

Understanding User Experience and Artifact Development through Qualitative Investigation: Ethnographic Approach for Human-Centered Design

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Abstract. In this paper, we introduce a method for utilizing qualitative investigation in the development of artifacts. In particular, we discuss ethnography principles that developers and designers need to learn in order to improve artifact quality and user experience in accordance with the principles of human-centered design (HCD). The objective of ethnographic interview in the development of artifacts is to understand users in their real environment and to build personas and scenarios based on this understanding. This objective applies to the first two steps in the HCD process, which are “Understand and specify the context of use” and “Specify the user requirements.” Furthermore, the investigative process of ethnographic research for development is outlined. While it is difficult to understand users through objective observation alone, and the fact that the knowledge that comes from interaction is also vital, the application of contextual inquiry through ethnography is a valuable tool for efficient understanding of the user in a short timeframe and with a limited number of observations.

Keywords: user experience, contextual inquiry, human-centered design, ethnographic interview, context of use.

1 Introduction

Recently, user experience (UX) has been regarded as an important aspect of the development of artifacts such as products, systems, or services. Previously, only practical qualities, such as performance and functionality, were sought after while using an artifact. However, recently perceptive user qualities, such as satisfaction, impression (wow factor) and joy, have been emphasized. Diller and his colleagues have stated that, as society matures, artifacts would increasingly be used to satisfy a user’s sense of fulfillment or aesthetic interest. Thus, the individual association each user makes with an artifact has become important [1]. When using an artifact, users would comprehensively judge the importance that the artifact has in terms of what type of emotions it evokes, such as curiosity and the feeling of fulfillment. Therefore, it is necessary to collect UX information through user-centered qualitative

investigations and then develop the artifact taking its relationship with users into account. In this paper, we introduce a method for utilizing qualitative investigation in the development of an artifact. In particular, we discuss the principles of ethnography that developers and designers should learn in order to improve artifact quality and UX in accordance with the principles of human-centered design (HCD).

2 HCD Process

Perceptive quality has become an increasingly important parameter, and the focus of artifact development has shifted toward UX. The importance of understanding UX was included among the changes when ISO 13407:1999 was modified; part 210 of ISO 9241-210:2010 focused on HCD for interactive systems. In the modified ISO 9241-210, UX is defined as the user's perception and response during the use of an artifact, and "To achieve a good UX" is the goal of this HCD approach [2] [3]. By this definition, UX should include physical and psychological reactions and attitudes on the basis of the user's perceptions, emotions, and tastes before/during/after use. It is thought that UX will be also affected by the user's physical and psychological state and capability, which is related to the artifact's brand image, design, function, operability, effectiveness, or usage support, and UX.

Figure 1 shows the configuration of HCD's activity process as determined by ISO 9241-210, which explains the artifact design process. In this HCD process, "Plan a HCD process" is the starting point and "Designed solution meets user requirements" is the destination. The four steps between the starting point and the destination are crucial for the entire HCD process. The initial step, "Understand and specify the context of use," involves clarifying each user's characteristics, usage environment, and usage status through user investigations. The user investigation conducted in this stage includes questionnaires, group interviews, and onsite interviews or observations. Table 1 summarizes the various characteristics of these investigation methods. The purpose of the next step, "Specify the user requirements," is to establish an artifact design process that is in accordance with the user requirements determined by the investigation results conducted in the previous step. The "Persona Method" and "Scenario Method" are often used in this step. In the next step, "Produce design solutions to meet user requirements," the device or system is specifically designed using the "Rapid-prototyping Method" or "Paper-prototyping Method." In the last step, "Evaluate the designs against requirements," usability testing, and heuristic evaluation are conducted. Depending on the feedback from the "evaluation," each step could be iterated.

The most important HCD process step to improve UX with the artifact is "Understand and specify the context of use," in which each user's lifestyle and work situation must be captured. For this step, it would be appropriate to conduct a qualitative investigation through contextual inquiry [4], in which users are observed and, if necessary, thoroughly questioned about their everyday situations and behaviors. We will cover the details of this method in the section that discusses ethnographic research.

