

Fourth Industrial Revolution Brought about by Data and AI

Joint Industry-Academia-Government Initiatives to Promote Utilization of Data

Data has been described as a new form of natural resource for the Fourth Industrial Revolution. Government, academia, and industry are each taking steps to utilize this data. This article describes some of the government- and academia-led initiatives with which the authors have been involved, and also measures adopted by Hitachi with reference to these. In broader terms, the article also identifies new data-related challenges that are arising around the world in various specialist areas as well as in different industries, and addresses subjects that need to be discussed by future joint industry-academia-government initiatives.

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1. Introduction

Certain human perceptual abilities are starting to be replaced by artificial intelligence (AI). While AI can be used to mean a wide range of things, in terms of what is currently possible in industrial applications it refers to machine learning, including such techniques as deep learning. A feature of machine learning is that, rather than running a previously developed program, it can acquire a variety of functions by learning from data and identifying rules. The scope of applications is expanding rapidly, including the use of image recognition for autonomous driving, unattended retail outlets, payment by facial recognition, voice response in call centers, and support for the examination of medical images. As a result, the management resources for providing valuable services to society are shifting to

the outcomes of machine learning in digital space. Further, an essential element of these management resources in digital space is the data used to feed machine learning. In this sense, data can be described as a new natural resource, one that serves as a source of competitive advantage in the Fourth Industrial Revolution.

Meanwhile, the sequence of steps for utilizing the data used in machine learning is complex, frequently involving a number of different companies. What matters most in this is to ensure a smooth interaction between a supplier and a user of data. Associated with this, the leaking of personal information and trade secrets (sales data such as customer records and technological information such as know-how), and also the question of how the outcomes that arise from the data will be handled often become significant concerns for data suppliers. First of all, it is important to clarify what the handling and protection of data means

in legal terms. Given that data is an intangible, the question of who it belongs to often lacks a clear answer.

With regard to this, Japan has recently been doing a lot to establish a legal framework. Along with amendments to the Act on the Protection of Personal Information, the passing of the Next-Generation Medical Infrastructure Act that establishes a framework for use of medical data, and amendments to the Unfair Competition Prevention Act that give a degree of protection to data that is commonly provided under restricted conditions for commercial purposes but does not meet the definition of a trade secret, this has also included the formulation of guidance for contracts between private sector parties that involve AI or data utilization^{(1), (2)} and numerous other new initiatives such as an information bank⁽³⁾.

The authors have also been involved in studies needed to achieve the unobstructed utilization of data from the respective perspectives of academia, the legal community, and industry, as well as the drafting and implementation of laws, frameworks, and guidance. From among this work, this article looks at two activities in which the authors have had a direct involvement, namely (1) the findings of a survey of data utilization⁽⁴⁾, and (2) the aims of the Contract Guidance on Utilization of AI and Data⁽²⁾ formulated by the Ministry of Economy, Trade and Industry (METI), and (3) also an example of measures what Hitachi is doing to ensure that more effective use can be made of data.

2. Current Situation Regarding Data Utilization by Japanese Companies

The authors were members of the Empirical Study on the Management and Utilization of Data Generated from Industry, a research project of the Research Institute of Economy, Trade and Industry (RIETI), and among them, Watanabe, Hirai, and Akutsu participated in the FY2017 Questionnaire Survey Regarding Data Utilization and wrote the analysis results in a discussion paper⁽⁴⁾. The questionnaire was sent out to 6,278 companies in Japan, of which 562 provided a valid response (approximately 9.0%).

In terms of the past outcomes of corporate data utilization, 15.2% of companies reported that they

achieved concrete outcomes across multiple businesses, indicating that a higher than expected number of companies are achieving outcomes from data utilization such as increased sales or cost reductions across multiple businesses.

