

User-Centered Design in SI/Software Development

AOKI Hiroyuki, MIURA Kazunari, TSUKIDA Ichiro, NODA Hisashi, NAKAI Haruo

Abstract

“Usability” is one of the critical quality characteristics for the users of software but it has an aspect that is difficult to accommodate in the traditional framework of software quality management. This may be because of the relative and subjective content of its “usability” quality. To deal with this issue, NEC Soft has introduced “User-centered design” extensively in its standard process of SI/software development and is targeting continual improvement in its “usability” quality. This paper introduces these activities.

Keywords

usability, software development process, production innovation activities
screen user interface (UI) design support tool, attractive UI quality

1. Introduction

NEC Soft is introducing structural improvements via “usability” quality by including user-centered design in the processes of SI/software development.

As a system integrator, almost all of employees are system engineers (SEs) and software developers working in software fields. This means that, when introducing user-centered design, it should be widely spread among the SEs/software developers. For this purpose, it has been necessary for us to promote corporate-level dissemination by developing broad education/personnel training activities, standardizing the development process and preparing the requisite tools. The corporate-level dissemination/deployment activities of user-centered design are detailed in sections 2 and 3 of this paper. Meanwhile, some of our customers are requesting higher-level, more attractive content for “usability” quality. In such cases, usability engineers carefully monitor the usability quality that each customer needs at the system proposal/order receipt stage and customer concerns are considered during actual project preparation. These activities of the usability engineers will be outlined in section 4 below.

2. Corporate-Level Dissemination/Deployment of User-Centered Design

At NEC Soft, efforts aimed at user-centered design are promoted by the Usability Group of the VALWAY Technology Center (hereafter referred to as the “Usability Group”), in collaboration with the production technology and personnel train-

ing departments.

The subsequent sections describe the usability training activities, personnel encouragement via on-the-job training (OJT) and the operation of the website transmitting usability information.

2.1 Corporate Usability Education and On-the-Job Training (OJT)

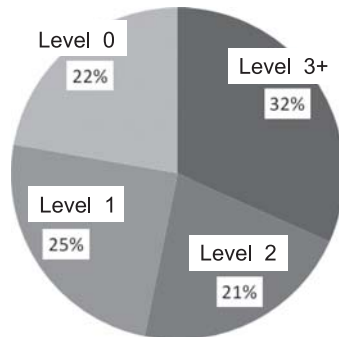
We currently run usability training composed of four standard courses, including one Introduction Course and three Practical Courses (Evaluation, UI Design and Required Definitions). These courses run for 3-1/2 days, using the teaching materials independently developed by ourselves. In addition, we also present lectures by outside experts to promote and enable managers and higher-level staff to understand user-centered design procedures. We also offer in-house training via technical seminars for those who already have experience of software development.

Training was originally given to a wide range of employees when the scheme was started in FY2007, but it is currently given according to specific career paths. For example, in order to train new employees or as training for those who have experience in system engineering (SE)/software development.

At present, there are 1,950 employees participating in the introduction course and about 390 employees in the practical courses. Up to the present about half of the SEs/software developers have received training corresponding to the introductory course.

Regarding OJT, when Usability Group supports the usability improvement of an in-house project, we have each project tailored to the needs of the candidate and promote it as a

Skill of designing easy-to-use user interfaces using ISO9241-210, etc.
(The number of assessed engineers was 2,044)



Level 3: Capable of practical work, applying a skill by oneself based on actual experience.
Level 2: Capable of practicing the relevant technology by receiving guidance or support from others.
Level 1: Having an understanding of the outlines of the relevant technology.
Level 0: Not having any experience of the relevant technology.

Fig. 1 Assessment of user-centered design skill.

continual activity.

As one of the means for measuring the effects of the training and OJT projects, we have the SEs/software developers perform self-assessments on their IT skills and evaluate the results each year. We define the skill required of user-centered design technology as “the skill of designing and developing an easy-to-use user interface (UI) using international standard ISO9241-210, etc.” (Fig. 1).

