New Business Trends Created by Big Data Utilization

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NATURE AND PURPOSE OF BIG DATA

AWARENESS of the term "big data" has risen in recent years as it has become a topical subject with frequent references in the news media. Many of these references have dealt with the analysis of customer purchasing activity acquired from loyalty cards, point-of-sale (POS), or other sources of data, with the emphasis tending to be on the large quantity of data involved. This has led to a misunderstanding in some quarters by people who assume that big data is nothing to do with them because the volume of data handled by their system or business is small.

In fact, the true nature and purpose of big data is the ability to utilize information acquired from large amounts of different types of data that was ignored in the past, or other heterogeneous data. Big data and its associated analytics can be seen as a foundational technology for supporting and enhancing future business activities, social infrastructure, and lifestyles.

This article summarizes and explains the new value generated by the use of information produced by big data and its analysis.

EXPANSION IN SCOPE OF IT RESULTING FROM USE OF BIG DATA AND ITS ASSOCIATED ANALYTICS

The predominant form of information technology (IT) in the past has been the processing of forms and other business data (transaction processing). In the meantime, however, digital devices such as personal computers (PCs) and smartphones have become ubiquitous, and with this have come the availability of high-speed network connections and the generation of large quantities of different types of digital data. Unfortunately, this data is still far from being fully utilized, with its value often left unappreciated or unexploited. This is true even of information that is relevant to business, such data on people's activities or the status of production equipment or social infrastructure.

On the other hand, there do exist companies that have recognized this value and have used it to build business models. These include Amazon[*1], which has developed internet sales techniques that utilize the large quantities of data collected on customer's purchasing behavior and patterns, and Google[*2], which utilizes information from collecting and evaluating search keywords in applications such as internet advertising. The current situation is that new businesses or services are starting to appear that collect data, even though the quantity of data may not be that large nor its scope world-wide.

Balance of IT Costs and Benefits

Behind this interest in big data is a dramatic fall over the last decade in the cost of the IT required for data collection and computational processing. The benefits of this data collection and analysis now outweigh its costs, a situation that seems likely to continue for some time (see Fig. 1).

Increasing the amount of data being processed and analyzing it to get a better understanding of various performance indicators will help improve the efficiency of commercial activity. Similarly, measures aimed at new business processes or incremental cost savings that result from the falling cost of IT will be able to be trialed without risking expensive losses. These trials can then be used in an ongoing cycle of quantifying improvements, establishing new indicators, and implementing actions.

Data with New Possibilities for Use in IT

This raises the questions of what new data is now able to be utilized, and in what new ways. The following lists the underlying changes brought about by big data and its associated analytics.

(1) Use of previously unused data

The falling cost of IT means that data that in the past was collected but not used, or simply discarded, can now be put to use (examples include past transaction records, text-based information, and operation logs).

*1 Amazon is a trademark of Amazon.com, Inc. or its affiliates.
*2 Google is a registered trademark of Google Inc.