Moreover, the result revealed that use of template contracts had a clear impact on the achievement of outcomes from data utilization. This indicates that mastering data utilization contracts appropriately is a prerequisite for benefiting from data utilization. The importance of contracts to data utilization is highlighted by comments such as that, “In terms of giving incentives for providing useful data, the following are important. First, the rights to use data arising from business transactions are clearly stipulated in contracts. Second, in those contracts, the rights to used data are fairly and concretely stipulated based on factors such as the degree of contribution to creating and/or collecting data, who covers the costs of data storage and management, etc. ⁽¹⁾” In the current environment where data processing is increasingly commodified, high-quality and high-volume data can boost corporate competitiveness⁽⁵⁾. Therefore, the appropriate use of contracts leads to the creation of useful data and the benefits thereof.

Meanwhile, approximately 15.0% of companies identified a lack of sufficient measures in place to deal with the risk of leaked trade secrets as an issue for data utilization. In particular, there is a concern that exchanges of data between companies might result in disclosure of technological know-how in manufacturing companies. Past study of technological know-how by the authors^{(6),(7)} has highlighted the likelihood that a significant number of instances of technological know-how being leaked, especially overseas, have occurred without Japanese companies being aware of the fact. Given that cross-border exchanges of information will become even more common in the future, it is likely that concern about the disclosure of technological know-how will increase and that effective measures will be needed to deal with this.

Analysis of those businesses in which data utilization is most advanced also indicates that demonstrating benefits to the individuals or companies that are the source of the data is also important. Even in the absence of legal problems, businesses or services that

handle data on individuals in particular, face reputational risk and other issues of public acceptance in the acquisition and exchange of this data, such as the potential for Internet flaming. A useful measure for countering this is to show some benefits (incentives such as points schemes, the provision of data analysis results, improvements to products and services, and so on) to the individuals or companies that provide this data. Considering how to provide benefits to those who provide data is one of the key factors in making a success of data utilization.

3. Importance of Contracts in Data Utilization

As indicated by the above survey, mastering how to write data utilization contracts appropriately is an important factor in making a success of data utilization. To help negotiations between the suppliers and users of data when writing contracts that involve the use of data or AI, METI published its Contract Guidance on Utilization of AI and Data⁽²⁾ in June 2018. Toshiya Watanabe served on the AI/Data Contract Guidance Committee and chaired its working group, and Masami Akutsu was a member of the working group.

The question of who owns data is one that comes up frequently, the debate being about whether data is something that can be owned and to which someone can have exclusive rights to use, profit from, and dispose of. Under Japanese law, however, ownership is limited to tangible objects. Given its characteristics, which are very different to those of tangible objects, namely that it is easily copied, modified, and combined, and that it can be used by different people and for different purposes at the same time, the legal interpretation of data as something that cannot be owned makes a lot of sense. Even if transactions that involve the use of data are spoken of in terms of ownership rights, like those involving tangible goods, this lack of a legal underpinning makes it difficult to cover the legal risks and to draft legally sound contracts.

The treatment of data in law and contracts has become a topic of debate in recent years due to the increasing volume of transactions that involve data utilization. METI and the IoT Acceleration

Consortium formulated the Contract Guidance on Data Utilization Rights version 1.0⁽¹⁾ in May 2017. The ministry then released its Contract Guidance on Utilization of AI and Data⁽²⁾, which was formulated through in-depth discussions among lawyers and other practitioners based on use cases and input from business operators and organizations. Running to nearly 400 pages, this guidance is comprised of a data section and an AI section and includes template forms as well as use cases that illustrate the legal points in a question and answer (Q&A) format.

(1) Overview of the data section

Given that data is not subject to ownership, anyone who has legitimate access to data can in practice make free use of that data except in the case of unauthorized access. This raises questions whether use of data to which one has access can ever be deemed to be unauthorized use and whether anyone can raise an objection. Dealing with this legal risk requires that the parties agree on rights to use data (conditions of use). To prevent problems such as violations of confidentiality or the use of data for other than the agreed purpose, it is important to clarify in advance who can use data and in what ways. Once the parties have agreed to such conditions to use data, it means that different people can use the data for their respective purposes at the same time, and, in terms of the big picture, use of the data will proceed. Furthermore, the contract covering use of the data needs to consider numerous points that depend on the nature of the data. The data section of the guidance addresses these points.

