

## **Building a System Model that Offers Mobility Assistance Information to Support Users of Public Transportation**

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### **Abstract**

We provide barrier-free maps of subway stations around the country on the web to meet the pressing needs for barrier-free information of public transportation and also try to make them available from mobile devices and on printed pamphlets. We improve the maps and booklets from the Universal Design perspective based on the user evaluation and promote the availability of barrier-free information in cooperation with other companies.

### **Objectives of the Activities**

Although barrier-free access to public spaces has been promoted in terms of facility maintenance, the guidance information maintenance for use of these facilities has lagged behind, which is an urgent problem. Guidance information maintenance should not be narrowly interpreted as support for persons with restricted mobility, such as disabled persons, but should be viewed as information maintenance that leads to the mobility assistance of all users. With a focus on the coming super-aging society, it is expected that we realize a system that allows seamless guidance between transportation systems.

Our project develops a guidance-information-providing-model based on universal design and provides a guidance information environment that is truly user-friendly through its introduction promotion and operation verification. Through these activities, we hope to assist independent mobility of all people, including disabled persons, and present a significant model for future guidance information maintenance.

We take the structure of current problems as below and consider design-oriented solutions and make concrete efforts to resolve these problems.

### **1. Problem of Mobility Assistance Guidance between Operators**

To make guidance information easy to understand and use, it is necessary to ensure that designs have certain commonalities in expressions and content even when cities and operators are different. Although the existing design systems seemingly have many commonalities such as color coding in systematic signs for exiting or boarding trains, guidance in using exit numbers, and unified use of pictograms, many people get lost in reality. Many such cases occur when people move to different facility spaces including transfers in transportation systems. This is mainly due to the fact that guidance information provided as people move along is not consistent before and after spaces managed by different operators. There are two possible measures other than unification of design/display systems.

- 1) Individual guidance systems of operators that are adjacent in the movement route should be given consistency and commonality in the contents and expression of information.
- 2) In large spaces such as terminals, where many operators are involved, guidance systems of individual operators should include a system with guidance functions that supplement guidance of each other's facilities.

### **2. Guidance Problem Related to Maintenance for Smoother Mobility**

Many of the guidance displays in stations are systematically designed on the basis on the criteria of people without disabilities, and barrier-free design is not necessarily assumed.

The guidance information maintenance involved in barrier-free facility maintenance focuses on the installation of guidance signs to barrier-free facilities. This is supplemental maintenance of guidance. As accessible routes vary depending on mobility restrictions, already-installed guidance signs are often not useful in reality for persons with restricted mobility, such as in a case in which route guidance includes a bump on the way.

- 3) A sign design system that does not have inconsistency in indicating route guidance for users with different mobility conditions is expected as a solution.

On the other hand, due to insufficient barrier-free facility maintenance or lack of guidance information in stations, the fact is that it is essential for disabled persons, helpers, etc. to gain barrier-free information in advance when going out. If the outing requires frequent changes of public transportation, they need to check information such as websites of individual operators for barrier-free information.

- 4) It is necessary to create an environment for providing guidance information through various media

### 3. Problem in Efforts to Improve the Current Situation

As a barrier-free guideline based on laws does not clearly define the framework for providing guidance information expected from the viewpoint of users, the status of support and maintenance of providing guidance information varies even in the maintenance priority areas for smoother mobility in cities of the country.

- 5) In areas such as the maintenance priority areas, where guidance information is important, there should be a certain scheme in which the maintenance of the guidance information environment is addressed through a committee in which the government, operators, and users participate.

#### Effort 1: Questionnaire Survey on "Outing and Transportation Guidance"

We conducted a questionnaire survey consisting of 20 questions in Osaka Prefecture in 2006. The questions included opportunities to go out and the barriers faced while going out, experiences of getting lost, user-friendliness of railways, and guidance in stations. Among responses received from 2,059 questionnaires, around 60 percent of the users highly evaluated the "hardware" maintenance of railway stations, such as the installation of elevators. However, guidance in stations received poor evaluation. The survey showed that disabled persons get lost very frequently in stations compared with persons without disability, and 70 percent of accompanying helpers had experienced getting lost. Also, there were complaints that necessary information could not be obtained before going out. In addition, to see whether guidance displays in stations serve the intended functions, we compared and analyzed the ways people with different physical attributes and mobility levels get lost. The survey results revealed that many of the cases in which people get lost occur when they try to find a barrier-free facility and the route to it or when they change platforms or lines. People want to know whether restrooms or exits are accessible or whether they can move around in a station, as concerns when going out. Improvement issues of barrier-free guidance in stations can be summarized in the following three items.

