Human-Centered Design Approach for Middleware

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At the UI Center of the Fujitsu Software Unit, we introduced the concepts of UI design and UI evaluation to our development processes with the goal of achieving universal design of open platform middleware products in fiscal 2008. Universal design of middleware products entails recognizing the target users of our products, and then developing software products that those users find easy to understand and use. We are concentrating our efforts primarily in three areas: the education and training of UI architects, standardization and process reform, and UI evaluation by specialists. In order to continue providing products of high UI quality, we consider the development of UI architects who are aware of the importance of usability on functionality and operability to be the imperative priority. Such UI architects need to be able to implement sophisticated UI design and evaluation based on the human-centered design (HCD) methodology such as benchmarking of competitors, analysis of UI-related issues and user analysis.

1. Introduction

Fujitsu Software Unit had many challenges to be overcome regarding user interface (UI) of open platform middleware products. For instance, incident reports issued by misunderstanding the method of operating products showed an increasing trend with an annual increase of 4%. Further, about 30% of these cases were attributable to UI-related issues. Besides, the results of a customer satisfaction survey carried out by a third party on the user-friendliness of Fujitsu middleware products indicated that satisfaction was falling continuously.

To overcome these issues, Fujitsu Software Unit established the UI Center in fiscal 2007 to start its approaches to human-centered design (HCD).

The UI Center is pushing forward with the initiative of the Fujitsu Software Unit for universal design (UD) based mainly on the following three areas: education and training of UI architects, standardization and process reform through guidelines and GUI bank, and UI evaluation by specialists.

The UI architects in this context represent the human resources among program developers and inspection engineers in the Software Unit who are well versed in UD and are capable of design and evaluation while giving consideration to UD in the overall development processes. Further, they need to have skills to design and evaluate middleware products for other units also by mastering special techniques and accumulating experience of UI improvement approaches and success cases.

This report describes UD approaches for middleware products and the method of addressing these approaches.

2. UD for middleware products

The target of UD for middleware products is to make them easy to use for users of the product,

instead of making them easy to use for all users (**Figure 1**).

To achieve this target, it is essential to understand at the early stages of planning and designing what types of users use the middleware products and in which situations. To achieve this objective, Personas of the target users are determined in discussions among stakeholders related to the concerned product from various divisions including the sales, design, quality assurance, development and support divisions.

In this approach, evaluation is conducted in accordance with Personas and Scenarios (description of situations where the product concerned is used by users), based on HCD theory by UD-conscious human resources with relevant skills from the planning and design phases. In UI evaluation, the products that indicate no problem in the following aspects are judged as being easy to use:

- Do you understand the current situation?
- Do you understand how to operate the product?
- Is the actual behavior different from the expected behavior?
- Is it possible to efficiently operate and setup the product?
- Are errors adequately dealt with?

The Software Unit has developed an evaluation check sheet summarizing these points called the User Interface Check List (UICL) and is promoting its use. This UICL includes descriptions on important points of confirmation and specific examples so that UI evaluation can be achieved by anyone. Besides, the Unit developed the "UI Evaluation Plan/Report Sheet" that integrates useful data for easy analysis and review of evaluation results, which not only provides evaluation results but also generates graphs automatically that indicate areas including many improvement opportunities only by completing the check lists.

Further, the Unit has clearly identified a work flow (**Figure 2**) of a series of processes from the planning of an evaluation program to the countermeasures for evaluation results and the decision on acceptance or rejection in conjunction with clear definitions of the roles of each staff member in charge of UI design and UI evaluation.

