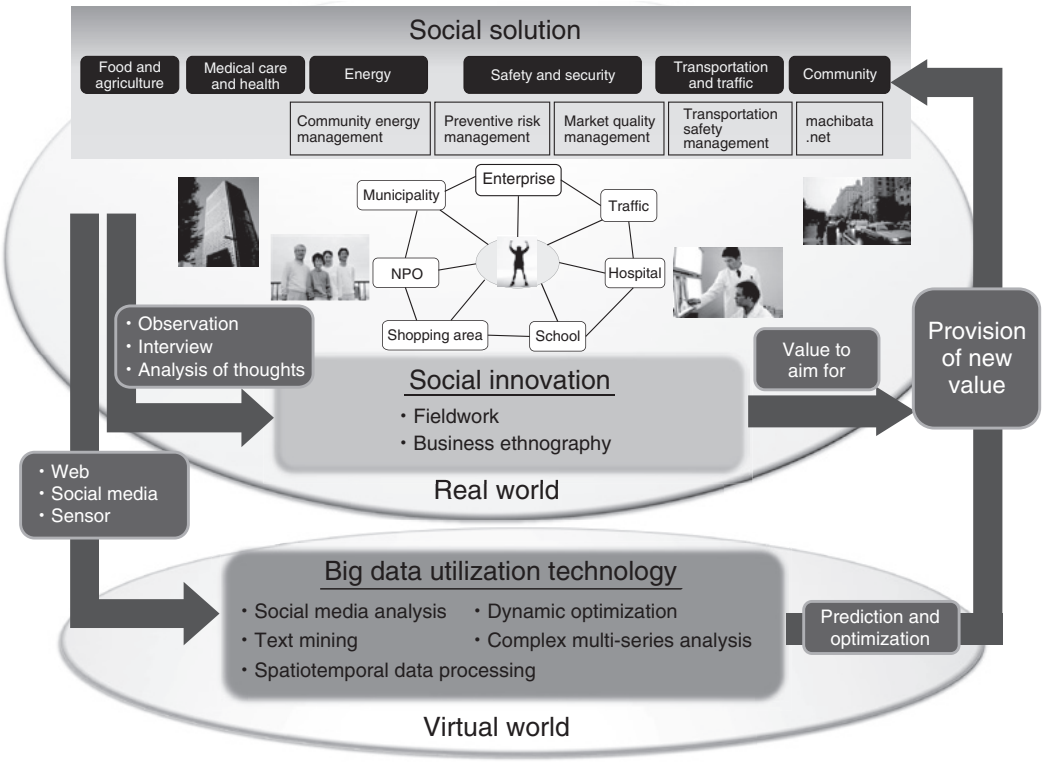

Figure 1
Entire picture of research for Intelligent Society.

research on big data utilization technology that supports sophisticated decision-making including prediction and optimization. It makes use of advanced ICT to analyze massive amounts of data such as social media and sensor information gathered from the real world.

The other is research on social innovation technology to discover and create affluence and value for individuals and society by observing and analyzing people, organizations and communities. We believe that combining these types of research will allow a truly affluent and secure society to be achieved.

In terms of controlling and optimizing electric power demand, for example, raising the awareness and motivation of individuals, households and communities is important for reducing power consumption. Economic incentives such as a rate system alone have their limits in changing the way general home users utilize energy, and non-economic incentives including links with people and communities and awareness of contribution must be added. Making use of advanced analysis and prediction technologies based on data in view of people's sense of value and feelings allows us to achieve electric power control that makes individuals and society feel satisfied.

3. Big data utilization technology

Along with the development of the Internet, the volume of Web information has exponentially increased to exceed 1 trillion pages. With the remarkable development of so-called social media such as Twitter and Facebook, numerous individuals have come to offer information and form new communities, and these have created new collective knowledge. Meanwhile, the development of sensor technologies such as the Global Positioning System (GPS) and radio-frequency identification (RFID) has allowed real-world conditions to be grasped in real time.

It is becoming more and more important to make use of these large amounts of data to provide beneficial value for enterprises and society.

Fujitsu Laboratories considers that processing and analyzing such massive amounts of data involve three factors:

1) Storage and analysis of a single type of big data such as point of sale (POS) and sensor data
2) Analysis integrating different types of data including structural and non-structural (such as Twitter) data
3) Advanced analysis such as prediction and optimization

Combinations of these factors provide the seven patterns of A to G as shown in **Figure 2**. As a result of our research mainly on the U.S. market, we have found that new applications such as those described below have started to be developed in the respective regions.

- Region A

A major bank analyzes a massive amount of transaction data to increase the accuracy with which it can detect fraud.

- Region B

A major entertainment company integrates information from different business units including theme parks, Internet sales, travel and shops to analyze customer activities.

- Region C

A major car dealership seeks to evolve from the existing analysis based on business intelligence (BI) to predictive analysis.

- Region D

The American Red Cross integrates different types of big data from the government, NGOs, and other parties to build 3D images of disaster areas so that they can be visualized.

- Region E

A major Internet sales company integrates and analyzes standard and non-standard data respectively from the stores, Web and call center to formulate optimum approaches to customers.

- Region F

A major hospital uses a large database of patient cases to conduct associated searches on multiple causes of diseases, which have not been possible with the conventional standard searches, to achieve analysis that allows medical care staff to immediately understand the nature of patients' diseases.

