Use of Smart Information Systems in New Markets

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OVERVIEW: Together with technological advances in communications, sensors, and other fields, the falling cost of hardware means that IT is now being used to improve business activities in areas or industries where extensive use of IT was less viable in the past. Smart information systems differ from past information businesses in that they include things like the collection of sensor data by M2M networks or the analysis of big data. This smart information can be applied in areas such as providing safety and security or efficiency improvement. Hitachi is utilizing its existing cloud technologies to commercialize the services of its information businesses and supply them globally, thereby extending its services to new industries around the world, such as agriculture, logistics, and mining.

INTRODUCTION

RAPID advances in hardware and in communications and sensor technology have reduced per-bit and communication costs. As a result, industries such as agriculture or logistics that have struggled in the past to deliver benefits from the direct use of information technology (IT) are now making progress on the use of IT for business innovation and smarter operations.

To date, the pace of adoption of IT in different industries has been dictated by the extent to which the benefits of IT to those industries have impacted directly on corporate profitability. The finance industry, for example, has been using IT since the 1960s, with financial institutions achieving great progress as they competed to build online systems. The mainframe-based IT resources that predominated in those days were expensive and cumbersome compared to current systems. Nevertheless, they were adopted because the benefits of IT outweighed the costs. The costs of IT were subsequently cut through downsizing, with one example being the adoption of point-of-sale (POS) systems by the retail industry. Throughout this process, there was a close correlation between the extent of advances and cost reductions in IT and the areas where it was able to be deployed. Recent years have seen further advances and cost reductions, leading to interest in the use of IT for business improvement and smarter operations in industries where it had not previously been widely used (see Fig. 1).

This article describes Hitachi's strategies for achieving smarter operation in industries such as agriculture, logistics, and mining.

AGRICULTURE

Given its dependence on the weather, conventional agriculture (particularly field cropping) is without doubt an unreliable form of commercial activity. Also, because it is underpinned to a considerable degree by the experience and intuition of farmers, agriculture in Japan finds it difficult to attract young people into the industry. This is posing a problem for the nation because the increase in land left uncultivated as a result of the shrinking and aging of the farming
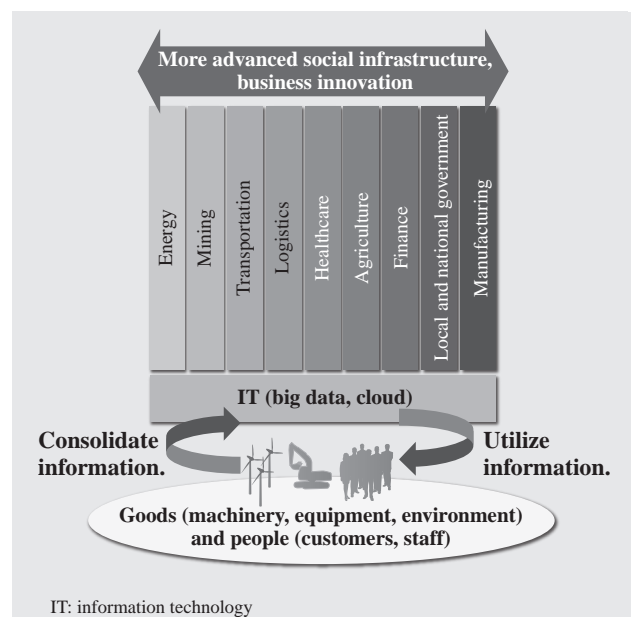

Fig. 1—Applications for Smart Information.
A shift is underway from traditional information businesses toward the commercialization of smart information systems that use IT to support the infrastructure of society.

population is diminishing food self-sufficiency. The following section describes how smarter agricultural practices offer one way of overcoming this problem.

Achieving Smarter Agricultural Practices

Based on discussion with agribusinesses, Hitachi believes that capturing the empirical knowledge of current farmers in the form of data will make farming more reliable and aid new entrants to the industry.

Consequently, Hitachi is planning the release of a cloud service for supporting vegetable production. Rather than field crops, which are exposed to the outdoor environment, this service will utilize information technologies such as sensor networks or cloud computing to support the production of agricultural goods from factory farms where managing the environment is comparatively easier. In doing so, it will provide the following three forms of "visualization."