(2) Overview of the AI section

Software development using AI often runs into obstacles owing to such misconceptions as that using AI can resolve any problems, that the availability of data on its own is enough for development, or that vendors can deliver solutions without the customers' contribution. Furthermore, because development methodologies are unlike those of traditional software development, persisting with past attitudes and practices will not only obstruct the development, it will also impede a full appreciation of the legal risks and inhibit decisions. Accordingly, the guidance starts by presenting the basic knowledge of AI that should be held, together with clear explanations of the nature of

AI and the characteristics of the development, advising that past ideas be put aside when embarking on such software developments. On this basis, the guidance also advises that exploratory multi-phases should be adopted in the case of software developments involving AI for which no contractual practices are established, and show points relating to what the contract should cover and what matters need to be discussed.

Both the data and AI sections cover basic knowledge and philosophy with regard to issues that are difficult to address on the basis of past thinking and practice. If the parties engaged in negotiating a contract are able to use the guidance as a common base for their negotiations, it should reduce the associated costs and allow the data utilization to proceed. Rather than the traditional concept of ownership rights, which involves 0:100 discussion to acquire all kinds of rights based on a power balance in business as the case for tangible goods, it is important to adopt a flexible arrangement based on rights of use and conditions of use, considering what provisions to include in the contract so as to ensure that the arrangements for data utilization or the AI-based software development proceeds smoothly once the contract is agreed.

4. Hitachi's Activities

Having set a goal of being an innovation partner for the Internet of Things (IoT) era in its 2018 Mid-term

Management Plan⁽⁸⁾, Hitachi has accelerated digital innovation, generating value from customers' data. Accordingly, the issue of how to handle the data entrusted to it by customers and the intellectual property produced by the analysis of this data has become a very important one for Hitachi also as it seeks to drive innovation. Having participated in academia- and government-led initiatives, providing case studies and submitting its views, Hitachi has also taken note of the outcomes of these initiatives as it has proceeded with its own in-house measures intended to facilitate data utilization.

When considered in terms of the handling of data and the intellectual property produced by its analysis, there is a need for major changes in the roles that different parts of Hitachi have played in the past. Product businesses have adopted practices based on serial processes, in which the product is designed and developed using new technologies developed by research departments in accordance with a business master plan, produced by the manufacturing division, and delivered to customers by the system engineering (SE) or sales department. It means that intellectual property was handled in a step-by-step fashion by successive departments in accordance with their roles. Particularly, it was important to use patents to protect technologies arising out of research, design, and development, or manufacturing departments, and to take steps to avoid infringing on the intellectual property of others (see **Figure 1**). The business processes

Figure 1 — Intellectual Property Activities in Product Businesses

Each department engages in intellectual property activities in accordance with its respective role.