According to the skill assessment in FY2010, 78% of engineers had been trained in the outlines of the technology (Level 1 or higher) and 32% of them were at the level of practicing the technology by themselves based on actual experience (Level 3 or higher). The number of assessed engineers was 2,044, which was almost identical to the number of the participants in the Introduction Course.

2.2 Transmission of Usability Information

Usability Group runs the website transmitting usability information aimed at creating an environment allowing the SEs/software developers to obtain the necessary technical information and at necessary timings.

Specifically, the website includes the following content.

The technical information includes the following items:

- 1) Introduction of standards and tools and a downloading facility.

- 2) Design guidelines.

- 3) Actual examples of applications.

In addition, some educational content is also provided, including columns about usability, interviews with well-informed persons and information on training and other procedures.

The website features meticulous quality improvement activities so that each of the SEs/software developers can utilize it at every step of the software development processes.

The total number of annual accesses to the website exceeds 36,000 and the number of downloads of standards, tools and actual case consultations is about 3,800, making this website one of the best utilized in-house websites of its kind.

3. Production Innovation Activities of User-Centered Design – Development and Dissemination of a Usability Design Support Tool –

SDE (SystemDirector Enterprise) is NEC Group’s SI development standards. It already incorporates the concept of user-centered design, which is defined as a UI Design Guide.

NEC Soft has developed the usability design support tool as a tool for efficiently practicing the user-centered design process in accordance with the above standard and for utilizing it actively in software development in the field. This section introduces the tool and report on the actual status of its utilization.

The objective of development of the tool is to enable incorporation of the concept of user-centered design from the upper process of software development. There is a technique called the scenario-based approach in the methodology for requirements engineering. This technique determines the UI using natural-language descriptions and pictures describing the situations and procedures of use. Although such an analytically based scenario has many advantages, it still has the disadvantage that it includes non productive work. We therefore set the target of developing a tool that can perform similar tasks more efficiently.

The tool is a prototyping tool that makes it possible to select the screen transitions and basic layouts from multiple patterns and edit them, and which can also be used in the upper process of software development for which the review and agreement of the UI with the customer are necessary. The UI Design Guide of the SDE defines the activities/tasks of organizing the UI requirements as one of the tasks to be performed by the system job analysis personnel. The task of creating

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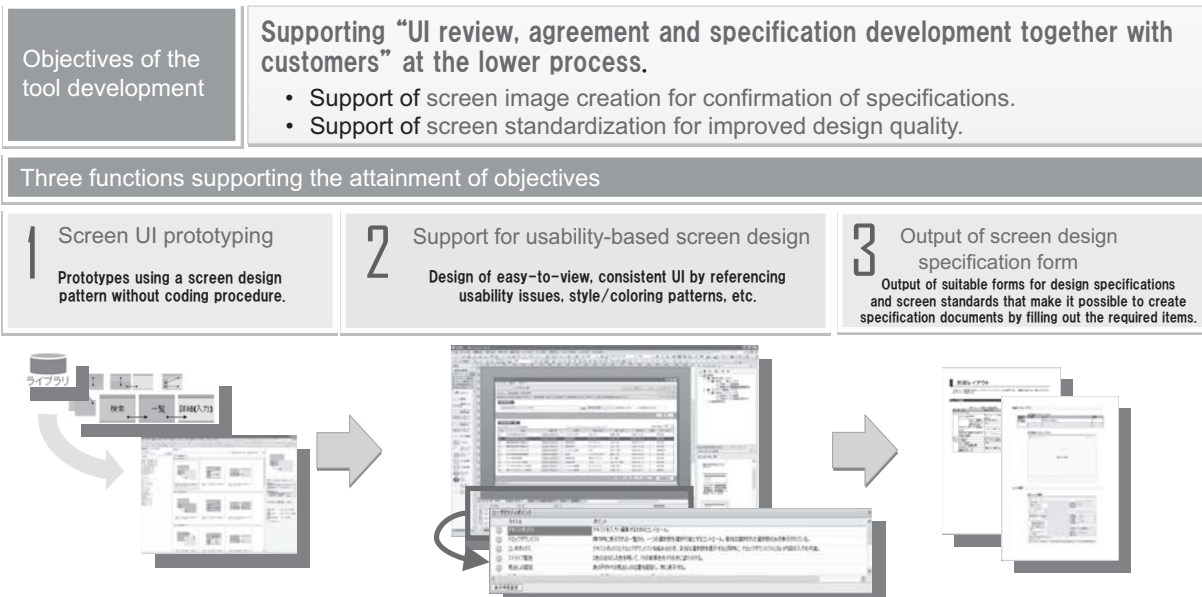


Fig. 2 Usability design support tool.

screen prototypes and screen UI standards is defined as one of the tasks to be performed by the development personnel in charge of the system standardization. Among them, the tool incorporates a function for supporting the development personnel in charge of system standardization, which is the creation of screen prototypes (visualization of UI requirements) and screen UI standard (compilation of UI requirements into a standard specification). In fact, it additionally incorporates the following functions so that it can be used throughout the software development processes.

(1)The image of usage situation by users can be easily visualized on a screen prototype.

(2)Giving guidance on the “knack” of designing an easy-to-use UI for specific screen design.

(3)Making the linkage to the lower process seamless.

For the present, function (3) is still under development (Fig. 2) and it has been completed only as far as the output of the screen design specification.

About a year has elapsed since the release of this tool. Over this period, it has been used by 90 users working on about 40 projects.

The users’ questionnaire pointed out the following effects of utilization.

- Customers and end users can easily obtain screen im-

ages, thereby facilitating decisions based on the relevant specifications.

- A screen design that takes usability into consideration is possible.
- Consistencies in the UI of elements and layouts of screen can be ensured.
- Screen transitions are easy to understand visually so that customer understanding is easily gained.
- Accurate screen images can be created so that the need for changes at the lower process is reduced.

The users of the tool have already addressed opinions including those on issues related to its performance. It is intended that it will be enhanced by incorporating user opinion and by promoting its dissemination/deployment as a tool for supporting customers via its initial objectives of “UI review, agreement and specifications development.” For the present, NEC Soft is promoting and deploying the tool as a development solution for internal use only.

4. Activities of Usability Experts Team

The above sections focused on activities for establishing user-centered design in-house and those for improving the us-

ability and productivity.

Meanwhile, the need for “usability” is diversifying widely and business systems as the primary products of our company are now requested to provide advanced, attractive usability quality as additional value. Under this trend, the main role of our group has shifted from establishment and production innovation activities to professional support activities for such development projects.

At present, the activities of our group are based on the user-centered design support menu shown below (Fig. 3).

The professional support tasks that are requested most frequently are as follows.

(1) User-centered design tasks at the system proposal/order receipt stage

This type of task requires an understanding of the characteristics of UI design of each business type or task in addition to the usability technology required at the upper process. In addition to the above, the estimation capability of the user-centered design process part is also required when estimating total cost of the project.

(2) Tasks requiring ingenuity in screen design

The design is performed in collaboration with designers from both inside and outside the NEC Group. In this case, the capabilities of informing the designers of the usability requirements and design policy of the system and of evaluating the results are required.

(3) UI design using RIA (Rich Internet Application)

This task is development work that necessitates advanced techniques both in the software development and in the de-

sign. In particular, the accumulation of RIA utilization techniques for job system UI design and standardization of the development work are expected to be important issues in the future.

In the following, we introduce an example of “tasks requiring ingenuity in screen design” referred to in (2) above.

When Usability Group was engaged to support the improvement of UI of a POS system for the distribution and service industries, we first held a hearing for identifying what kinds of users make use of it and on which occasions. When the form of business differs for example between a convenience store and a supermarket, the user of the checkout counter also differs, for example as between a working student and a part-time homemaker. In addition, the requirements for the checkout counter and its design also differ between users of different forms of business. Operability and designs that match the target users are essential. In this regard, we set the target users as the part-time homemakers and proceeded to the UI design by informing the designers of their usability requirements and of our design policy. As a result, we were able to propose UI that featured a stylish image yielding a high degree of customer satisfaction to meet the requirements of the homemakers. An early decision by the targeted user made it possible to reduce specification changes and the number of process modifications at the design stage.

Currently, we are providing this kind of professional support service for about 20 projects each year. However, as we consider that an annual expansion rate of about 150% will be necessary in the future, we are planning to enhance the

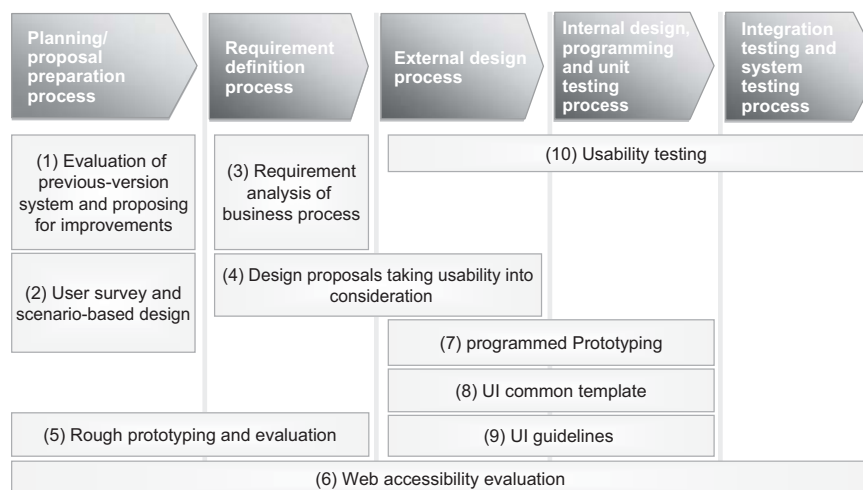


Fig. 3 Support menu.

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system by training personnel of Usability Group as well as personnel with associated skills from the SE/software development departments.

5. Conclusion

The activities involved in introducing and establishing user-centered design are usually performed under the leadership of the product development or design departments. However, since the main business of NEC Soft is in SI/software development, the leadership is necessarily taken by all of the SE/software development departments, which means almost the entire company. This presents a characteristic aspect of our activities at NEC Soft.

Traditionally, the UI for the business systems has not been required to be so innovative. But the situation is gradually changing as discussed in section 4. Especially, the user-centered design technology is of increasing importance under the trend toward cloud computing, the implementation of new UI terminals for job systems and the shift from SI to services. In consideration of this trend, we will continue to endeavor to establish effective user-centered design and to attain implementation of enhanced “usability” quality.

Authors' Profiles

AOKI Hiroyuki

Usability Expert
VALWAY Technology Center
NEC Soft, Ltd.

MIURA Kazunari

Production Engineering Expert
Production Engineering Division
NEC Soft, Ltd.

TSUKIDA Ichiro

Project Manager
VALWAY Technology Center
NEC Soft, Ltd.

NODA Hisashi

Project Manager
VALWAY Technology Center
NEC Soft, Ltd.

NAKAI Haruo

Senior Project Manager
VALWAY Technology Center
NEC Soft, Ltd.

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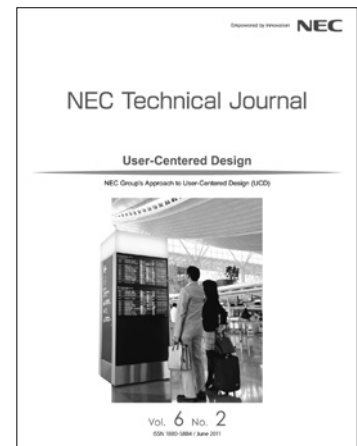
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