

Information as a Resource

— Intelligent Operations Combining Big Data and the Cloud —

With big data and cloud computing having become new trends in IT platforms, there are moves to generate practical value through the incorporation into IT of know-how and other knowledge from a variety of industries.

Intelligent Operations are a suite of smart information services that use the latest IT to support innovation in business and other areas of society.

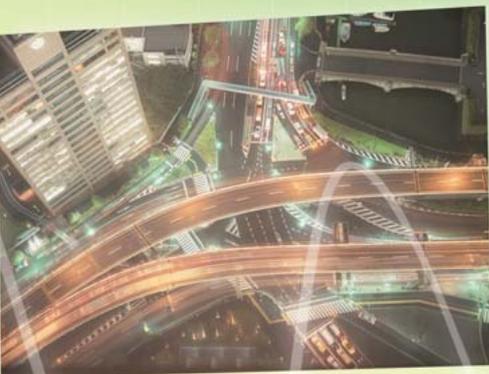
With applications that include enhancing the visibility of business processes, solving practical problems, maximizing service value, ensuring safety and security, and providing more advanced social infrastructure, a new era is emerging in which innovation is achieved through the utilization of the ongoing generation of large amounts of different types of information.

Business Know-how x IT

The four trends in information technology (IT) represented by big data, the cloud, mobile devices, and social networks constitute a new direction in IT called the “third platform.” In addition to the standalone use of these technologies, it is anticipated that innovation in business and other areas of society will be achieved through the synergies that result from the combination of these different elements.

Based on advanced IT that incorporates features

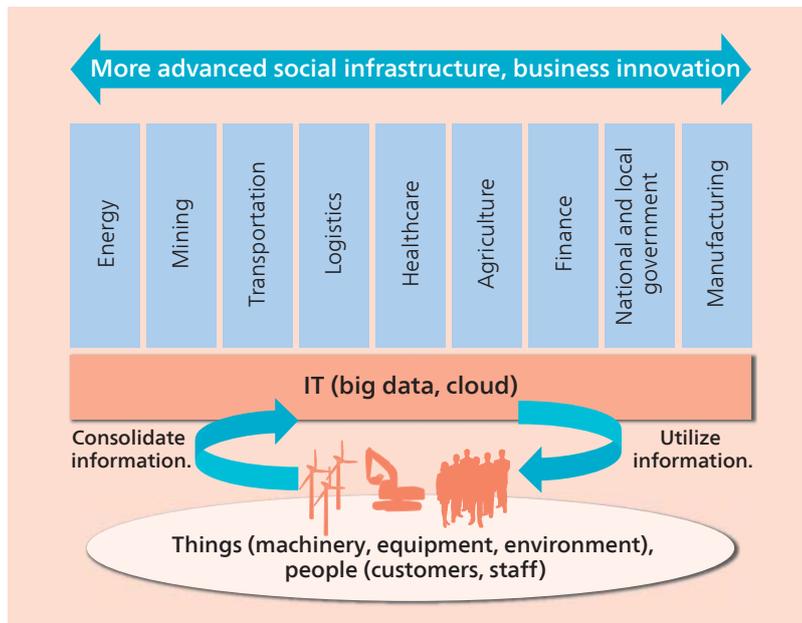
such as the latest technologies for the utilization of big data and highly reliable and secure cloud services, Hitachi has launched the Intelligent Operations suite of services that combine different forms of know-how built up through its social infrastructure, IT, and other businesses to deliver a powerful boost for customers adopting smarter practices. The term “Intelligent Operations” is used to cover a suite of vertically integrated services for specific industries, the IT platforms (Intelligent Operations Suite) that underpin these



services, and early-stage consulting in a variety of industries. By building IT systems from know-how and other practical knowledge that in the past was the preserve of people, these services help create real value, such as making business processes more visible and efficient, making social infrastructure more advanced, or enabling people to live in safety and security.