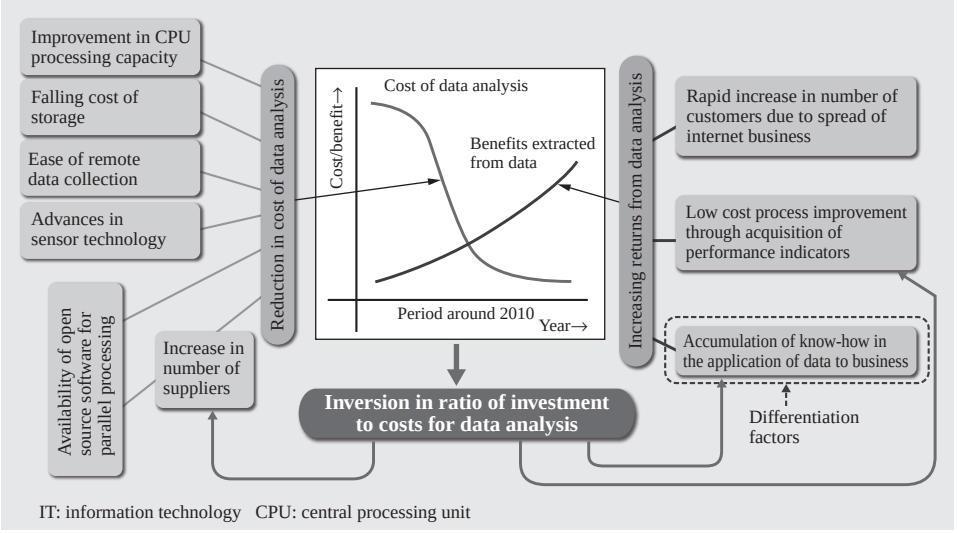

Fig. 1—Reduction in Cost of IT and Use of Data Analysis to Boost Profits.
The cost of the IT required for data analysis has fallen dramatically over the last decade. As a result, the benefits of data analysis now outweigh the costs.

(2) More things can be measured

Advances in sensor, network, and other technologies mean that phenomena that could not be measured in the past can now be captured in the form of data [examples include the operational status of machinery, worker activities, or posts on social networking services (SNSs)].

(3) Discovery of new data or knowledge

As data increases in quantity and becomes more comprehensive, it becomes possible to extract new data or knowledge by collating this data or subjecting it to more sophisticated analyses. This has been described as the process of "data begetting data" (examples include the correlation of customer profiles and their purchasing behavior, or of equipment status and faults).

Hitachi classifies the use of big data for business into five main categories based on the source of the data, and is researching and developing solutions for each of these (see Fig. 2).

The aim is to create more opportunities for applying these to business by expanding the scope of IT. Ways of doing this include developing new sensors for data acquisition or developing special-purpose data collection and analysis techniques.

NEW COMMERCIAL VALUE ADDED BY BIG DATA

This section describes the commercial value added or otherwise made possible by big data and its associated analytics. The methods and benefits of analyzing and utilizing data can be grouped under a number of different patterns (see Fig. 3).

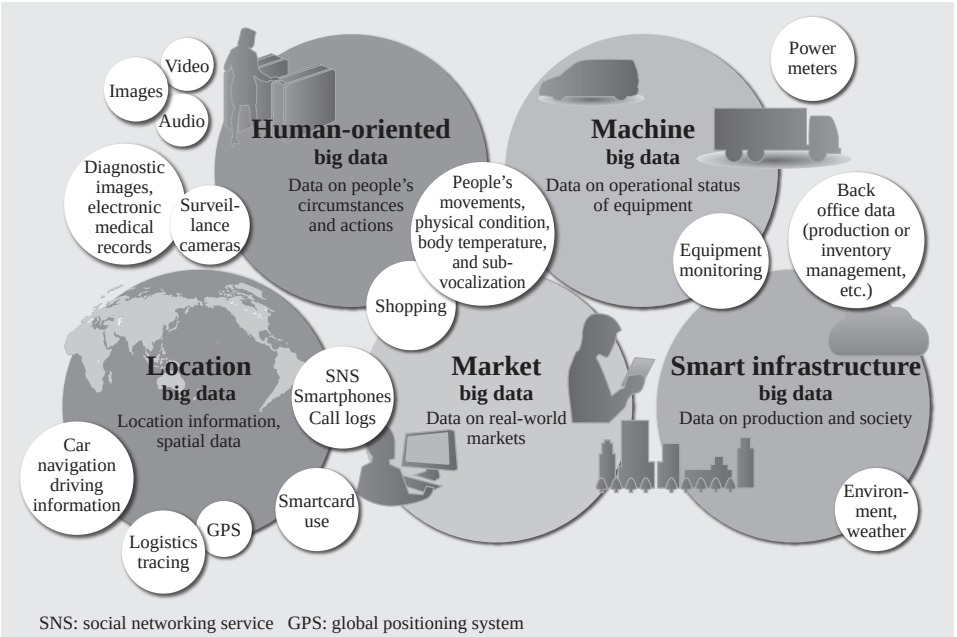

Fig. 2—Five Types of Big Data Businesses.
Data can be broadly divided into five types based on its source: human, machine, location, market, and smart infrastructure.

