

THREE IN ONE USER STUDY

Turkka Keinonen¹, Vesa Jääskö² and Tuuli Mattelmäki³

¹School of Design and Environment, National University of Singapore, akitkk@nus.edu.sg / School of Design, University of Art and Design Helsinki, tkeino@uiah.fi

²Vesavisio, vesa@vesavisio.com

³School of Design, University of Art and Design Helsinki, tuuli.mattelmaki@uiah.fi

This paper introduces a promising user study approach, Three in One User Study (TO US). The approach is applicable for SME-scale design projects with limited resources and in quest for semi radical innovation. TO US is built on applying a set of studies in parallel, which speeds up and lightens the process. It also follows the logic of problem solving in design practice. In TO US face-to-face contacts with the users are integrated into one designer-user session during which prior produced self-documentation material and early design solutions are the basis for further user centred exploration. TO US combines three different complementary points of view to design: users' own open interpretations, designers' focused observations and intervention to change existing practices. TO US has been applied in a kick-bike design case. The procedure led to essential improvements to the initial concepts and well justified decisions for further design development.

Keywords: Probes, Observation, Prototypes, Design process

I. BACKGROUND

I.1 MAPPING OF USER CENTERED DESIGN METHODS

User centred design can be approached with a wide range of methods from traditional and adapted to innovative as categorized by Hannington (2003). Many of these methods are based on research traditions such as ethnography and market research, and some have their roots in designerly problem solving. In the present user centred design practice it seems that a combination of three categories of methods are widely accepted into use: observation based methods, exploration with prototypes and emerging approaches supporting designers' and users' creativity.

Users' present behaviour in context can be studied with observation-based approaches with their several variations: shadowing, contextual situated interviews, video ethnography, etc. When the design team needs to learn about prevalent practices, problems and issues these approaches provide detailed and deep understanding, and well-documented guidelines for data collection and interpretation are available.

Prototyping either by drawing or creating 3D models is the traditional backbone of design process. It is an essential part of designers' reflective problem solving. Because prototypes are excellent vehicles for facilitating group communication, their importance is also revitalized in recent innovation literature (e.g. Kelley and Littmann 2005, von Stamm 2003). From the point of view of user centred design the role of prototyping varies from design driven prototyping, where the role of the users is limited to testing, via interactive testing as with paper prototypes (e.g. Snyder 2003), where user interface designs are adjusted during the testing sessions, to approaches where essentially more initiative is given to the users like with Make Tools (e.g. Sanders & William 2001). Sometimes the prototype testing phases are organised in real environments and extended over lengthy periods of time to allow people to develop new use innovations and to provide designers information about the domestication process of radical novelties (e.g. Paulos & Jenkins 2005, Hutchinson et al. 2003, Routarinne & Redström 2007).

The development of novel user centred design methods often values and supports both designers' and users' creativity and design thinking. Especially generative methods (Sanders & Williams 2001), experience prototyping (Buchenau & Fulton Suri 2000) and probing (Gaver et al 1999, Mattelmäki 2006) have awakened interest in the design community. One of the newest additions to the toolkit is probing. Probes are based on self-documenting; they aim at reporting users' personal perceptions and contexts; and they have

exploratory character (Mattelmäki 2006, 40). Probing focuses on user experience, subjective interpretations and it trusts on users' initiatives and interpretations. It is a visual design oriented way to approach users and it often puts more emphasis on inspiration than information – though there is a large variety of applications (see Gaver et al. 1999, Mattelmäki 2006).

1.2 CHALLENGES WITH THE EXISTING METHODS

The advocates of user centred design underline that what is spent for getting users involved in time and money in the beginning of design, pays back later with high interests in terms of increased value that the products deliver. User centred approaches are nowadays recommended not only by the method developers but also innovation literature, which approaches design from business point of view. However, applying user centred approaches in consulting practice is not free of challenges.

In spite of the expected high gains and interests, it cannot be denied that conducting user studies takes resources. This is especially true when one of the key principles of user centeredness namely continuous user involvement through the project (Gould & Lewis 1985, ISO 13407) is faithfully followed. In addition to the core research and design activities, practical tasks of arranging the meetings, travelling and recruiting take considerable amount of time. In qualitative user research for design it is crucial that the users are just the right kind of people, because the products are often designed for special markets like narrow niche consumer segments or professional use. Finding them and organising appointment with them may be laborious. Thus, especially in small scale consulting projects the relative proportion of resources needed for involving users may turn out to remarkable, and this if not prevents the user participation, at least sets very high expectations on the amount and applicability of the lessons learned during each single point of contact with the users.

