

Professional Community and Its Activities for Meeting Diverse Needs in Data Utilization

Data utilization is a data-driven feedback process for improving business that starts from understanding business issues, and processing and analyzing data with information technology through the eye of statistics and artificial intelligence. To deal with the various business issues, data utilization must be done by teams of specialists with the appropriate and latest skills for handling problems because the technological progress in statistics and artificial intelligence is so fast. This article presents the practices of a professional community that activates human resource development and mutual development, as an approach to foster the groups of specialists needed to meet diverse needs in data utilization.

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1. Introduction

While the data utilization that is indispensable for digital shift or digital transformation requires data science skills such as statistics and artificial intelligence (AI), these skills alone are not enough for business success. Specialists should have a skill set that includes understanding the business issues, applying knowledge such as statistics and AI, using IT for processing and analyzing data, and feeding data back into business processes (see **Figure 1**).

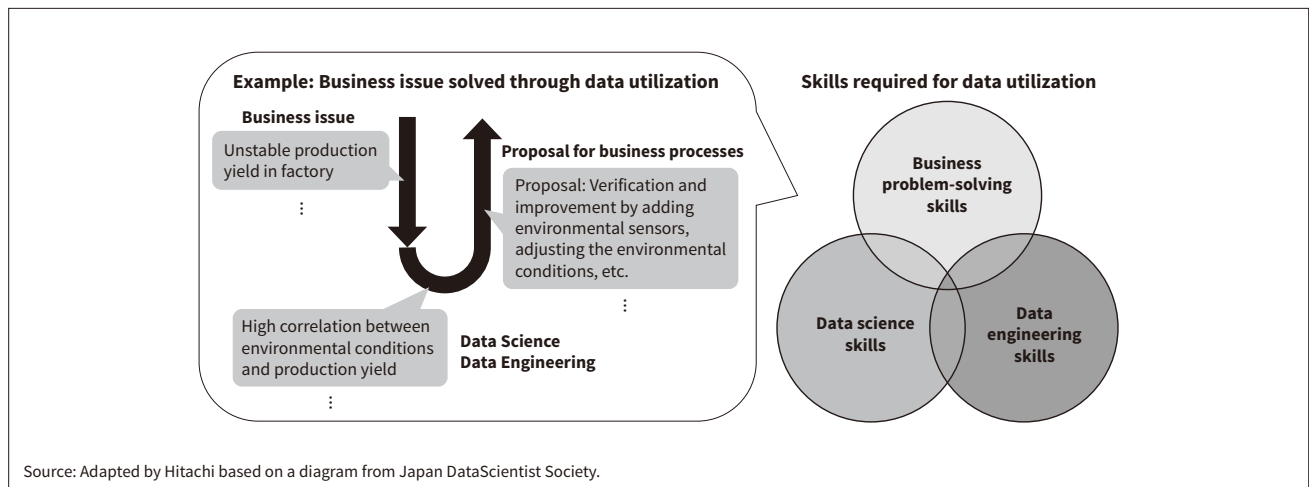
For example in manufacturing sites, in the case of improving efficiency by incorporating the Internet of

Things (IoT), specialists need to understand site issues such as unstable yields, convert these issues into data science problems, interpret the results of data analysis (such as correlations between environment data and yield data), and link the results to site improvements such as by adding environmental sensors or making environmental adjustments. Meeting these requirements will also require business problem-solving skills based on operational technology (OT) in the manufacturing field.

On the other hand, the cutting-edge nature of AI and the other data science and data engineering technologies and methods, which are updated daily, make it difficult for any one individual to master every skill for handling the entire wide range of business issues

Figure 1 — Skills Required for Data Utilization

An example of how a business issue can be solved through data utilization is illustrated here along with the skills needed by data scientists as defined by the Japan DataScientist Society⁽¹⁾. The term data scientist is used here to mean a worker with basic data science skills and some understanding of business and data engineering. The term data scientist is sometimes used more narrowly to mean a worker with specialist data science skills, and the term data engineer to mean a worker with specialist data engineering skills.



faced by customers or manufacturing sites. Therefore, specialists need to create teams to respond to each issue at hand.

