Hitachi Building IoT Solution for Added Value and Enhanced Quality of Building Operation

The business environment for office buildings has been undergoing major changes, including intensifying competition for tenants due to an oversupply of office buildings and the widespread adoption of telecommuting in response to the COVID-19 outbreak, and the functions required of office buildings are also beginning to change. In response, commercial real estate companies are enhancing software aspects using ICT and IoT technologies, such as smart buildings, in addition to conventional hardware aspects to differentiate their real estate properties through higher added value. Hitachi is implementing a business service offering building platform solutions that enables commercial real estate companies to consolidate and utilize building management and usage data in a centralized manner for providing highly scalable solutions.This article presents an overview and the features and value provided by a Hitachi building IoT solution that provides unprecedented new value in addition to improving the efficiency and quality of building management through the integration and utilization of data related to building management. It also covers the value provided by linking with the Hitachi office worker solution and its projected applications going forward.

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1. Introduction

Before the spread of COVID-19, there was already intense competition for tenants in central Tokyo due to the continuous supply of large-scale office buildings. However, the COVID-19 outbreak has accelerated major shifts in work styles, and people are beginning to re-think what offices should be. These changes in the environment surrounding buildings have led to a growing shift to add value to buildings by leveraging digital technologies to achieve increased efficiency and sophistication of building management operations and to improve the productivity and comfort of office workers and other building users. In response to these developments, this article introduces Hitachi's initiatives for office building solutions.

2. Changes in the Environment Surrounding Office Buildings

Since the global financial crisis, there has been stable demand for office buildings in central Tokyo due to relocations and increases in floor space in response to the recovery in corporate performance, and the vacancy rate for office buildings was at a record low at the beginning of 2020. In addition, large-scale redevelopment projects were being planned one after another in office areas, primarily in central Tokyo. In addition to improving the appeal of hardware aspects such as the location, buildings, and functions of the buildings, commercial real estate companies had been actively working on enhancing software aspects such as improved convenience and smart buildings that utilize information and communication technology (ICT) and Internet of Things (IoT) technologies.

However, due to the widespread adoption of satellite offices and telecommuting in response to the spread of COVID-19, the average vacancy rate in the Tokyo business district (the five central wards of Tokyo: Chiyoda, Chuo, Minato, Shinjuku, and Shibuya) has risen for 14 consecutive months as of April 2021[(1)]. In response, commercial real estate companies are working on new measures to respond to the changing roles and functions of offices, such as addressing the new normal with a focus on safety and security, and turning offices into places for creating innovation.

Thus, it is becoming necessary for commercial real estate companies to review the nature, business strategies, and roles of office buildings, and to further increase their added value.

3. Challenges and Measures Faced by Commercial Real Estate Companies

The challenges facing commercial real estate companies at the moment are divided into the following five categories.

(1) Reduction of building management costs

Just as buildings incur repair costs as they age, building equipment incurs management costs to keep it running stably. Furthermore, there is a need to reduce management costs to provide attractive building spaces, including the possibility of lowering rents due to aging.

(2) Addressing the labor shortage and dependence on knowledge of specific individuals

There is a chronic shortage of young staff involved in building management, and the current management staff is aging. As a result, there is a need to pass on the knowledge that has been gained through experience.

(3) Variations in building management quality

When repair information on building equipment used in one building is not shared with other buildings equipped with similar equipment, variations in quality occur, leading to a decline in management quality.

(4) Measures to enhance competitiveness in obtaining tenants

In the wake of COVID-19, tenant demand has declined as tenant companies have withdrawn or relocated from office buildings, and it has become increasingly important to enhance competitiveness by making offices into more attractive spaces.

(5) Rethinking the roles and functions of the office for transforming the business model

As a result of COVID-19, there is a need to re-think the role and function of the office, such as providing value and services that "bring people together" rather than simply providing a site for an office.

