Collaborative User Experience Design Methods for Enterprise System

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Abstract. The importance of user experience (UX) design has increased in enterprise field. In traditional product and service development, a division of labor between UX designers and engineers was necessary. It is, however, difficult to pursue the same development style in the enterprise field. Therefore, in this study, collaborative UX design Methods for Enterprise System between UX designers and engineers were proposed. These Methods were designed to allow UX designers and engineers to supplement each other's knowledge and experience. The first Method was UX Observation Tour, a behavioral observation method used to understand the psychological and/or physical characteristics as well as behavior patterns of target users. In this Method, UX designers and engineers shared user research experience through field work. The second Method was UX Idea Mapping. This was a method for establishing associations between the needs of target users and unique ideas that UX designers and engineers, who achieved a detailed understanding of the target users, developed together based on their expertise in systems. In this study, these two methods were applied to internal projects, and as a result, both Methods effectively promoted collaborative development of UX designs by the UX designers and engineers.

Keywords: User Experience, UX design, UX Method and UCD.

1 Introduction

UX design is effective in improving the value of the user experience, and its effectiveness has been proven in development of mobiles phones, computers, computer applications, and consumer products and services such as SNS and EC sites where the attractiveness of products directly influences their sales or market valuation.

In recent years, UX design has been used for developing consumer products and services. Its importance has also been increasing in the enterprise field.

In order to introduce UX designs into consumer product and service development, UX designers and engineers usually divide tasks. The division of tasks in each

development process allows the designers and engineers to take advantage of their expertise and effectively develop the target product or service (here, UX designers refers to those who have expertise in UX such as information architects, interaction designers, human researchers, and UX consultants, and engineers refers to those who have knowledge of technical and business in the enterprise systems fields such as product planners and developers).

As the importance of incorporating UX design into enterprise systems increases, it is important to establish an UX design methods for system development. However, in the enterprise field development, the nature of products and services as well as the knowledge required of engineers may differ from what would be required in consumer product and service development. In this case, UX development methods used in consumer product and service development cannot be applied to enterprise system development as they are. We have therefore proposed UX design methods that could be applied to enterprise system development.

In this paper, Chapter 2 describes the issues involved in applying traditional development styles to enterprise system development, Chapter 3 describes UX Observation Tour and UX Idea Mapping, which are the two proposed collaborative UX design Methods in enterprise system development, and Chapter 4 describes the results and effects of applying these Methods.

2 Issues

2.1 Traditional UX Design

A UX design is generally implemented through the flow of: '1.user research', '2.idea generation' and then '3.product or service design and development' (Fig.1).

The objective of user research is to obtain basic information for product or service ideas that would improve user experience. For this, it is necessary to collect user comments and behavioral data as objectively as possible in order to analyze and evaluate the psychology, environment, habits, and value concepts that exist in the backgrounds of these comments and behavior.

The objective of idea generation is to create ideas that would improve user experience and incorporate them in product and service development. The ideas must be created based on a good and detailed understanding of the psychological and/or physical characteristics, behavior, and environment of target users obtained through the analysis and evaluation phase of user research.

In the field of consumer product and service development, UX designers conduct the user research, and either UX designers or engineers are in charge of idea generation. An appropriate division of the company is appointed to carry out each process to adopt UX design methods efficiently and successfully.
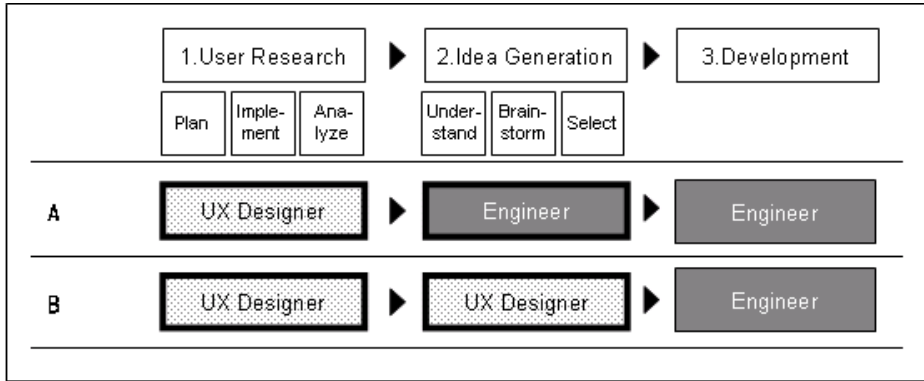
Fig. 1. UX design flow