(1) Visualization of the environment: This involves using sensors to measure variables such as temperature, humidity, or carbon dioxide concentration and periodically transmit them via a network to a monitoring center. (The development of this technology is allowing for the potential use of environmental control in the future as the number of factory farms being monitored increases.)

(2) Visualization of crop growth: This analyzes data on the growing environment that has been collected by the monitoring center to predict what effect changes in this environment will have on future crop growth and harvests.

(3) Visualization of production and sales: This is concerned with factors such as the volume and timing of agricultural production, and also market prices.

Cloud Service for Supporting Vegetable Production

This service supports the production and management of agribusinesses, and assists the entry of young people into the industry.

The following examples describe the two main ways it is envisaged for the service to be used.

(1) In the case of a poor harvest, the reasons can be identified by analyzing historical data on the growing environment and this knowledge put to use in cultivation of future crops.

(2) New entrants to the industry can obtain information about current conditions at the factory farm and make changes to the environment to bring it closer to optimal conditions.

In the case of lettuce grown at a factory farm, a rapid feedback cycle is possible because crops are harvested after approximately 30 days (see Fig. 2).

Advances in Smarter Agricultural Practices

Agriculture is seeing an accelerating trend toward big data analysis involving rational decision-making based on data rather than on experience and intuition as in the past.

In operating its services in the future, Hitachi intends to use feedback to improve its services while also seeking to identify which information is essential for farmers.
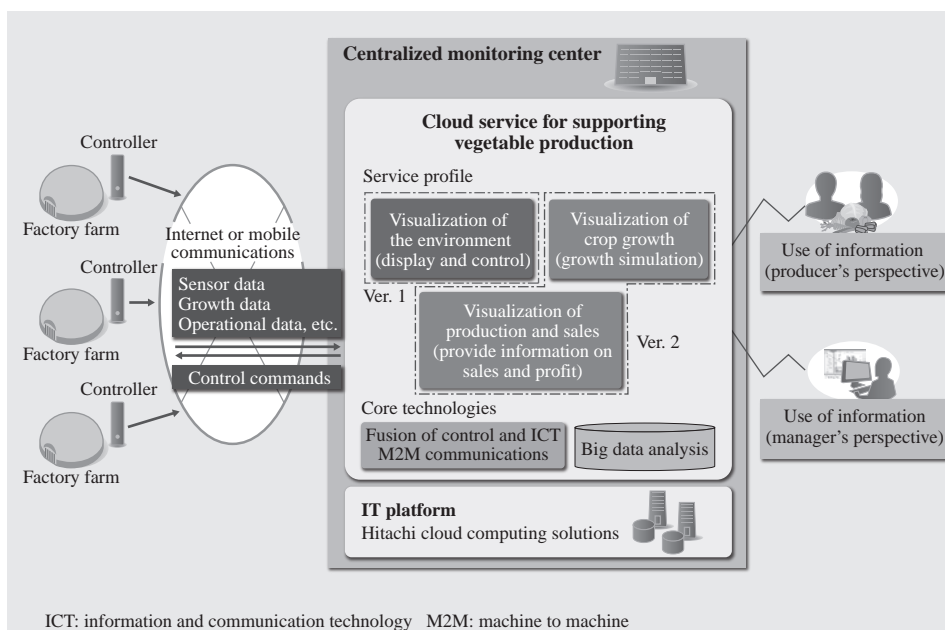

Fig. 2—Cloud Service for Supporting Vegetable Production.
This service supports production and management activities of farmers by managing the conditions at factory farms from a centralized monitoring center in the cloud.

ICT: information and communication technology   M2M: machine to machine

LOGISTICS

Logistics in the future will need to deal with challenges such as global supply chains, changing social structures, the information society, and environmental problems, with growing opportunities for adopting smarter practices. The following sections describe the background to these various challenges, which markets and issues offer opportunities for adopting smarter practices, and how to go about establishing the best business models for logistics.

Background to Growing Globalization

Factors such as growing demand in emerging economies and the relocation of production sites overseas have been driving growing globalization in recent years. As a result, the question of how best to improve and strengthen logistics has become an even more important management issue than it was in the past. This has made it necessary to develop further the logistics that enhance the efficiency and sustainability of supply chains and help provide a safe and secure way of life by extending the scope of system-wide optimization based on a rigorous approach to overall management in companies.