This article reports on Hitachi's professional community activities and how members are approaching a wide range of issues through data utilization by creating teams of specialists from different fields.

2. Human Resource Development Measures to Meet Data Utilization Needs

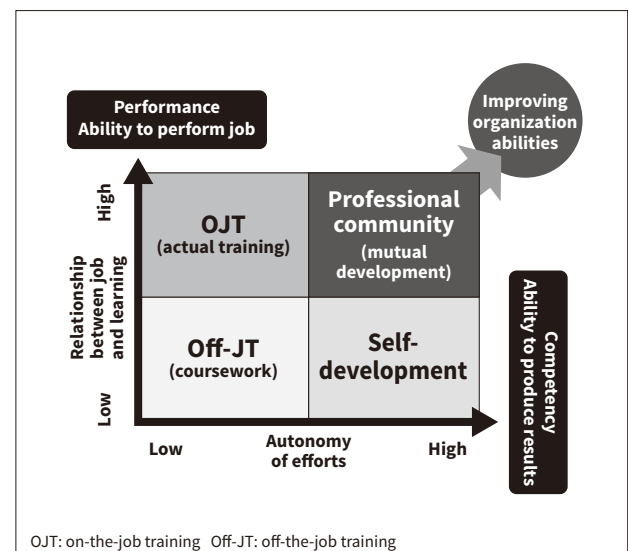
Figure 2 shows human resource development measures classified by strength of relationship to job performance and by amount of self-directed activity. On-the-job training (OJT) and off-the-job training (Off-JT) are effective methods of learning practical business skills. However, in order to learn skills related to technologies in fiercely competitive areas of development such as AI, it's important to acquire the latest knowledge through self-directed activities such as talking to specialists or reading papers and case studies.

As shown in Figure 1, the wide array of skills required for data utilization needs to be approached by creating teams of specialists with the skills needed to solve the issues at hand. To encourage these groups of specialists, Hitachi has created a professional community and is working on solving problems such as those below⁽²⁾.

- (1) When specialists want advice for the issues they face, they don't know where to direct their questions, how to judge the appropriate types of specialists, or how to address such specialists.
- (2) When specialists are unaccustomed to collaborating with each other, they cannot obtain answers even if they ask for advice.
- (3) When specialists from different fields interact, they cannot obtain suitable advice, if they lack a minimum common knowledge (i.e. vocabulary).

Figure 2 — Four Human Resource Development Measures

In addition to OJT and Off-JT guided by workplace superiors, it is important for employees to engage in self-directed activities to acquire new skills outside the sphere of their job duties.



2. 1

Professional community activities

Hitachi's professional community enables data utilization practitioners to engage in interactive learning activities while exchanging ideas about data utilization, receiving answers and advice from specialists, and improving their understanding of the technologies.

To solve problems (1) and (2) above, specialists routinely interact in the community with the aim of strengthening a collaborative spirit as an organizational ethos and culture.

IT infrastructure is indispensable for developing human resources who can use cutting-edge technologies, and for assisting global activities. As will be described in detail later, the activities involve more than just providing opportunities for personal interaction with cutting-edge technology researchers. Their aim is to enable global activities involving practitioners and specialists from each center around the world that are made possible by providing resources such as practical environments for data analysis and IT infrastructure enabling online information sharing and discussions.

2. 2

Defining the skills needed for data utilization

In response to problem (3) above, Hitachi has worked on defining the common knowledge and skills that data utilization-related practitioners and specialists need to understand.

Using the IoT requires knowledge and skills to be defined in a multidisciplinary and systematic manner,

across fields ranging from IT to OT. Individual fields also offer not a few examples of similar definition on data analysis, such as the seven tools of quality control (QC) used in the field of OT. Relevant education and certification systems and related information from inside and outside Hitachi were surveyed to select initial menu items that would be useful for learning baseline knowledge and skills, and for sharing them as human resource development guidelines. Due to today's rapid technological advances, the content will be continually reviewed and systematized in relation to higher-level skills.

