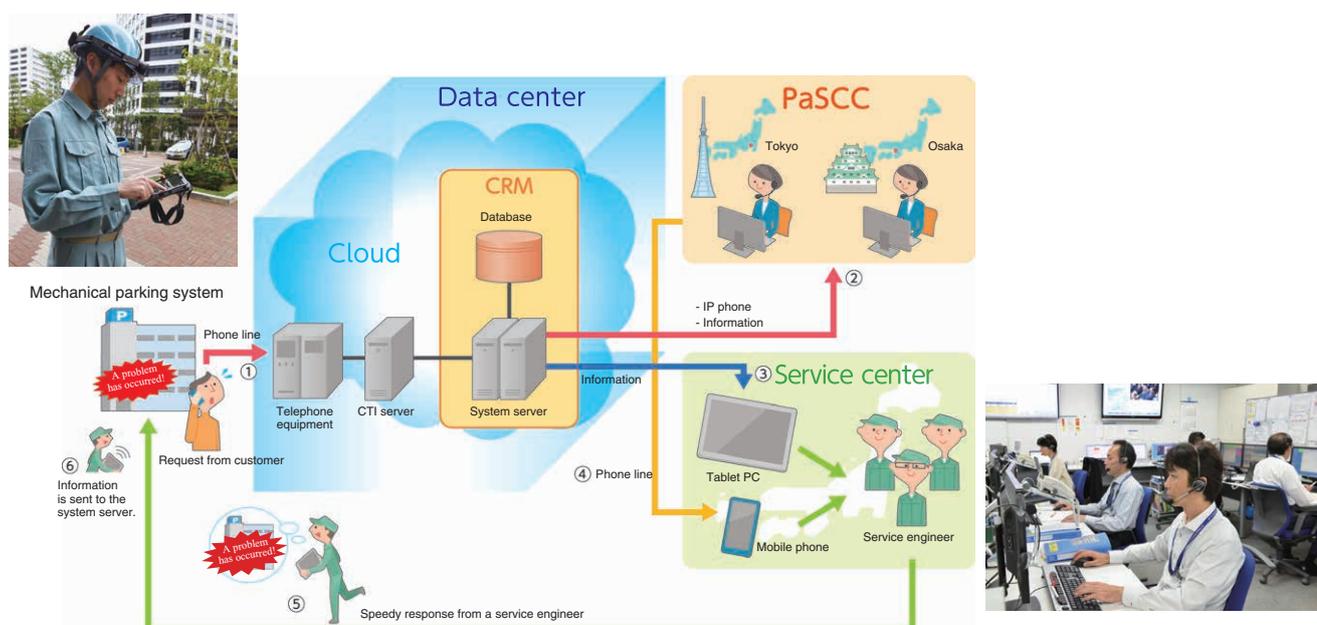


# Utilizing ICT to Ensure Precise Maintenance and Speedy Responses to Faults

**A maintenance system that connects mechanical parking system users and service engineers**

IHI Transport Machinery Co., Ltd. began operating remote abnormality monitoring systems for mechanical parking systems in 1992, and has since promoted the digitalization of information by establishing call centers and employing field support tools. This article introduces communication platforms for connecting people and the operations that they undertake in the context of system reconstruction that utilizes the latest Information and Communication Technologies.



System for parking trouble resolution

## Introduction

You may have experienced problems when contacting a call center to discuss malfunctioning household appliances, such as having a hard time explaining the circumstances of the malfunction to the call center operator or having to re-explain the problem to the service engineer who was sent to carry out the repairs.

A company that carries out maintenance for mechanical parking systems, IHI Transport Machinery Co., Ltd. (IUK), has succeeded in eliminating misunderstandings between

customers and operators and overlapping information. Furthermore, we have developed call centers that can respond precisely to the caller's problem as well as Customer Relationship Management (CRM) systems that facilitate integrated management of service engineer support to ensure that problems are quickly resolved.

IUK has developed a new parking maintenance system that leverages Information and Communication Technologies (ICT) such as the cloud and tablet PCs, and this system commenced the operation in July 2017.