The present era of big data is making it easier to extract and collate the large quantities of data collected from logistics operations, including procurement, production, sales, distribution, and the recycling or disposal of goods. This in turn is recognized as making it more important that this data be utilized in future decision-making aimed at improving corporate profitability.

Markets and Issues Where Opportunities Exist

The global logistics market is currently growing at an annual rate of 8%, with growth in the emerging economies of Asia running at an even higher 18%. In China in particular, which features both a large market and rapid growth, the market is forecast to reach $US 2 trillion in 2015. Despite this, inefficiency remains an issue in the Chinese market where logistics accounts for 17 to 18% of gross domestic product (GDP), a higher proportion than in Japan and other developed countries. Limited logistics assets need to cope with rising freight volumes, higher expectations, increasing labor costs, and compliance with environmental regulations.

Management overheads make up a high 13% of the cost of logistics in China, suggesting that issues exist at the operational level. Possible reasons for this high figure include that the systematic creation of smoothly functioning logistics systems remains inadequate in China, and problems with wasteful spending on fuel for trucks and unnecessary administration or delays.

Smarter Logistics through Combination of Operations and IT

Against this background of change, Hitachi supports better and more efficient logistics for manufacturers of transportation equipment, electrical machinery, and components in the Chinese market through a "One Hitachi" approach that integrates the operations of Hitachi group companies with the cloud platform provided by Information & Telecommunication Systems Company of Hitachi, Ltd. Hitachi also intends to establish businesses that support corporate operations by providing IT services with high added value through the repurposing of big data collected from logistics operations.

In a first practical step toward achieving these objectives, Hitachi will provide a service for improving existing logistics operations that directly addresses the issues of concern to its customers (cargo owners). This can cut logistics costs in the short term while also shortening delivery times. Subsequent steps will include expanding services that improve logistics quality by supplying information that assists with the continuous improvement of logistics operations. Finally, in its role as a corporate partner to its customers, Hitachi also intends to supply IT services with high added value that support business strategy through the use of logistics information, involving analysis and evaluation based on the utilization of big data (see Fig. 3).

MINING

Worldwide demand for minerals and other natural resources is rising in response to rapid growth in emerging economies, and this in turn is creating a need for IT-driven changes to operating practices in mining, a field that has been slow to adopt IT in the past. This section describes the background to the adoption of smarter mining practices, the areas where this is happening, and the necessity of using the cloud.