3. Developing Human Resources Capable of Using Cutting-edge Technologies

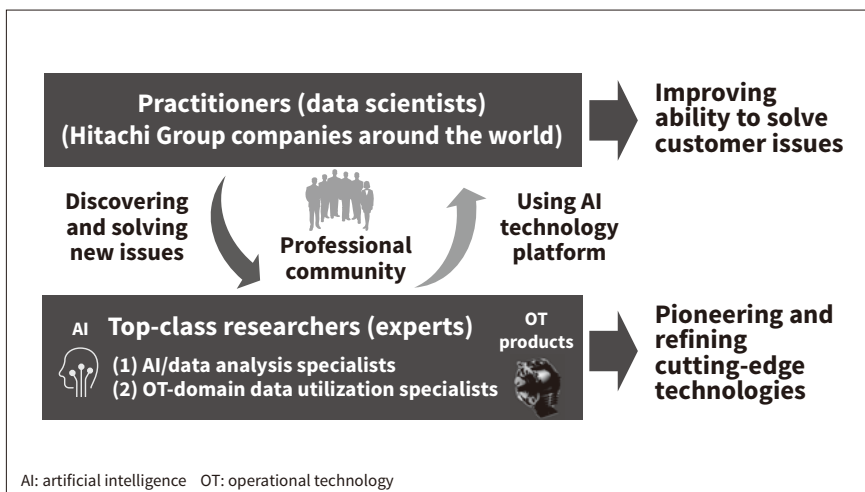
3. 1

Pioneering and extending cutting-edge technologies

For solving a wide range of customer issues by applying cutting-edge technologies such as today's rapidly evolving AI, the top-class cutting-edge researchers in the AI and data science fields, and the practitioners (data scientists) who work on actual issues, must interact with each other (see **Figure 3**). Beyond providing technologies only, researchers are expected to share information on research trends and application examples with practitioners as needed, and to stay abreast of upcoming customer issues and technology issues by interacting with practitioners. On the other hand, by exchanging information with researchers and their peers, practitioners will be called on to keep

Figure 3 — Role of Top-class Researchers

Top-class researchers efficiently provide solutions to customer issues by pioneering AI and other cutting-edge technologies for widespread release to practitioners (data scientists).



up on a wide range of cutting-edge technologies and case studies applicable to various business areas, and to explore potential technologies that are applicable as solutions they are working on.

To enable this type of in-depth interaction, Hitachi holds research discussion meetings several times per month, grouped by research topic. These meetings give Hitachi employees a venue for sharing cutting-edge research trends, along with research findings and application examples from Hitachi's top researchers. The meetings include many different features to promote knowledge-sharing and lively discussion. For example, there are lectures given by invited outside speakers, panel discussions on the topics of particular interest within the company, and a chat system that lets participants ask questions anonymously during the meetings. Social networking communities have also been created in association with the research discussion meetings, and features are provided that enable information exchanges extending beyond the limits of the question-and-answer sessions at meeting venues. These features enable discussion among members who are unable to physically attend meetings, questions from lecturing researchers to practitioners, and discussions among practitioners with the same views on particular issues. Another feature is provided to enable researchers and practitioners to continue discussions after meetings.

These social networking communities are also expected to enable a proper understanding of the need for information exchanges and interaction within the professional community, and to serve as venues for promoting autonomous participation. In the future, they will be used for more than just connecting people from various different backgrounds. By analyzing the information exchanged in these venues, Hitachi will look into creating an information curation system that will promote further self and mutual development by researchers and practitioners.

3.2

AI technology platform

Hitachi has created an AI technology platform designed to enable data scientists and researchers to work effectively on developing rapid solutions to various customer issues.

A suite of AI and analysis software forms the core of the platform. It includes components such as open source software for applications such as deep learning, Hitachi's characteristic AI technologies [Hitachi AI Technology/H⁽³⁾ and Hitachi AI Technology/Machine Learning Constraint Programming (AT/MLCP)⁽⁴⁾], self-growing dialogue AI⁽⁵⁾ and explainable AI⁽⁶⁾. Other components include data processing software for applications such as the data cleansing and data blending needed when preparing data for AI use, along with hardware environments such as a general-purpose computing on graphics processing units (GPGPU) environment (used for effective computational processing) and complementary metal-oxide semiconductor (CMOS) annealing machines⁽⁷⁾. These components are configured on a research and development (R&D) cloud, not only for researchers, practitioners, and engineers to refine the platform, but also for business departments to easily create new solutions on a trial basis. In the future, this environment will be released to Hitachi's customers and partners to expand the creation of solutions while creating an ecosystem (see **Figure 4**).

