User-operated ticketing terminals are a major hurdle for passengers unfamiliar with how to use them. We thus started development of a new type of user-operated ticketing terminal in which station personnel on the terminal’s screen gives instructions. In this research, we made a prototype of the terminal and carried out a survey on service acceptability to see whether or not the passengers would be open to using it. As a result, we were able to confirm that it could be an option of future information services at stations as passengers received it favorably. Here we will report the development.

Keywords: User-operated ticketing terminal, Interface, Service acceptability, Network-building

1 Introduction

The first user-operated ticketing terminal made its debut in Japanese railways in 1926. Four German-made single function ticket vending machines (that could issue only one type of ticket) were introduced to Tokyo Station and two to Ueno Station. However, they were only introduced on a trial basis due to cost performance issues. Practical ticket vending machines would not appear until 1952.

In the 60 years since their appearance, functions available with ticket vending machines have increased, their printing method has changed and they started issuing prepaid cards in the 1980s. Today, the high versatility of ticket vending machines allows a single machine to provide services other than just ticket purchasing. They can also issue commuter passes and IC card tickets and add funds to IC card tickets.

However, we have to face the fact that a few passengers cannot fully utilize those functions as they become increasingly diverse. When station personnel are nearby, they guide those passengers on how to operate according to the situation and the extent that the passenger is familiar with the terminal. Station personnel determine the level of familiarization with the terminal by interacting with the passenger. According to that level, station personnel may operate the terminal on behalf of the passenger or prompt the passenger on to operate it (Fig. 1).

But, when no station personnel are nearby, passengers cannot ask how to operate the terminal. In some cases, passengers may finally give up operating the terminal themselves and lose the motivation to use the terminal thereafter.

We thus developed a user-operated ticketing terminal and support system (hereafter “user-operated system”) that guides passengers as if station personnel were present.

The purpose of that user-operated ticketing terminal is to have passengers understand how to operate it and encourage them to operate it themselves by having passengers talk with a guide remotely on the display screen. Furthermore, when necessary, the system can provide passengers with personalized service such as the guide remotely operating the terminal for the passenger (Fig. 2).

2 Comparison to Existing Technologies

Examples of remote services for customers already in use can be seen at banks in Japan. With those, some of the services at the counter of the bank can be provided in the system where two persons (a customer and an operator) remotely communicate via videophone and share data input by the operator.

However, the basic purpose of the user-operated system we developed is to have passengers operate the terminal while station personnel only assist remotely. Our user-operated system differs significantly from existing systems of banks in terms whether operations are done mainly by the passenger (customer) or the guide (operator).
With this research, the first step in developing a user-operated system that guides passengers remotely by a monitor screen and prompts them to operate themselves was a survey on acceptability of such a service. In other words, the main purpose of this research was to see whether service by such a system would be accepted by passengers when provided at stations and whether passengers would want to try using it.

3 Production of a Prototype

We wanted to survey acceptability of such never-before-seen services. So we had to produce a simple prototype that would allow such a survey to be conducted.

3.1 Overview of Services Provided by Prototype

For the services provided by the prototype system, we chose those currently provided at stations for which passengers often ask about and which assistance by station personnel is needed.

Upon interviewing station personnel, we found that passengers typically ask station personnel for directions in stations. Thus, we decided to provide three services with this system: in-station directions, instructions on purchasing commuter passes and instructions on adding fare balance to IC card tickets. Of those, purchasing commuter passes requires complicated terminal operations and adding fare balance to IC card ticket involves relatively simple terminal operations.

At present, when passengers operate terminals without asking for assistance, station personnel simply watch over passengers without speaking to them. Similarly, we built a system that allows passengers to operate terminals alone when they do not need assistance by remote guide. When assistance is needed, passengers can call up the guide.

3.2 Specifications of the Prototype

Display: 42 inches
Size: 180 cm (from floor to top of display)
Maximum power consumption: 880 W

3.3 System Configuration (Fig. 3)

The developed system consists of the passenger interface part to be installed at the station for use by passengers and the assistance part to be installed at a remote location for the assistance by the guide. The passenger interface part is equipped with a camera and a microphone to allow the guide to talk directly with the passenger while watching over the on-site situation. The guide is shown on the display of the passenger interface part to allow the passenger to talk with the guide face-to-face.

3.4 Method of Providing Services

Services are provided to passengers as follows.

(1) Desired service (purchasing a commuter pass, etc.) selected by passenger pressing the appropriate button on the initial screen. Procedures can continue without assistance if terminal operation is known.

(2) Passenger presses “talk to guide” button if button for desired service is not known.

(3) Remote guide is called up.

(4) Passenger operates terminal according to instructions by guide.

(5) Connection can be terminated at any time by informing the guide when assistance is no longer needed.

(6) Passenger can call up guide for any time for assistance while operating by pressing “talk to guide” button.

3.5 Screen Composition

3.5.1 Initial Screen (Fig. 4)

The initial screen must be set up in a way that passengers can recognize the services provided by the terminal at a glance. Thus, we made the initial screen show two items: an image of station personnel (prerecorded) to show that the terminal is interactive and a menu button to go to the services.