In light of these challenges, commercial real estate companies need to improve operational efficiency through the centralized management of equipment operation data by leveraging ICT and IoT technologies, as well as work on standardization of operations through cost reduction and systemization. In addition, it is necessary to implement not only measures for each building, but also measures and integrated management spread across multiple buildings in order to improve operational efficiency, prevent variations in management quality between buildings, and avoid duplication of investment.

Moreover, commercial real estate companies are being looked at to provide new value that has never been provided before, such as contributing to the creation of a safe, secure, and comfortable office environment by transmitting to office workers information that had previously been used for building management, such as the building usage and congestion status.

4. Hitachi's Intended Direction

With this situation as the background, Hitachi is implementing building platform solutions that enables commercial real estate companies to consolidate the management and usage data of multiple office buildings in a centralized manner, to create new value by utilizing this data, and to provide solutions that are highly scalable and can be continuously updated.

The concept for the building platform solutions that Hitachi is working on is shown in **Figure 1**. Two solutions will be provided from this platform. One of the solutions is Hitachi building IoT solution. This solution provides a centralized interface that consolidates various building management data. This data can be linked with various applications for supporting improved quality and higher added value for building operations.

The other solution is Hitachi office worker solution. This solution provides a centralized interface that consolidates the activity data of the office workers, who are the building users, and provides new experience value to the office workers through their smartphones by linking them with experience value and productivity improvement applications.

This section focuses on Hitachi building IoT solution, and the following section introduces the value provided by the linkage between Hitachi building IoT solution and Hitachi office worker solution.

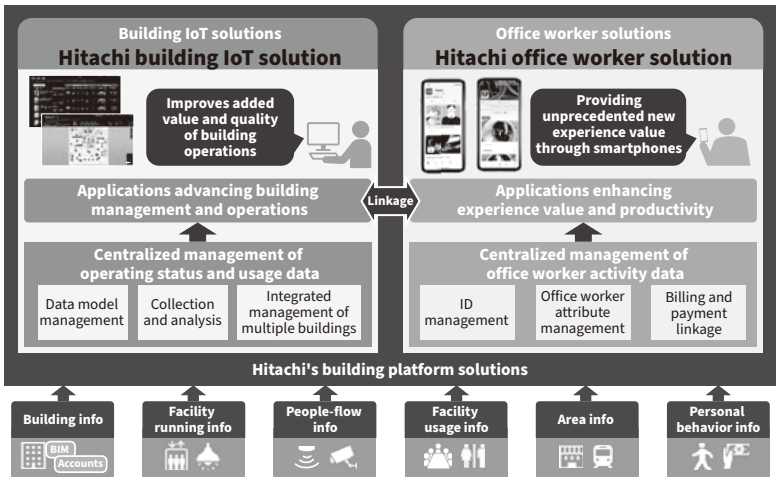
5. What is Hitachi Building IoT Solution?

5. 1
Overview of Hitachi Building IoT Solution

Hitachi building IoT solution is a solution for commercial real estate companies, mainly for large-scale buildings, that

Figure 1 — Conceptual Diagram of Hitachi's Building Platform Solutions

Hitachi's building platform solutions integrates and manages data obtained from the management and use of office buildings, and utilizes the data to create new value by linking it with various applications.



BIM: building information modeling IoT: Internet of Things

provides a centralized interface for collecting and consolidating the operating status of building equipment such as elevators, escalators, and air-conditioning systems, and enables integrated and cross-sectional monitoring and analysis of multiple buildings remotely. In addition to data on building equipment, Hitachi building IoT solution can combine and analyze people-flow data, such as the degree of congestion in each area of the building, to improve the efficiency of building management, enhance the comfort of users, and maintain and improve the quality of building operations. An overview of Hitachi building IoT solution is shown in **Figure 2**.

5. 2 Hitachi Building IoT Solution Features

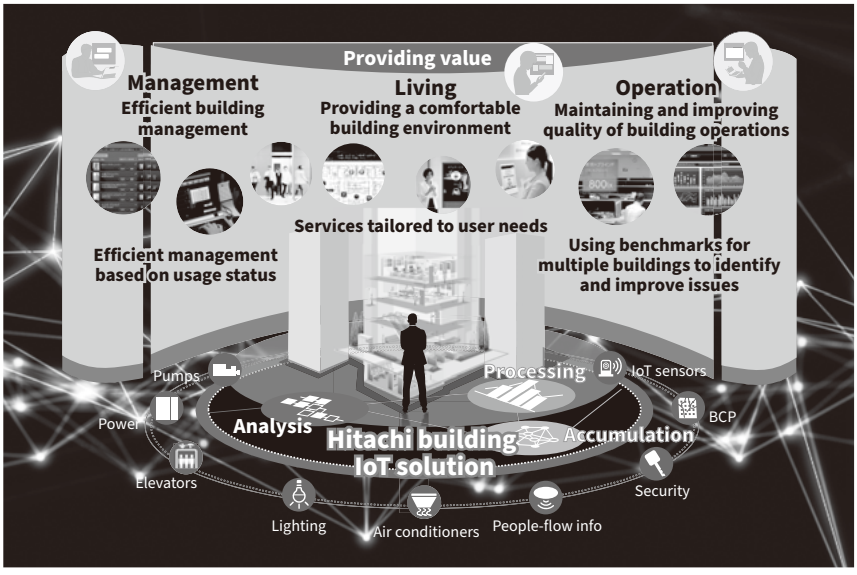
The main features of Hitachi building IoT solution are as follows.

(1) More efficient building management

Hitachi building IoT solution provides an integrated interface for remotely monitoring various equipment in multiple buildings and for visualizing the operating status of the equipment and the usage status of the buildings. By comparing multiple buildings or floors within the same building, it is possible to develop efficient cleaning and security operations that take into account the usage status, and maintenance plans that take into account the condition of building equipment, thereby helping to improve the efficiency and quality of building management.

(2) Improved comfort for building users

Based on people-flow data, such as the degree of congestion in each area of the building, Hitachi building IoT solution can be linked to the control systems of building equipment such as elevators, escalators, and air-conditioning systems to alleviate congestion and set the temperature



BCP: business continuity plan

Figure 2 — Overview of Hitachi Building IoT Solution

Hitachi building IoT solution integrates data collected from various equipment, devices, and sensors in a building to deliver value by providing more efficient building management, a more comfortable building environment, and by maintaining and improving operational quality.

according to usage conditions to assist in achieving a comfortable building environment. In addition, by providing information on the use and congestion of restrooms, meeting spaces, and other locations, Hitachi building IoT solution helps to realize more efficient use of equipment by building users and new ways of working and office life that respond to the new normal, such as social distancing.

(3) Maintaining and improving the quality of building operations

By benchmarking the number of activated alerts, energy consumption, and other data of each building for multiple buildings, building managers can identify operational issues and study improvement measures for maintaining and improving operational quality.

(4) Open application programming interface (API) for flexible service expansion

The inclusion of standardized, open APIs makes it easy for partner companies to add new solutions and allows for flexible expansion of service offerings. This enables commercial real estate companies to add more diverse and convenient services and enables partner companies to gain access to a large number of commercial real estate companies and tenant companies through the Hitachi platform. Hitachi will continue to actively collaborate with its partner companies to provide new value to commercial real estate companies and tenant companies by continuously expanding the functionality of its services and applications.

5. 3
Examples of Applications Provided by Hitachi Building IoT Solution

This section presents three applications as examples of providing new value. The applications presented here are in their initial stage of development, and Hitachi plans to expand them in the future using the open APIs mentioned above.

(1) Building IoT monitor

The building IoT monitor implements a top screen for integrated visualization of the status of multiple buildings (see **Figure 3**), a real-time monitor screen for visualization of real-time building information (see **Figure 4**), and a statistical information screen utilizing the collected data. The top screen provides the operating status of various building facilities, alert information, electricity usage, usage rate for contracted power, and other data. The building IoT monitor can also be linked to image analysis systems to monitor various types of incident information, such as suspicious person detection information and suspicious object detection information. The real-time monitor screen displays various sensor information, operating information for lighting, air conditioners, surveillance cameras, and other devices, and people-flow information on the floor plan of a specified floor for allowing the user to grasp the information in real time. The statistical information screen allows comparison and analysis of the collected data by floor and by building.

(2) AI-based application for supporting air conditioning comfort in conference rooms

This application uses artificial intelligence (AI) to predict changes in room temperature based on weather information, environmental sensors (temperature and humidity), and people-flow sensors. Based on the prediction results, the room temperature is adjusted before the actual room temperature deviates from the preset temperature range by coordinating with the air-conditioning system. This enables the keeping of a comfortable indoor environment without making users feel uncomfortable and without even users being aware of operation.

(3) Restroom monitoring

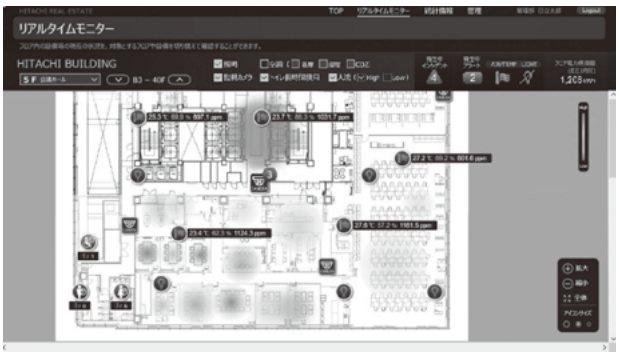
Restroom monitoring has functions for notifying the manager of the time and number of times that the restroom has been used. This contributes to the maintenance and improvement of the quality of building operations and the providing of a safe and secure environment for optimizing cleaning based on the frequency of use and offering additional support to security staff in case of long hours of usage. The system is also equipped with a function

Figure 3 — Top Screen of Building IoT Monitor

This shows the top screen of the building IoT monitor, which can provide integrated visualization of the information from multiple buildings. This enables visualization of the equipment abnormality alert information and power usage status for each building.

Figure 4 — Real-time Monitor Screen

This screen provides visualization of real-time information that includes sensors and operating information for lighting, air conditioners, and surveillance cameras on the floor plan of a specified floor.



that provides the status of restroom usage to office workers through smartphones and signage, which encourages voluntary congestion mitigation and contributes to less complaints.

6. Creation of High Value-added Services through Linkage with Hitachi Office Worker Solution

Hitachi building IoT solution can provide even higher value-added services through linkage with Hitachi office worker solution, mentioned above. The services includes direct transmission of building congestion status to building users and linkage of building facilities with office worker attribute information (tenant information, usage privileges, etc.) and building facility reservation information. For example, this enables avoiding of crowded conditions by transmitting information on congestion in offices, restaurants, and restrooms, and allows less staffing at the reception desk by enabling access without ID cards for visitors and other temporary users through linkage with access control systems. This also makes it possible to call elevators and operate the air-conditioning system from applications on PCs and smartphones for reducing elevator waiting times and energy usage.

In this way, linkage with Hitachi office worker solution enables connection of buildings and people for contributing to the development of safe, secure, and comfortable office buildings with value as gathering sites and for improving the quality of life (QoL) of office workers.

7. Conclusions

This article presented the changes in the environment surrounding office buildings, the issues faced by commercial real estate companies, and Hitachi's initiatives to resolve these issues. The environment surrounding office buildings is expected to further evolve in the future in response to the new normal and the ongoing shift in how people work.

With Hitachi building IoT solution and Hitachi office worker solution presented here at the core, Hitachi is taking on the challenge of improving its solutions and addressing advanced topics proactively to further improve their appeal. The company will form an ecosystem in cooperation with partner companies to continuously provide a variety of services to commercial real estate companies and building users.

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