Each method for user centred design has their inherent strengths and limitations: some are suitable for learning, some for elaborating design solutions and some for evaluating them; some approaches address goal oriented action, some contextual impacts, some subjective interpretations, information and inspiration; and some support communication in a design team and the commitment of stakeholders. No single method can cater for all requirements, though some approaches have been developed into processes, contextual design (Holtzblatt et al 2003), video supported design (Ylirisku & Buur 2007) or scenario-based design for instance.

Consequently, several methods are needed to cover process phases and to give broad enough insight. Even though this as such is necessarily not a problem as competent and qualified designers and user researchers are expected to master several methods, it may pose, as above, a practical challenge for conducting a consulting

process. Different methods call for different preparations and arrangements, which may multiply the needed resources.

Much of the development work with new methods, innovative and adapted, has been focused on projects where completely new product concepts have been looked for in academic research settings. On the other extreme there are methods that are suitable for fine-tuning and adjusting design details, such as usability testing. In practice most design projects are somewhere in between these extremes: they have their fixed starting points derived, e.g. from the business strategy of the client company, their previous products and technology platforms the use, but the expectations when applying user centred approaches are higher than just to see minor adjustments. A wrong choice of methods can easily lead to a situation, where the results are perhaps from the research point of view interesting, but their relevance for the design decisions in the current project may remain poor. The results can be either too generic giving contextual understanding, but failing to influence on the design. Too specific focusing only on details may become relevant during the last phases of design – in case the process ever survives that far. If design were like solving well-defined problems, the choice of the methods would be easy on the basis of the recognized information needs. However, design activity unveils new issues and information needs as the work proceeds (e.g. Lawson 2005). Thus, the rather crucial choice of user study approaches has to be done based on fuzzy information, i.e. expectations concerning later information needs. During the user study sessions and later in the interpretation phase, when important issues should be picked from the flow of data, the designer faces a corresponding problem. She needs to decide what to pick to be used later, even though all the questions are not known yet. Our experience suggests that when designers have already explored the design space and alternative solution possibilities they have created a pre-understanding, which helps in activating a designerly attitude and attention towards promising solutions during the user studies (See e.g. Ylirisku and Vaajakallio 2007).

When user centred approaches aim at generating new interpretations instead of collection information from current practices, they become more difficult to conduct. Especially, co-design may work well with collaborative users, but users' not-so-untypical suspicion and narrow focusing on where they feel completely confident leads to mundane results. Thus, having a specific attitude and having been sensitized to particular design foci is as important as the question of choosing a right study method. Everyday people, and also professional designers, need sensitizing to look at current practices with critically constructive eyes. Reflecting today's experiences through specific tools such as probes can make this happen. Sleeswijk Visser et al (2005), for instance, have applied an approach in which users and designers are first sensitized with what they call primes before co-design sessions. Primes make people look at more closely to their current experiences and

routines with given tasks. They become more focused to the design topic and can better prioritize and propose solutions. And once again, this phase adds up to the hour list.

Based on the discussion above, we can recognize some intertwined problems that the design practitioner is faced with in her attempt to apply user-centred methods. First, she needs to optimize the result-resource ratio in organizing sessions with users. Here we assume that she does not want to compromise the quality of subjects recruited, so the optimization focus is on maximizing the learning at each user contact. Second, while in qualitative research projects often any interesting results are welcome, in consulting the practitioner has to choose approaches and later the applicable results so that they cater for the yet-to-be-known knowledge needs of the project. On one hand all the information needs should be covered, but working for excess knowledge cuts the profit margins – consultants or clients. Third, the practitioner should be able to create an atmosphere of creative design contribution without affording lengthy sensitizing and priming sessions with the users. The challenge for the practitioner is to solve these problems and to decide, how to utilize methods so that maximum amount of knowledge that is relevant in the project context can be generated, and so that user and designer innovation can be stimulated within the given design space.