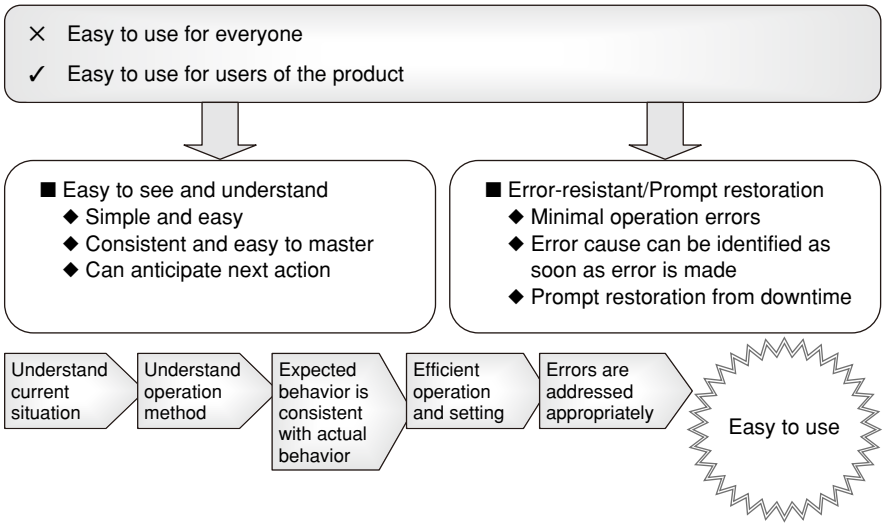


Figure 1
UD in Software Unit.

3. Long-term and short-term programs

In fiscal 2008, UD activities were started for some of over 350 Fujitsu middleware products centered on those that will continue to be further invested in, after classifying them into products for long-term programs and those for short-term programs while giving consideration to their speed and efficiency of implementation.

Education and training are provided to develop UI architects in the development division, in addition to GUI design specialists (Fujitsu Design Center), in the long term to achieve the UD initiative. However, it takes a long time to develop such human resources and, moreover, various preparations are necessary for process reform to integrate new elements in the conventional development process.

Therefore, in fiscal 2008, approaches for realization of UD were implemented as joint efforts with Japanese and international specialists who belong to the Fujitsu Design Center and Fujitsu Australia Software Technology Pty. Ltd., within the framework of a short-term program. These are some of the efforts to achieve UDs that are valid in the global arena.