##### <Barrier-free guidance in stations

###### Improvement issues for functions>

- 1) Simple and easy-to-understand guidance for a route that allows smooth mobility is necessary.
- 2) Clear indication of the facilities and functions of station entrances/exits and restrooms are necessary so that users can decide whether facilities are accessible for them or not.
- 3) The exit guidance display using exit numbers also assumes the use of the stairs and often includes barriers on routes. Thus, the guidance displays indicating smooth routes are necessary.

Survey report <http://www.annai.or.jp/project/enquete.pdf>

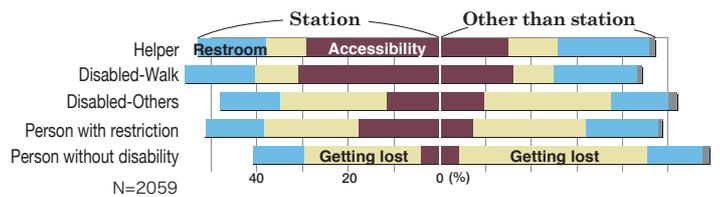


Figure 1: Concerns While Going to New Places (multiple answers)

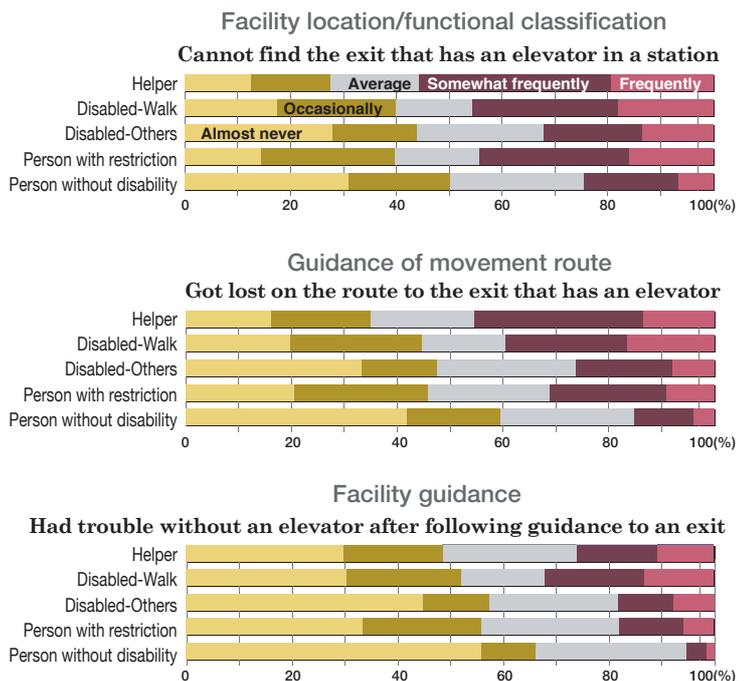


Figure 2: How People Get Lost While Using an Elevator (with guidance provided in the railway station they use)

## Effort 2: Key Content for Development of Guidance for Smoother Mobility

The core of addressing improvement issues for guidance functions 1) and 2) is to provide maintenance of the station guidance map and facility information for smoother mobility. To make it easier for users to understand information, simple content and familiar expressions should be used, even when areas, facilities, and media differ. Especially in the guidance map design, expandability that allows various facility spaces to be indicated with consistency and reproducibility when design is applied to various media are required, which are development requirements.

### Guidance Map for Smoother Mobility "Rakuraku Map"

Figure 3 is a map that has only carefully selected information in the guidance map and focuses on the guidance of routes for smoother mobility and facilities. This map was developed for the intended use by people from disabled persons to people without disability. Crossing transfer stations are described in one map, and route spaces where people use elevators and escalators are simply and clearly indicated so that people can easily find barrier-free entrances/exits and restrooms.