2.2   Issues of Traditional UX Design in Field of Enterprise System

Although the traditional user research and idea generation methods described above have been proven successful in the field of consumer product development, they lead to the following 3 issues in the field of enterprise system development:

1. Unlike in the case of consumer product development, UX designers alone cannot implement user research in the field of enterprise system development. In a user research, it is necessary to create a research scenario. In the field of enterprise system development, which user types, tasks, or conditions are selected for the research depends on business tasks such as monitoring, and data input or making settings relies on skills. Therefore, selection of types of behavior and tasks depends on the tasks and skills required in a certain specialized field. Therefore, it is impossible for UX designers to fully understand the tasks and skills required to establish a research plan. In the implementation phase, it is necessary to collect user comments and information on their behavior by means of interviews, observation, and facilitation. However, UX experts, or UX designers, have limited understanding of user behavior expected by engineers. Therefore, they cannot observe users or obtain their comments completely. This means that UX experts alone cannot implement user research for enterprise system development. They cannot implement the analysis and evaluation phase of the research alone for the same reason.
2. Unlike in the case of consumer product development, engineers alone cannot implement idea generation in the field of enterprise system development. it is difficult for engineers alone to fully achieve a detailed understanding of users. The first step of the idea generation phase is to group users with similar behavioral patterns into user groups based on the behavioral patterns identified in the work model analysis described above. These behavior patterns are based on users' business tasks and skills. In the field of consumer products and service, engineers can develop ideas by themselves, because user behavior is simple.   In the field of enterprise system development, user behavior is often triggered by individual reasons such as tasks,

work hours, and work environment. Therefore, it is necessary to examine in detail the causal relationships. Although engineers have knowledge of the business tasks and skills of users as the background of their behavior, it is difficult for them to master how to organize the obtained information from the user perspective. There is another reason why engineers alone cannot brainstorm and select ideas in the field of enterprise system development. In this field, advanced technologies are often used. If engineers alone discuss and generate ideas, they are likely to lack the value-perspective of the users and will generate technical potential-oriented ideas.

3. Unlike in the case of consumer product development, UX designers alone cannot implement idea generation in the field of enterprise system development. In this field, user behavior often relies on specialized tasks and skills. Therefore, UX designers who have no special business or technical knowledge in the field cannot achieve a detailed understanding of users, brainstorm ideas, or select ideas.

3   Proposal Methods

Designing of UX in the field of enterprise system development requires UX designers and engineers to supplement each other's knowledge in '1.user research' and '2.idea generation' phases. In this study, two collaborative UX design Methods were proposed for UX designers and engineers.

UX Observation Tour. UX Observation Tour is a behavioral observation method of user research. In this Method, UX designers and engineers engage in brainstorming ideas [1] and field work to share their common views and experience of implementing a user research. This enables the engineers who are unfamiliar with user research methods to work with the UX designers and to obtain data on users' behavior and their psychological and/or physical characteristics. UX Observation Tour has been designed to focus on the planning and implementation phases of a user research. Analysis and discussion are carried out in UX Idea Mapping described below. It is important that engineers implement user research at the actual research site.

UX Idea Mapping. In UX Idea Mapping, engineers and UX designers work together to analyze and discuss obtained user research data to achieve a detailed understanding of users, associate user needs with unique ideas developed based on their expertise in systems, and select suitable ideas for a system using a UX map.

3.1   UX Observation Tour

Planning. The first step in this Method is brainstorming ideas for a 'tour' plan that will allow the UX designers and the engineers to work together and supplement each other's knowledge and experience. Note that brainstorming ideas also serves as a rehearsal for the collaborative work to be carried out by the UX designers and

engineers later in the process. The UX designers and engineers select a theme for the UX experience in advance, and discuss and share information about themes 1 and 2 below:

Theme 1: Project goal: Ideas are brainstormed for a top-down assigned project goal, project success, expected effects, desirable direction, background, and issues. Then, the ideas are shared among the members.

Theme 2: Research subjects: The following items about the research subject are discussed: type of system, role of the system, preceding events, and competing systems and/or services. In general, in the field of enterprise system development, engineers are able to select prospective research participants based on their expertise in specific business tasks and skills. It is, however, difficult for those who have no UX knowledge to come up with preceding events or competing systems and/or services because these events or systems and/or services must have value that is equal to that to be provided to users. Here are some examples of events listed by UX designers that have equal value, 1) Events with a similar business task requiring selection of an appropriate product in accordance with given conditions such as 'customer service desk for insurance products' and 'cosmetic product counter', 2) Events with a similar mission requiring a device to endure long hours of operation such as 'monitoring system in a flight control room' and 'game arcade', 3)Events with a similar desired attitude in customer interactions to achieve customer satisfaction such as 'store support system' and 'hotel concierge'.