2. OBJECTIVES AND APPROACH

The objective of this paper is to present a design process innovation, Three in One User Study, TO US, aiming at solving the above mentioned problems. More specifically the process aims at optimizing 1) the **efficiency** of user research by maximizing the learning at one point of contact with a user, 2) **focus** on project relevant information by combining complementary approaches, and 3) ensuring the **relevance and creativity** during appointments with users by priming the users and designers to the given design space.

By contributing to solving these problems TO US is assumed to be particularly suitable for projects with limited resources when aiming to semi radical innovation in typical small and medium size enterprise (SME) scale product development projects. TO US does not introduce new methods to the existing versatile palette, but explores an alternative way to combine existing core approaches.

Methodologically the paper is based on a study dealing with the design of a kick-bike concept (Jääskö and Keinonen 2006). The case was planned and conducted by an industrial designers having experience with user centred design methods and product development. The case was done in a commercial context by small design organization for an SME client and reported on academic forum. The process was planned to enable efficient user involvement into process with minor resources available. The case was not organized to test TO

US approach. On the contrary, the rationale of TO US was identified as worth of attention and described afterwards based on the published project documentation.

In the following we will describe TO US approach, introduce the project where it has been applied, and finally discuss the approach from design process and design knowledge points of view.

3. THREE IN ONE PROCESS

Three in One User Study (TO US) combines a 1) self-documentation based user study, 2) contextual observations and 3) user evaluations of prototypes into a streamlined two-phase process consisting of priming phase and a joined TO US session. The priming phase starts with identifying relevant design issues. Designers explore the design space considering its opportunities, restrictions and open questions through a traditional design procedure, i.e. by finding relevant information related to design task from secondary sources, defining potential design problems and creating alternative design solutions. Based on the exploration, the designers produce probes kits, which are delivered to users.

The probes kit contains documentation and self-reflection tasks focusing the users' attention towards the phenomena of interest in the design project. Probes are typically used to access private experiences. By completing the task the user collects information that might be difficult for the designers get during a short observation, as some interesting issues take place infrequently during a relatively long period of time and perhaps in environments and situations that are difficult to access for researchers. Through the self-reporting phase user is exposed to experiences related to the design task in a conscious manner and becomes more prepared to discuss those during the TO US session. The self-reporting material can also reveal surprising issues or essential factors missed by the designers or the client.

After completing a set of documentation and interpretation tasks with the probes, users sent them back to the designers. Through a pre-review of the probes material, designers get sensitized with the users' experiences in the use context. They acquire a good initial understanding about the design task and they can interpret users' comments and observed behaviour accordingly in the following joined TO US sessions. By being present in the joined session and open for users' ideas the designers can actively point out solution possibilities. They are able to focus their, and users', attention to the already identified potential solution areas within the design space.

TO US session is organised in an environment where the product under development is normally used. The session starts with the users' and designer's discussion and interpretation of the completed probes tasks. The

focus is in bridging information gaps and clarifying the issues that the designers did not understand correctly as well as opening new perspectives relevant to design. The second phase of the TO US session is contextual observation or situated interview. The user may show how to use the present product in a particular context. He or she can complete the most relevant key tasks related to the design challenge in real environments explaining things that are not obvious to the designer. Designer documents the behaviour with digital camera, video and with field notes. This phase complements the probes data with actual performance in context. Based on the joined interpretation session, the set of tasks to be observed can be defined or adjusted immediately before the observations. In the third phase, the designer presents her interpretation about an improved solution as a model, mock-up or prototype. The partly functional prototype does not only allow the user to express her opinion about it, but try it out in the real environment and assess it on the basis of the previous phases of the session, where the most essential evaluation criteria were jointly identified. Thus, the design evaluation is done in an atmosphere of sensitized reflection and contextually embedded action.

Instead of starting a project with a user study and ending it with evaluation, TO US session is in the middle of a project. Before the TO US session there needs to be enough time for the designers and users to get prepared with the priming tasks of their own. After the sessions there should be enough time to utilize the results. Obviously, if needed, TO US can be complemented with other user centred approaches in different phases of the project. However, our argument here is that with the suggested combination and timing of methods several benefits can be gained and the need for organizing several sessions with users is essentially decreased. See figure 1 for a summary of TO US scheduling.