Guidance display and guide check monitor show the same image. Thus, operations by the passenger on the guidance display are reflected on the guide check monitor, operations by the guide on the guide check monitor are reflected on the guidance display.

A view of the passenger is shown on the passenger check monitor, allowing the guide to give directions while observing the passenger.

Fig. 3 System Configuration
The guide also can write text and arrows on the screen with a pen mouse. That will make the passenger feel as if the guide were assisting close by.

3.5.2 Transition Screen Between Initial Screen and Guide Screen

A transition screen is shown between fading out from the initial screen and switching to the live image of the remote guide.

3.5.3 Guide Screen

Here a live image of the guide is shown. Gestures by the guide magnify the button to be pressed by the passenger to show the passenger how to operate the terminal.

A live image of the guide is shown on the display of the passenger interface part at this time so the guide can show the passenger instructional materials at hand. For example, the guide can use this function to tell the passenger to “buy this ticket” or “get this brochure” by showing the actual material for easier understanding.

3.5.4 Screen for Providing Service (Fig. 6)

This screen shows the individual services the passenger may want to use (purchasing a commuter pass, etc.).

The guide can also see the passenger on his or her own display, allowing the guide to see it seems that the passenger will have difficulty doing them alone (when the passenger has much luggage, etc.). That way, the guide can decide if it would be best to inform the passenger that he or she will make operations for the passenger.

We produced the above-mentioned prototype and gave a demonstration of the user-operated system with that prototype at a presentation of the Research and Development Center of JR East Group in July 2010 (Fig. 7). At the demonstration, a questionnaire survey was conducted to check the acceptability of the service provided using this system.

We received much feedback through the comments of visitors to the demonstration and replies to the questionnaire at the presentation. That included opinions that the terminal was very interesting based on an unprecedented idea and that it provided a sense of security as an actual human provides directions.

To the question “do you want assistance by a guide using this terminal?”, 85% of the respondents replied that they would. Based on those results, we believe that the concept was fairly well accepted.

On the other hand, only 32% of the respondents replied that they understood at a glance that the terminal gives assistance by a guide. In fact, one demonstration visitor spoke to the pre-recorded image on the initial screen, and another asked the demonstrator what to do upon seeing the terminal. That shows there is room for refinement of the initial screen design.

In the free comment space of the questionnaire sheet, many comments and requests were entered. Some typical comments are as follows.

Comments on terminal specs:
- Changes must be made to the screen to take into consideration the fact that personal information must be input to purchase a commuter pass. However, this screen size makes reading a displayed map easy.
(3) System Utilization Plan (Fig. 8)
The prototype was used between a passenger and a guide. But more detailed investigation will be needed on real-world situations such as how to allow use between several passengers and a guide or between several passengers and several guides.

Comments on possibilities for the user-operated ticketing terminal:
- With the coming aging of society, it can be used as a terminal for elderly passengers who feel a psychological barrier to operating user-operated ticketing terminal.
- It can be used as a terminal for foreign users too if guides who can speak foreign languages are available.

5 Future Issues

5.1 Initial Screen
The initial screen was a major topic of debate in developing the prototype.

When discussing whether to show still or video images on the screen, we decided to use video because we expected that it would highlight the fact that a person gives guidance and motivate people to operate the terminal. We thus adopted a pre-recorded video of a guide. However, many people spoke to the initial screen as it seemed like a real person was waiting.

For the image on the initial screen, we had options such as showing station personnel in uniform, using an animated character and featuring an actor. An animated character could cause people to think that it is a game terminal. With an actor, some may mistake it for an advertisement instead of a user-operated terminal. We therefore decided to show station personnel in uniform, assuming a situation where a passenger speaks to station personnel at an information desk.

In light of this background and other considerations, the design of the initial screen will be a major issue in future development. Design considerations will include the content of text to be shown on the screen.

5.2 Other Issues
Other issues found in the production of the prototype and from the questionnaire are as follows.
(1) Selection of the Display
We have to consider ease of viewing and privacy protection in selecting the size of the display monitor.
(2) Method of Conversation
- Measures need to be taken to prevent the content of the conversation from being heard by others in the vicinity.
- We have to find a way to present that the terminal allows conversation with a guide and method to promote that on-screen.

(4) Information Transmission Method
We need to study areas such as technology for interactive communications with more realistic video and audio.
(5) Network-building Technology
We need to study network-building technology for connecting multiple user terminals in standby mode to operator terminals.
(6) Review of Service Menu
The menu of services provided by terminals needs to be reviewed.
(7) Others
- We need to investigate a method to allow natural eye contact between a passenger and a guide.
- The background of the guide on the screen needs to be modified.

6 Conclusion
Production of the prototype and the questionnaire survey results have shown that on-screen remote guidance service can be an option for future information services at stations. But we did not make detailed examination on running the service, product specifications and target costs as our focus of research was on system acceptability. Many issues need to be overcome for actual introduction, such as total system introduction cost and how to run the service.

Stations of the future will face unavoidable situations such as a fewer station personnel and passengers becoming older and more multinational. Thus, we believe we will need to expand the possibilities for such user-operated systems.

Reference: