Easy-to-Use, Smartphone-Oriented Internet Banking, featuring Color Universal Design

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Abstract

The internet banking service developed for use with smartphones by NEC is designed to promote ease of use when matching the properties of smartphones. This strategy is in order for smartphones to be of use to more types of people. For example, by taking color-blind people into consideration, the service has become the first smartphone-oriented service in Japan to acquire the Color Universal Design certification. By following the design process of the service that has been actually implemented, this paper introduces actual cases that apply the three design concepts - Color Universal Design, accessibility and user experience.

Keywords

Color Universal Design, smartphone, accessibility, user experience

1. Introduction

Banking facilities are now an important part of our social infrastructures and they have a highly public nature because of their commercial features. One of the key sales channels is Internet banking, which is required to offer a public service of high universality. In other words, it is now important that this service has to be available anywhere, by anyone and at any time.

Following the recent dissemination of smartphones among a wide range of people regardless of age and sex, the need to benefit from the Internet banking service via smartphones is increasing. Since smartphones have different screen sizes to those of PCs, designs that follow the screen sizes and control procedures employed for PCs may cause operational difficulties for some smartphone users when trying to use the service. From the viewpoint of the pursuit of usability, it is important to provide services that offer smartphone-dedicated designs.

In this paper, we describe the design process of the smartphone-oriented Internet banking service that aims for higher ease of use. We also deal with examples of its actual implementation.

2. The Design Process and Actual Examples of Its Implementation

We decided to take the following four steps in examining the design process.
(1) Determination of target users
(2) Clarification of goals
(3) Solution by design
(4) Evaluation by users

2.1 Determination of Target Users

It is first of all necessary to determine who are the target users and to understand them. They are generally people who use Internet banking services in their everyday lives. The IT literacy of aged persons has advanced recently and now many of them have started to use Internet banking services. Following the recent dissemination of smartphones among a wide range of people from the young to senior generations, the target users now include any Internet users regardless of age, sex or level of ability. Additionally, with regard to the present project, we are also considering people with color weakness issues who have not been cared for so fittingly in the past.

It is said that there are about 200 million people with a color weakness, and that their number in Japan is about 3.2 million or more, or about 1/20th of all males and about 1/500th of all females. In addition, the perception of colors varies as the eyesight deteriorates due to eye disorders following disease or the ageing process (glaucoma, cataract). Japan is said to have more than about 720 thousand glaucoma patients and more than about 960 thousand cataract patients. However, it seems that not much care or consideration are made for individual differences related to the perception of colors or how colors are sensed, depending on the person.

2.2 Clarification of Goals

The next step is to clarify the goals. We have established the following design concepts based on the present project strategy, which proposes "universal services that are easy to use for more people".

2.2.1 Design Concepts

1) **Color Universal Design:**
   A design that is easy to understand for all, including people with a color weakness:
   Specifically, one of the goals we set was to acquire the Color Universal Design Certification by the NPO Color Universal Design Organization (**Fig. 1**). The Color Universal Design is a campaign that aims to implement designs that are easy to understand for people with a color weakness, as well as those with a normal color sense.

2) **Accessibility:**
   A design that is easy to use even by the aged or handicapped persons:
   Specifically, we set another goal, which is to comply with classes A and AA of JIS X 8341-3: 2010. This is the JIS standard on the accessibility of web contents. Although this JIS standard also contains color prescriptions, in the present project we prioritized compliance with the Color Universal Design Certification.

3) **User experience:**
   Providing users with better experiences via easy-to-use and attractive designs:
   The target users are unspecified, individual users, who vary greatly in their literacy standards and usage frequencies for IT services and products. Our strategy is to achieve an intuitive operation so that users are enabled to use services without a need for explanations.

2.2.2 Basic color

Besides the design concepts, we also established the "basic color," which was set to "gray" in consideration of the fact that

Fig. 1 Color Universal Design Certification Mark.

the banking service has a high public profile. This color also blends easily with the corporate colors and logos of the various banking institutions. Gray has a highly coordinative ability with other colors and its restrained tone delivers a pleasant impression.

2.3 Solution by Design

2.3.1 Color Universal Design

Smartphones are used in various scenarios including both indoor and outdoor uses. Even when used indoors, the screen display condition differs depending on where a user is positioned; e.g., by a window where there is sunlight or far from a window where the sunlight does not reach. In order to improve the screen display condition in such environments, the Color Universal Design does not simply select easily identifiable colors but also adopts various helpful measures as described below.

1) **Categorizing colors**
   We categorized colors into two groups according to the applications and purposes of use.
   The first group consists of colors to which functional meanings are given. We here refer to these colors the "functional colors." An example of a functional color is red for arousing caution. This particular "red" is not the ordinary one, but is actually a vermillion that is easier to recognize by people with a color weakness.
   The second group includes colors used rather for decorative purpose than for specific functional meanings. We call these colors the "decorative colors." The decorative colors may be any color but the positions where they can be used are specific. Examples include colors used as the corporate colors of banking institutions and those used in their logos.

2) **Gradation design**
   If only the ease of identification by people with a color weakness is taken in consideration, the solution would be to use clear cut designs by limiting colors only to black and white. In such a case, however, the design

might be considered boring and have a low appeal potential to people with a normal sense of colors. The Color Universal Design should consider both people with a color weakness and those with a normal sense of color. As a result, to ensure a pleasing design while maintaining ease of identification, we decided to apply gradation design using the gray basic color (**Fig. 2**).

3) Demarcation

In case two colors are adjacent and the contrast between them is weak, their boundaries may become difficult to identify. We therefore decided to examine the need for demarcation in positions where two colors are adjacent and to delineate them as required (**Fig. 3**).

