Process Support Method for Improved User Experience

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Abstract

Usability has recently been increasing in importance for business information systems. In response to this trend, NEC is developing a software engineer support method to enable the efficient development of systems with higher usability. The support method is being developed with the viewpoint that it is important to clarify usability-related customer needs during upstream processes of system development. This method consists of a procedure for deriving usability-related customer needs from the properties of the target system's users and tasks and connecting them to usability requirements. The verification experiments of this method succeeded in recognizing the validity of the output requirements and the effectiveness of the method. This paper introduces this method for supporting the clarification of customer needs.

Keywords

user experience, usability, human-centered design, system development process, upstream processes

1. Introduction

Social Value Design creates new value for society and our customers' business using Human-Centered Design and Design Thinking.

As everyone is now aware of the convenience of "intuitive operations" in daily life because of rapid dissemination of smartphones and tablet terminals, users have come to demand a better experience with business information systems. Usability is one of the central factors of this user experience.

Technological progress is expanding functions that can be implemented in a system and customer demands for usability are diversifying as a result. Efforts to improve usability have, however, made a very heavy burden for software engineers in the field. This is because these efforts require not only system development technology but also knowledge of ergonomics and cognitive psychology to understand system user's characteristics and take them into consideration.

One of the means to assist field software engineers in usability improvement is to convert knowledge of usability improvement experts into formal knowledge and provide it to software engineers. At NEC, we have been tackling research into a method to assist software engineers in making independent efforts toward usability improvement. Specifically, we are developing a support method for software engineers without expert knowledge to improve usability. In this method, the activities needed in each phase of system development are defined based on the concept of human-centred design (HCD),[1] which is known to be effective for usability improvement, and the tasks and procedures necessary to execute these activities are clarified.[2] **Fig. 1** shows an overall schematic of this support method. As shown in Fig.1, this method focuses on the clarification of the customer's usability-related needs (customer needs clarification) and the matching of these needs to the system design (conformance between needs and design), and then defines the activities (tasks and procedures) necessary to support these. We considered that it is particularly important in upstream processes of system development to clarify usability-related needs of customers and users, such as "What do customers want to solve in their management or operation by improving usability?" and "What kind of usability do customers want to the system?" [3] It is because this needs clarification is effective to improve usability, achieve customer satisfaction and decrease redundant work during development. We therefore developed a support method for customer needs clarification.[2] In the rest of this paper, we will introduce the support method we developed as described above.

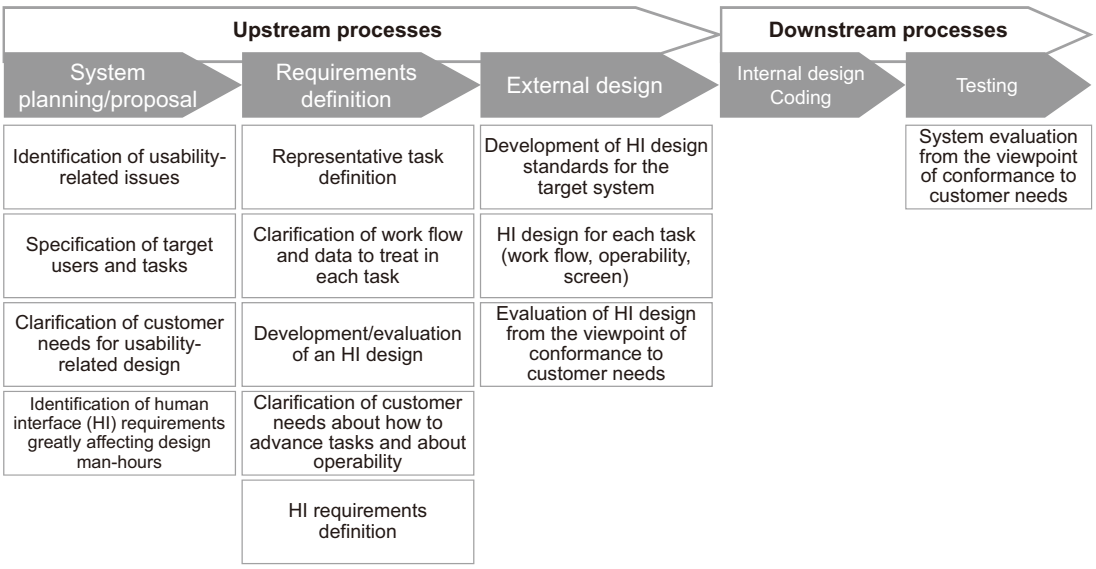

Fig. 1 Human-Centered Design process support method.

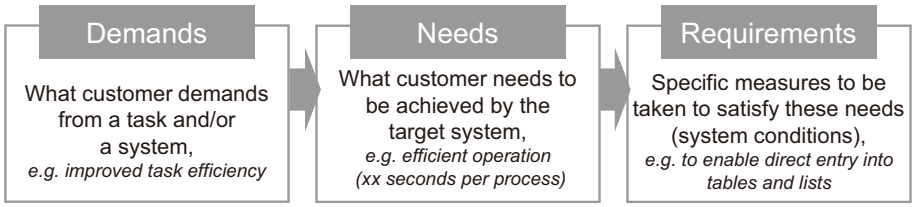

Fig. 2 Needs and requirements.

2. Customer Needs Clarification Support Method

To develop a system with high usability, it is important to draw out properly usability-related customer needs (such as how to use a system and intended effects through using the system) in upstream processes of system development, compile a draft of requirements about usability, revise it through detailed examinations with customers and then reach an agreement.[3)]

The method we developed supports the activities for compiling a draft of requirements about usability. The activities include "specifying target tasks and users," "understanding characteristics of tasks and users" that correspond to "Understand and specify the context of use" of HCD.[1)] "Identifying usability-related requirements" that correspond to "Specify the user requirements" of HCD is also included in these activities. The following subsections deal with the main features of this method.

2.1 Activity Definition and Procedure development for Needs Clarification

Based on the concept of HCD, we have developed a method to identify usability-related customer needs from the characteristics of target system users and tasks and to connect them to requirements.

In this method, needs and requirements are defined as shown in **Fig. 2**. Namely, "needs" is defined as what a system should achieve based on demands that a customer has for the system. "Requirements" is defined as the specific measures to be taken to satisfy these needs, or specific characteristics that the system should be equipped with.

The actual procedure is as shown in **Fig. 3**. First, main tasks and representative users for a system are identified and the characteristics of each user and each task are specified (c), then based on these characteristics, the usability-related customer needs (d) and the requirements for satisfying these needs are identified (f). To draw out customer needs that are difficult to express with words, such as look and feel and operations, we also developed a procedure for clarifying needs by using operable screen samples[4)] in accord with the characteristics of each user or task (e) and connecting these needs to specific requirements (f).

On the other hand, there are cases in which the in-depth study of usability-related customer demands is necessary, de-

