

# Using Agile Software Development Methods to Support Human-Centered Design

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## Abstract

In recent SI/software development, the concept of user experience (UX) that enhances experience values from the user's viewpoint has been increasing in importance. An effective means of improving "User Experience" is by applying human-centered design (HCD) as specified in the international standard ISO9241-210. In repeating HCD processes, interest is increasing in the use of Agile Software Development, which flexibly enables the required additions and priority changes to be added at the development stage. This paper describes how Agile Software Development methods may be used when carrying out HCD. The case of a smart device application development project is considered as an example.

## Keywords



human centered design (HCD), agile software development, user experience (UX).

## 1. Introduction

The UX Innovation Strategy Office at VALWAY Technology Center of NEC Soft, Ltd., is supporting improvements to user experience (UX) as a part of its SI/software development. The human-centered design (HCD) specified in international standard ISO9241-210 is effective in improving UX. As shown in **Fig. 1**, HCD executes four processes. These are; 1) "Understanding users" via investigations of targeted users, working environments and the jobs of users, 2) "Goal clarification" from analyses of user requirements, 3) "Solution by Design" compilation of solutions by design classifications and 4) "User Evaluation" from the viewpoints of users.



Fig. 1 Four processes of HCD.

In the repeated executions of the four processes of HCD, what is required differs depending on each project. Most of the projects we have been involved in for UX improvement were waterfall sequential design projects, but more recently, the use of Agile Software Development methods has been increasing mainly for the relatively small-scale projects. Nevertheless, by repeated execution of the four processes of HCD, expectations for the success of Agile Software Development have been increasing as seen from the viewpoint of UX improvement. This is because of its flexibility in adding requirements and changing priorities at the development stage.

This paper shows how to use Agile Software Development methods in the practice of HCD by taking the case of a smart device application development project as an example.

## 2. Agile Software Development Process in the Project

One of the fields in which smart devices are expected to be used more actively is for "Equipment Inspection." The present project is intended to improve the UX of an application for supporting the operation of Equipment Inspection. In the development process, we applied Agile Software Development in order to enable the required additions and priority changes

to be applied flexibly by considering that frequent prototyping and brush-up exercises are to be expected.

One of the representative Agile Software Development methods is the “Scrum.” With “Scrum,” a development duration of 1 to 4 weeks (sprint) is defined and the development is performed by repeating the sprints. At the end of each sprint, all of the project members gather to hold a review (sprint review), make decisions about task additions and priority changes and determine the tasks for the next sprint. “Scrum” was applied in the present project.

### 3. Field Applications of HCD Using Agile Software Development

In the present case, we apply innovative solutions to the various Agile Software Development procedures that are adopted in support of HCD. In this section, we will introduce three of the characteristic activities. The first of these is the “Simplified Product Backlog” intended to letting developers understand the development process of HCD based on repeated evaluations and corrections. The second is the “product backlog format user survey sheet” for efficiently sharing information among the project team, third and finally, is the “prioritization by going back to the Persona of each sprint review” in order to instill awareness of the user’s viewpoint among the team members.

#### 3.1 Simplified Product Backlog

The repetition of evaluations and corrections in HCD results in complicated task management. Agile Software Development uses a document called the “product backlog” for task management. The product backlog shows the progress, task priority, man-hour estimate and scheduled completion date of each task in a list and is therefore suitable for task management involving repeated evaluations and corrections. However, product backlog access does not exist in the waterfall sequential design process. Therefore, we decided to add a backlog to the development man-hour estimation document used by the waterfall developers (Fig. 2). Specifically, as the development man-hour estimation document already contained information on the “implemented tasks” and the “man-hour estimate” of each task, we added the information on the “scheduled completion dates” representing the tasks to be implemented before the next sprint review, to enable use of the document as a simplified version of the product backlog.

In addition, we also adopted additional elements effective for the administration of Agile Software Development according to the relevant project situation. For example, the prioritization of implemented tasks is indicated so that the task to be implemented next may be understood instantly when a target task is implemented before the sprint review. Another

**Entries in traditional estimation document**  
Functions (implemented tasks), man-hour estimates, etc.

**Item added for Agile Software Development**  
Actions to be taken until the next review (Scheduled completion dates)

大機能	中機能	機能詳細	工数 【人日】	次回までの 対応箇所
	ヘッダー	戻るボタンを実装する	0.50	2014/9/21
		手入力も自動実行に対応する。その際、実行日は「J」を付けて表示させる	0.50	2013/9/4
	スワロール	ヘッダーをスワロール可能にさせる。	1.00	
		ヘッダー非表示になった際のイベント処理	0.50	2013/9/4
		最小ヘッダーを画面最上層に表示させる。	1.50	
		最小ヘッダーにヘッダーと同機能を盛り込む	1.00	
	パネル内レイアウト	全パネル共通レイアウトへの実装対応(オプション/機能追加)	1.50	2013/9/28

Fig. 2 Example of a simplified version of a product backlog.

example is the simplification of the estimation of low-priority items when an estimation load causes the problem of a large increase in the volume of implemented tasks after a spring review. A developer is able to practice repetitions of evaluations and corrections by adopting the Agile Software Development elements after a learning time of only around 30 minutes, even with no previous experience of Agile Software Development. This is useful when a developer compiles and utilizes a product backlog of minimum configuration based on the document he or she is accustomed to, as described above.

#### 3.2 User Survey Sheet of Product Backlog Format

Identification of the actual field status is necessary for the users to understand it. As the present example does not have a specific customer, we held a user survey including interviews and field work by inviting the cooperation of companies engaged in “Equipment Inspection.” Considering that the user survey imposes a serious burden on the cooperating companies, we sorted out the check items and prioritized them in advance in order to facilitate execution of the user survey.

The sorted check items are related to the ages, service durations and skills of the field workers, the working environment, and the outline of the field workers’ jobs and the details of inspections. To assist the analysis of the field issues, we prepared a user survey sheet by placing high priority on the laws related to specific jobs, the risks that may result from mistakes, initiatives applied in a specific field, and field issues. This strategy enabled high prioritization of check items so that they might be investigated in detail with regard to the opportunities presented by the interviews and field work.

As there have been several opportunities of user surveys throughout the project period, it has frequently been necessary for us to share the information on the user survey progress and survey results with project members and to manage the check items by adding new items or changing the priorities. In order to improve the efficiency of the information sharing and management of the user survey, we developed a user survey sheet incorporating the elements of the product backlog so that it could be administered in the same way as the product backlog.

Fig. 3 shows an example of a user survey sheet used in the present project. The information entered on the user survey sheet includes the “check item,” “priority” and “survey result.” The entered information may be for example, for the check item of “differences between inspections done by 1 person and those done by 2 persons,” the priority is “High” and the survey result is “Routine inspection is done by 1 person and periodic inspection done by 2 persons.” By assigning the priority and clarifying the progress/result for each task called the check item, the user survey sheet can be administered in the same way as a product backlog, making it possible to increase its similarity to the Agile Software Development.

The effects reported as a result of the use of the user survey sheet included, “while the priority varies following the progress of the project, it was possible to perform interviews always regarding the item with the highest priority,” “I could reduce the labor for preparing the second and later hearings,” “I noticed there were check items for which hearing were not done,” “it was possible to share hearing results efficiently with project members” and so on.

### 3.3 Prioritization by Going Back to the Persona in Each Sprint Review

To clarify the requests from the field, we analyzed the issues by focusing on the actual status of jobs, inventive attempts made by field workers and issues arising from the interviews

and field work. After clarifying the essential requirements, the next step is to fulfill requirements via design and implementation of the application. However, developers who were not accustomed to the user’s viewpoint often misunderstood the concept of implementing user requirements and tended to make proposals from the developer’s viewpoint such as by advocating ease of implementation. Therefore, to raise the awareness of the project members, we promoted the prioritization of tasks by going back to the Persona in each sprint review.

Whenever there was an addition or change of requirement or collision of opinions in the spring review, the system engineer specialized in the UX (UX engineer) explained the priority of tasks by returning to his or her Persona. For instance, during a study of the two display switching patterns of “switching by left-right flicking” and “switching by menu selection,” the developer asked, “can the switching by left-right flicking be omitted when there is a switching by menu selection?” The UX engineer requested the developer to recognize the necessity of both patterns, using an explanation that referred to both kinds of user. He advised “experienced users prefer a smaller number of operations so that they prefer switching based on left/right flicking, but novices like easy-to-understand operations so they prefer the switching by menu selection.”

As seen above, the importance of Persona prioritization can enable members to acquire an awareness of user requirements. Especially, towards the middle or later stages of the project, the developer becomes capable through experience of proposing ideas from the user’s viewpoint for resolving implementation issues, thereby accelerating the implementation of user requirements.