4) Additional design and character information

If a color is hard to identify, the information can be made easier to identify by combining a graphic design and/or character information. An example of typical countermeasures is the design using red and green colors for pedestrian lights. We therefore decided to add icons and/or character information to facilitate the understanding of design criteria (**Fig. 4**).
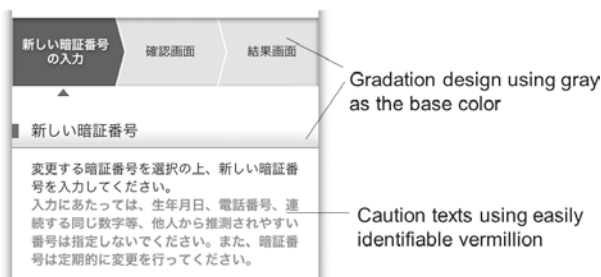

Fig. 2 Color Universal Design Case 1.

Fig. 3 Color Universal Design Case 2.

Fig.4 Color Universal Design Case 3.

2.3.2 Accessibility

We decided to comply with classes A and AA of JIS X 8341-3: 2010, which is the JIS standard on the accessibility of web content. This decision was based mainly in consideration of voice reading software and includes the following measures.

- Addition of explanatory information to an image
- Avoidance of use of TABLE tag of HTML for decorative purposes
- Clarification of steps up to the completion of transactions that use several screens
- Displaying a prompting message to activate the JavaScript function in case it is disabled

2.3.3 User Experience

There is no universal solution for improving ease of use, or for designing an interface that will surely attract users to use services or devices. Below, we introduce examples of solutions that were actually adopted in the present project.

1) Design allowing for device operations scenarios

For example, with regard to the control buttons, we increased the button sizes, such as for "go to the next step" in order to improve identification and operability, because these buttons are frequently used. The return buttons are placed both at the top and at the bottom of the screen. By providing a second return button its identification potential is enhanced (**Fig. 5**). Since smartphones basically employ vertical scrolling, we also took special care in the placement order and positioning of scrolled items.

2) Implementations aimed at a quick response

We have tried to adopt icon images as much as possible in order to reduce the number and volume of data transactions. Specifically, in the design implementation

Fig. 5 Design example considering the usage scenario.
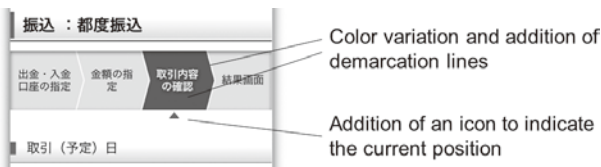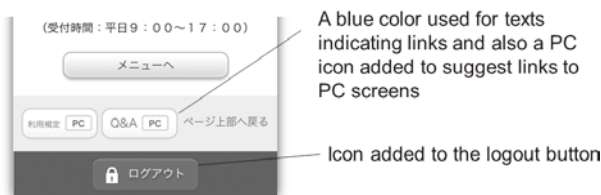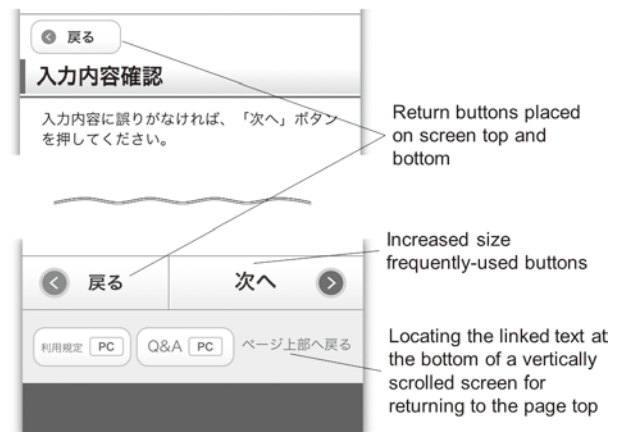
we adopted HTML5 + CSS3, a new web technology, in order to facilitate display of highly expressive designs without using icon images. For the same reason, we also adopted the CSS sprites technique, which is a web implementation system that compiles multiple icon images into a single one in order to reduce the number of data transactions. We thereby succeeded in achieving minimal operational load with a shorter wait time.

2.4 Evaluation by Users

Since each concept has a different evaluation target, we evaluated the result of each concept individually.

The compliance evaluation for the Color Universal Design was carried out by the Color Universal Design Organization. We have applied some improvements to issues pointed-out by this organization, and have thereby obtained the Color Universal Design Certification.

Accessibility was evaluated using NEC's in-house tool called "Accessibility JIS X 8341-3 Adaptability Test" and we were able to confirm that it complies with classes A and AA of JIS X 8341-3:2010.

We have conducted user experience tests by providing sets of evaluation versions to participants (including those not familiar with the smartphone) other than those for the present project. We have asked them to use these sets freely and to honestly report feedback. As a result, we have obtained evaluations indicating that general operations are "possible without the need of specific explanations." We later studied the requests for improvements and other stated opinions and the results were fed back to the design team as required.

3. Conclusion

In the above, we explain the design process that achieved a universal, easy to use service for more users, and also introduced actual implementation examples. The present project gained the first award of the Color Universal Design Certification among the Japanese Internet banking services as well as for Japanese smartphone use, regardless of the type or category of business. Therefore, we believe that our innovative project marks the first step in the dissemination of Color Universal Design for smartphones.

Internet banking is sure to increase in importance and to become an indispensable channel for supporting financial institutions. We are determined to provide Internet banking services that can be used easily by more people in the future so that we may thereby contribute to the advancement of society.

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Vol.9 No.1   Special Issue on Solutions for Society - Creating a Safer and More Secure Society

Vol.9 No.1
January, 2015

Special Issue TOP

NEC Information