User Driven Innovation: Incorporating Disabled Lead Users in Early Phase Product Development

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1 Introduction

How can disabled non-designers play a leading role in product development? As part of early phase product ideation, designers often rely on methods (Pahl & Beitz, 1996, Chapter 4). These methods help designers develop appropriate solutions to design problems. However, ideation processes may also involve non-designers. These could be end-users, managers, domain experts or other stakeholders.

A very specific form of user involvement is through lead users. Lead users can be identified as: 1) being at the leading edge of an important market trend, and experiencing needs that will later be experienced by many users in that market, and 2) anticipating relatively high benefits from obtaining a solution to their needs. This motivates them to participate. They are often a limited group of persons with specialized skills or experiences (Urban & von Hippel, 1988).

In this paper discuss the involvement of disabled lead users in early product development. We will focus on generative methods used for the creation of a wearable mobility device. The device consists, in part, of a 3D, time-of-flight DepthSense camera by Softkinetic, combined with a wearable tactile display developed by Elitac, two technology manufacturers. In addition to reflecting on our approach, we also introduce relevant research themes involving disabled lead users.

2 Background

The lead user method has shown its value through many studies in diverse domains, including business-to-consumer and business-to-business contexts (Franke & Shah, 2003; Herstatt & von Hippel, 1992; Hienerth, 2006; Lilien, Morrison, Searls, Sonnack, & von Hippel, 2002; Oliveira & von Hippel, 2011; Shah & Robinson, 2007). Typically, by establishing a network of experts that may qualify as lead users, designers may be able to identify unique ideas from users on the edge of a particular market trend (von Hippel, Thomke, & Sonnack, 1999). Essentially, this process is an effort of expanding the design space. Defined as *a representation of all possible solutions* (Westerlund, 2005), an expansion of the design space could yield products and concepts that are non-obvious.

Persons with disabilities have been shown to contribute to expanding the design space by contributing to product development (Conradie, De Couvreur, Saldien, & De Marez, 2014). Framed as lead users due to their adherence to the two lead user characteristics introduced earlier - being at the leading edge of a market trend and expecting high benefits of obtaining a solution - they are motivated to think of solutions, while also offering alternative perspectives.

We are aware of the potential criticism associated with terms such as disability. While alternatives such as “differently abled” have surfaced (Harris, 2001), we agree with Jones (2001) that “disabled” acknowledges that disability can be a disadvantage which can be mitigated by changing the person’s environment. Additionally, the term is recognizable and used widely, including by the WHO (World Health Organization, 2007) and other supra-national organizations such as the United Nations (2007).

Hannukainen & Hölttä-Otto (2006) has illustrated how persons with disabilities contribute to product innovation through ethnographic studies of blind and deaf persons and their use of mobile phones. They argue that the needs of extraordinary users in their study can be related well to those of non-disabled users. Conradie, De Couvreur, et al (2014) reviewed 18 cases where persons with disabilities collaborated in various ways to create new products or services, for both assistive and mass market products. Examples included the design of toothpaste packaging (Berg, 2006), but also development of specialized assistive devices such as prosthetic limbs (Rust & Wilson, 1999). An added valuable role for disabled lead users may be contributions to products they themselves

may not use, but through high experiential knowledge can offer valuable insights about (see Figure 1).

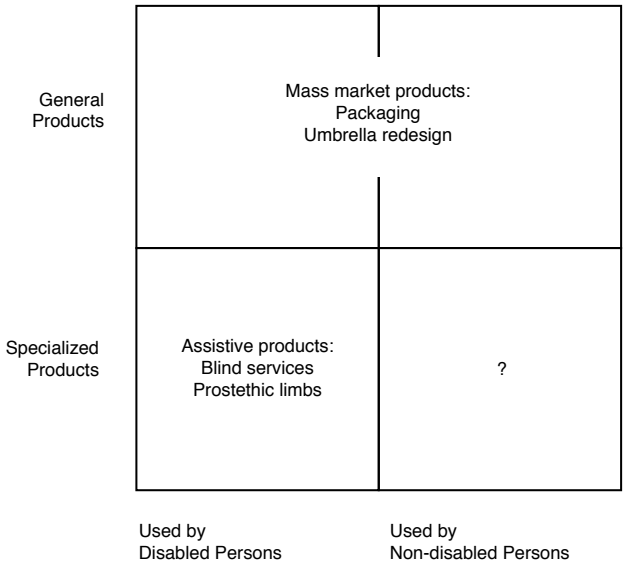

Figure 1: Product domains involving disabled persons as lead users

3 Methodological Approach

How did we apply the lead user method in our research? The method typically involves finding appropriate participants. This can occur through pyramiding (von Hippel, Franke, & Prügl, 2009), based on the that idea experts can often point to others that are even more knowledgeable about particular topics. Following this, generative sessions are used to arrive at new product ideas, while concepts are subsequently re-evaluated with non-lead users (von Hippel, 2005).