This concept dovetails with the ideas behind the Social Innovation Business in which Hitachi is engaged on a group-wide basis. The services are targeted at a variety of different industries. In addition to having prospects for growth in the global market and the potential for major benefits from IT-based innovation, another advantage is that Hitachi has collected data from its own operations in these fields.

Intelligent Operations website (in Japanese)
<http://www.hitachi.co.jp/smart-it/hr403/>



Hitachi has launched services that support innovation in social infrastructure and other business, particularly those industries where there is a potential for major benefits from the adoption of IT.

| Vertically integrated services (industry-specific added-value services) |
|--|
| Intelligent Operations for Agriculture |
| Intelligent Operations for Community |
| Intelligent Operations for Energy |
| Intelligent Operations for Facilities |
| Intelligent Operations for Healthcare |
| Intelligent Operations for Manufacturing |
| Intelligent Operations for Mining |
| Intelligent Operations for Mobility |
| Intelligent Operations for Retail |

These vertically integrated Intelligent Operations services are available for a variety of different industries.

In collaboration with its corporate customers in each industry, Hitachi is currently embarking on proof-of concept (PoC) studies of “practical operational know-how × IT” models to verify their effectiveness. The aim is to accelerate the expansion and reproduction of value creation by supplying these models to companies in the same industries based on the experience and knowledge built up through these PoC studies.

Improving Quality in Healthcare

Intelligent Operations work has already started in a number of areas. A leading example is the healthcare industry.

In September 2013, Hitachi and the **NHS GM^(a)** in the UK announced that they would undertake a joint PoC project for using IT to improve healthcare services. The project has two broad objectives that are based on the two organizations’ shared vision for healthcare.

(a) NHS GM

The National Health Service (NHS) England (Greater Manchester). The NHS is the public health service for the UK. NHS GM is the NHS organization that serves the Manchester region.



Dr. Mike Burrows, Director of the NHS GM, and Masaya Watanabe, Vice President and Executive Officer, CSO and CIO of Information & Telecommunication Systems Company, Hitachi, Ltd. at a press conference. NHS GM and Hitachi announced the launch of a joint proof of concept project aimed at improving healthcare services.

and verify proprietary Hitachi technologies for presenting this data in a form suitable for analysis and optimizing its storage in a database.”

Both in the healthcare sector and elsewhere, protecting privacy and taking account of security are major prerequisites if data is to be put to use. To achieve this, Hitachi will supply a highly efficient and dependable technology called k-anonymization, data access control based on agreed levels of access, and other services in accordance with UK national standards and practices.

The second objective is to trial lifestyle disease programs that target people at risk of diabetes and to assess program effectiveness. In the Salford district of Manchester where the PoC project will be based, measures have already been implemented that use health counseling via telephone to help prevent lifestyle diseases. The aim now is to use IT to enhance these further.

Mr. Ugajin said, “The effectiveness of this assistance has depended to some extent on the skills of the counselor involved, with only a limited number of people able to perform this work. In response, we intend to use IT-based prevention support technologies developed over time by Hitachi to provide a means for the efficient delivery of effective advice based on data analysis. Another important point is the use of technology for estimating healthcare costs to make cost-benefit information available.”

In addition to improving quality of life (QoL) by preventing diabetes, the program is also expected to help control healthcare costs. Dealing with diabetes is currently a challenge for nations around the world. Setting up prevention solutions with

The first is the implementation and trialing of a secure integrated healthcare platform for the sharing of data between general practitioners (GPs)^(b), hospitals, and research institutions. Atsushi Ugajin (General Manager, Smart Information Systems Division, Information & Telecommunication Systems Company, Hitachi, Ltd.), one of the staff involved in the project, commented as follows.

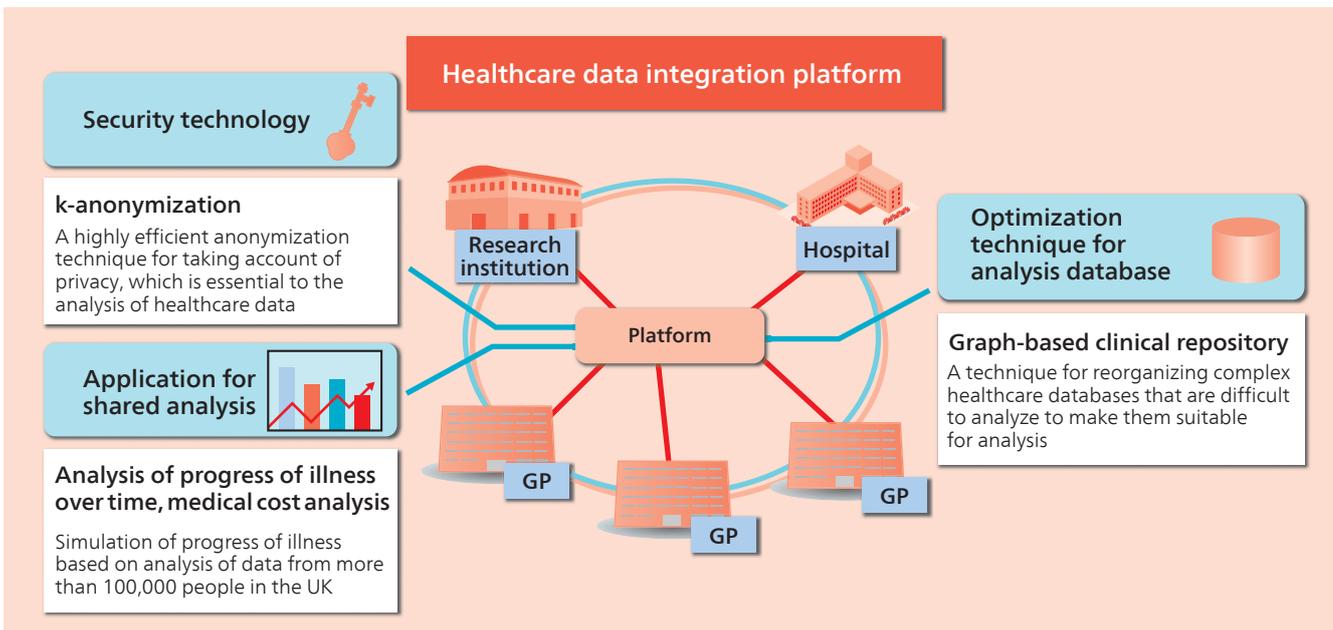
“The healthcare system in the UK has a hierarchical structure in which GPs who serve a particular community refer patients to specialists as required. We will build the system and network infrastructure for the centralized management of medical records and other data, which also provides for the analysis and utilization of a variety of healthcare big data. Because it is made up of a combination of different types of data in a variety of formats, such as test results, treatment details, or medication records, healthcare data is difficult to analyze in its raw form. The project will apply

(b) GP

A general practitioner (family doctor) who acts as the initial point of contact for consultations or treatment for any illness.



Atsushi Ugajin



Hitachi is working on the development of an integrated healthcare platform for Greater Manchester that takes account of privacy. The aim is to allow the shared use of data by GPs, hospitals, and research institutions.

Acting as a Partner with a Shared Vision for Healthcare Services

Dr. Mike Burrows, a Director of NHS GM who is enthusiastic about improving the quality of healthcare services in the UK, has a leading role in the healthcare service improvement PoC being run jointly with Hitachi. He made the following comments.

“Like other parts of the world, England and Greater Manchester face a variety of healthcare challenges, including aging populations and the growing incidence of obesity and adult-onset diseases brought about by lifestyle or poverty. Meanwhile, rather than offering preventive measures, healthcare providers frequently only get to deal with problems after they have manifested. There is a need to overcome problems such as rising healthcare costs and the pressure on medical resources required to provide treatment.

This is why we want to build an IT system that can collate healthcare data from Greater Manchester in ways that do not compromise privacy, and use it to improve clinical decision-making, provide patients with the appropriate care, and cut healthcare costs. Based on our investigations, we concluded that the best way

forward was to collaborate with Hitachi, which has a track record of world-class technology and innovation. Hitachi’s approach is somewhat different to that of other IT suppliers. Rather than seeking to impose ready-made solutions, Hitachi took the time to understand the issues we are facing and then presented a clear vision of how these could be overcome. I felt confident that these were people who understood our problems.

Our success with implementing leading-edge practices at Greater Manchester should also have a positive impact on other regions. Being able to deliver the best possible healthcare in terms of both medical care and costs is a boon both to patients and the people of the city. To achieve these goals, we are working in partnership with Hitachi to accelerate the pace of healthcare innovation in the UK.”



Dr. Mike Burrows

a favorable cost-benefit ratio can make a global contribution and has the potential for application to other lifestyle diseases.

The PoC project commenced in October 2013 and covers approximately 250,000 people in Salford. The plan is to expand the scope of data sharing to cover the Greater Manchester population of about 2,870,000. Mr. Ugajin made the following comment.

“After that, we hope not only to extend the system to other parts of the UK or to the entire country, but also to expand the scope of data it handles to include the health promotion and nursing sectors, and to utilize collected big data to enhance treatments or in other areas of medical research.”

To help bring about a society in which everyone can enjoy a long and healthy life, there is interest in what can be achieved with higher quality healthcare services made possible by IT.

Providing Access to Information on Mining Operations

Mining is another industry with the potential to use IT to adopt smarter operational practices.

Mining involves the extraction of resources such as coal or ore. It takes the form of a value chain that resembles a large factory, extending from

excavation and conveying through to crushing, separation, and transportation of the end product, and using mining machinery such as excavators and dump trucks. As this machinery requires a large amount of capital, there is a need to improve equipment utilization and get a quick return on investment.

Katsuya Koda (Senior Director, Smart Business Strategy Planning Department, Smart Information Systems Division, Information & Telecommunication Systems Company, Hitachi, Ltd.), who manages Intelligent Operations, describes the situation as follows.

“The inability to fully utilize their mining machinery assets due to operational problems or equipment failures is a major business issue for mining companies. As many aspects of mining are dependent on the skills and experience of individuals, major benefits can be expected from the incorporation of know-how into IT systems. Accordingly, we have taken on the challenge of using IT to raise the utilization of mining machinery as high as it will go.”

The goal is to contribute to efficient management by using IT to provide access to the operating details of machinery used across the mining process. As a first step, Hitachi is working on research and development aimed at enhancing the systems used



Katsuya Koda



Mining requires a large capital investment. Improving the utilization of machinery and increasing the efficiency of dump truck scheduling are important jobs at mine sites.

to support the remote monitoring and preventive maintenance of dump trucks and other equipment used for excavating and conveying ore at mine sites. For remote monitoring, Hitachi has implemented a system in which on-board units installed on dump trucks collect global positioning system (GPS) locations, engine operating conditions, and other parameters and transmit them to a control system. By viewing the information this makes available on dump truck operation, the dispatchers charged with dump truck scheduling can perform their job more efficiently.

operating practices that prevent mine accidents before they happen.”

The sophisticated use of IT has the potential to bring about major changes in the mining business in the not-to-distant future.

Extending Life of Social Infrastructure

The maintenance of social infrastructure is another field with potential for the use of IT. In Japan, social infrastructure built during the era of rapid economic growth is now aging and concerns are growing about how to extend its life and ensure its safety and security. A particular challenge for society is how to ensure the safety of road infrastructure such as tunnels and bridges. There are also growing moves aimed at maintaining the quality of social infrastructure at the level of government policy, including conferences being held by the Ministry of Land, Infrastructure, Transport and Tourism on how to deal with the aging of public assets, for example. To provide greater impetus for these moves, Hitachi has introduced a facility monitoring service.

