

FIS (Flight Information System) Design at Haneda International Airport

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Abstract

Information displayed on the flight information system (FIS) is very important for airport users for acquiring flight information or details of the available airport facilities. In order to construct FIS at the International Flight Passenger Terminal of Tokyo International Airport (Haneda Airport), we employed the UCD (user-centered design) concept in order to achieve a human-friendly “Universal Design.”

Keywords

design, universal design, accessibility, user-centered design, user evaluation, prototype, observation

1. Introduction

A new international flight terminal for passengers using the Haneda Airport opened on 21st October, 2010, and is continuing to impress users. Based on research undertaken in 2009, approximately 62 million passengers per annum (total of domestic and international flights users) pass through Haneda Airport. Size-wise it is one of the top-ranked airports of the world. Scheduled international flights were resumed in 2009 from Haneda Airport after being absent 32 years since the time that the New Tokyo Airport (Narita International Airport) opened in 1978 (**Photo 1**).

All kinds of travelers use the airport, including those from various countries, the elderly, disabled and children. Therefore, the question of how much the universal design concept



Photo 1 A view of the International Flights Passenger Terminal taken from the domestic flights passenger terminal.



Photo 2 A view of the FIS installed at the center of the departure hall.

can be employed to help provide better accessibility has become a vital issue.

With the opportunities offered by the design of the FIS (Flight Information System) in the newly opened International Flight Passenger Terminal of Haneda Airport, we employed the UCD (user-centered design) concept to achieve human-friendly “Universal Design” (**Photo 2**).

This paper introduces a case study of the FIS design that was developed employing development processes under the UCD concept.

2. The Three Main Elements of UCD

As shown in **Fig. 1** , in order to promote the UCD concept, three contributory elements are essential; these are process,

FIS (Flight Information System) project employing the UCD concept

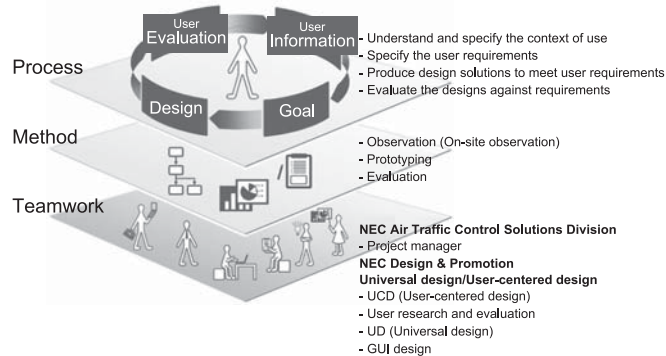


Fig. 1 Three main elements of UCD.

method and teamwork.

In the “process” development stage, we repeat activities such as analyzing customer needs and defining their circumstances, establishing goals, designing projects and evaluation processes. In the “method” development stage, we make the best use of our proven related methods in order to conduct the planned process effectively. In the “teamwork” development stage, we organize project teams using co-opted members and specialists with the aim of achieving the UCD concept.

For this project, two main teams are deployed. One is the Air Traffic Control Solutions Division of NEC that manages the entire FIS project. The other is the Products Design Business Division of NEC Design & Promotion that promotes the UCD process to achieve the universal design concept, develop satisfactory designs and carry out evaluations.

3. Processes Employing UCD Concepts

Details of the processes employing UCD concepts are described in the following sections.

3.1 Understand and Specify the Context of Use

The first step is to identify the target users and then to obtain a thorough understanding of the characteristics that defines them.

Various sorts of information are collected, such as details of the airport facilities of the International Flight Passenger Terminal at Haneda Airport, as-built drawings of the airport and

existing records such as the number of passengers using the airport. On-site observations were undertaken at Haneda Airport, Narita International Airport and Chubu International Airport (Centrair). The flight information boards installed at each airport, the way to treat passengers at check-in counters and the passenger guidance systems were all observed at these airports from the perspectives both of the user and of Universal Design. As for the information about overseas airports, this was collected via Internet research or from local researchers.

3.2 Specify the User Requirements

At the second stage, the goal should be set by defining the needs of users and requirements specifications should be prepared.

