

Site Worker Support Solutions using Smart Device

Hiroshi Sawamura

The recent spread of smart devices including smartphones and tablets has been remarkable. Aside from the obvious consumer use, cases of companies using the devices for business use are also rising. Eyeing the business usage, majority of use is checking corporate email or accessing business systems on the intranet while away from the office. In site work such as construction and equipment inspection, operation is still predominately carried out using paper and phone.

Therefore, to help work progress in the field, OKI has devised a solution that supports speedup and streamlining of information transfer using smart devices.

That site worker support solution is introduced in this article.

Current Site Work Situation and Issues

The current procedure in the field and issues are described below using the railway switching construction work as an example.

(1) Work Phase

Person in charge of the work group prepares, in advance, a checklist of the work to be performed and confirms the contents with the manager of the work management department.

On the day of the work, the work group prints the checklist and brings it to the construction site. Work is performed according to the checklist. When necessary, procedure manuals and other reference documents brought to the site are referenced. At strategic points in the work, before/after photos are taken as work evidence, and result of the work is written in the checklist. Additionally, at the start/end of work and at vital points that have been pre-determined, the work group calls the manager by phone to make a progress report.

When the manager receives a report from the work group out on the field, the progress is recorded in the checklist. This is done for several work groups to manage overall progress, and if work of one group requires collaboration with another, instruction to start work is given in view of the other group's progress. The work

group will begin the next work once they have received instructions from the manager.

The field procedure of the work phase is shown in Figure 1, and issues are outlined below.

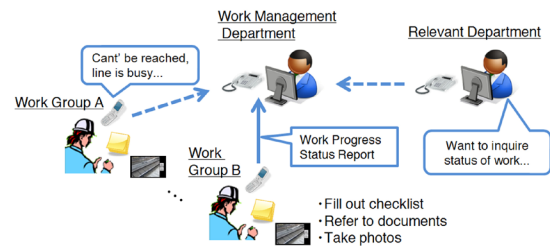


Figure 1 Current Procedure of Site Work (Work Phase)

(a) Progress reporting between work groups and manager is time consuming

In railway switching construction, a management department at a single location may manage progress of work groups mobilized to several work sites. Work groups will timely phone in their progress to the manager, but since there is only a single management department, line may be busy. When this occurs, work must be suspended, and workers must wait until the call gets through.

Furthermore, the amount of time the manager spends on the phone will be (length of call) x (number of work groups) x (number of progress reports). Time available for railway switching construction is limited, especially for overnight work. Therefore, efficiency of progress reporting is an important issue for the effective use of construction time.

(b) Tracking progress and relevance of multiple work groups is difficult

Currently, when work is spread over multiple work groups (for example, switching signals after a line relocation), progress reports filled out by each work group must be compared before instructing the relevant work groups to start the next work. However, understanding the relevance of the work can be difficult requiring time to give out the next set of instructions.

Moreover, because work progress from the field is centrally managed by the management department, other relevant departments must regularly make an inquiry to the management department to keep abreast of progress, which is troublesome. For instance, although the train operation department is not directly related to the switching construction, progress on a line or signal may affect train operations, thus real-time sharing of progress information is important.

(c) Bringing documentations to the work site is a burden

Besides construction materials and tools, workers must face the burden of bringing several documentations to the work site such as checklist, procedure manuals, diagrams and various other reference documents.

(2) Post-work Phase

The worker returns to the office after work to enter the results of the work into the checklist on a PC based on the checklist filled out at the work site and creates a work report using the photos taken at the site.

The procedure of the post-work phase is shown in **Figure 2**, and issues are outlined below

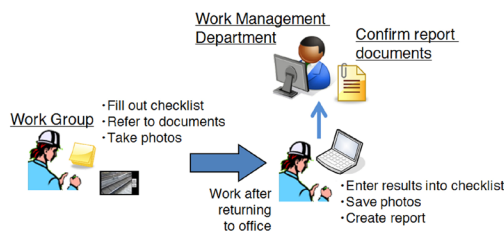


Figure 2 Current Procedure of Site Work (Post-work Phase)

(a) Creating work report is time consuming

Creating a report takes too long since the worker must reenter the contents of the paper checklist filled out at the site into the PC and transfer taken photos to the PC for report attachment.