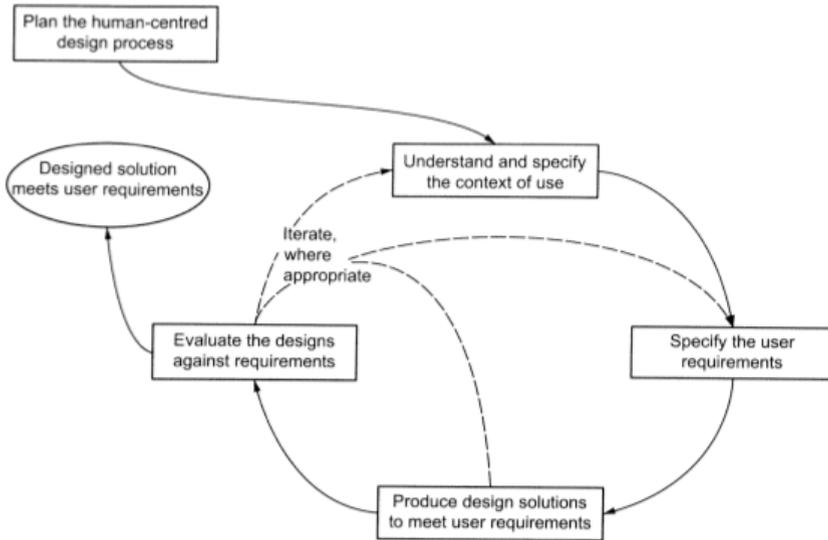


Fig. 1. HCD process (ISO 9241-210)

Table 1. Investigation methods and characteristics

Investigation method and characteristics	Interview		Observation		Paper questionnaire
	Unstructured interview	Structured interview	Unsystematic observation	Systematic observation	
Type of data	Linguistic data	Linguistic data	Visual data	Visual data	Linguistic data
Contents of data	Subjective	Subjective	Objective	Objective	Subjective
Linguistic skill required for targets	Capable of conversation	Capable of conversation	N/A	N/A	Capable of reading
Sample size	Small	Large	Small	Small	Large
Method to extract samples	Intentional sampling	Random selection	Intentional sampling	Random selection	Random selection
Necessity of mutual communication	Yes	Yes	Yes	No	No
Impact by investigators (answers, skills)	Large	Large	Large	Large	Small
Time required	Relatively long	Relatively long	Long	Long	Short
Privacy protection for targets	Privacy measures Required	Privacy measures required	Privacy measures required	Privacy measures required	Privacy can be easily be protected

3 Qualitative and Quantitative Investigation

User investigation is divided into quantitative and qualitative methods. The quantitative method is represented by experimental design, which seeks to elucidate universal characteristics or trends by focusing on a specific aspect on the basis of numerous case studies. The qualitative method, represented by interviews or case studies, aims to gather a comprehensive understanding of an individual user from multiple aspects on the basis of a limited number of case studies. Each of the investigative methods has a different purpose. The purpose of the quantitative method is to construct a generic principle that explains a phenomenon in a certain situation in order to extrapolate the possible consequences of several different situations. On the other hand, the purpose of the qualitative method is to grasp how each individual is trying to comprehend the reality of a certain situation and to interact with it from a subjective standpoint. Historically, there is antagonism between these investigation methods. Where quantitative investigation is the norm, qualitative investigation is often not accepted, and its validity and reliability has frequently been questioned.

The validity of qualitative investigation can be divided into internal and external validity. External validity is often questioned. Internal validity evaluates whether the relationship between the two variables defined in a hypothesis is being appropriately measured. Thus, internal validity corresponds to the credibility of the qualitative investigation. In other words, the focal point of internal validity is not only to discover the truth but also to determine whether the target of study is correctly reflected in the investigation results. External validity means determining whether the components of a hypothesis can be applied to other situations. In qualitative investigation, external validity corresponds to transferability. However, because the purpose of a qualitative investigation is not to conduct a hypothetical evaluation but to understand the target of the study and produce a hypothesis, it cannot be generalized in the same way as a quantitative investigation. Ohtani argues, “With the qualitative investigation, there is no formulated proceeding for data analysis, which is as comprehensive and generic as the statistical method for the quantitative investigation” [5]. In quantitative investigation, the targets of study are randomly chosen, and statistical analysis is used to evaluate the hypothesis. However, in qualitative investigation, it does not make sense to use statistical analysis because intentional sampling is adopted. Furthermore, the Grounded Theory Approach (GTA) emphasizes the necessity of grasping external validity through triangulation and improving the validity of the study using the triangulation method based on multiple people data [6].

