User Interface (UI) Standardization Activities for Sure and Efficient Communications Networks Administration

NIHEI Morihiro, HORIGUCHI Eiji, SATO Hiroyuki

Abstract

The operation systems supporting communications networks as social infrastructures are required to maintain service quality and improve job efficiency, and the interface between the system and the administrator, called the user interface (UI), is an important factor for implementing these needs. The NEC Group has recently held an exercise to promote UI standardization with the aim of providing consistency between products. This paper describes the process, techniques and results of this activity.

Keywords

communications network, management system, UI standard, UI rule, persona, wireframe, template, global.

1. Introduction

In modern society, the communications networks that support the IT systems have come to be indispensable social infrastructures. As social infrastructures, the communications networks must be operated in a permanently stable manner. This cannot be guaranteed merely by establishing reliable communications network components included devices and software. It is also necessary to build a user interface (UI) that allows the system administrator to manage the communications networks management systems and to review network components confidently and efficiently and without initiating human errors.

In this paper, we discuss UI standardization research activity aimed at providing communications network management systems which are indispensable in our society. These have acquired the social importance that we see today, due to the usability and clarity that is supported by human-centered design (HCD).

2. The Need for and the Issues of UI Standardization

2.1 UI Standardization Needs

The services provided by a communications network are composed using various software running on a large amount of hardware. Communications networks management systems that include such a large number of components need to identify the configuration and status of each server effortlessly and to manage and maintain them efficiently. It is important for the efficient operation of each system to assure consistency of operation between the different software programs that provide the services and, for this purpose, it is essential to establish UI standards to support the operations system. Standardization and unification of the software UI can reduce the number of operations to be mastered by the system management operators. They can thereby reduce the time required for learning as well as the number of mistakes that occur in actual operations.

On the other hand, from the standpoint of software product development, UI standardization makes it possible to achieve a certain quality in the GUI design and to reduce the man-hours taken up in the design work, so that improvements in the software quality and productivity can be expected. In addition, UI standardization is expected to underpin NEC's brand identity by supporting the integration and appeal of NEC products.

2.2 UI Standardization Issues

The main issues in UI standardization include how to define

the needs of communications network management systems and which needs must become standardization targets. The system administrators who use communications network management systems have different skills depending on the systems, and their need for UI standardization varies depending on their skill levels. Even when the work to be done is the same, the UI that is thought to be easily usable varies between those who are accustomed to system management and those who are not. In addition, the operating procedures of the services provided via the communications networks also vary between services. What is required is to clarify the various needs and define the appropriate factors as the standardization targets.

3. Process and Methods for UI Standardization

In order to standardize UIs, it is necessary to define the standardization targets from a variety of perspectives, as described in the previous section. For this purpose, we employed a team of Human-Centered Design specialists to execute the HCD process. In consequence we decided to compile a UI standard (composed of UI rules and GUI templates) from the results achieved by this process. The implementation process was as outlined below.

1) The system planning phase begins with confirmation of the business plan, the targeted user is then hypothesized, ideas appealing the product are developed using an Experience Map (**Photo 1**) and the Product Concept is defined.
2) In the subsequent requirements definition phase, images of the users are specified using Personas, and user requirements for implementing the product appeal are clarified (**Fig. 1**). Job procedures are then shaped by adapting user behavior scenarios to function as work flow to meet user's requirements.
3) In the final design phase, standardization of the basic structure of screen frame and information presentation/control component are examined, and the GUI design is undertaken by compiling the UI rules that will become the UI standards for developing the Wireframes of each screen (**Fig. 2**).