Tokyo International Air Terminal Corporation sets its business concept as the “air gateway of Metropolitan Tokyo.” The design and color concepts were planned to characterize an airport equipped with facilities, space and ambience that would be suitable to such a business concept. It was also essential to consider the diversity of passenger characteristics as well as to provide understandable information that could be obtained conveniently.

The three main design concepts are described below.

1) An attractive and delightful design

- A well-appointed design presenting both advanced and traditional impressions that are harmonized tastefully within the airport environment.

- State-of-the-art designs appropriate to a newly opened airport and easy-to-understand designs should be prioritized.

2) Intuitive acquisition of required information by users

- Arrangement of the display of information in a way that is easy to understand and facilitates easy, speedy and accurate acquisition by users.

- Layout/organization of information that responds to the information priorities and retrievability/search requirements of users.

- Design that will respond to the anticipated increase in the number of code sharing flights in the future.

3) Achievement of Universal Design

- In considering accessibility and status issues that satisfy the requirements of an air gateway to Metropolitan Tokyo, the information displays were prepared to display in four languages (Japanese, English, Chinese and Korean).

- Achieving universal design concepts of colors suitable for color blind persons and to enable them to understand the

FIS (Flight Information System) Design at Haneda International Airport

information easily.

- Examining the FIS installation environment to enable enhanced passenger accessibility.
- Employing fonts that provide better visibility and readability.
- Employing larger font sizes and setting better color contrasts for information texts and board background colors for the elderly and persons with vision deficiencies.

A blend of progress and tradition suitable for an “air gateway of Metropolitan Tokyo” was the concept behind the color design, and grey was employed as the basic tone color. Grey gives a stylish urban-like impression and at the same time, grey has been treated as a traditional Japanese color, *nezumi-iro* (mouse color) that has been widely used throughout our history. We aimed at a high-class design employing grey as the basic tone color as a means of giving a stylish impression that is also traditional (Fig. 2).

3.3 Produce Design Solutions to Meet User Requirements

At the third stage, user requirements should be solved via design work. Low fidelity prototypes are created based on the design objectives and color concepts aimed at examining the visibility and readability of the texts. By repeated examinations of the issues, they will be eventually solved by a process of elimination.

(1) Design examination using paper prototypes

Paper prototypes should be created at an early stage of the project. Such prototypes are easy to create and it is also easy to bring them to a meeting. Prototypes are used to check the visibility of the displayed texts of the same size as the original texts. After this examination, a prototyped display board

of the same size as the display board to be installed in the airport is prepared in order to display the prototyped image data, the visibility and design quality of the texts and images are then evaluated. By repeating such examinations, the quality of the design is improved and any remaining issues are progressively resolved (Photo 3).

When considering how to display information to enable passengers to intuitively and easily understand them, we decided to display time related information in the first of the lines because it has priority over other information.

In order to identify each flight name, we have provided different background colors for each flight. This treatment has been applied in order to support a future increase in flight code sharing. In case the code sharing of flights increases in



Photo 3 Visibility evaluations conducted on a prototyped display board of the same size as the actual display board.

COLOR CONCEPT

Gray

We aimed at a high-class design employing grey, that is Japanese traditional color (mouse color), as the basic tone color as a means of giving a stylish impression.

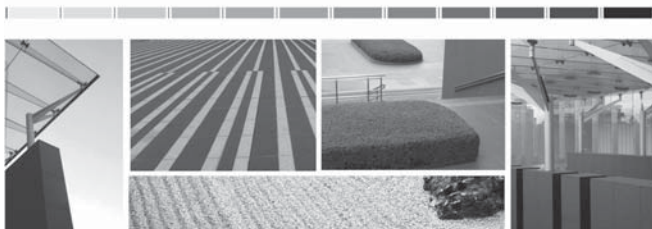


Fig. 2 Image boards color concept.



Photo 4 FIS display board operated at the airport.



Photo 5 Construction site of the airport terminal building.