Furthermore, reliability corresponds to stability, consistency, predictability, and accuracy of the quantitative investigation, which in turn corresponds to the dependability of the qualitative investigation. However, this dependability can be lost over time and is also vulnerable to the fatigue or stress of the participants and researchers. With quantitative investigation, reliability can be damaged by changes in investigation or study methods during the study. However, with a qualitative investigation, such changes are natural, and are even considered helpful in improving the accuracy of the investigation.

Table 2. Investigation methods and characteristics

Investigation Method	Pros	Cons
Quantitative Investigation	<ul style="list-style-type: none"> • Many samples can be handled due to ease of quantification. • Easy to analyze the data due to ease of numeric conversion. • Enables statistical assumption. • Replication study is possible due to its repeatability. 	<ul style="list-style-type: none"> • Its standardization feature makes it hard to capture details. • Complicated interrelationship is hard to be understood. • Hard to understand the entire aspect. • Only static phenomena at a certain point can be handled.
Qualitative Investigation	<ul style="list-style-type: none"> • Enables a comprehensive understanding. • Investigation can be deeply pursued on each item. • Situation variance can be captured. 	<ul style="list-style-type: none"> • Hard to generalize. • Re-examination is not possible.

The argument over quantitative and qualitative investigation methods intensified during the 1990s but settled considerably by the end of the 1990s. The theory behind this resolution was that, because each method had pros and cons, both should be used in a single study. This combined quantitative and qualitative investigation is called “Mixed Method Research.” Using Mixed Method, it is possible to systematically combine the advantages of both methods. In other words, it becomes possible to depict the study targets more realistically. When Mixed Methods Research is conducted, it is important to specify a study design that explains how to combine both methods. By specifying the study design, a shot-in-the-dark type of “inappropriate study report” can be avoided [7]. Furthermore, when the processes of data collection and analysis are taken into consideration, the basics of both methods must be accommodated. For example, when a paper questionnaire is conducted with the same set of individuals after a participant observation study, a parametric evaluation method cannot be used to analyze the questionnaire results unless those questioned were randomly chosen from the participants of the observation study. In general, in a qualitative investigation, the study targets are often intentionally selected for observation. When a quantitative investigation is then conducted with the same targets, it is important to remember that only a nonparametric evaluation method can be used to analyze the results.

As mentioned above, when an artifact is being used or developed, its practical qualities tend to be the central focus. In contrast to the qualitative method, the quantitative investigation method involves user investigations or usability tests to count the number of errors during use or to measure the time required to achieve a goal, because the focus is on practical improvements by generalizing user requirements for the usage of artifacts. However, once the HCD process was generalized, investigators began to understand that examination of the actual usage environment would be more useful. In addition, as the demand for improved perceptive qualities and UX increased, qualitative investigation was deemed to be more appropriate, and consequently there has been increased interest in an ethnographic method. Understanding users’ goals and requirements in their real living environments and developing artifacts taking these various realities into consideration contributes to the improvement of quality and UX of an artifact. However, from the perspective of a cultural anthropologist, Kimura made the following suggestion [8]:

“The expectation for ethnography from the industrial world seems to be a never satisfied desire. It is because ethnography is grasped as if it was a magical panacea capable of providing new resolutions against the dissatisfaction with the quantitative investigation, which only targets the limited variables mostly based on snapshot data. However, ethnography can never be a panacea. Moreover, since 2000’s, the assumption that the methodology of combining qualitative investigation and quantitative investigation might be the key to develop social science and human science has been increasingly predominant.”