Masaki Ogihara (Senior Engineer, Systems Department 2, Security Solution Operations, Services Creation Division, Information & Telecommunication Systems Company, Hitachi, Ltd.), who is currently working on the development and delivery of this service, made the following comments.

“The first step is to attach small sensors to facilities and then to use machine-to-machine (M2M)^(d) technology to perform measurements on these facilities and make this information available. The next step is to analyze the collected data to identify changes and to assist customers in deciding on the best time for remedial measures such as repairing or rebuilding. We will be providing all of these functions through a cloud service.”

Mr. Koda said, “Although systems like these are already operating in the mining industry, they require a major effort to set up and operate, such as providing electric power at mine sites and installing hardware, software, and other IT systems. Instead, we have sought to use cloud technology to allow monitoring to be performed via a data center from a remote site such as headquarters or a branch office. Also, by utilizing the collected big data on machinery operation for purposes such as maintenance management or the pre-emptive detection of faults, it becomes possible to prevent lower utilization due to faults and maximize the return on capital investment by choosing the ideal timing for performing maintenance.”

Once implemented, this provides mining companies with access to the latest remote monitoring and preventive maintenance systems via the cloud with a short lead time and small investment.

“We are also looking to integrate these systems with [Global e-Service on TWX-21^{\(c\)}](#),” said Mr. Koda. “We are aiming to provide visibility across the entire value chain and help improve business value at mining companies by using IT to tie together mine sites and administration. By analyzing large amounts of operational data, it may also be possible to do things like identifying

(c) Global e-Service on TWX-21

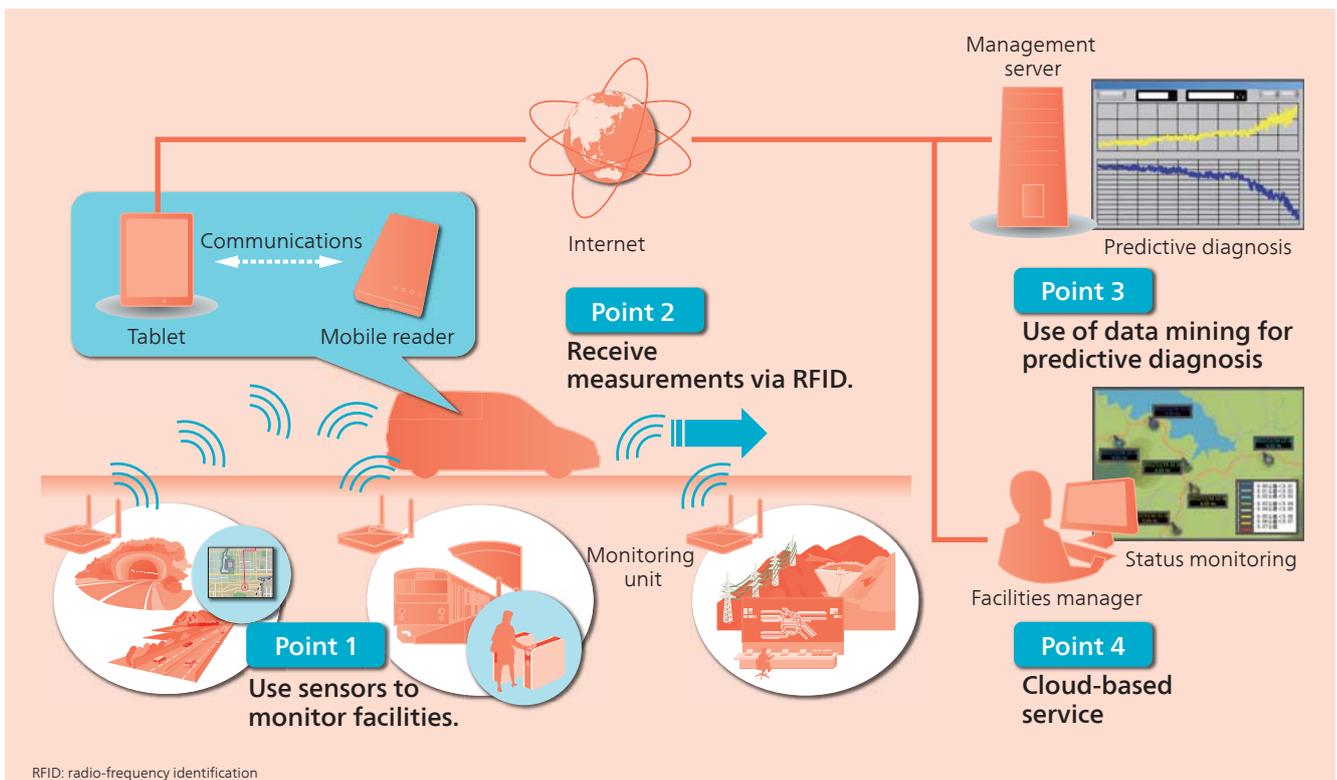
A cloud-based service that supports the lifecycle management of machinery by collecting information on the manufacture, sale, operation, maintenance, and other aspects of machinery, and making this information available for shared use. TWX-21 is a trademark of Hitachi, Ltd.