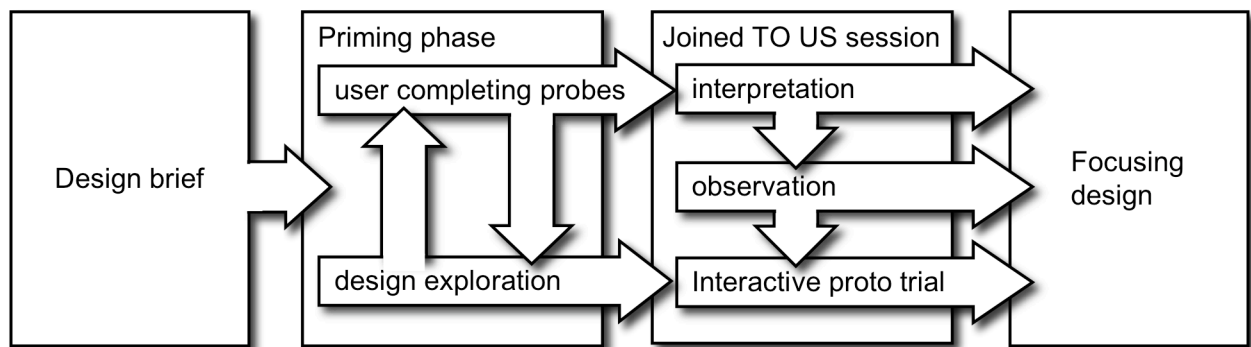


Figure 1: Three in One User Study process. The first main phase, priming, includes users’ and designers’ sensitizing tasks with probes and design exploration respectively. The second main phase, TO US session, includes joined interpretation of probes, observation or situated interview and trials with simulations or interactive prototypes, in this order.

4. CASE KICK-BIKE

Kick-bike case study describes the development of a product concept in which a child seat was integrated into a four-wheel kick-bike (see figure 2)(Jääskö & Keinonen 2006). The aim of the project was to introduce a new category of muscle-powered, short-distance vehicles for families with small children. The designers' task was to develop the functionality and structure for the concept, and to create a favourable design and appearance for the product. During the first phase of the project in which the aim was to create a working prototype also a self-documentation based user study was conducted. As the reasons for this, the designers mentioned the need to get versatile information about parents' short distance mobility needs with small children and the attributes of the concept idea itself. Another reason for the development and user research being run in parallel was the limited amount of project resources. Bundling probes interpretations, situated interviews and prototype evaluations into one session saved time.



Figure 2: Refined Kick-bike concept

Six families documented their daily travelling activities with self-photography and a diary over a period of four weeks. The objective was to acquire material to inspire the design and to prepare the families for the interview sessions, where the self-documentation material was discussed. This was done to ensure that self-documentation was correctly interpreted and to get a deeper understanding about the most interesting incidents and phenomena. After probes interpretations, a deeper scrutiny into design relevant issues was possible in the real context. At the end of the session, a new kick-bike concept was introduced with illustrations, scenarios and a functional prototype, which the families also tested. The prototype trial was photographed and the conversations during the session were recorded and annotated to identify potential problems and design opportunities immediately after the sessions. The designer who was in charge of the design development conducted the user study and assessed the relevance of the findings.

The results of the study were classified into three main information types: Features that needed to be developed, Comparison of the kick-bike with existing and competing products, and Critical success factors. Examples of these include the following. The basic concept was considered mainly positive: the designed fitness image seemed appropriate; families without a (second) car saw a possibility for extending the daily mobility range; children liked the low sitting position and the feeling of speed; the low centre of gravity was a positive safety factor and the carrying capacity was regarded better than with normal prams. The kick-bike was considered capable of competing with bicycles, because of the ease with which it could be controlled when riding with a child. Based on the results the earlier assumptions about the user groups were adjusted to cover a wider range of different uses. It was realised that the concept should be developed for more urban environments and made compatible to use also in public transportation. It became obvious that the new concept could not replace existing prams and could be a significant purchase for a young family. Therefore more emphasis was put on extending the life cycle of the product, including the use before a child can sit upright and after she is no longer transported as a passive passenger.

The case study shows that a user-centred design could be adapted for use even in compact concept project. By selecting the appropriate approaches and integrating the end-user sessions, it took only 2 person weeks to complete the user-data gathering, interpretation and consolidation processes in order to provide information for design. Through user involvement, it was possible to identify the crucial success features of the new product type.

