

User Participatory Sketching in User Requirements Gathering

Jin-Yi Wang and Robert Ramberg

Department of Computer and Systems Sciences
Stockholm University
Forum 100, 164 40, Kista, Sweden
{ jiny-wan; robban }@dsv.su.se

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ABSTRACT. *In this paper we present User Participatory Sketching as a complementary approach to user requirements gathering methods. We apply the approach in an empirical study and investigate its potential benefits early in interaction design processes. The findings from a case study suggest the User Participatory Sketching approach can complement conventional user requirement gathering techniques in the aspects of: (1) tangibilizing communication; (2) contextualizing design concepts; and (3) unveiling underlying thoughts. The sketches created by the users may also facilitate design by providing recourses for idea exploration, documenting the users' requirements in a visual way and allowing for further interpretations.*

Keywords: Sketch; Design; Methods; User Centered Design; Design Process.

1. Introduction. One challenge of interaction design (IxD) lies in its characteristics. Interaction design deals with a digital material with immaterial qualities of both *temporality* and *spatiality* [1]. Such abstract qualities are difficult to handle by professional designers and naturally these become even more difficult for users to understand, reflect upon and describe. The elements of an interactive system are directly or indirectly depending on other elements [2]. All parts of a system are *Dynamic* and *Interactive* [2]. Digital products, environments, systems, and services being designed are all interrelated rather than separate independent components. Such interrelationships generate *Complexity* by their nature. IxD also deals with issues such as tangibility, immersion, sound, and haptic aspects [3]. Interaction could further be said to be *invisible* and functioning behind the scenes [4]. Designing interactive artifacts is about designing a *Future*, a future consisting of future users and future use contexts. IxD can be defined as “an act of choosing among or informing choices of future ways of being” [5]. These characteristics of interaction design are extremely difficult for IxD designers to address when communicating with users in early design stages, especially when a specific design language is lacking for describing the abstract and complex design concepts [6].

A complex interactive system can include more than one interface where the users have to interact with the system in order to achieve his/her goal. The different interfaces are usually installed in different locations and contexts. Each interface may only help the user to complete a single step of what could be described as a journey. Thus, it is very difficult to build prototypes for such systems. Although building a prototype for a complex interactive

system is possible, it will cost huge amounts of time and other resources. Therefore, such systems require designers to have a thorough understanding of the users' needs and to identify design problems accurately early on in the design process. Gathering user requirements data is a crucial step to gain such understandings [7].

The commonly used requirements gathering techniques in IxD practice are heavily dependent on natural language communication, either by talking (such as using interviews and focus groups) or by writing (such as using written notes of direct observations) [7]. These techniques pay little attention to the multimodal aspect of language, communication and social interaction. Sense making processes in communication can be a combination of making use of writing, images, speech and embodied actions [8], sometimes even touch, feel and taste [9]. "It is now impossible to make sense of texts, even of their linguistic parts alone, without having a clear idea of what these other features might be contributing to the meaning of a text" [9].

Defining characteristics of IxD, including aspects of temporality, spatiality, interactivity, complexity etc., are extremely difficult to address by means of natural language alone. Thus, the user requirements gathering methods purely based on natural language can hardly provide the designers with enough understanding of the users' needs, wishes and limitations. The dependence on natural language puts a problem to the documentation of user requirements. Written reports are the ones mostly used for communicating findings from user studies, but these tend to provide abstract conclusions, which leads to a loss of richness of the data [10].

New approaches are urgently needed to complement the disadvantages of conventional user requirements gathering methods. In this paper, we present User Participatory Sketching as a complementary approach to the conventional user requirements gathering methods. This approach was applied in an empirical study [11]. The results from the study showed that: (1) sketches can enhance the communication between the designers and the users by visualizing natural language and tangibilizing abstract conversation; (2) sketches can support contextualizing design concepts, which is particularly important in location-dependent interactive systems; (3) sketches may help designers to unveil the users' underlying needs, which may otherwise be neglected. The sketches created by the users may also facilitate design by providing resources for idea exploration, documenting the users' requirements in a visual way and allowing for further interpretations.