For this reason, the UX designers are in charge of listing the subject events and providing ideas on research subjects based on engineer comments. The UX designers then request feedback from the engineers.

The results of discussions of theme 1 and 2 above are then put together into a research plan. The research plan must include information on the research subjects and schedule such as subjects and observation points at each observation site, Time table, information on observation sites and where to meet, important points of the research. Also, it should include the following information so that the engineers who are not familiar with user research   can check it during the research.

Implementation. The UX designers and engineers participate in the user research as UX Observation Tour. As described above, this research requires engineers to fully understand the user needs and generate ideas for a system. For this reason, it is desirable to invite engineers with as many attributes as possible, such as different specializations or roles, to the research group. The duration of the tour should be shorter than half a day in consideration of the busy schedule of engineers. Note that the research should focus more on the number of observation points than duration. Here is a example of the schedule for a half-a-day tour: 30 minutes: orientation / 2 to 4 hours: research / 60 minutes: review.

The research members repeat the cycle of conducting the research for 15 to 20 minutes and sharing the research results within the team for the next 10 minutes.

Opinion exchanges will allow discovery of new perspectives, and information sharing will clarify the details to be recorded. Each team consists of up to six members. Note, however, a team can be reduced to the size of two or three members if needed because a smaller number of individuals might be better suited to discussions and less likely to pressure or discomfort the research subjects. Note that each team should include at least one UX designer to check how the engineers conduct the observations and to share the check result with the team members. Each member carries the research plan and checks it before entering an observation site. It should be understood that it may be difficult for engineers to conduct the research as planned because they are not used to conducting observations. For this reason, UX designers must check how engineers are conducting observations. They must give advice to the engineers if any of the following applies in order to encourage the engineers to conduct the research autonomously.

Here are some examples of cases in which the UX designer should give advice to the engineer :

— The engineer does not have a general understanding of the subjects or the individuals who have business relationships with the subjects. Example advice: "Keep a record of people who talked with your research subjects and also the individuals who were near them."
— The engineer focuses only on the product and service provider perspective or on the user perspective. Example advice: "Fill in the observation sheet for both of the perspectives."
— The engineer focuses only on objects such as work environment, including interior, or a work tool, and it is therefore necessary to guide him or her to focus on how a person interacts with another person or an object. Example advice: "What is the user doing? Why is he or she doing it?"
— It is necessary to guide the engineer to establish a hypothesis on the psychological and/or environmental background for the user's behavior during the observation.
— The engineer acts like a spectator or a critic, and it is therefore necessary to show him or her how to act like the users. Example advice: "Ask a question as if you were a user, 'What would you do if you were a user like XXX?'"

Preparation of Analysis and Evaluation. After the research is completed, a 60 minute review session is held so that the members will not forget the research results. This session also serves as a preparation for the analysis and evaluation to be conducted in UX Idea Mapping. The members then put all the facts observed, estimated backgrounds of the behavior, and findings during the research on an observation summary sheet (Fig. 2). An observation summary sheet is provided for each observation site or scene, and the members are expected to spend at least 15 minutes filling in each sheet. On each sheet, information must be provided in the following order: Each information item should be written on a sticky note for later use in UX Idea Mapping. The members then affix the photos and memos that they took to each observation summary sheet. It is important that these sheets contain as much information as possible for the later task: understanding users in detail.
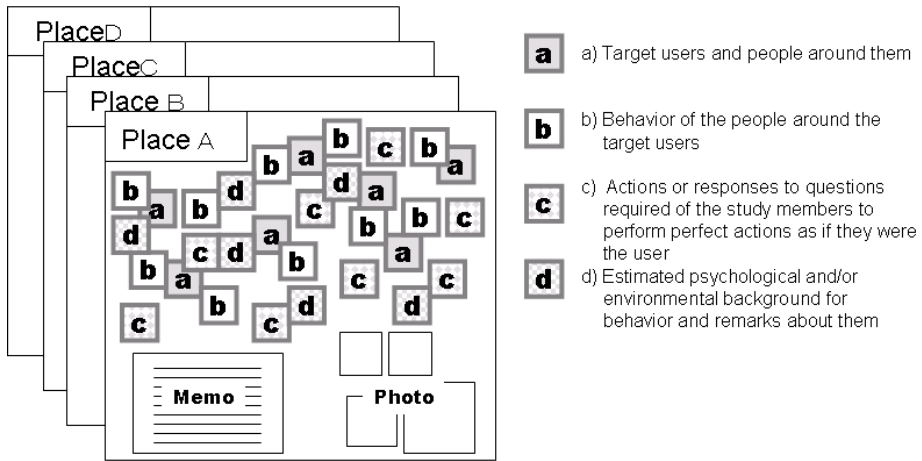
Fig. 2. Observation summary sheet