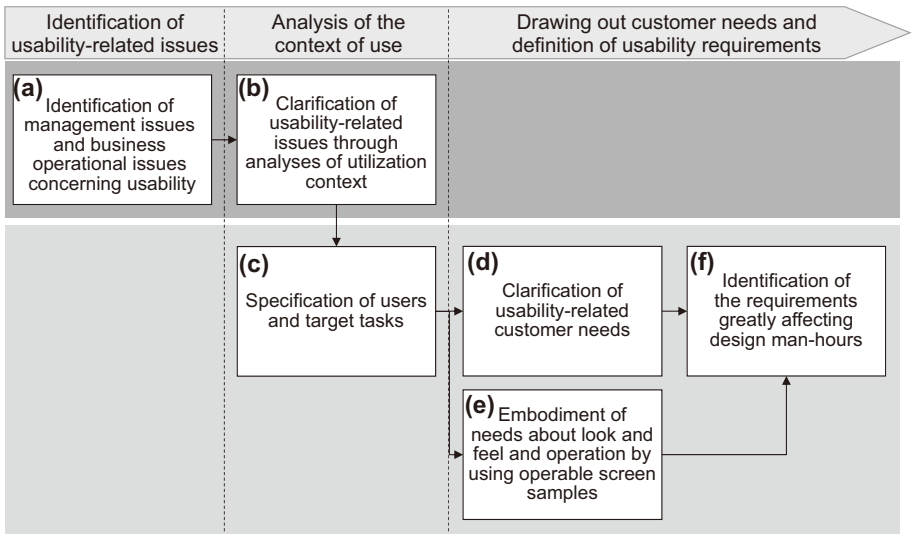

Fig. 3 Activities for usability-related customer needs clarification.

pending on the awareness of customers for issues, the characteristics of tasks and the scale of a system. The support method prepares the procedure (a, b) for identifying such cases.

2.2 Explicit Specification of Tasks and Representative Users

Activities to clarify usability-related customer needs are based on an understanding of the relationship between tasks and users of a system. With the progress of technology, expanding system scale and target tasks have complicated and diversified the data and functions and have also diversified system users. This has also resulted in a complication of the relations between users and systems, e.g. data exchanged and functions to use vary between users. Meanwhile, no activities to identify relations between tasks and users of a system have been undertaken explicitly as part of system development processes.

To ensure the positive promotion of such activities, this support method has developed an entry form to specify target tasks of a system, identify representative users and describe works of which they are in charge in each task. This entry form is shown in **Fig. 4**.

2.3 "Check Items" for User and Task Characteristics

We also developed "check items" for use in specifying the characteristics of the users and tasks of the target system (c) (**Fig. 5**). They were made by arranging necessary information for specifying system development conditions and indispensable information for improving system usability, based on HCD. Typical examples include user age group, user skill level to a work and execution frequency of a work. These items can be easily selected by software engineers without expert knowledge of usability improvement.

A target task	Flower shopping on the Internet	
Who	**What**	**Questions** (to be checked)
Customer	・Order of flowers on a website ・Request for delivery ・Payment by credit card	What are specifics of target customers (age, sex, etc.)?
Headquarters	・Request for flower gift delivery to the contracted shop ・Follow-up of the delivery situation ・Payment to the contracted shop (after confirmation of delivery completion)	Is there cooperation with credit card companies?
…	….	

Fig 4 An entry form for specifying target tasks and representative users.

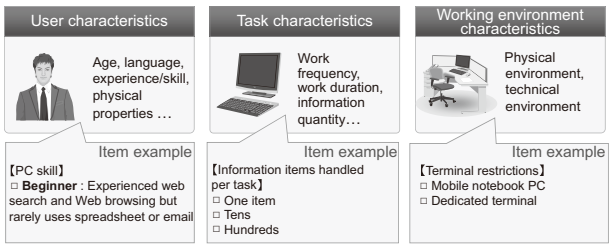

Fig. 5 "Check items" for specifying user/task characteristics.

2.4 Rules for Connecting Customer Needs to Design Requirements

We made items for usability-related customer needs (d) and those for requirements to achieve the needs (f), based on in-house guidelines for usability improvement, which was compiled by systematizing the principles of usability and the expertise obtained in actual cases.[5] These items are made by dividing usability-related customer needs into categories such as basic input method, data display method, etc. We also enumerated the requirements for achieving each need as items.

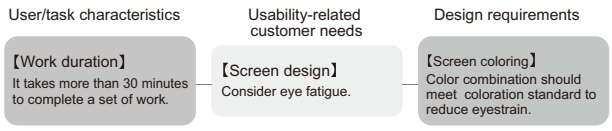

Fig. 6 A sample of rules to convert characteristics into customer needs and then into requirements.

We then narrowed these down to items that greatly affect man-hours in downstream processes after internal design, and classified them as selection items. Additionally, we identified customer needs and the requirements for achieving the needs, for every user characteristic item or task characteristic item and made the rules for their correspondence. A specific example of a rule is shown in **Fig. 6**.