(d) M2M

Machine-to-machine. A system in which machines exchange information directly over a network.



Masaki Ogihara



The figure shows the outline of a facility monitoring service. The status monitoring service monitors for abnormal situations such as landslides and provides realtime notification. The predictive diagnosis service detects signs of problems such as deterioration or aging from data collected during daily inspection tour.

This status monitoring service incorporates active wireless functions into sensors that allow them to transmit radio signals capable of being received up to 200 m away so that sensor data can be collected automatically.

“When sensors are installed at a tunnel or other form of road infrastructure, for example, data can be collected easily from a vehicle as it drives by on a daily inspection tour. In addition to transmitting measurements to a management server in realtime, the data can also be displayed on a smartphone and used for on-site assessments of the state of the facility. We have already conducted field PoC studies on road infrastructure to demonstrate the reliability of the technology,” said Mr. Ogihara.

The sensors are chosen based on the infrastructure being measured and the data to be collected. Specialist of suppliers has a proven track record for devices such as characteristic frequency gauges, inclinometers, strain gauges, and anchor load cells. The range of available sensors is to be expanded in the future.

Another service of a type that only Hitachi could provide uses its proprietary data mining technology to perform predictive diagnosis. This system uses measurements taken over a period of time to learn what constitutes the normal situation, and then extracts correlations with abnormalities by comparing actual measurements with this normal-state data. For example, by attaching sensors to a jet fan installed in a tunnel for ventilation to measure the state of the fan blades

and suspension fittings, predictive diagnosis can be used to take appropriate steps to deal with deterioration or with the loosening of fittings that hold the fan in place.

While this facility monitoring service has been developed for the aging infrastructure of Japan, Hitachi is also considering its use overseas in the construction of new infrastructure, particularly in emerging nations.

Mr. Ogihara said, “If sensors are fitted when the infrastructure is being built, they can also help prevent construction accidents. In addition to road or railway infrastructure, they also have potential for widespread use in water treatment and other plants. Our aim is to deploy solutions that take advantage of the unique capabilities of Hitachi with its IT and infrastructure technology.”

New Fields Opened up by IT

Progress in IT has made it possible to collect and utilize large amounts of real-world data, something that was difficult to achieve in the past, thereby opening up new fields and leading us into an era in which value is created from data. This steady accumulation of huge amounts of data can be seen as a resource for building a better society. As the diverse range of Intelligent Operations services expand into all the different areas of society, they will bring with them a variety of value and innovation.