## 4. Conclusion

In the above, we introduced Agile Software Development procedures in support of HCD with the aim of improving UX. In the future, we undertake further research into techniques for improving UX at the development stage, and also prepare the foundations of innovative UX improvement projects by establishing an optimum strategy, development processes and techniques based on elementary research. We intend to undertake these proposals so that all of our customers may enjoy rich, useful and pleasing experiences when using the SI/software of the NEC Group.

Check item classification	Check item	Priority	Result
• Confirmation of classification by job, user, work environment, etc.	• Information to be confirmed	• High, Middle or Low	• Results of hearing
No. 大分類	小分類	確認事項	優先順位
1.業務効率化	業務	業務効率化の促進	高
2.業務効率化	業務	業務効率化の促進	中
3.業務効率化	業務	業務効率化の促進	低
4.業務効率化	業務	業務効率化の促進	高
5.業務効率化	業務	業務効率化の促進	中
6.業務効率化	業務	業務効率化の促進	低
7.業務効率化	業務	業務効率化の促進	高
8.業務効率化	業務	業務効率化の促進	中
9.業務効率化	業務	業務効率化の促進	低
10.業務効率化	業務	業務効率化の促進	高
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12.業務効率化	業務	業務効率化の促進	低
13.業務効率化	業務	業務効率化の促進	高
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15.業務効率化	業務	業務効率化の促進	低
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18.業務効率化	業務	業務効率化の促進	低
19.業務効率化	業務	業務効率化の促進	高
20.業務効率化	業務	業務効率化の促進	中
21.業務効率化	業務	業務効率化の促進	低
22.業務効率化	業務	業務効率化の促進	高
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24.業務効率化	業務	業務効率化の促進	低
25.業務効率化	業務	業務効率化の促進	高
26.業務効率化	業務	業務効率化の促進	中
27.業務効率化	業務	業務効率化の促進	低
28.業務効率化	業務	業務効率化の促進	高
29.業務効率化	業務	業務効率化の促進	中
30.業務効率化	業務	業務効率化の促進	低
31.業務効率化	業務	業務効率化の促進	高
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65.業務効率化	業務	業務効率化の促進	中
66.業務効率化	業務	業務効率化の促進	低
67.業務効率化	業務	業務効率化の促進	高
68.業務効率化	業務	業務効率化の促進	中
69.業務効率化	業務	業務効率化の促進	低
70.業務効率化	業務	業務効率化の促進	高
71.業務効率化	業務	業務効率化の促進	中
72.業務効率化	業務	業務効率化の促進	低
73.業務効率化	業務	業務効率化の促進	高
74.業務効率化	業務	業務効率化の促進	中
75.業務効率化	業務	業務効率化の促進	低
76.業務効率化	業務	業務効率化の促進	高
77.業務効率化	業務	業務効率化の促進	中
78.業務効率化	業務	業務効率化の促進	低
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81.業務効率化	業務	業務効率化の促進	低
82.業務効率化	業務	業務効率化の促進	高
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84.業務効率化	業務	業務効率化の促進	低
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86.業務効率化	業務	業務効率化の促進	中
87.業務効率化	業務	業務効率化の促進	低
88.業務効率化	業務	業務効率化の促進	高
89.業務効率化	業務	業務効率化の促進	中
90.業務効率化	業務	業務効率化の促進	低
91.業務効率化	業務	業務効率化の促進	高
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93.業務効率化	業務	業務効率化の促進	低
94.業務効率化	業務	業務効率化の促進	高
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96.業務効率化	業務	業務効率化の促進	低
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98.業務効率化	業務	業務効率化の促進	中
99.業務効率化	業務	業務効率化の促進	低
100.業務効率化	業務	業務効率化の促進	高

Fig. 3 Example of a product backlog format user survey sheet.

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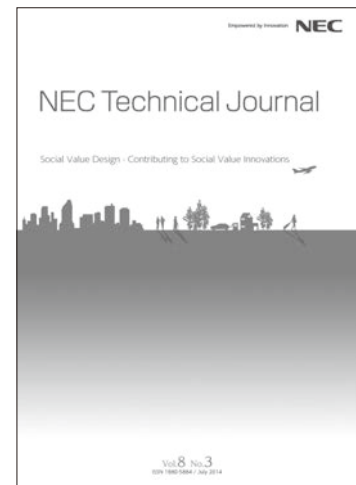
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