In this way, the support method makes it possible to draw out usability-related customer needs from the check items of user or task characteristics, which do not require any particular expert knowledge, and to connect customer needs to requirements by using the rules so that software engineers can clarify usability-related customer needs and convert these needs into requirements by themselves.

2.5 Operable Screen Sample for Specifying Needs about Look and Feel and Operation[4)]

With regard to look and feel (including design) and operation, there is a possibility that usability-related customer needs and requirements cannot be specified enough only by the above-mentioned check items. This is because look and feel and operation are accompanied with a sense and experience, to be said such as “operational feeling” and “display image.” They have something that cannot be communicated only by words expressed as needs and requirements.

On the other hand, the way in which look and feel and operation are achieved directly influence development man-hours. When operability is improved or look and feel is more finely designed, development takes more man-hours. It is therefore extremely important to confirm the achievement level which a customer wants about look and feel and operation - which is use/non-use of visual effects, exquisite design, etc. - also from the viewpoint of cost estimation.

We have prepared actually operable screen samples[4)] as a means to draw out needs concerning look and feel and operation, which are difficult to express in words, in conjunction with their achievement level and connect them to requirements. These operable screen samples are prepared systematically for each level of operability and design. Every sample is tied to certain requirements, so that selecting a particular sample can identify these requirements. **Fig. 7** shows an example of an operable screen sample and the requirements tied to it.

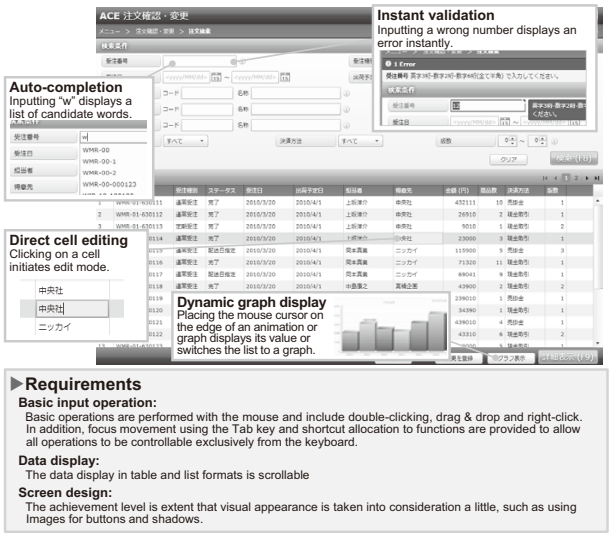

Fig. 7 An example of operable screen samples and its tied requirements.

2.6 Clear Specification of Man-hour Information on Each Requirement

Based on experience with supporting projects related to usability improvement, we clarified (1) a coefficient indicating impact on usability-related design man-hour and (2) points to be considered in man-hour estimation. (1) is specified with a numeric value how extra design man-hours is necessary compared to the case in which the target requirement is not included in a system and (2) indicates information concerning man-hours that are necessary to achieve requirements but are difficult to express as numeric values, such as task analysis, function development, etc.

3. Conclusion

This paper introduced a software engineer support method focusing on usability, which is one of the central factors of user experience, by taking as an example a specific methodology for clarifying customer needs in the upstream processes of development.

For the support method introduced above, we verified (1) validity of the requirements that are the output results and (2) the usefulness of this method. We had usability improvement experts execute the upstream processes, from needs clarification to requirement identification, of a specific project on a trial basis in two ways, by applying the support method and by using human labor without applying the support method. Then we compared the needs, requirements and execution processes of these two approaches.

As a result, for (1), it was determined that the needs and requirements output by the support method are nearly equivalent to those extracted by the labor of the experts. On the other hand, for (2), positive effects on the efficiency and quality

improvement of activities were reported, including a reduction of man-hours for preparation of interviewing customers and an extraction of evidence-based requirements. These facts consequently allowed us to confirm the validity and usefulness of this support method.

In the future, we would build a highly practical support method that matches the actual system development process through having software engineers without expert knowledge try this support method.

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