Smarter Mining Practices

While fluctuations may occur in the short term, factors such as the increasing demand associated with rapid growth in emerging economies mean that, viewed over the medium to long term, the markets for minerals and other natural resources are expanding internationally. In response, there is vigorous activity
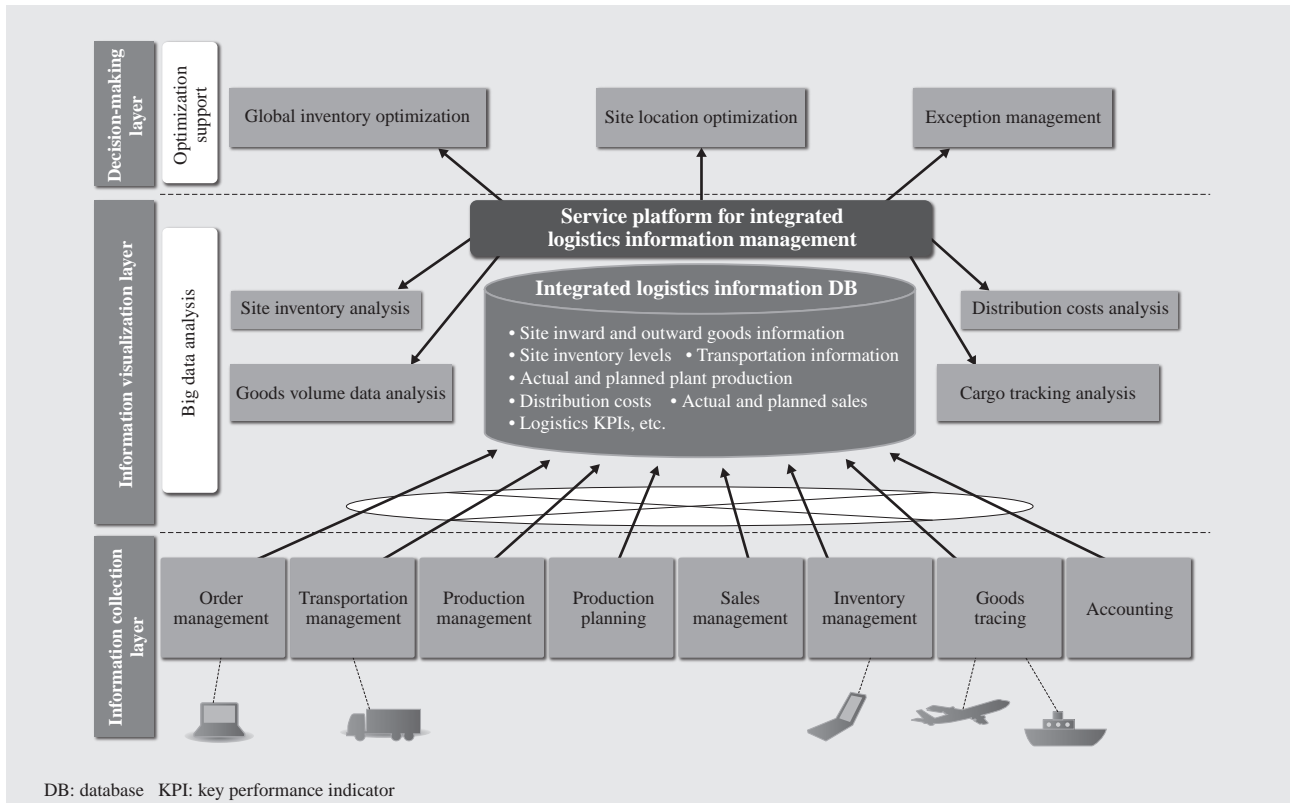
Fig. 3—Service Platform for Integrated Logistics Information Management.
The aim of the platform is to deliver services with high added value that extend from the collection of information to its application in analysis or visualization, and that support management strategies when making decisions.

in the field of mining development throughout the world. One of the challenges of the mining business is that, while the upfront and running costs of excavation, refining, and other production equipment are very high, they tend to have poor utilization and productivity compared to the plant used in other industries. Rapid mining development also puts strain on the availability of experienced technical staff, creating a need for measures for sharing know-how and dealing with rapidly rising labor costs. Also, because operating conditions at mines tend to be harsh and the machinery very large, there is a need for safety and security measures as mine site accidents can often put human lives at risk.

As a result, there is strong demand for the adoption of smarter mining practices based on IT to increase the utilization of production equipment (assets), improve productivity through initiatives such as sharing the know-how of experienced technical staff, and ensure safety and security.

Opportunities for Smarter Mining Practices

After the initial prospecting to survey the site, mining projects can remain in production for decades.

The production processes extend from excavation and conveying at the mine through to crushing, grinding, separation, and refining at a processing plant close to the mine and then transportation by rail or ship (see Fig. 4).

Potential opportunities for smarter mining practices include the use of sensors, communications equipment, and other devices to improve safety and security at the mine, increase the utilization of excavation equipment, or boost productivity by coordinating the operation of the machinery used in the different processes performed at the processing plant. Other possibilities include identifying and removing bottlenecks in production or optimizing the mining supply chain through measures such as making available information on each step of the mining process.

Use of the Cloud for Smarter Mining Practices

Because mines are often located a long way from cities, use of the cloud is considered to be essential if mining is to be made smarter (see Fig. 5).

The following four points need to be considered in relation to smarter mining practices.
(1) Uncertainties about the full-scale use of IT systems due to unreliable electric power at the mine.
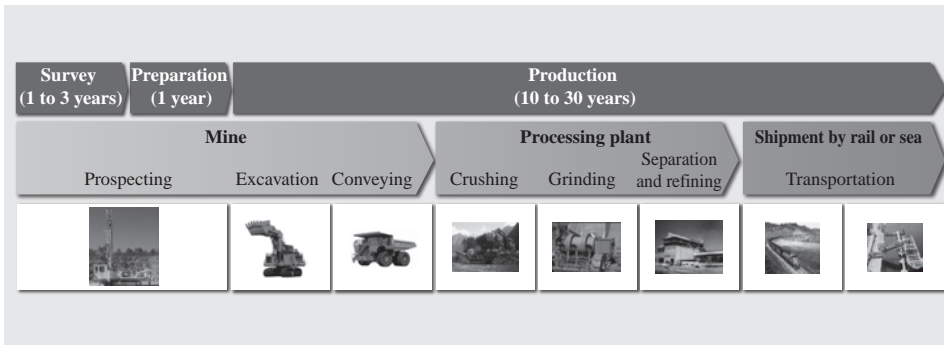
Fig. 4—Mining Processes.
This shows the processes used in mining from the mine to the transportation stage.