2. Sketching. A sketch is usually referred to as a simple and rough drawing with a lack of details, used as a tool to support various kinds of creative works. There is a long tradition in areas such as architecture, industrial design and graphic design to use sketching as an essential technique to "develop, explore, communicate and evaluate ideas" [12]. Sketching has different characteristics in various fields of design, but it has three basic purposes: to structure thoughts and form ideas, to externalize ideas and communicate with oneself, and to support the communication with others by offering something to reflect upon [13].

2.1. Forming of Ideas. Sketching is a way to structure thoughts and form ideas. Without such external representations new possibilities and combinations of ideas are difficult to see [13]. Sketching is a way of externalizing an idea quickly [14] and "facilitate memory by externalizing the basic design elements" [15]. A sketch allows designers to think about other properties of the elements, such as spatial arrangements and functions [15]. The

feature of sketches in representing spatial information has its roots in human cognition – sketches have the attribute of representing three-dimensional visual experiences by using abbreviated two-dimensional lines. These lines can provoke visual experiences resembling that associated with the objects or scenes represented [16]. Thus, sketches can be used to depict spatial scenes and convey the conceptions of reality [17].

2.2. Communicating with Oneself. Externalized ideas presented in sketches can become new design materials for designers to reflect upon [13]. By observing how designers work, Schön defined the design process as a reflective conversation and characterized sketching as a recursive “seeing-drawing-seeing” loop [18] typical to design conversation. Goldschmidt also emphasized the conversation attribute of sketching [19]. The process of sketching can be seen as a systematic dialectics between the “seeing as” and “seeing that” reasoning modalities as shown in Figure 1. “Seeing as” is regarded as using figural or gestalt argumentation while “sketching-thinking”.

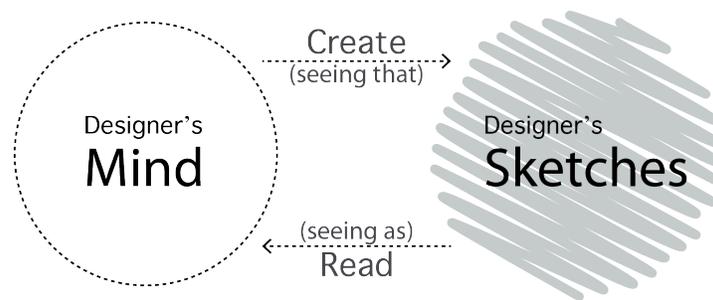


FIGURE 1. Sketches support communicating with oneself

2.3. Communicating with Others. Sketches can serve as a tool for communicating with others by offering something that collaborators can see and discuss [13]. IxD is a multi-discipline design field where design tasks often involve designers from different backgrounds. Collaboration and communication thus becomes crucial for the designers as a way to explore, reflect, validate and reshape ideas. In design collaborations, sketches serve as shared design materials for communicating with others since “expressing ideas in a visuo-spatial medium makes comprehension and inference easier than in a more abstract medium such as spoken language” [17].

2.4. A Way to Move on? The related research on sketches indicates the possible usage of sketches in facilitating the process of user requirements gathering. Firstly, sketches are visual representations. They may complement the user requirements gathering methods, which are solely based on natural and spoken language, with a visual perspective, especially when the intended design concepts are too abstract to describe by words alone. Secondly, sketches can depict three-dimensional environments. Reading spatial information from sketches may allow users to think about the context in which a system will be situated early on in the design process. Further more, sketches can become shared design materials between the future users and the designers so that the future users collaboratively can participate in the user requirements gathering.

3. User Participatory Sketching. The use of sketching in IxD is often limited to interface

sketches, storyboarding and paper-based prototypes [13]. In recent years, more research has been devoted to exploring the role of sketching in IxD [8, 20-21]. Some studies extend the use of sketching outside of the designers' world and introduce sketches to stakeholders and end users [12, 22-23]. Inspired by the potential benefits of sketches and the results from related studies this paper proposes adding sketching as a complementary approach to support conventional user requirements gathering methods.

The approach is proposed to bring sketching into the user requirement gathering process and allow users to come to multimodal expressions making use of sketches, spoken and written language. It emphasizes the sketches' role in supporting the communication between designers and future users when words are lacking for talking about abstract IxD concepts since sketches can "convey abstract ideas metaphorically, using elements and spatial relations on paper to express abstract elements and relations" [17].