### Conventional PaSCC

Having begun operating remote abnormality monitoring systems in 1992, IUK established its own type of call center called the Parking Support Control Center (PaSCC) at the end of 1999 to respond to maintenance and mechanical problems at parking lots.

Unlike conventional call centers, which are used by large numbers of unspecific customers, the PaSCC is established for contracted users of the parking lot. Given this, a level of personal service that you would usually expect from a concierge is essential. In other words, customers expect the staff that they are dealing with to have a good understanding of their situation. With conventional systems, however, operators take a long time accessing information on matters such as the property’s registration, the maintenance contract, and any requests concerning inspections or malfunctions.

There were also cases where a service engineer was dispatched only to find that the customer had already solved the problems by themselves. Consequently, there was a need to assess the situation and determine whether the dispatching of an engineer was actually necessary. To do this, the operator needs to understand the situation more accurately. In other words, it was necessary for information on matters such as the specifications of the parking lot, the details on the most recently conducted maintenance, and the nature of past problems to be immediately searchable, and for a feature to integrate the new information obtained by the operator there to be developed as well.

Additionally, although IUK claimed to offer 24-hour operational support, it was actually operating a system (servers) installed in our headquarters from two locations: Tokyo (inside the IUK headquarters building) and Osaka (inside the IUK Kansai office) during the day as well as centrally from Tokyo during the night and on non-business

days. PaSCC Osaka had a backup system in which information was synchronized on a regular basis, but since there was a certain period of time in which the system shut down when switching to the backup, it was a conditional type of 24-hour operational support.

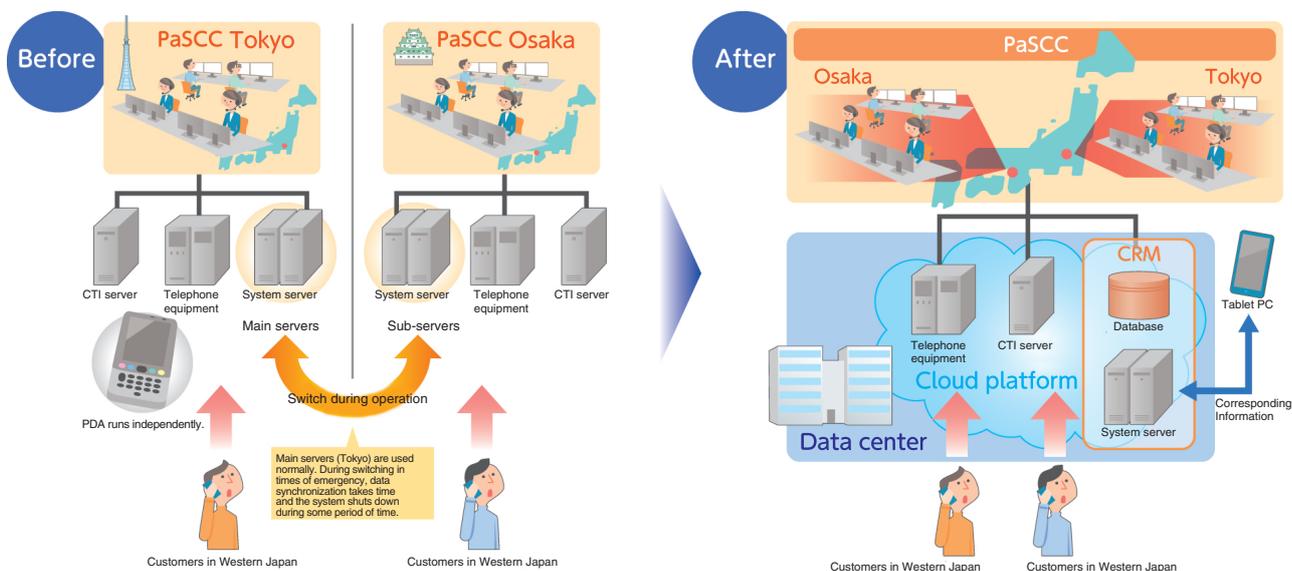
Furthermore, although Personal Digital Assistants (PDAs) were used as an information communication tool by the service engineers who actually visited the sites, the screens were too small to display drawings or other visual content clearly.