Providing these opportunities for interaction between researchers and practitioners along with this cutting-edge technology platform will produce a community of researchers and practitioners who collaboratively improve each other's capabilities, and will enable a faster pace of organizational digital innovation.

4. Knowledge- and Expertise-sharing Activities

The professional community shares Hitachi's diverse portfolio of proprietary digital technology as use cases and practical expertise. Practitioners are engaging in mutual development while improving their data science skills. By bringing together the expertise of practitioners from a wide range of departments, and using it in human resource development and business innovation, these activities are helping to grow Hitachi's data utilization-driven OT and IT business areas.

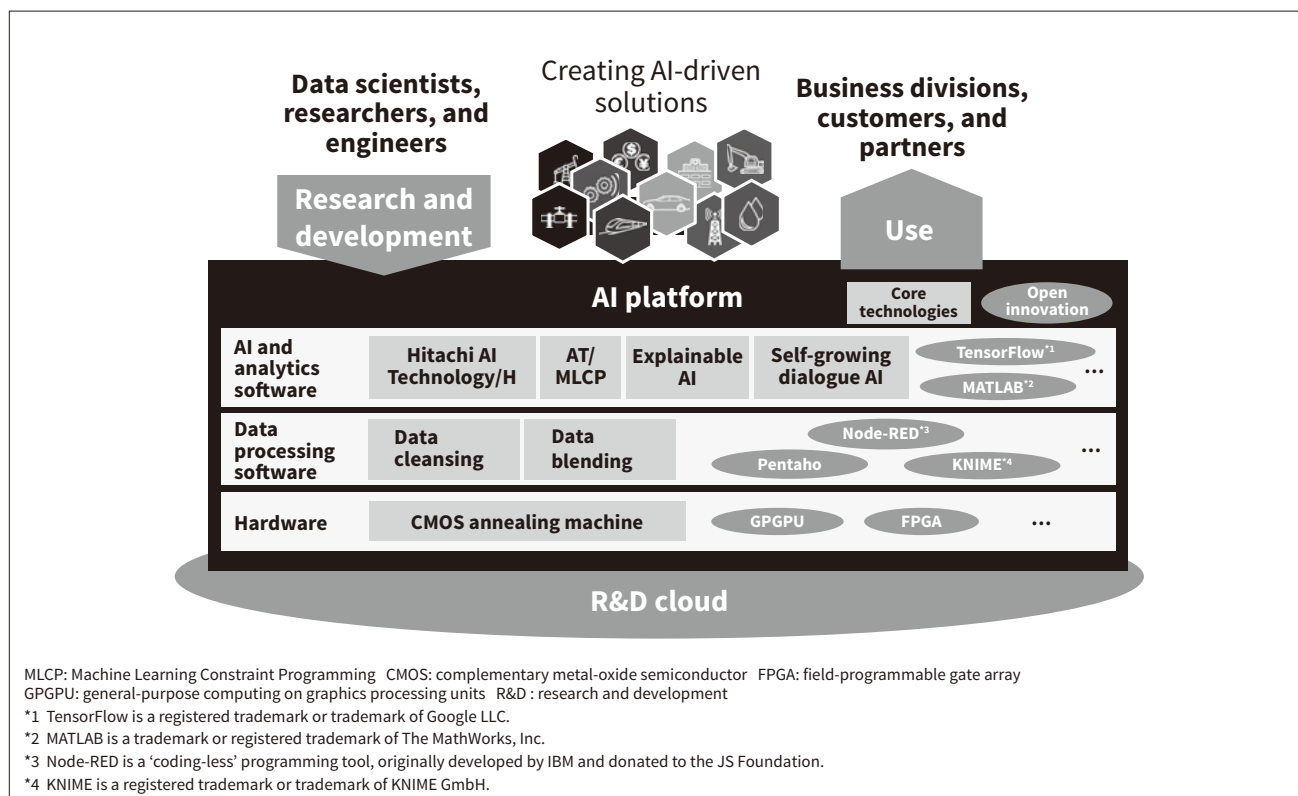
4.1

Activities to assist the global business

Hitachi focused on expanding its digital solutions business throughout the world, and created an IoT