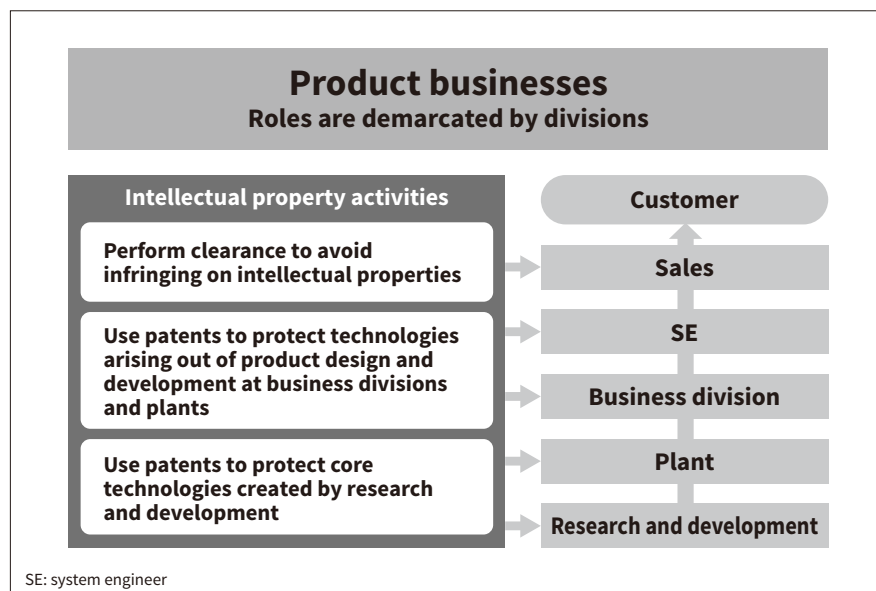
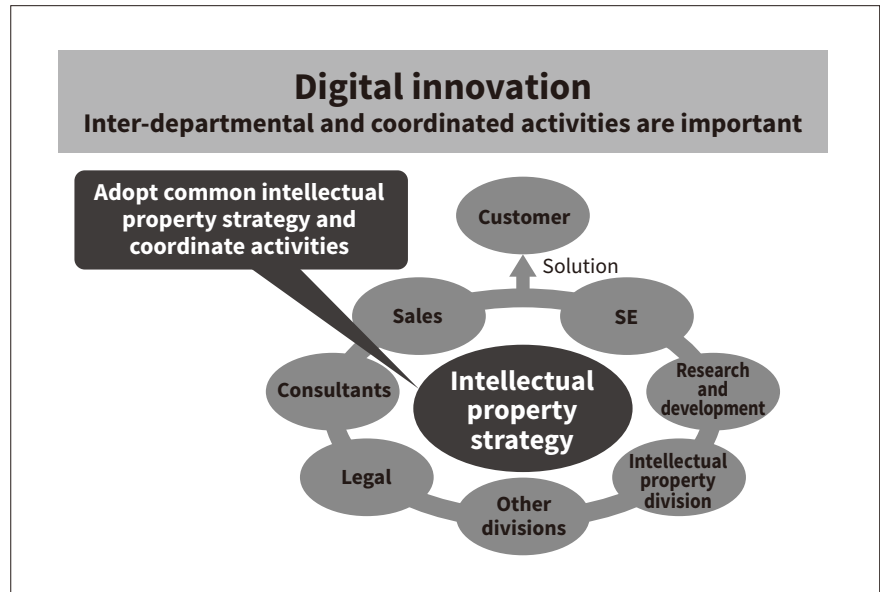


Figure 2 — Intellectual Property Activities Supporting Digital Innovation

Relevant departments adopt a common intellectual property strategy and engage in intellectual property activities together.



of digital innovation, in contrast, are more complex. Because digital innovation involves the generation of value from customer data, it is important to handle intellectual property in ways that take account of the customer's circumstances. In the case of a new solution that arises out of the analysis of customer data, for example, the intellectual property issues associated with how to attribute ownership of the intellectual property embedded in this solution and how to set the conditions for using them need to be managed across all business processes. A business needs to formulate its strategy while taking account of the customer's circumstances, and when implementing the strategy, it should manage intellectual property risks across all business processes that include how to decide on the scope of collaborative creation with the customer, negotiation of the terms of the contract, management and handling of data held on the customer's behalf, how to deliver the outcomes, and how to present information to third parties through news releases and other communications. Accordingly, all of the departments involved in the business need to adopt a common strategy and coordinate actions across the different departments when putting it into practice (see **Figure 2**). Given this need for change, Hitachi has adopted a number of measures.

First of all, the sales division that handles contract negotiations with the customer plays a more important role in the intellectual property strategy than ever. Accordingly, the sales and intellectual property

divisions held joint study workshops that served as an opportunity to consider what intellectual property will be important in the era of the IoT, what the impact of its mishandling will be on customers, and, conversely, what opportunities for customers and for Hitachi will arise out of it being handled correctly. Because Hitachi has sales offices throughout Japan, the intellectual property division sent its personnel to them through the course of a year to hold the study workshops. As a result, the distance between the sales and intellectual property divisions, which had not been in frequent contact with each other in the past, became drastically close.