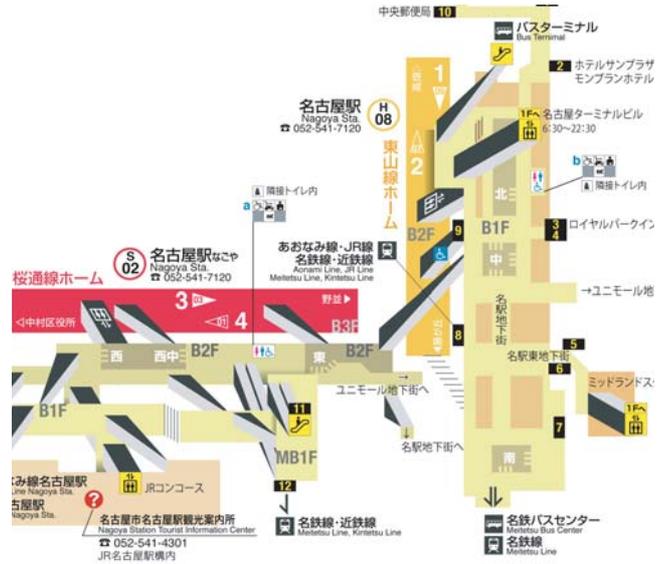


Figure 3: Guidance Map for Smoother Mobility "Rakuraku Map"(Example)

Design specifications [http://www.annai.or.jp/project/map\\_design.pdf](http://www.annai.or.jp/project/map_design.pdf)

## Effort 3: Improving Key Content Design

In the cases of Effort 4 and the next, we expand our services to various media and conduct user evaluation and improvement activities. Figure 4 shows the result of questionnaire about a booklet issued in 2009. We continuously make improvements by including elements such as pictograms as well as in information and layout. In addition, a research dealing with color vision deficiency in 2008\* produced a design that also serves as a map for persons with normal color vision even for multi-color route map design without additional visual information, specifically intended for persons with color vision deficiency, such as color names or patterns, after thoroughly considering the colors used.

\* [http://www.annai.or.jp/project/kogai\\_ud.pdf](http://www.annai.or.jp/project/kogai_ud.pdf).

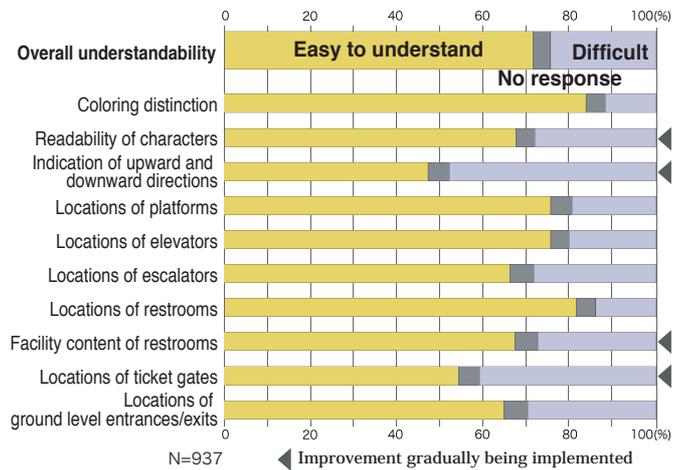


Figure 4: User Evaluation of the Osaka Version Barrier-Free Booklet [http://www.annai.or.jp/project/book1\\_questionnaire.pdf](http://www.annai.or.jp/project/book1_questionnaire.pdf)

## Effort 4: Providing and Promoting Barrier-Free Information

While asking subway operators in individual cities for cooperation in order to obtain information, we develop key barrier-free contents based on the onsite survey and provide them as the "ekipedia" system. In the following cases, we expand our services to various media and conduct user evaluation and improvement activities.

Also, as information about transportation and destination needed while going out should be provided in an interactive and collaborative manner. From the practical point of view, we promote activities to encourage hosts of events and the like to actively provide and reveal barrier-free information about venues and accesses.

### 1) Providing Information through the Internet

We maintained the subway station barrier-free information of Osaka in 2006 and publicized the information as "ekipedia" on the web. Currently, a "Rakuraku Map" and a route map in



Figure 5: Station Barrier-Free Information "ekipedia" Web Site

the unified design format and facility information are posted and updated for all of the 721 subway stations in the country. After several times of site renewal, total revision of maps, and improvement in supporting color vision deficiency, the current site is linked to many sites including those of the government, transportation operators, organizations for disabled persons, and private companies and is utilized. In addition, to provide information in a collaborative manner, we recommend that hosts of events including sports events such as the national athletic meet in Niigata and Asian Youth Para Games or Food Expo, extensively provide guidance information such as transportation access and barrier-free information of venues and facilities on the web or through other media.