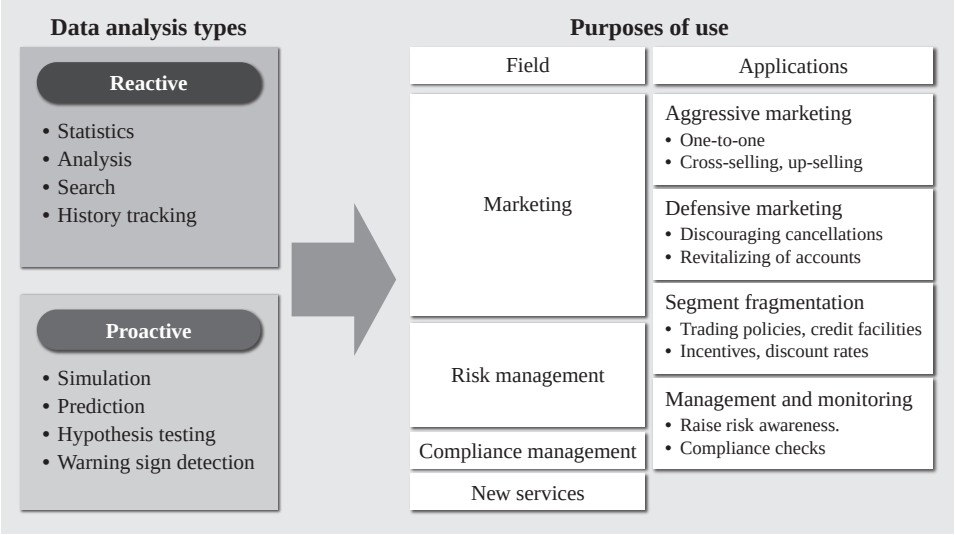

Fig. 3—Categories of Data Analysis and Purpose of Use. Data analysis can be broadly divided into reactive (reviewing and assessing) and proactive (prediction and inference). Purposes of use include marketing, risk management, compliance management, and the development of new services.

The analysis of data can be used to determine cause and effect relationships, consider new perspectives, or create new performance indicators, while the collection of real-world data from front-line systems, for example, can improve the accuracy of business management and provide more information for making decisions. Also, new business processes or businesses can be created using this information and the associated processing techniques.

The following sections consider this added business value in terms of its relationships with customer businesses, manufacturing, and social infrastructure respectively.

Relationship with Customer Businesses

Firstly, big data can be used to get a better understanding of customers, and to create new relationships or business opportunities. If knowing your customer is the basis of business, then big data has a major contribution to make.

Many companies act as if they know their customers when in fact they do not. Naturally, such companies have customer databases in their business systems and their sales staff collect information through their daily activities. However, this information often remains unused, being left dispersed and not collated together. It is also often the case that the information held by a company is not enough on its own to see more than a one-sided view of customer behaviors or profiles.

The term “personalized marketing” is used to refer to sales and marketing practices in which in-depth analysis of customer information is used to obtain a clearer and more detailed image of the customer. The basis of big data analytics lies in collecting together data from across the company, such as past sales or other transactions, communications with the customer, or use of website or other services, and using it to obtain a more personalized appreciation of customers and to analyze its correlation with sales figures or other information. The knowledge gained by this process can then be put to use in achieving more accurate sales and marketing practices. Amazon’s recommendations produced from an analysis of purchase histories and activity on the web, and the resulting impulse purchases, are examples of personalized marketing.

This exploitation of information on customer activity is beginning to move away from being the exclusive preserve of the internet, with increasing bricks and mortar applications involving the acquisition of customer information. The following are two examples of this trend.

(1) Use of sensors to track customer movements

This involves using business-card-sized sensor nodes fitted with infra-red and acceleration sensors to detect face-to-face communication between wearers, what is known as “human-oriented big data.” Infra-red laser sensors are also used to determine the location of people within an area. Technologies like these allow the creation of selling environments that can deliver higher sales by collecting and analyzing detailed and accurate data on the movement of customers around a store, for example, and then using the results to improve the store layout, displays, advertising, or other merchandising methods.

(2) Use of data from different industries

New business opportunities can also be identified by collecting and analyzing information from outside the company. One example is an insurer that uses various types of vehicle telematics information to offer pay-as-you-drive car insurance.