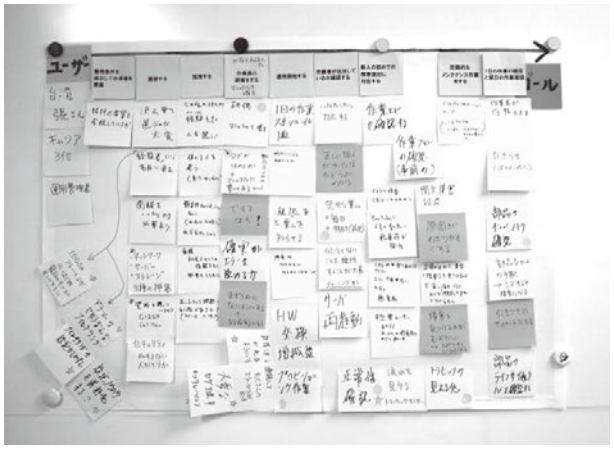

Photo 1 Experience Map.

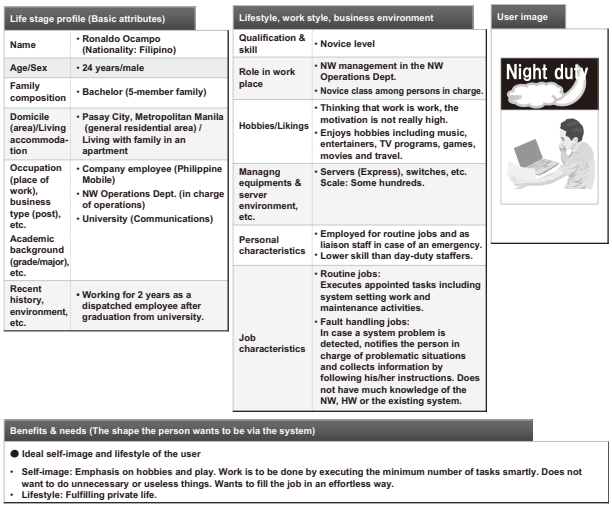

Fig. 1 Example of a Personas.

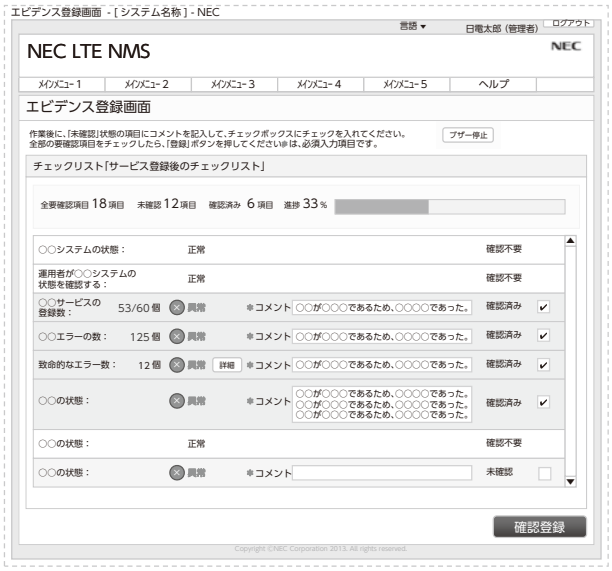

Fig. 2 Wireframe (Image).

4. Results of HCD (Human-Centered Design) Process Activity

The following subsections describe activities in the HCD process for this project.

4.1 Product Concept

Because one of the business plan targets was compatibility

with the global situation, we collected information on users from who are familiar with foreign markets at the concept development stage of the system planning phase. Thereby we realized the need for dealing with differences in the sense of values of work and occupations and the differing cultural attitudes between the target countries and Japan. We particularly noticed that the differences in skills and motivations between users depend on the employment conditions and job contents. We therefore assumed two types of user as target users, a "day-duty employee in charge of system operation" and a "night-duty employee in charge of system operation", and finalized the Product Concept by applying measures for dealing with values and needs of those target users into the GUI and setting the result as the appealing point.

4.2 Personas and GUI Design

In the needs definitions phase, we gave more detailed profiles to the target users by defining them as "Personas." We then confirmed the values emphasized by these Personas, defined the goal to be achieved by the UI, and developed operating procedures, GUI flow, actions and the operations scenario in order to aid the GUI design (**Fig. 3**).

The Persona of "day-duty employee in charge of systems operation" is a user that acts positively based on his/her own judgment (who sustains hard work, has high skill and is career-oriented). The Persona of "night-duty employee in charge of systems operation" is a user who receives instructions passively (does not have high morale or will and has skills that are still in the developing stage).