(b) Rework may occur

Worker may not realize there are missing or wrongly taken photos until it becomes time to create a report. Worker must return to the work site and retake the photos.

Overview of the Site Worker Support Solution

Against this background, the site worker support solution was devised using OKI's smart device middleware "MoBiz" to streamline onsite progress reporting and result reporting. The solution usage is shown in **Figure 3**, and the functions are described in detail below.

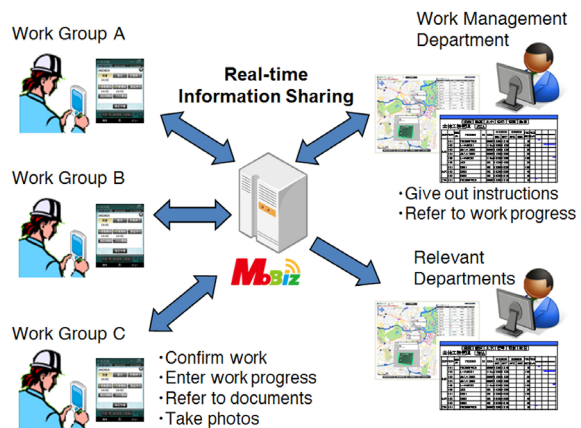


Figure 3 Usage of Site Worker Support Solution

(1) Work Progress Report Function

This function is used by work groups for reporting start/end of work and work progress. Examples of the screen images are shown in **Figure 4**.

Start/end of work is reported by simply entering the date and time. Work progress is reported by selecting the appropriate work from a list, and if necessary, an evidence photo that has been taken can be attached. For the checklist, tapping the appropriate item will enter the current time as the reported time.



Figure 4 Progress Reporting by Worker

(2) Manual Reference Function

This function stores digitized manuals and diagrams on a server, and as shown in **Figure 4**, allows workers

to access documents relevant to the work on their smart devices.

(3) Work Progress Management Function

Using this function, the manager can check the progress of each work group in real-time. Screen images are shown in **Figure 5** and **6**.

Progress of each work group sorted by departments such as rail track and civil engineering can be referenced on a schedule sheet with planned/actual representation. Furthermore, detailed progress of each work group can be confirmed chronologically from work status, evidence photos and work messages.

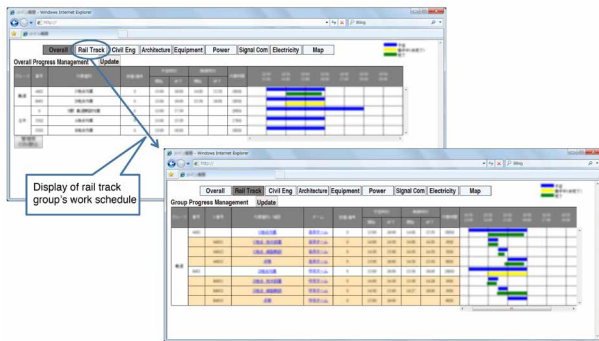


Figure 5 Work Progress Confirmation by the Manager



Figure 6 Confirmation of Progress Details and Auto Report Creation

(4) Work Report Creation Function

As shown in **Figure 6**, this function uses information such as work status and evidence photos submitted by the work groups to automatically create work reports and checklists with actual records.

(5) Location Management Function

The manager can use this function to confirm the locations of work groups. The screen image is shown in

Figure 7.

Location is obtained from the GPS in the smart device held by the work group, and the current location of each group is displayed with an icon on a map. Along with the icons, photos of the work progress can be displayed and photographed sections confirmed.

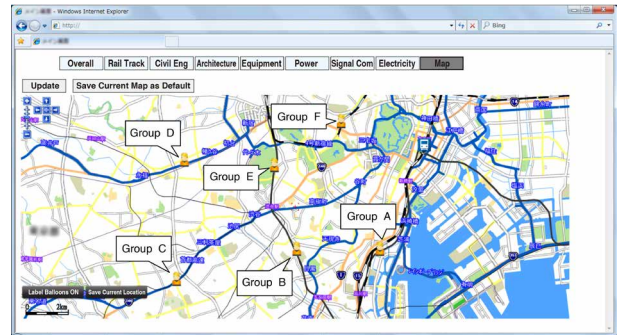


Figure 7 Location Confirmation of Workers by the Manager

Features of the Site Worker Support Solution

The solution system's features are described below.