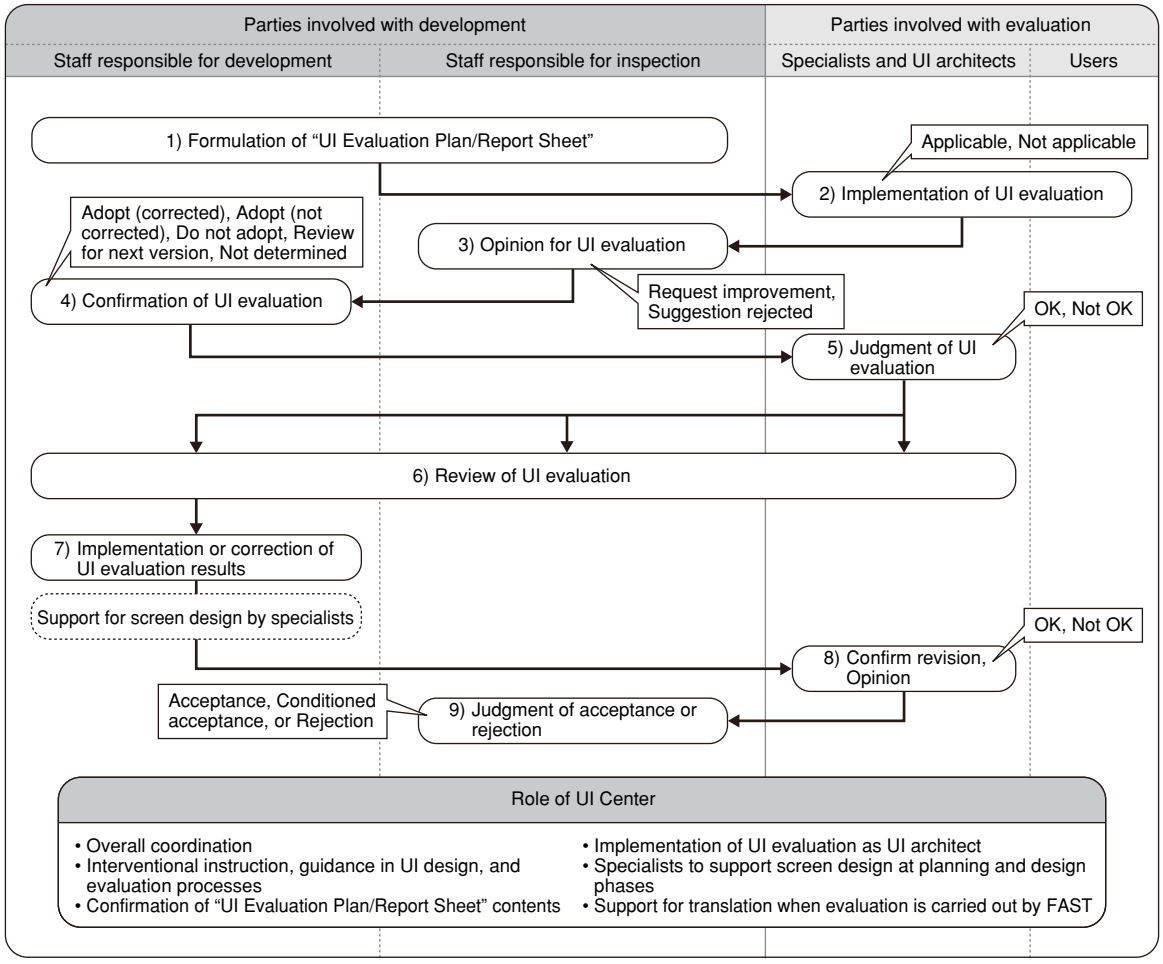


Figure 2
Flow of UI design and evaluation process.

4. Education and training of UI architects

To develop UI architects, a mechanism to improve trainees' motivation through a qualification system is essential in addition to mastering special skills, implementing UI evaluation and self-evaluating skills.

In the collective education of HCD theories and methodologies for mastering special UD skills, the details of training are customized by adopting specific middleware products as examples so that the trainees can master the concept more easily based on their familiar examples.

Further, as a follow-up of the above-mentioned lectures, workshops based on the Persona method and Scenario method are held so that participants can receive hands-on training of evaluation methods using UICL. In addition, the specialist qualification system promoted by the Software Unit has been used positively within the framework of a community activity called "Development Initiative of Design and Evaluation Specialist for UD products". This program allows employees to experience UI evaluation of actual products within the context of the education and training of UI architects.

For self-evaluation of skills, a diagnostic program was developed by adding contents to "Skill Compass". Participants can confirm their own skill level in UI design and UI evaluation (**Figure 3**) by completing a questionnaire that asks them to choose a single answer from four options. In the Software Unit, L3 is determined as a category of specialists who have special skills in a specific area, while L4 and above are the categories of professionals who can utilize these skills in a specific area. Similar definitions are applicable also to the UI design and evaluation areas. The levels are sub-divided into multiple classes depending on the scale of objects to be evaluated.

Concerning the qualification system, a new category of "UI technology" has been added to the existing professional qualification system promoted by the Software Unit, aiming to motivate employees to achieve their target of becoming specialists in the area of UI design and evaluation. Moreover, a UI Engineer Examination is held quarterly. Employees who pass this examination will be given the qualification of UI engineer. Examinees need to evaluate a mock-up system by using UICL within a specified period. They are judged based on a five-point scale depending on their capability to find out UI-related nonconformances in a mock model. Among the successful examinees, those who achieved a conformance rate of at least 80% for their correct an-

Concept of human resources: Envisaged activities

Level	UI Design		UI Evaluation		UI Proposal	
	Availability	Scope	Availability	Scope	Availability	Scope
L3	○	Own feature	○	Specific features of product	△	–
L4	◎	Own products	◎	Product as a whole	○	Product as a whole
L5	◎note)	Product series	◎	Product series	◎	Product series

◎: Can make decision, ○: Has knowledge, △: No requirement
note): Person who can design policies for a product series. Persons with L4/L3 qualification can reflect their decisions in the products (programs).

UI architect development plan
• One to two UI architects should be developed in a department.
• Skills higher than L4 qualified for proposal of whole product.
• Development of human resources who can also evaluate and propose products other than their own should be targeted.

Figure 3
UI design and evaluation skills.

swers with no erroneous suggestions and whose suggestions include one or more major nonconformance are recommended by their supervisors as candidates for UI architects, to sit for professional qualification exams.

5. Standardization and process reform

The UI Center issued the "Fujitsu Middleware UI Guidelines" in August 2008 which compiles professional know-how in this area. The following concepts that are critical in the approach for UD are described in these guidelines:

- Concepts and realization method of UD in the Software Unit for middleware products
- Level of approaches and applicable standards for UI design and UI evaluation
- Specific GUI design samples and recommended terminologies

UI architects contribute to UI design and evaluation activities in appropriate processes according to the rules stipulated in the applicable guidelines (**Figure 4**). In this process, they actively use GUI bank and Persona bank provided by the UI Center to achieve a higher level of harmonization in screen design or improved efficiency of development work. UI parts templates and icons commonly used in the middleware products are registered in the GUI bank for the convenience of developers.

The Software Unit will determine the targets for UD to achieve better usability depending on each level. To be specific, these targets are defined in the UI guidelines. They are implemented based on the rules and the level of necessity (**Table 1**).

6. UI evaluation by specialists

In fiscal 2008, UI evaluation by specialists was implemented on our core products among around 80 products within the scope of investment increase and continued marketing. The target of our UD by specialists is to have products that are more competitive than those of our competitors. To be specific, we benchmark our competitors, and based on the results some specialists in the Fujitsu Design Center and Fujitsu Australia Software Technology Pty. Ltd. develop a mock-up model in the planning phase. Thereafter, UI design is started after third-party evaluation has been completed.

In addition, in fiscal 2008, this approach

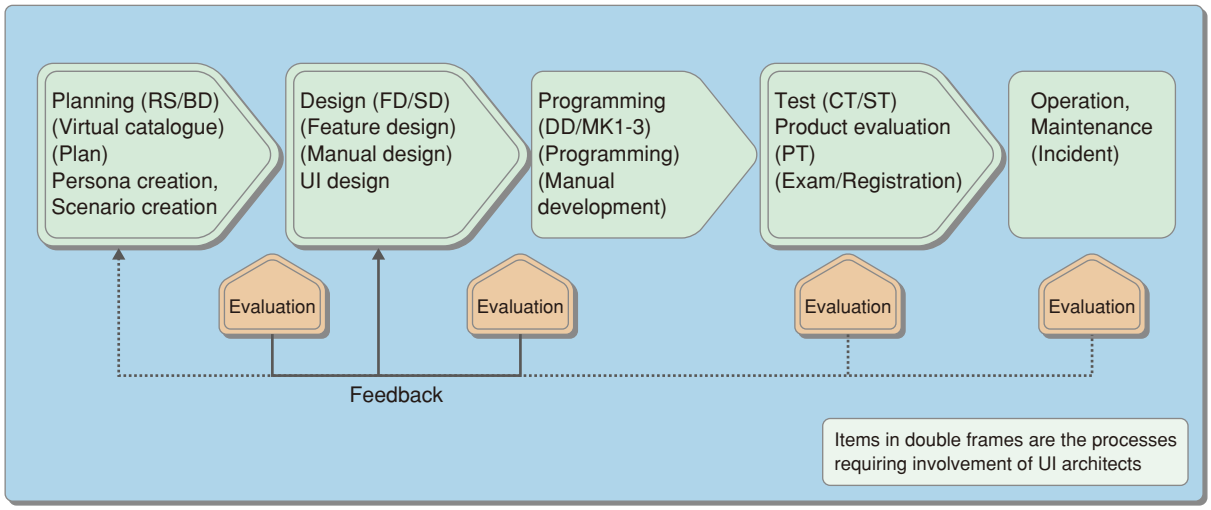


Figure 4
Processes and tasks to be designed and performed with the help of UI architects.

was started for our system management products (about 20 products), targeting harmonization of screen design and terminologies as well as drastic improvement of usability across all the products in this series.