3.2 UX Idea Mapping

In UX Idea Mapping, engineers and UX designers work together to analyze and eva-luate the obtained research data to achieve a detailed understanding of users, associate user needs with unique ideas developed based on their expertise in systems, and select suitable ideas using a UX map.

In collaborative work, visualization and sharing of research details are important. Therefore, teams of 5 to 6 members are created for effective and efficient discussions. The members implement UX Idea Mapping using a large map by sharing the analysis and evaluation results, detailed understanding of the users, and information on the selected ideas.

Analysis and Evaluation of the Research Results. Referring to the observation summary sheets (Fig2), the background of the user behavior is modeled. Work model analysis [2] is then conducted to find potential user needs. Also, both the research subjects and individuals who have business relationships with the subjects are ana-lyzed for each observation site. Engineers tend to focus on individuals who regularly use systems, but in this process, they must consider the value and business significance of a system for those who have business relationships with the subjects. To achieve this, UX designers must pay attention to the individuals around the users who have business relationships with the users so that no information about them is missed.

Understanding the Users in Detail. Based on the behavioral patterns identified in the work model analysis described above, users are classified into user groups accord-ing to the types of behavior patterns. For each user group, behavioral goals, higher needs, and the highest needs are examined. The members then create essential value identification sheets containing data on each user group's ideal and required state. The sheets are shared among the members. During this process, the engineers must review

their research results to carefully examine what the users want from their business operations and why they feel so. Meanwhile, during this collaborative work, the UX designers must check whether or not the engineers have properly incorporated their research results into the examination and have gained an insight into the nature of the research.

The next step is to create a persona sheet [3] for the target user groups based on the results of work model analysis and the data in the essential value identification sheets. On the persona sheet, an image of a hypothetical user is created based on the results of UX Observation Tour. Each sheet must contain not only the users' names, ages, careers, and preferences but also their 'user characteristics', which include the users' final goals and their roles when using a product and service. The sheet must also provide the task and skill characteristics of the users, which describe what greatly influences user behavior in terms of their business tasks and skills. Note that the task and skill characteristics are merged from artifacts created during the work, influencers and the extent and level of their influence, and physical environment and tools that were examined in work model analysis.

In this Method, all processes and specific ideas are visualized and shared on the UX map. For this, a Then UX map framework must first be created (Fig.3). The vertical axis is the user axis, and the horizontal axis is the time axis. The user axis is divided according to combinations of user characteristics and business characteristics and technical potential described in the persona sheet. In the field of consumer product development, a user scenario could only be created by using the user axis. In the field of enterprise system development, however, it is difficult to understand user behavior based only on the user characteristics, because user behavior relies heavily on tasks and skills. For this reason, task and skill characteristics must also be considered. The time axis must be divided into three or four levels indicating steps to reach the goal. Here, the rightmost column is for the highest user needs, which indicates the ideal situation that the users aspire to, as identified from the essential value identification sheet.

Engineers usually find it difficult to divide the axes when creating a UX map framework. If the divisions are rough and inappropriate, user scenarios and ideas cannot be properly mapped. Therefore, this process requires the experience of UX designers. They must work closely with engineers because dividing the user axis needs an engineer's knowledge on business tasks and skills.

Once the framework is completed, a user scenario is created and shared among the UX designers and engineers. 'Needs' shown in the essential value identification sheet are mapped onto appropriate locations with respect to the user and time axes of the framework. Then, referring to the observation summary sheet (Fig.2), the following items are mapped as the 'Fact': a) target users and people around them, b) behavior of the people around the target users, c) tasks worked on, responses to questions, and situations in which the questions are asked, and d) estimated psychological and/or environmental background for behavior and remarks about it. The user scenario creation process up to this point can be systematically and quickly carried out by engineers because they can use the information that they developed. This process does not require as much time for engineers compared to a process in which they are required