We developed screen Wireframes by selecting three job UI for the communications network management system, including the "journal (situation/status confirmation) screen," "evidence registration (system checking) screen" and "log collection (logging) screen" as the key screens. We will explain, in the following sentence, how the Persona was used for examining the screen Wireframe, and also how the Persona and the screen Wireframe worked each other.

The "role in workplace" and "job characteristics" of the target user clarify job procedures and contribute to decisions on transition of screens. For example, the "evidence registration screen" is prepared in order to ensure that the operator (night-duty) who receives instructions performs the required operations as requested.

The "Qualifications & skills" and the "managing equipment & server environments, etc." define the IT skills of each user

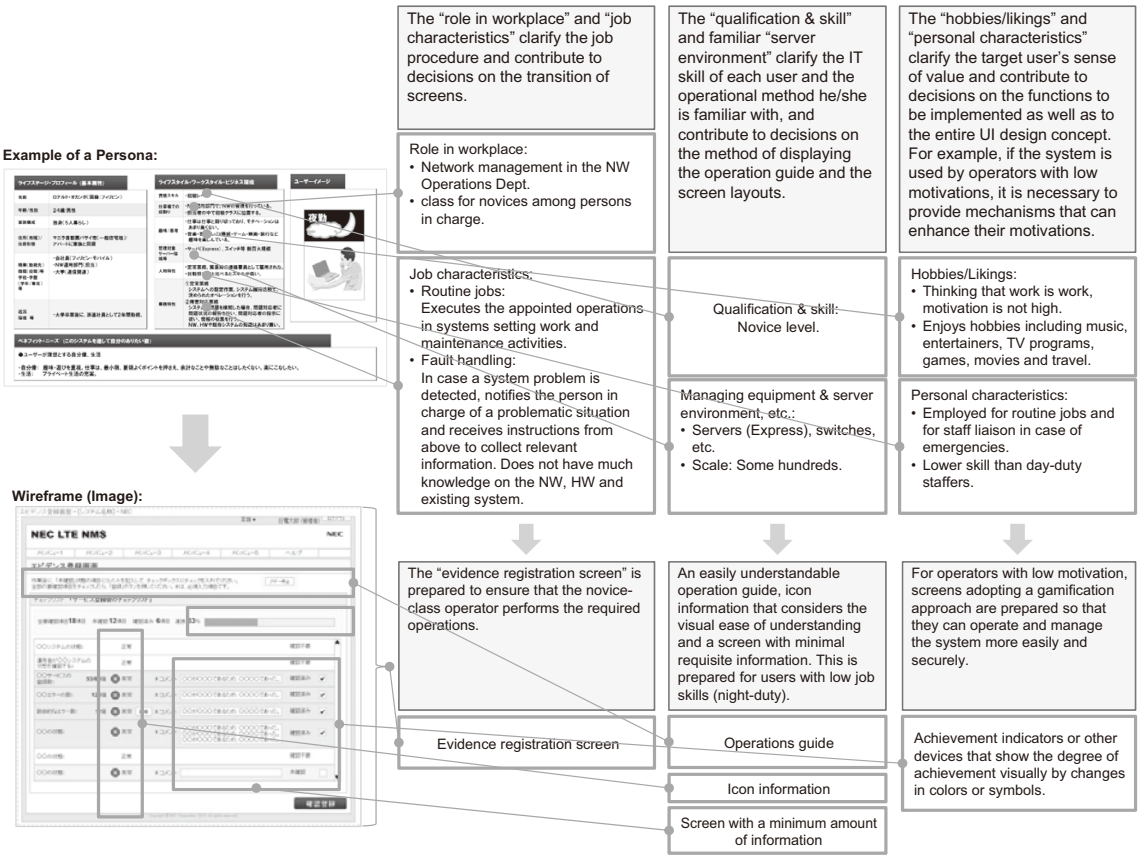

Fig. 3 Relationship of the Persona to the screen Wireframe.

and the operation method that he or she is familiar with, and thereby contribute to decisions regarding the method of displaying operations guides and the screen layouts. For example, we found that it is necessary to provide an easily understandable operation guide, icon information that considers the visual ease of understanding and a screen with the minimum requisite information. These are prepared for the users with low job skills (night-duty). On the other hand, simple-to-handle, efficiency-oriented screens with high information densities are prepared for higher-skill users (day-duty).