Figure 4 — AI Technology Platform

Hitachi has created a technology platform designed for data scientists and researchers to develop solutions to various customer issues effectively and rapidly.



site in Thailand (Lumada* Center Southeast Asia) in FY2018. Digital specialists who can respond to local business needs are a crucial requirement for handling these digital technology-driven business areas, so the organizations in charge of digital business around the world are working together to interactively assist in training the digital specialists who promote the global business.

In December 2018, for example, the specialists who promote digital business at centers in Thailand, Singapore, and Hong Kong were brought together within the Hitachi organization that promotes digital business in Japan to learn Lumada-based data utilization examples and the corresponding data analysis methods. Specifically, they have learned about failure precursor diagnostics, failure cause diagnostics, and other typical data analysis examples. They used Lumada-based data utilization for exercises and held workshops to discuss methods of handling analysis projects.

* The collective term for solutions, services, and technologies driven by Hitachi's cutting-edge digital technologies. Designed to generate value from data and accelerate digital innovation.

Starting in Thailand, Singapore, and Hong Kong, Hitachi is planning to expand these human resource development activities for global digital specialists who respond to local business needs. The expansion will be tailored to demands and business conditions in collaboration with global centers (see Figure 5).

4.2

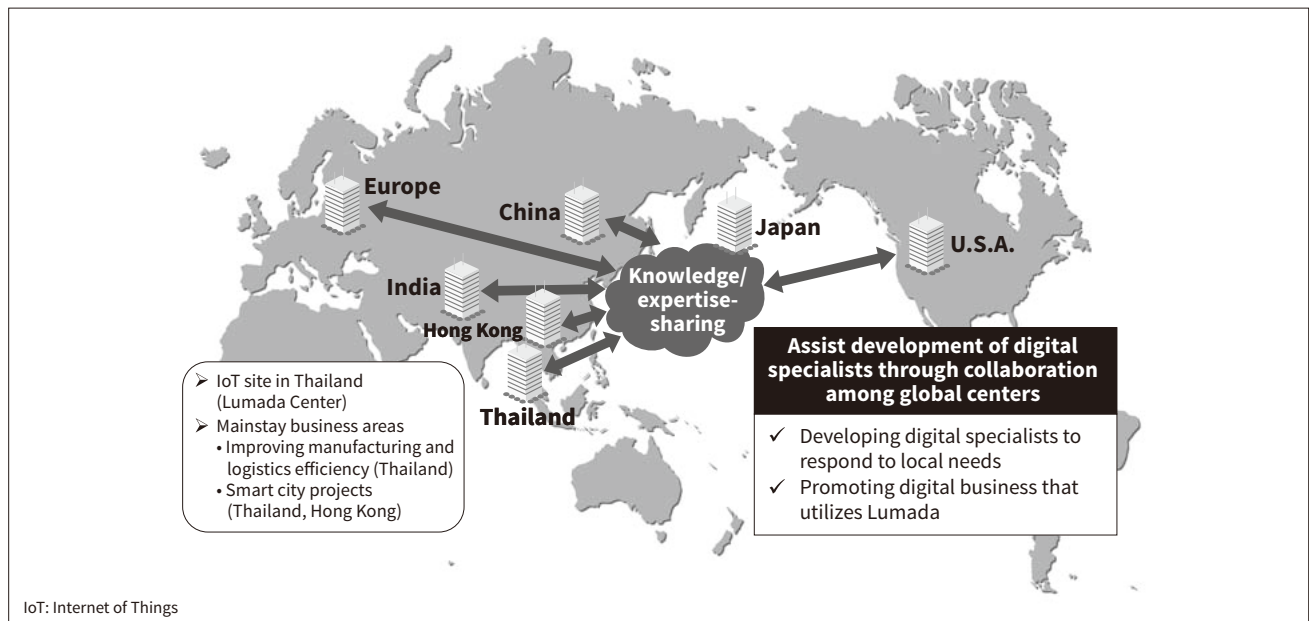
Self-development-based human resource development activities

To promote the ongoing rise of data utilization, Hitachi is promoting human resource development assistance through self-development activities. Self-development is usually done by taking coursework-based classes. However, to enable more practical learning on a routine basis, Hitachi is promoting expertise acquisition and skill improvement activities through hands-on data analysis.