### Working towards the provision of 24/7/365 support

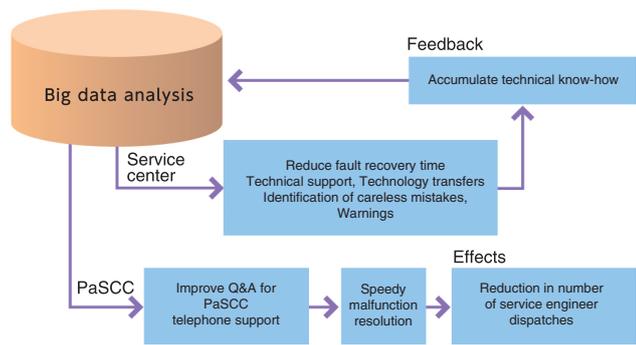
The mechanical parking systems used up to the year 2000 were mostly parking lots for rented buildings and they were operated by the building managers. Not many parking lots were used at night and PaSCC was not contacted so often.

Recently, however, there has been a rise in the number of apartment parking lots that users operate themselves (mainly multi-story parking systems and high-rise Tower Parking (Pallet-type) for high-rise apartments) and it is becoming more common for parking lots for rented buildings to be operated by users with IC cards rather than by the building managers. As a result, parking lots are now used 24 hours a day all year round, so PaSCC needs to provide 24/7/365 services as well.

Additionally, following discussions on Business Continuity Planning (BCP) due to concerns about the rolling blackouts that were implemented in the Kanto area in the aftermath of the Great East Japan Earthquake in 2011 and the possibility of an earthquake with an epicenter directly below Tokyo occurring, IUK began developing a new system designed to ensure that our business could continue operating responsibly under any circumstances and that our customers and service engineers are connected seamlessly.



System reconstruction using PaSCC cloud platform



Speedy malfunction resolution: Learning the past Q&A in PaSCC telephone support makes it possible for the operator to identify the request details in the first stage of a request being made, thereby helping to reduce the number of dispatch requests.

Big data analysis utilization

## Creating a stable network using the cloud

In creating its new system, IUK decided to replace the information devices used by its service engineers from PDAs to tablet PCs, which can handle more information and have a faster transmission speed. To do this, it is necessary to have a stable network that can connect the company's 13 000 or more property information management servers nationwide to the 250 tablet PCs used by its service engineers at 58 directly-managed service centers and service shops. Therefore, IUK built a cloud-based system at its latest data center.

For the new system, IUK began using IP phones instead of traditional phone lines. Traditionally, the distribution of the call centers and a centralized reception was difficult since telephone switchboards had to be installed at both of the call centers (PaSCC Tokyo and PaSCC Osaka). Once the telephone switchboards could be installed at the data center, it was possible to build PaSCC at the two locations as a single call center. As a result, IUK has been able to improve its customer service for received phone calls and support BCPs by automatically transferring overflow calls on one PaSCC to the other.

Incidentally, call centers nowadays only require the installation of a private line and terminal devices (PCs and phones). Therefore, given today's global network, local call centers can be added abroad easily.

Security and stability were ensured by using private lines as the communication lines for the tablet PCs. This facilitates the operation of a 24/7/365 system that is unaffected by blackouts or other such incidents at the company's headquarters building.

To ensure that the new system was fully functional, the various data it stores has to be up to date. This includes customer information, which is updated every 24 hours, and records of faults and other such matters, which are updated in real time. This was also made possible by the establishment of a cloud platform and a stable network.

The tablet PCs used by the service engineers allow the fault

data registered at the PaSCC to be checked in real time and they are equipped with features as a CRM system terminal for entering field work reports. By accessing the maintenance support feature, the service engineers can review inspection records (charts) as well as technical information such as inspection guidelines. Additionally, inspection reports can be printed on-site via mobile printers. New inspection data is instantly stored in the database via the cloud, thereby allowing it to be used together with PaSCC fault data in cause analysis (big data analysis).