(1) Simple Progress Report Operation

Normally, in site work such as construction and equipment inspection, predetermined work is carried out at a predetermined time. Focusing on that point, the system has been designed to enable progress reporting to the manager with a simple operation of the worker's smart device.

Specifically, for a selected task, the worker taps the progress item (work start or end) he wants to report, and report is made as is (changeable if necessary). The worker is able to submit a progress report with a simple, two-tap minimum operation.

Conventionally, reporting was time consuming, because work progress needed to be confirmed via telephone regardless of the content of the progress report. If work is progressing as planned, reporting with a simple smart device operation as in this system is sufficient. Only when problems occur, remedies should be discussed over the phone. This leads to work efficiency and reduction in reporting time.

(2) Easy-to-understand Display of Work Progress

The manager can check work progress using the schedule sheet display shown in **Figure 5**. The display enables the manager to see at a glance the planned/actual progress of the entire work and the degree of influence on other groups. This allows the manager to

hand out instructions quickly for the next work even if the work requires coordination of each work group. When a problem occurred, the manager would conventionally confirm the situation with work group by phone as instructions are handed out. With this feature, the problem can be addressed while viewing photos of the situation making it easier to understand the happenings and hand out precise instructions to the work group.

(3) Reduction of Carried Documents

Previously, in addition to the printed checklist, the work group carried several documentations including procedure manuals, diagrams and other reference documents. Manuals were especially large in number, and although they were seldom referenced, they needed to be available in case of an emergency. The system allows necessary documents to be accessed from the smart device lessening the burden of carrying documents out into the field.

(4) Less Burden Creating Reports

Reports, which the workers previously created manually, can be created automatically using the report creation function lessening the burden of doing reports.

Moreover, opposed to the current reports that vary in level and content depending on the worker creating them, the uniform reports created by the system make checking easier for the manager

(5) Prevent Rework

Since the manager can immediately view the progress without waiting for the worker to complete a report, he can point out mistaken or forgotten evidence photos on the spot and reduce the risk of rework.

(6) Efficient Placement of Workers

The system can display locations of work groups on a map with icons. The feature is useful when progress of one of the groups is delayed and workers from a nearby group need to be sent to assist or when an unforeseen event occurs, decide which group shall respond.

(7) Other Features

(a) Offline operation

Typical smart device applications are often Web-based, and their lack of usability outside the communication service area is an issue.

The system is designed to be worry-free for the worker even when the smart device temporarily loses signal outside the service area. Retry process is also

held back as much as possible when outside the service area to minimize battery consumption.

(b) Device independence

The sales cycle of recent smart devices is quick and with increasing use of personally owned devices for business, restricting the use to a specific device is difficult.

In the system, business applications are implemented over MoBiz, which is designed to absorb differences in devices. This way, it is not necessary to customize applications for individual devices, thus greatly reduces the load on system operators.

(c) Security considerations

Although the system is designed not to save business data in the smart device, unsent data may temporarily be maintained in the smart device. Therefore, unsent data are encrypted and saved. Networking between the smart device and server uses VPN and designed with security in mind.

Online checklist and manual referencing function reduces documents carried out into the field and helps avoid the risk of being lost.

Future Developments

This article introduced the site worker support solution, which solves the current issues faced by site workers. The solution mainly targets preplanned work conducted primarily by site workers. The solution includes a wealth of features with emphasis on efficient reporting of work progress and results especially when multiple work groups are mobilized over a wide area.

Currently, the solution is being deployed for railway switching construction. In the future, OKI plans to expand and widely deploy the solution to the construction and inspection work in such fields as roads, communications, electricity, gas and water. ◆◆

Authors

Hiroshi Sawamura, Enterprise Systems Department-1, Information Systems Division, IT Solution & Services Business Division