4 Ethnographic Research for Development

Since the early 20th century, ethnography became a focus of attention in the fields of cultural anthropology and sociology, particularly at the Chicago School. Ethnography has been extensively used and is now receiving attention not only in research fields, such as psychology and education, but also in practical areas, such as business and administration. However, there is a significant overlap between ethnography and fieldwork. Ethnography presents a methodology for understanding a “site,” whereas fieldwork is positioned as a step within the research process in which the actual site is visited and investigations are conducted. While ethnography is one of the methodologies included within the field of qualitative research, it is unique within that field because it has a low level of standardization and a high degree of freedom in detailing specific phenomena and their context, and in combining individual cases with theoretical considerations.

Now, we would like to introduce a contextual inquiry through ethnographic approach for HCD, which you might have recently heard of quite often. Ethnography is defined as a description or a report (monograph) of a particular culture. Ethnography is characterized by a long-term relationship in a natural setting, where the researchers actually live in a society and write a report based on their onsite observations and investigations. The essential condition for observing and describing a culture is that the target individuals must be in their “natural situation,” and a long-term relationship is required for accurate observation.

Ethnographic research for HCD is completely different from ethnography as it is applied to cultural anthropology. The word “ethnography” gave rise to the expectation of a “magical panacea,” as Kimura put it. The contextual inquiry through ethnographic interview might sound like a new investigative method; however, in most cases it is an onsite investigation through contextual inquiry, in which users’ actual living situations and behaviors are observed and questioned. While it is difficult to understand users through objective observation alone, and the knowledge that comes from interaction is also vital, the application of contextual inquiry through ethnographic interview is a valuable tool to acquire an effective understanding of users in a short time with a limited number of observations.

The objective of ethnographic research in the development of artifacts is to understand users in their real environments and to build personas and scenarios based on this understanding. This objective applies to the first two steps in the HCD process

(Fig. 1), which are “Understand and specify the context of use” and “Specify the user requirements.” The investigative process of contextual inquiry through ethnographic research is discussed in the following sections.

4.1 Selection of Investigation Targets

Investigators select the targets for a group interview after conducting a quantitative study, such as an online questionnaire, or a mail questionnaire. Target individuals for onsite investigations are determined by group interviews. Conducting both questionnaires and group interviews help select the investigation targets best suited for the effectiveness and objective of the subsequent investigations.

4.2 Onsite Investigation

Individuals involved in the artifact development would visit each target’s home, office, or shop, and observe their field artifact usage or purchase activity artifact. In addition to onsite observations, investigators would also interview the target individuals and their family members, if needed, to collect information that could not be obtained from observation alone. The investigator group should comprise a primary interviewer and one or more secondary interviewers. In addition to asking supplementary questions, the secondary interviewers must also take notes, pictures, or record videos during the interview. The investigator group should conduct a briefing



Fig. 2. Examples of Photo Panels

and debriefing before and after each home visit in order to establish mutual knowledge and understanding. During the debriefing, investigators should create photo panels using notes, pictures, or videos taken during the investigation of each target. The photo panel should include basic information for each target as well as the pictures and brief explanations of memorable scenes or characteristics that accord with the objectives of the investigation.

4.3 Downloading

Onsite investigators share the information obtained from observations and the onsite interview with development colleagues who did not accompany them. When sharing this information, the investigators explain their experience while using the environment by means of storytelling and photo panels.

4.4 Extract Scenes and Insights

After sharing the results of the onsite investigation, there is a general discussion about what the investigation targets said and what happened onsite. From that discussion, the investigators extract usage scenes and insights, and create a visual summary, such as a plan proposal, persona, or scenario.

5 Conclusion

Following this process of conducting onsite ethnographic interview investigations and using the investigation results for the development of an artifact shall lead to an improvement in artifacts and UX. However, if the investigators conduct an onsite investigation and do not have the specialized skills necessary for effective qualitative investigation, the collected data cannot be deemed as completely objective, and this would be problematic. The practical specialized skills necessary to conduct an effective qualitative investigation cannot be obtained solely from academic studies. Therefore, new investigators should necessarily accompany an expert for several onsite investigations to acquire these skills through practical experience.

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