Relationship with Manufacturing

Just like customer relationships, there are also cases in the manufacturing industry where companies do not have good knowledge of their own products. It is not uncommon, for example, for a manufacturer to lack an overall understanding that encompasses design information, production technology, production information, and post-sales maintenance information. In fact, there are surprisingly few cases of manufacturers with a good grasp of things like how their products are used in practice and their operating status.

If correlations between technical information such as on a product's design and manufacturing and information on its operation, faults, and maintenance could be analyzed by product or by serial number, the information could then be utilized in quality or functional design. Also, the availability of information on actual operating status opens up the potential for new business processes in maintenance and inspections and after-sales and other services. These are important differentiating factors that potentially add value to the product. New products that make greater use of digital technology include large numbers of sensors, and utilizing the information these generate is a source of added value for businesses. An example is a Japanese copier manufacturer with a strong international market presence that collects information such as operational status and errors via a network and utilizes it for tasks such as maintenance and design.

This use of new processing techniques for big data is also happening in the machine-to-machine (M2M) sector. In the past, even if data could be collected from sensors, it was only able to be used for things like simple threshold-based control or fault detection. Now, however, big data processing techniques can process large quantities of sensor data concurrently and utilize more sophisticated algorithms to make accurate operational decisions. Furthermore, high-speed networks mean that this advanced monitoring and operation can now be performed remotely.

Hitachi supplies the Global e-Service on TWX-21[(a)] to support all aspects of machinery lifecycle management, and is working on strategies for using M2M to achieve smarter operation in agriculture, logistics, and mining.

(a) Global e-Service on TWX-21
A software as a service (SaaS) lifecycle support service for Japanese corporations that manufacture and sell machinery on the global market. It manages the lifecycle of machinery by collecting information on its manufacture, sale, operation, and maintenance, and by making this information available for shared use. Hitachi Construction Machinery Co., Ltd., Hitachi's construction machinery business, operates the service for the global market and delivers the functions of Global e-Service, which collates the collected business know-how, over Hitachi's TWX-21 inter-company business media service. TWX-21 is a trademark of Hitachi, Ltd.

Relationship with Social Infrastructure

Whether it be in social infrastructure or people's way of life, opportunities exist for utilizing big data and generating added value.

Social infrastructure covers a wide range and is made up of complex equipment and services. Furthermore, each form of infrastructure, such as electric power, water, or transportation, has been operated independently. Integrating IT with the operation technology (OT) systems that control the social infrastructure in order to make it more efficient and sustainable is one of the objectives of Hitachi's Social Innovation Business. The wide variety of data and information obtained from social infrastructure is a genuine contender for being treated as big data.

Adding value to the utilization of information in social infrastructure means that each type of infrastructure can be operated in the best way possible and advanced services delivered through the coordination of this infrastructure. Open data is also being used by other businesses and other organizations, where "open data" means public data held by national or local government that is made available in a form suitable for repurposing. Using optimized social infrastructure to support the lifestyles and activities of individuals is another form of added value achieved through the use of information.

Examples of optimizing the entire social infrastructure include electric power transmission and distribution systems that incorporate renewable energy, and traffic systems based on road information and data on people's movements. Other examples of supporting the lifestyles and activities of individuals can be found in the use of information in the healthcare sector.

REQUIREMENTS FOR UTILIZING BIG DATA IN BUSINESS

A number of issues need to be resolved for big data to be utilized in business, including providing the necessary personnel and environment.

Business Knowledge × Analysis × IT

Utilizing big data in business demands a higher level of knowledge and understanding of business than was required in the past. When strong correlations, points of difference, or other findings are identified by the analysis of data, it is necessary to explain their