The "hobbies/likings" and "personal characteristics" of the target user clarify his/her sense of values and contribute to the definition of functions to be implemented as well as to the entire UI design concept. For example, if the system is used by operators with low motivation (night-duty), it is necessary to provide mechanisms that can enhance their motivation, so screens that adopt a gamification approach are prepared.

4.3 UI Standards (UI rules)

At the design phase, we examined the transition of screens of the entire system as well as the basic screen frame structure and component layout that are common to all the screens. These were based on the job procedures, job/screen flows, operation scenarios and main transition of screens that were aimed at implementing the product appeal that was defined in the requirements definitions phase. Subsequently, we identify the concepts and rules regarding the GUI, and then compile them into the UI standards (UI rules) (**Fig. 4**).

The UI rules specify "common rules" including the basic screen frame structure, component layouts including information presentation and buttons and operability unification. The "specific rules" includes the screens such as login and menu screens that should be distinguished from the basic screen frame structure, and the "general rules" includes information providing methods for terms, languages and colors.

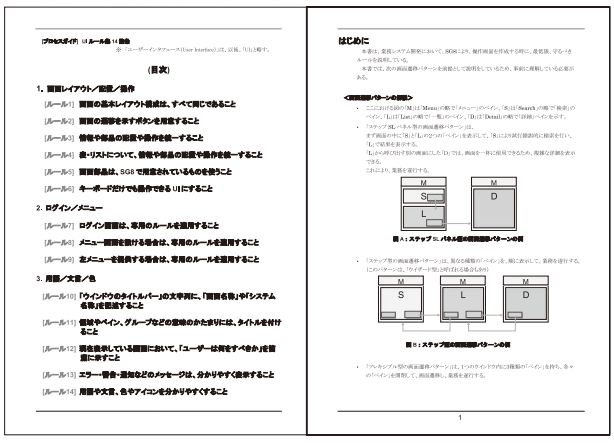

Fig. 4 Example of UI standards.

Based on the Persona, we standardized the rules by taking the attributes of target users into consideration. Examples of this policy are given in the rules on guidance and messages (guide/instruction/caution texts) to communicate the actions to be taken to support the low-skill users in a simple and easy-to-understand manner in order to reduce the burden of learning. Additionally, in order to allow the higher-skill users to execute tasks efficiently and securely, rules that deal with keyboard operations such as shortcut keys and access keys were also prepared.

With regard to the contents of the UI rules, we focused on the requisite rules for the field of communications network management systems and described the optimum information in a simple way, so that the relevant points could be understood easily.

In order to allow the developer to enforce the rules with full understanding and motivation, we explained the "reason" for the need for rules and described the "method" for enforcing them by using illustrations for facilitating understanding. Although there were restrictions to the functions and layouts due to the adopted development library, we contrived the design so that no disharmony was felt, even when the system was used in combination with others.

We have standardized the UI standards developed in the present project so that it can be applied to other systems as a platform for GUI-related developments, with GUI templates and prototypes.

5. Conclusion

In this paper, we have introduced the methodology and achievements of the development of UI standardization based on the identification of the skill levels and job contents of the system. We have also dealt with the examination of the desirable shape of the UI using HCD, as part of the UI standardization activity for the communications network operations systems.

In the future, we intend to continue these activities by developing GUI templates to be a part of the UI standards, based on developed Wireframes so that the UI can also be applied to operations/management systems in the telecom carrier field. It is also our aim to improve the quality of our software products and continue the development and improvement of UIs so that our efforts can contribute to society effectively via a reduction in human errors.

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Vol.8 No.3
July, 2014

Special Issue TOP