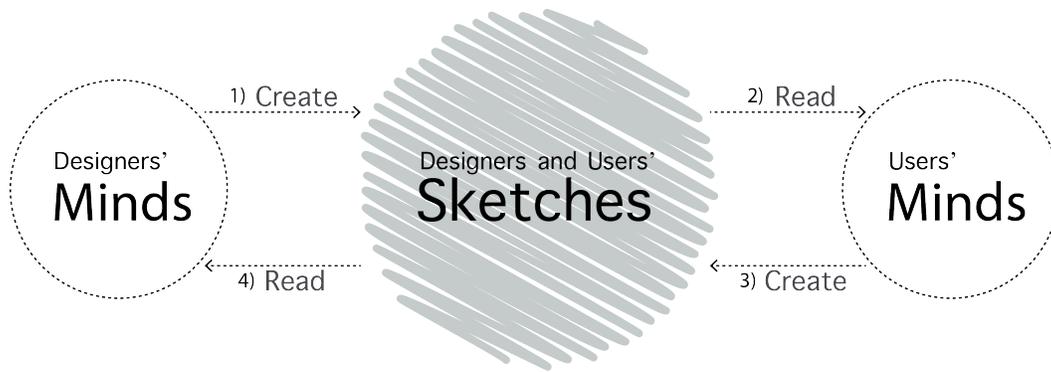


FIGURE 2. User Participatory Sketching

As illustrated in Figure 2, sketches are shared design materials between designers and future users: 1) the designers create the sketches as a way of bringing the future users into a certain design situation and posing questions about their requirements; 2) the future users read these sketches; 3) create their own sketches, either by changing the designers' sketches or by creating completely new sketches; 4) the designers read the sketches created by the future users and gain new knowledge of their requirements. The approach can be used together with other user requirements gathering methods, for example, interviews and focus groups. It is a dynamic and open-ended approach that can be modified to fit specific design situations. But the designers need to prepare the initial concept sketches before the participatory sketching session with the future users. Below we shortly describe results from a case study where the approach has been used (for further details regarding the empirical study, we refer to [11]).

3.1. Results from case study. Analysis of video recordings of the approach being implemented highlighted the supportive role of sketches in transforming the intangible communication into a tangible design material with help of multimodal expressions, including written/spoken language, gestures, facial expressions and sketches. Adopting sketches as a communicable material in meetings with future users can thus help designers to make intangible concepts, topics and communication more tangible, supporting gathering future users' requirements [11]. The future users' comments on the designers' sketches

containing spatial information showed that the sketches captured the interaction touch points and their contexts of use. The sketches and comments helped the designers to further contextualize the design concepts and allowed the future users to situate interaction moments into the context. Comments were often given using a combination of written language and drawings, which directly showed what the future users wanted. Adopting sketches as a tool to communicate with future users early on in the design process can be especially beneficial when the intended system requires a consideration of the environment, the surroundings and the context of use. Further, in analyzing the future users' own sketches the user requirements of desired functions, symbols and layout started to unveil [11]. These to some extent reflected their thoughts and facilitated the discovery of their requirements emphasizing the role of sketches to "serve as an external display to facilitate inference and discovery, to go from the intended to the unintended, to go from the seen to the unseen" [17].

4. Conclusions. There are of course other approaches proposed in the IxD field to include sketching as a means to communicate with users, stakeholders and other designers. In an approach proposed by Tohidi, Buxton and Baecker [12], users' sketching is involved in the evaluation of alternative design concepts. In their study users were exposed to different sets of paper prototypes of an interactive artifact and then required to create their own sketches. In this way the designers got the users' reflective feedback, which would not be obtained only by using conventional user testing techniques such as questionnaires, interviews and think-aloud protocols. Another example is one of the most recent studies to include sketching in the early stages of IxD, proposed by Wyche, Tech and Grinter [23]. In their study sketching was used to translate findings from fieldwork and then these sketches were presented to the participants who became motivated and inspired by the ideas depicted in the sketches. The findings suggest that sketching can be used to uncover value differences between users and designers, to highlight promising design ideas, and to validate qualitative research findings [23]. User participatory sketching adds to these approaches by providing means to collect user requirements early on in the design process in processes of inquiry.

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