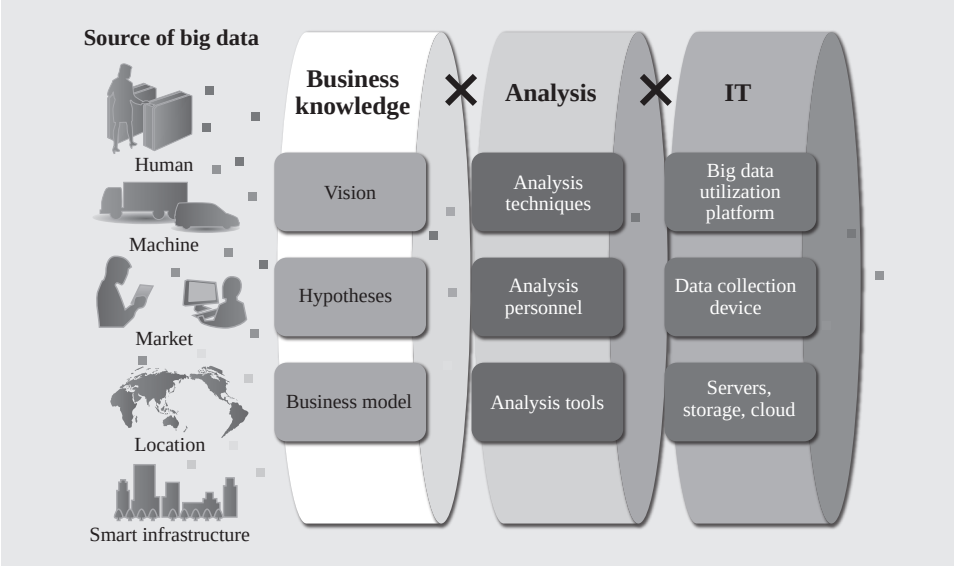

Fig. 4—Business Knowledge × Analysis × IT.
The use of big data in business requires a combination of business knowledge, analysis techniques, and IT.

meaning and to assess their impact on the business. There is also a need to plan for approaches and scenarios through which business can incorporate new knowledge acquired from analysis. What is required to achieve the utilization of big data is a combination of business knowledge, data analysis capabilities, and IT (see Fig. 4).

Hitachi defines data analytics meisters[(b)] as experts who draw out the customer's business knowledge and act as leaders in putting big data to use, and is working to build on these talents. Hitachi is also working on integrated platforms designed specifically for big data, including middleware and high-speed data access platforms.

New Skill Set Focused on Information Value

In contrast to past business systems designed with consideration for processes and their associated processing, systems that deal with big data focus on the value of information. Naturally, it is necessary to acquire new skill sets and have appropriate personnel in place. Although there are similarities with past skill sets in terms of the technical aspects of IT, there are also issues relating to skills acquisition and transition that will require time and effort to overcome (see Table 1).

(b) Data Analytics Meisters
These are experts at Hitachi with a high level of knowledge and skills in the utilization of big data. Data analytics meisters lead customers or other partners who are seeking to create new business value from big data through the steps up to final system installation. These include building a vision for the utilization of big data, scenario planning in which quantitative estimates are made of the targeted value, and feasibility studies that establish the data analysis techniques to use and verify factors such as the performance of the system implementation and the viability of the scenarios.

Literacy in Real-world Numbers

Business management involves deciding on important performance indicators and then working steadily through the plan, do, check, and act (PDCA) cycle to achieve them. What is important is to set quantifiable performance indicators and to measure progress toward their achievement. What cannot be measured cannot be managed. On the other hand, having a large number of things able to be measured provides more alternatives for action, and this is the only way to improve management accuracy. That is, the use of information that incorporates big data also provides more performance indicators and methods.

While a value of 1% in statistics or samples is often assumed to be error (and therefore meaningless), a 1% value measured from real-world data is a real difference of 1%. The meaning of data is changing. It is becoming increasingly important to understand data and information, and to use it as a basis for business decisions and actions.

Table 1. New Skill Set Focused on Information Value
The new skill set can be considered in terms of how it compares with the past.

Past skill set	New skill set
Computational and processing logic	Analytics
Program	Algorithms and mathematical models
Programmer	Data scientists
Processing speed and response	Complexity and precision
Accurate coding and standardization	Hypothesis-based reasoning and testing
User interface	Visualization and infographics
Business design	Business model design

BIG DATA AS SOURCE OF NEW BUSINESS CREATION

The use of big data technology is a means, not an end. Ultimately, all IT provides are things like scale, volume, and speed. It is people who need to provide business with its values, ideas, and insights.

Big data and its associated technologies are a genuine source of new business creation. With its philosophies and objectives, Hitachi intends to take on this challenge, and to deliver the sort of value that only Hitachi can provide.

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