5. CONCLUSIONS AND DISCUSSION

This paper has reported a user centred design process innovation called Three in One User Study, TO US. TO US refers to a user study process where three approaches are applied in parallel and bundled into one single face-to-face contact with a user. These approaches are self-documentation, observation and design trials with prototypes. In addition, TO US essentially features users' and designers' preparation for the meeting by sensitizing with probes and design exploration respectively. The case, based on which TO US has been formalized in this paper, indicates encouraging experiences and potential for TO US to be applied especially in short and scarcely resourced projects typical to SME industry. The approach allows effective use of designers' time, creates versatile and relevant results that range from business opportunity related issues to usability and design details. Two issues related to the design theoretical foundations of TO US will still be discussed, namely sensitizing periods and the reverse logic of the process.

5.1 SENSITIZING PERIODS

In TO US users become sensitized to the design topics through self-documentation with probes while designers' sensitizing is based on exploration with the solutions. Both parties are prepared to the joint session by being involved in activities where they can utilize their best knowledge. Users build on their understanding about the practices where they are involved. Probes tasks help them to explicate their knowledge and at best they challenge users to consider the foundations of their current practices under the study.

Designers sensitize by activating the arsenal of solutions potentially feasible to solve the problem. They elaborate the starting point given by a design brief and aim at identifying the more focused information needs. Early references of empathic design point out that designers should be involved in user research because they know what can be manufactured. However, without considering the specific design challenge the knowledge about implementation options is not anchored and may remain vague and elusive.

The priming periods help users and designers to contribute from their own points of view as they have positioned themselves in the design space. Users have documented who they are, where they stand and how they see the topic. Thus, in the TO US sessions they can refer back to their documented experiences and build on them, or alternatively they can criticize the current practices including their own earlier behaviour and attitudes. Similarly designers are freer to see the topic from the users' point of view after they have expressed their own interpretations, i.e. made design solution proposals. In TO US session these perspectives meet. The tasks done before the session create a discussion agenda, which can be complemented during the session in a flexible manner.

5.2 REVERSE LOGIC

Traditional user centred design process models (e.g. ISO 13407) assume that framing the design challenge has been completed before studying user requirements and that requirements should be defined before solutions can be designed. And finally, the evaluation phase can only be done after enough knowledge has been gathered for specifying and building a prototype. Consequently, several contacts with the users are required if, as is suggested, all these phases are conducted in a user centred manner. TO US challenges this traditional thinking by combining the framing of the phenomena under scrutiny, learning detailed information, elaborating new ideas and evaluating solutions into a process of two phases: priming phase and a joint session between a designer and a user. In spite of the seemingly reverse order of logic, we claim that TO US actually follows well the logic of design problem solving and design knowledge presented for example by Brian Lawson (2005).

First, TO US lets the designers to elaborate the design problem the way, which is the most natural to them, i.e. by exploring with solutions and concretizing them into prototypes. The design brief and designers' own experience give them in most cases good enough prerequisites to *start* thinking about the possible solutions, even though their knowledge is not enough to *complete* the design. Based on the design exploration they create an image about the scope of possible solutions and identify a set of key problems. Thus, in addition to creating a prototype to be tested, they learn about the key design challenges, get to understand what they do not know and are well prepared to meet the users.

Second, the TO US process trusts on designers to use prototypes as tools for learning, communicating and as platforms for developing the concept. It also pushes designers towards iterative use of prototypes, as they know that prototypes will be discussed with users and most likely adjusted. The prototypes presented in the session are not the results of design, but seriously considered professional guesses, which work as platforms for discussion in corresponding way as the probes answers and the real environment did during the first steps of joint TO US session. We can say that TO US rides on three parallel avenues using three alternative grounds of reference between users and designers: self-documentation material, actual environment and design prototypes.

Third, decision-making in design is seldom a linear process from the analysis of user needs to responding to those by design solutions. Instead, design solutions evolve through a dialogue of the both. Iteration well acknowledge in many design process models is an inherent feature of design. Thus, saying that design should start from framing the problem, and continue via information gathering and solution generation to evaluation, is in many cases idealizing and oversimplifying the reality. In the iterative loop any phase can be the one triggering the new winning solution and thus be the actual start of the work that will eventually lead to the final solution.

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