to write a user scenario in sentences. At this point, all team members review the behavior of individual users to avoid missing information or mistakes. When doing so, they should have the persona sheet at hand so that they can read it while reviewing the characteristics or values of individual user groups. Finally, the needs and the current state are compared, discrepancies between them are examined, and 'Issues' to be resolved are mapped. (Fig.3)
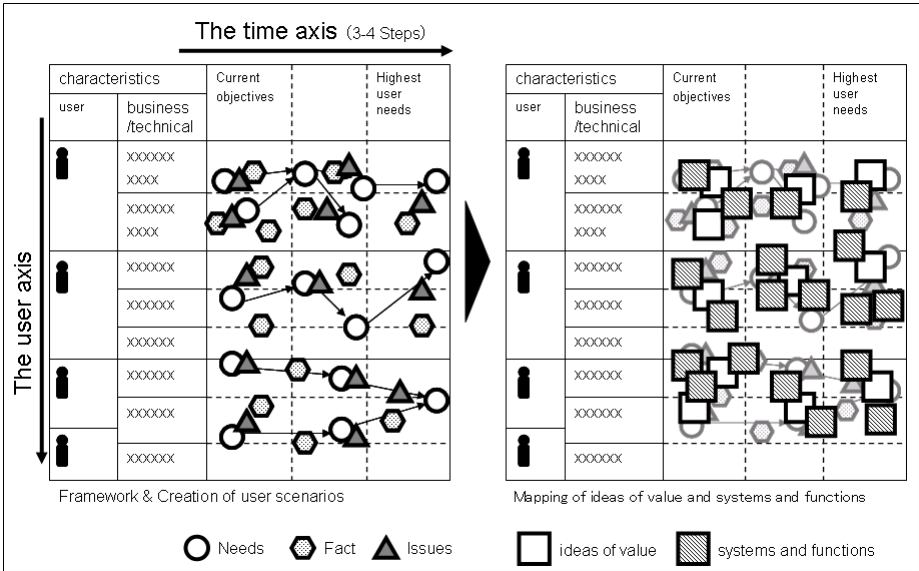

Fig. 3. UX map: Creation of Framework and user scenario / Mapping Ideas

Brainstorming Ideas. Focusing on the needs, current state, and issues for the target users, the members brainstorm for value that a system can provide. Since engineers tend to provide ideas on specific functions or systems, UX designers must guide them to talk about value. Here are some examples of ideas about value. "A user who is XXX becomes able to do YYY.", A user who wants to do YYY becomes able to prevent or reject XXX.". After value is discussed, the members brainstorm ideas for systems and functions that can realize the value. These ideas of value, systems and functions are mapped to user scenarios. An idea assessment sheet is created to assess and select ideas based on value for the users and for the company.

4   Result and Effect

The proposed collaborative Methods were applied to the following enterprise system development projects, agent system for carriers, conference system for executives, door-to-door insurance sales system, store visitor service system, projector for business use and broadcasting system.

Application of the collaborative Method to the projects listed above resulted in the following effects:

1. Effect of applying UX Observation Tour to the user research phase
In UX Observation Tour, the UX designers and engineers were able to jointly create a user research plan, and the research enabled sufficient information to be collected for the engineers to achieve a detailed understanding of the users. Application of this Method indicated that the UX designers and engineers worked together to examine the task- and skill-dependent behavior of the hypothetical user (subject of the research) and observation points, create the research plan, and appropriately implement the user research.

2. Effect of Applying UX Idea Mapping to the idea generation phase
In the post-project interviews, the engineers stated that they learned to think from the perspective of a selected type of user in their daily work. Therefore, participating in even only one project allowed the engineers to understand the users in detail.

Before participating in the project, the engineers were unable to determine the quality of their own ideas. By associating value that can be provided to the users with ideas about systems and functions, the engineers became able to examine the value of ideas for the users such as "this idea may suit this scene that a user may encounter". Also the engineers improve the specificity and accuracy of ideas in early stages due to an enhanced ability to assess from many perspectives their ideas developed for a particular type of user. And they improve the value of their own ideas.

5   Conclusion

In this paper, two UX research methods, UX Observation Tour and UX Idea Mapping, for enterprise system development were applied to internal projects. As a result, the UX designers and engineers jointly designed UX, and both of the methods were effective in promoting understanding of users and development of ideas. Both methods required all members to stay in a project from the beginning to end. This meant that we needed to call our engineers to all the meetings. As a result, for some of our projects, we could not apply the same methods. Many engineers could not help cancelling meeting attendance due to work pressures. Therefore, exploring more efficient ways to share and deliver information should be addressed.

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