(Figure 5)

### 2) Providing Information on Printed Media

We receive many requests especially from elderly people asking for information provided on printed media that are easily portable. Therefore, we ask cooperation from companies and make booklets containing major stations by cities so that they can be distributed at information centers, etc. In addition, we produce subway barrier-free booklets for individual cities in collaboration with local NPOs, using subsidy support to distribute to user-led organizations and special needs schools, and we are working on making a system for continuous release.

(Figure 6)

### 3) Providing Information on Mobile Terminals

We have developed and are selling an iPhone version of a subway application for nine cities as a mobile application that allows users to view information even in a moving train.

To provide information on going out in a collaborative manner, we are also working on interactive collaboration with various applications such as time table, town walk, gourmet, and art. (Figure 7)

## Effort 5: Building a Guidance Collaboration Model in a Terminal

We accepted a project for creating barrier-free maps around the Sendai Station area from Tohoku District Transport Bureau last year and conducted the project. Current problems were horizontally shared by operators after setting up a committee in which the government, transportation operators, and organizations for disabled persons participated. At the same time, we aimed to create maps that supplement the current guidance signs and allow users to easily understand barrier-free routes. Figure 8 shows stations connected to JR Sendai Station with pedestrian decks and underground passages in one map as a terminal map and is created on the basis of the design format of "Rakuraku map." In the process of creating maps, we conducted experiments around the Sendai Station area to compare and verify cases when a map was carried and when it was not carried. The result indicated that use of a map gives a comprehensive understanding of the area around the station and allows users to find a continuous line of movements to reach their destination. After a fine-tuning based on the experiment result, maps were printed and distributed as barrier-free access maps for the airport, railway, and bus.



Figure 6: "ekipedia" Subway Barrier-Free Map Osaka (B6 booklet)  
[http://www.ekipedia.jp/services/osaka\\_001-022w.pdf](http://www.ekipedia.jp/services/osaka_001-022w.pdf)



Figure 7: "ekipedia" Subway Map iPhone Application  
[http://www.ekipedia.jp/services/iphone\\_app.html](http://www.ekipedia.jp/services/iphone_app.html)



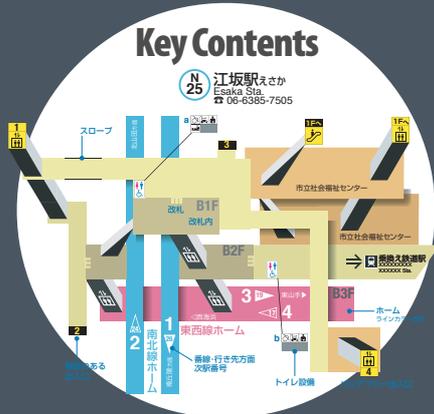
Figure 8: Example of a Created Barrier-Free Terminal Map  
[http://www.tb.mlit.go.jp/tohoku/kk/1004tht/kk-sub005\\_01.htm](http://www.tb.mlit.go.jp/tohoku/kk/1004tht/kk-sub005_01.htm)

**公共交通利用における移動支援情報の提供システムモデル構築**  
Building a System Model that Offers Mobility Assistance Information  
to Support Users of Public Transportation

案内における課題への対処 Solutions to the problems in giving guidance

**移動円滑化を図る案内の標準化**

Standardization of guidance for smoother mobility



1. 乗換え駅も、一つのマップで表現
  2. エレベータ、エスカレータ利用の経路を簡明に
  3. バリアフリーな施設を見つけやすく
1. Transfer stations displayed to one map
  2. Clear and simplified routes to elevators and escalators
  3. Easy-to-find, barrier-free facilities

**都市や交通機関が異なっても  
提供される案内情報に統一性を持たせる**

Provide consistent guidance information  
even when cities and transportation systems are different

国内の地下鉄 全駅に適用済み  
Applied to all subway stations in the country

施設表現への  
汎用性  
Versatility of  
indicating facilities



メディア展開  
適合性  
Media deployment  
compatibility

**Sign  
Web  
Print  
Mobile**

情報提供 Provide information      案内の連携 Collaborate guidance



外出の利便性を向上させる  
Improve the convenience of commuting or traveling

デザインの力を障がい者や高齢者、子育て支援の力に Use the potential of design to support the disabled, elderly, and child care

One Source for Multimedia **えきペディア**

Provide barrier-free information **ekipedia**

**展開例  
インターネット**



**展開例  
印刷物**



**展開例  
携帯端末**



外出に必要な情報を、何時でも、何処でも、誰にでも Information necessary for going out made available to anyone anytime, anywhere