(2) When IT systems are installed at a mine, the difficult working conditions for IT staff compared to urban workplaces is a cause of high labor costs.

(3) Mining company headquarters are often located in the city or in another country, meaning that a network is essential for the transmission of business information.

(4) Improving the utilization of production equipment requires the establishment of maintenance arrangements with the supplier or their agent, and this in turn requires the sharing of operational and fault information.

Hitachi believes that the use of the cloud to implement IT systems able to share information with remote locations and multiple sites offers an effective way to overcome these challenges, and is proceeding on this basis.

CONCLUSIONS

This article has described Hitachi's strategies for achieving smarter operation in industries such as agriculture, logistics, and mining.

Industries that have tended to be slower to adopt IT have begun taking advantage of advances in the field to start utilizing IT for business innovation and smarter operations. By steadily pursuing the strategies for adopting smarter practices described in this article, they should contribute to progress in social infrastructure that incorporates IT.
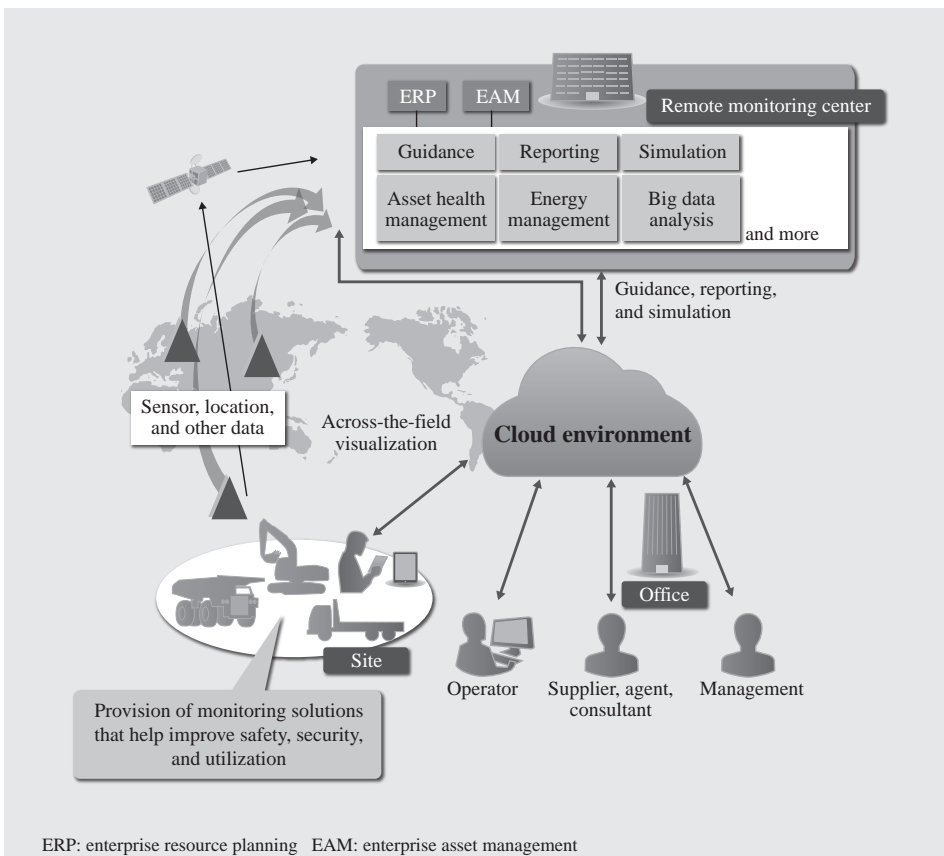

Fig. 5—Use of Cloud for Smarter Mining.
Hitachi aims to use cloud technology to provide services with high added value that support management strategies by promoting smarter practices across the full range of processes associated with mining.

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