As the contracts with customers that are handled by the sales division stipulate the assignment of intellectual property rights and conditions of use, the terms of a contract will have a large impact on the flexibility of research and development and of the scaling up of the business. This makes it essential that the research, business planning, design and development, manufacturing, and SE and sales divisions go about the task of building solutions and supplying them to customers on the basis of a common intellectual property strategy. Hitachi has also embarked on an initiative to enable intellectual property policy to be formulated for each solution and adopted across all divisions.

Furthermore, with regard to addressing the specific terms in contracts, Hitachi has also established a committee to support digital solution contracts, a measure for facilitating contract negotiations with

customers that is targeted at those business units that are already taking a lead in the use of AI. This committee is organized by the business management division and features a virtual unification of the divisions responsible for things like legal, procurement, and intellectual property that have an indirect involvement. By assisting the sales division with the finalization of contracts that deal with intellectual property or data by helping to put together the terms of those contracts, the activities of the committee are intended to help businesses to scale up and expand.

5. Future Prospects

A variety of legal measures for personal data and other data are being put in place not just in Japan, but around the world, with restrictions on data transfer and access, and they are having a major impact on the data utilization process internationally. These include the General Data Protection Regulation (GDPR) that regulates the protection of personal data in Europe, rules on controlled unclassified information (CUI) in the USA, and the Cybersecurity Law in China. Due to those restrictions, issues arising from cross-border data transfer and utilization of those data by AI will be a focus of attention. In its 2018 Intellectual Property Strategic Program⁽⁹⁾, the Japanese government made reference to international as well as domestic issues, stating its intention to encourage the use of data and AI by raising awareness as well as by undertaking studies for recognizing issues arising from data utilization and accelerating international data utilization. As with supply chains for physical goods, companies need to take action to establish supply chains for data, which is becoming increasingly important as a management resource, and therefore the formulation and implementation of strategies for achieving this becomes important in the future. In this respect, the survey referred to above is inadequate, and understanding of overseas institutions and data utilization practices will be important for establishing cross-border supply chains for data. Moreover, the above survey did not address decision making by data suppliers on whether or not to supply data, but an understanding of the factors that influence such

decisions is also vital. A typical data supplier will base their decision on the balance of risks and benefits that accompany such supply. When supplying data, particularly that which includes personal data and know-how, the decision will also likely be influenced by how much the data user is trusted. Establishing processes to foster trust in the data-receiving organization will be essential and it is also an important issue for future study.

The problems associated with data utilization also arise across wide-ranging specializations and industry sectors. To address these matters and engage in debates that are based on evidence, a symposium entitled “Policies and Strategies for Data Utilization – Achieving a Better Data Utilization Society –”⁽¹⁰⁾ was held on November 19, 2018 at the Ito International Research Center on the Hongo Campus of The University of Tokyo. The symposium addressed a wide range of problems relating to data, encompassing such diverse industry data as personal data; medical, health, and sport information; scientific and technological data; and infrastructure data, with presenters who represented a wide range of specializations, including legal policy, engineering, information science, and healthcare. How to find quick solutions to these diverse problems and proceed with the necessary measures effectively can be thought of as questions for those nations and industries embarking on the Fourth Industrial Revolution, and also for universities and other research institutions.

6. Conclusions

It has been more than five years since people started talking about data as a new natural resource. Initiatives for research and development of data utilization and its commercialization have advanced significantly during that time, with the importance of data continuing to rise. Nevertheless, in terms of corporate strategy, there remains much that is immature about the handling of data. This is an issue both in Japan and overseas, with a wide variety of challenges to be addressed by companies and national governments in ways that go beyond ownership and nation in order to establish global data supply chains. Along with

corporate activity, progress on research into data utilization by universities and other research institutions will have key role, as will the use of this work in corporate strategy and government policy. Partnerships between industry, academia, and government will likely become increasingly important for encouraging data utilization.

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