- Region G

A major security company integrates big data stored in separate databases including those for spam, firewalls and malware and conducts sophisticated, relevant analysis to allow quicker

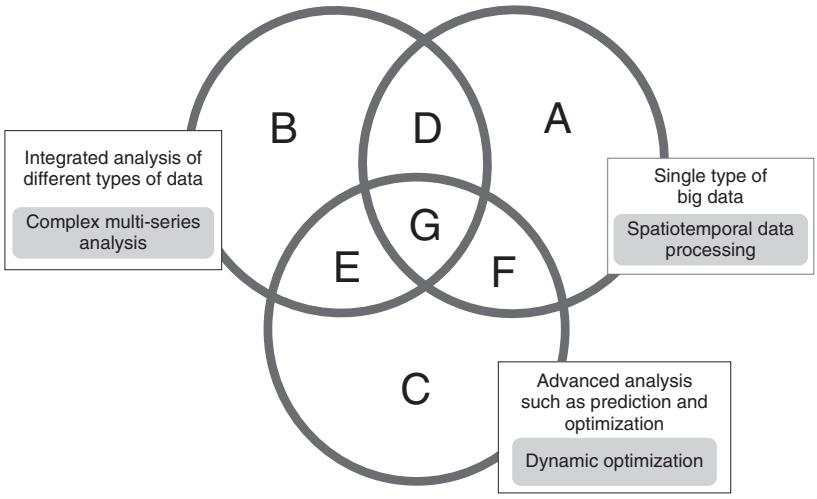

Figure 2
Classification of utilization of big data and related technologies of Fujitsu Laboratories.

responses and understanding of the entire picture of problems.

Taking these research results into account, Fujitsu Laboratories is working on the research and development of leading-edge technologies in relation to big data utilization such as:

1) Spatiotemporal data processing technology for efficiently processing massive amounts of data on time and space gathered from sensors
2) Social media analysis and text mining technology for analyzing non-standard text such as Twitter
3) Complex multi-series analysis that handles text data from the Web and numerical data from sensors in an integrated manner
4) Dynamic optimization technology that deals with problems in fields that contain many uncertainties such as people and society

These technologies can bring new values to society not realized in the conventional ICT. "Advanced Analytics for Intelligent Society" and "Approach to Social Solutions" contained in this magazine give descriptions about the details of these technologies, and the applications and solutions to which they are applied.

4. Research from a human and social perspective

For research from a human and social perspective, Fujitsu Laboratories has been engaged in the development of practical fieldwork techniques[2] in business fields based on joint research with the Palo Alto Research Center (PARC). These technologies have also been used in Fujitsu's Field Innovation[3] activities. The qualitative surveying of society and groups based on fieldwork is called ethnography[4] in cultural anthropology and sociology, and application of this technique to product development, organizational improvement, and such like is referred to as business ethnography. Fujitsu Laboratories' activities are being conducted at the highest level in the world. In 2010, Fujitsu Laboratories held EPIC 2010,[5] an international forum on the application of business ethnography, as a local co-chair in Tokyo, which was the first of the conferences in Asia. This forum ended successfully.

On the basis of these technologies, Fujitsu Laboratories is now working on research into "social innovation" to discover and create new value for communities and society. For example, the concept of "persona"[6] used for designing consumer products is applied to the design of social systems.[7] This in turn is utilized to build an overall consensus between the interested people with various senses of value and to design new services.

Figure 3 shows the concept of machibata.net,[8] a new social medium intended for community development that helps the different individuals and organizations (such as NPOs) involved to cooperate. This Web site, machibata.net, makes use of the Appreciative & Imaginative (AIm)[9] methodology developed by Fujitsu Laboratories to efficiently visualize the customers' viewpoints and senses of value and represents the "thoughts" of various individuals and groups engaged in community development as the "machibata," or the banner of community

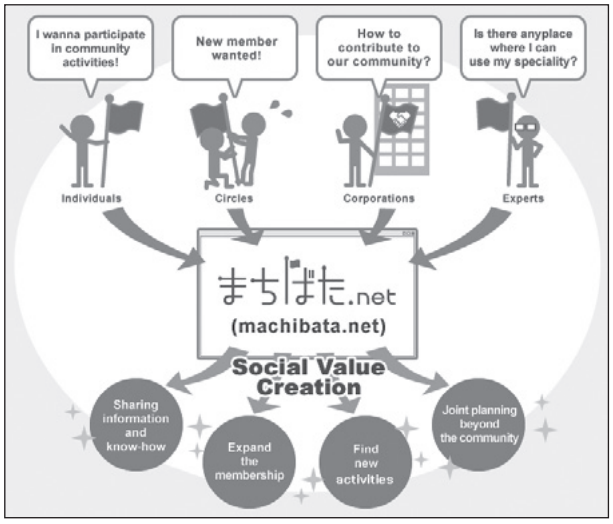

Figure 3
Concept image of machibata.net.

development activities. Mutual cooperation at the "thought" level can further advance community development activities, leading to the creation of new value in society.

Based on such research, Fujitsu Laboratories intends to work on a new type of social medium that mutually connects various social media and offers higher reliability by linking people and organizations in various fields in the real world.

5. Conclusion

Fujitsu's vision of Human-Centric Intelligent Society does not mean a thoroughly controlled and streamlined future society. It aims for a social system of coexistence and mutual assistance that solves social problems by means of new links between homes, communities, enterprises and other groups with people at the center. In addition, it aims for a society that helps people to engage in energetic activities and that creates hopes for the future. To achieve such a society, Fujitsu Laboratories recognizes problems in communities and society from the viewpoint of the people living there. At the same time, it is conducting research and development to provide solutions to those problems by creating new value from the big data in the real world obtained from the Web and various sensors.

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