A common analysis execution environment available within Hitachi is used to share analysis knowledge and expertise. It lets participants execute actual analyses on their own and learn analysis knowledge and expertise by sharing questions and discovering

Figure 5 — Work on Assisting Global Activities

Hitachi is providing assistance to the global business as part of its knowledge- and expertise-sharing activities. Assistance is being provided for digital specialists to learn to respond to local needs, and to promote Hitachi's Lumada-based digital business.



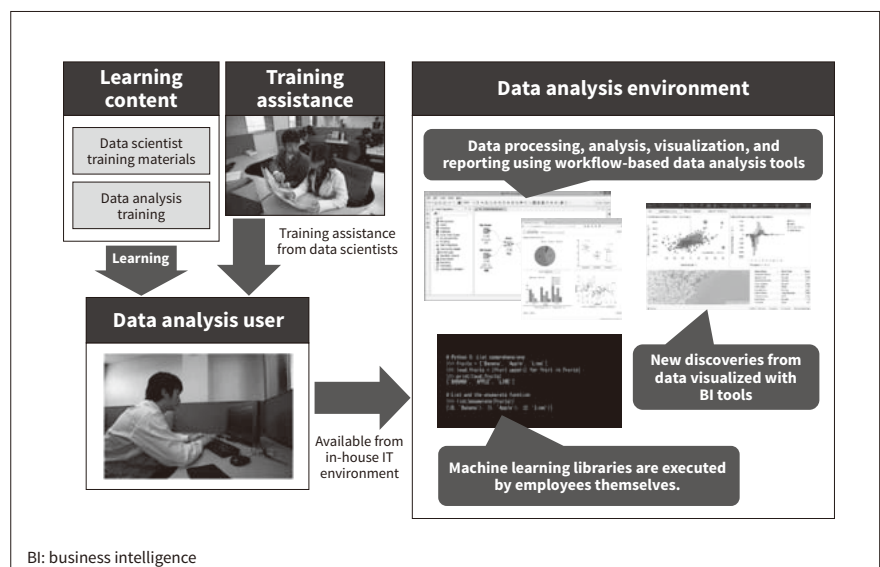
solutions. Their data science skills are honed collectively through intensive interactive learning. Participants in this self-development program use a common companywide analysis execution environment. Communication is promoted by taking part in a community of group members doing hands-on data analysis. The program lets participants share issues and solutions to improve their practical skills while helping each other.

The analysis execution environment is a data analysis environment used throughout Hitachi and

provided by means of a common companywide IT infrastructure environment. Each employee can access the common companywide data utilization environment from their own PC environment and use data analysis tools for applications such as AI and Machine Learning. Learning contents and training assistance are provided for participants with no data analysis experience. By assisting self-development in terms of data utilization in this way, Hitachi is helping breathe new life into data science activities (see **Figure 6**).

Figure 6 — Providing a Data Analysis Environment for Assisting Self-development

To assist the self-development needed to promote the growth of data utilization, Hitachi provides programs that enable participants to acquire expertise and improve skills through hands-on data analysis. Analysis knowledge and expertise are shared by using a common analysis execution environment available for use in-house.



5. Conclusions

Specialists from many different fields are teaming up in a self-directed way to work on a wide range of data utilization activities. This work style will be a driving force behind organizations in the digital era, promoting open innovation along with Hitachi and outside specialists.

Hitachi will continue to work on the activities presented in this article. The benefits attained from them will be provided to Hitachi's customers and partners to help expand collaborative-creation-based social innovation.

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