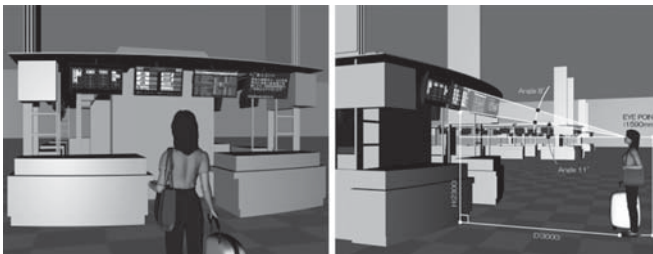


Fig. 3 Design examination using a 3D prototype.

the future, the line height of the relevant flight information can be widened and set against a single background color (**Photo 4**).

(2) Checking the installation situation using 3D prototypes

The FIS design evaluation process was carried out during the construction stage of the airport terminal building, as shown in **Photo 5** . Low fidelity 3D prototypes were created based on design sketches in order to check the installation conditions of flight information boards and the positional relationships between the boards and the passengers (**Fig. 3**).

3.4 Evaluate the Designs against Requirements

At the fourth stage, the following evaluations were conducted to acquire feedback opinions from users regarding: “font visibility,” “FIS display visibility,” “color universal design capability” and “conformance capability with various types of users.”

(1) Font visibility evaluation

Three types of font samples were prepared: UD fonts (fonts conforming to the universal design concept), fonts to be used for sign boards and fonts to be built in personal computers. These fonts were displayed on a 40-inch LCD screen, which was the same size as proposed for the airport installation and their visibilities were checked from the assumed viewing distance in the airport at a distance of 3 m. Two types of fonts



Photo 6 Font evaluation.

were displayed at a time in order to enable evaluation by using the “pair comparison method”. Finally, the UD font acquired the highest point score, so we decided to employ this font (**Photo 6**).

(2) FIS display visibility evaluation

Three sample display images of different designs were prepared in order to check the information search capability under the same conditions as with the evaluation (1): font visibility evaluation, “understandability,” “appearance” and “display impression” were scored to evaluate the total visibility performance.

The evaluation results showed that a grey background distinguished the displayed information more clearly than did a blue background. It also showed that a grey background gave a superior and straightforward impression. By reviewing these results, we decided to employ grey as the basic tone color, which matched our original concept.

(3) Color universal design evaluation

Visibility and readability evaluations have been conducted for the entire sample of display images that were prepared for the design work in this project. Color vision simulation goggles, simulation monitors and the appropriate software were used in these evaluations.

(4) Evaluation of conformance capability to various types of user

The evaluation results conducted by the NEC Group were again evaluated by the Universal Design Evaluation Committee of the Tokyo International Air Terminal Corporation. The evaluation carried out by the committee was

FIS (Flight Information System) Design at Haneda International Airport

conducted together with on-site evaluations. We have improved our design work by reviewing the results of these evaluations.

4. Conclusion

Haneda Airport was founded on the concept of providing users with a friendly airport terminal that can be safely used by a wide diversity of passengers and visitors. In cooperation with the Tokyo International Air Terminal Corporation, the NEC Group has applied the concept of universal design and contributed to the successful realization of an airport that profoundly impresses all visitors with its user-friendly design and facilities.

Drawing on our Haneda project experience, the NEC Group will promote the development of UCD-inspired FIS at the Chitose and other airports.

In the future, we shall continue to provide our customers with airport solutions that employ universal design concepts, always aiming to achieve ever friendlier, more attractive and easier-to-understand designs that allow people to spend their time at airports in safety and comfort.

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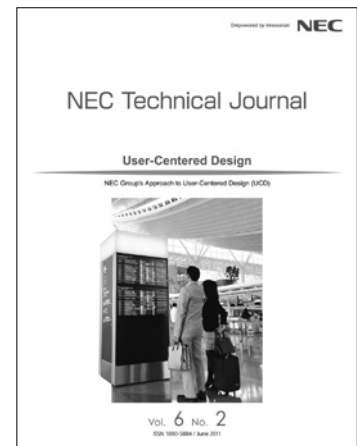
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Approach to UD Font (Universal Design Font) Development
User-Centered Design Activities of NEC Infrontia

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Vol.6 No.2

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Special Issue TOP