## Built to ensure constant availability and good operability

While building the new system, IUK focused particularly on ensuring that it would offer constant availability as well as good operability and ease of input.

In terms of ensuring constant availability, we anticipated that one set of PaSCC phone lines would be flooded with calls in the event of an emergency such as sudden torrential rain or an earthquake or in the event of a fault such as a blackout at a PaSCC. We aimed to develop a robust system that would be able to respond to such eventualities by automatically transferring the calls to the other PaSCC so that operations do not shut down.

We also focused on providing good operability and ease of input, which refers to the operability and information display speed of the support system.

For example, although the client (parking lot) can be identified at once by means of the Computer Telephony Integration (CTI) system in the event of a phone call from companies such as a management company, the operator has to identify the parking lot in question through conversation in the event of a phone call from an individual user. The problem in these cases is that an individual customer may tell the property using its common name or an abbreviation. In fact, the customer may not know the official address of the parking lot. Given this, IUK enhanced its "fuzzy compound retrieval feature," which combines fragmented information such as the property name and its address, so that operators can quickly identify the relevant parking lot.

IUK also developed a call log display so that if a customer calls back, the call can be put through to the operator who handled the original call.

Additionally, operation becomes easier for the PaSCC operators and service engineers if they can select items (from a pull-down menu) rather than have to enter text. Furthermore, the number of options was minimized to avoid potential confusion when making a selection, although sections for the entry of details were left as text entry.

The information entered in the text entry area may seem unnecessary at times, but it is important as part of the essence of communication. Big data analysis in this system classifies the general framework based on the selected item and then performs text mining (natural language analysis) for text entry data such as customer opinions, response details,

and articles. As a result, this essence information is the key to analysis.

### Expected benefits of the new system

Direct users of the new system are PaSCC operators and service engineers. Precise telephone support and field support leads to greater customer satisfaction.

Traditional call center operations (e.g. taking calls and arranging service engineer dispatches) and service engineer operations (e.g. repairs) are seamlessly coordinated, enabling problems to be resolved quickly as the service engineers have a detailed understanding of the situation.

Additionally, by utilizing big data analysis of accumulated data in PaSCC telephone support Q&A, the operators can provide support in finding a speedy resolution to a malfunction, thereby helping to reduce the percentage of calls that result in a service engineer being dispatched.

Furthermore, the scope for on-site investigations of the cause can be narrowed by analyzing the cause of the fault and providing recovery support, which in turn can be expected to lead to a reduction in recovery time. Moreover, it also facilitates the provision of the kind of technical support that would previously have been dependent on the experience or intuition of an experienced engineer, such as being able to carry out a repair in such a way as to ensure that the damage caused by the fault will not have any lasting impact or being able to identify the next inspection points.

### ICT advancements that made this system possible

The development of this new system was made possible not only by IUK's technologies, but also several dramatic advancements in ICT. The advancements that were particularly closely related to the development of this system are as described below.

- (1) Advancements in mobile data communication and the internet led to the development of high-speed corporate networks, making it possible to use cloud platforms in external data centers.
- (2) Applications that integrate the Sales Force Automation (SFA) and CRM necessary for PaSCC telephone support were commercialized, enabling the development of an ICT tool for connecting the call center and the service engineers.
- (3) Low-cost tablet PCs with good operability and detailed drawing capabilities were commercialized.

### Aiming to leverage ICT for on-site use

In the future, IUK expects to see the following developments in operating this system.

- (1) Map (traffic, etc.)/weather information: Taking phone calls from around the country, the PaSCCs provide telephone support and service engineer dispatches based on the local situation of the users
- (2) Voice recognition: Input support for PaSCCs and

service engineers

- (3) Augmented Reality (AR): Visual technology support through layered virtual reality (equipment) that uses the camera on the tablet PCs used by service engineers, as well as information such as equipment specifications and repair guidelines based on image recognition
- (4) Big data analysis: Analysis of notices concerning matters such as careless mistakes and warnings issued by service engineers

We aim to utilize ICT to provide support to those working on site and to deliver the high-quality parking lot maintenance as a top manufacturer.

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