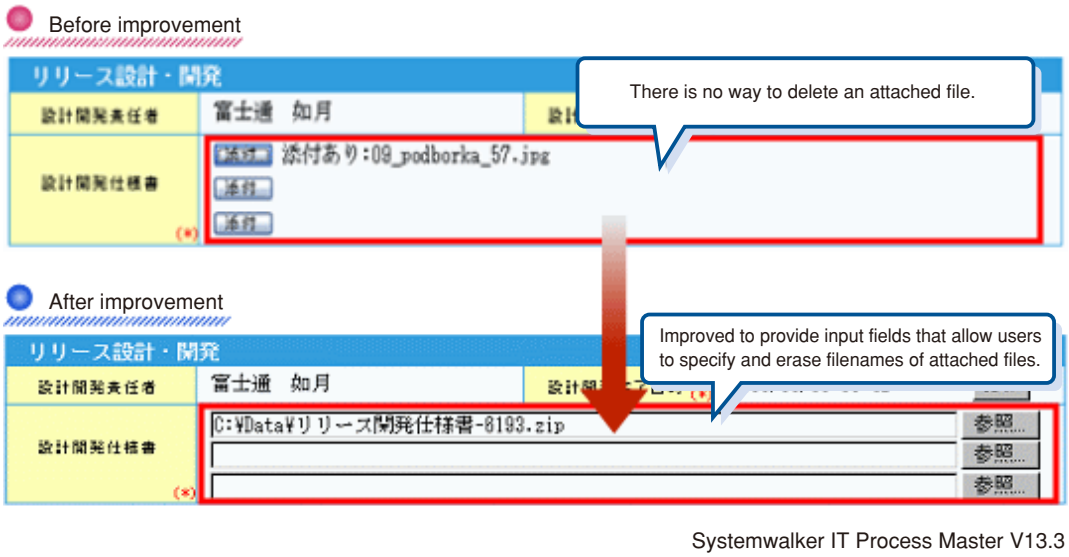
Figure 5 indicates an example of improvement for a middleware product. Before the improvement, a user could not delete a file that had been selected in the screen for designating files to be attached. After the improvement, the field for designating attachment files allows flexible selection and deletion of files and the name of the button has been changed to "Reference" which has a more general meaning.

7. Conclusion

The Software Unit recognizes the need to propose UI that users find easy to understand and

Table 1
Level of UI design and UI evaluation.

Level	Target	UI design and UI evaluation	Effect	Scale in scope
3	More competitive than competitors	Upon benchmarking of competitors, design and evaluation are carried out based on HCD methodology. Design by specialists undergoes third-party evaluation and feedback is supplied	Realization of UI that enables differentiation and exceeds that of our competitors	New products Major revision
2	Harmonization in the operability and realization of universal design	Third-party evaluation by UI architect is implemented and feedback is supplied to UI design	Human error prevention and improved visibility and easier understanding	Minor revision Revision of products for which Levels 2 and 3 were completed
1	Harmonization of screen design and conformance to the minimum rules	Harmonized screen design across the products	Human error prevention	No significant revision



Systemwalker IT Process Master V13.3

Figure 5
Example of UI improvement.

use in addition to its error-free characteristics in delivering open platform middleware products.

To achieve this target, development of as many UI architects as possible who are aware of the importance of usability on functionality and operability is an urgent issue to be addressed. Such human resources need to have a capability to implement sophisticated UI design and evaluation based on the human-centered design (HCD) methodology such as benchmarking of competitors, analysis of UI-related issues and user analysis. The UI architects skilled in using development technology can help to develop, implement and present recommendations from the aspect of product functions. Further, by positive use of UI architects, the reverse of the development process can be minimized, leading to enhanced efficiency of development procedures. We plan to increase the number of products within the scope of this initiative together with the number of UI architects.

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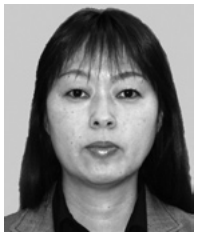

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