Yet, when focussing on disabled lead users, the potential group of participants may be much smaller. To still be able to select appropriate lead users, other strategies must be used. As other authors have pointed out, this could be barriers to participation (Rust & Wilson, 1999), increased technical skills (Lightbody et al., 2010), or community involvement (Tangsri, Na-Takuatoong, & Sophatsathit, 2013).

In our case, we focused both on skills, technical knowledge and community participation of blind persons. We conducted qualitative interviews with six (four female, two male) blind persons by phone, followed by two focus group discussions. Group 1 contained nine participants, while group 2 contained twelve.

During interviews, participants were questioned about their technology preferences and current assistive device use. Besides providing contextual insights about being blind, these interviews also allow lead user identification. Through questions about which current assistive technologies are used, persons with higher technological affinity can be identified. For blind persons, specific mobility needs also play a role. Additionally, product dissatisfaction was discussed.

Finally, four follow-up interviews were conducted with persons at home, also examining the home environment and technology use (see Conradie, Mioch, & Saldien (2014)). Through this process we identified a single lead user, Lucas (anonymised), within the cohort of participants. Most important reasons for selection was Lucas' ability not only to criticise suggested ideas, but to propose alternative solutions. Additionally, he was an avid user of various technological devices and had high mobility needs.

To involve Lucas further, we applied a mixed method approach using a variety of generative and evaluation methods. First, we used clay to develop low-fi prototypes that allow reviewing physical properties such as size and shape of, for example, the 3D camera. Following this, several related issues such as camera placement was discussed.

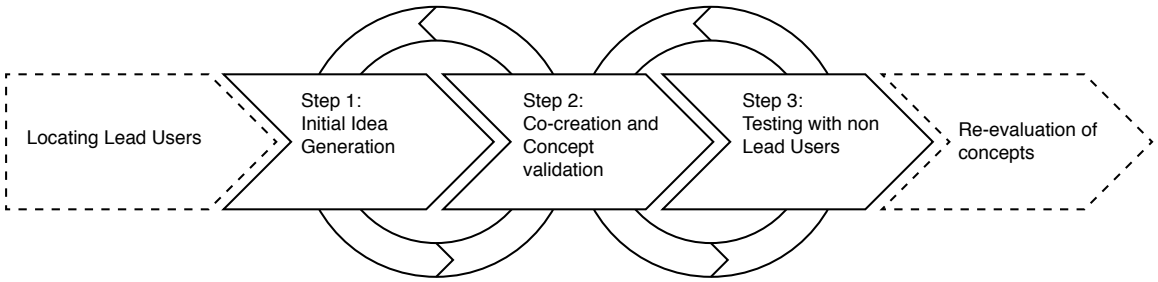

Figure 2: User involvement process overview

In a second meeting, we focused more on interaction with the proposed system. A dummy wearable camera was used, combined with tangible input prototypes to test and evaluate concepts. To understand a particular interaction, we would experience prototype the interaction, which led to subsequent iterations (Buchenau & Suri, 2000). These tests are similar to Wizard of Oz type studies that have been previously used to develop mobility systems for blind persons (see Poláček, Grill, & Tscheligi (2012)).

To ensure that these concepts are also supported by a larger community of users, lead user sessions where followed by studies together with other blind persons. Aspects such as wearability using Knight & Baber's (2005) wearability assessment tool, and interaction with the system was re-evaluated. An overview of this process is visualized in Figure 2.

4 Discussion

For our paper proposal, we want do discuss the benefits and drawbacks of this particular approach. First, the search for a lead user is an ideal opportunity to be submerged in a new theme and better understand the context of the end user. Following the identification of a lead user, it is possible to intensively work towards tangible design results while being able to iterate very fast and efficiently.

However, drawbacks in with this method may be that the lead user is not representative of the larger cohort of users (see Sanders & Stappers (2008)). While further studies with other users could point this out, this might already be too late during the process. Additionally, when designing for a user group such as blind persons, it might not be possible to easily locate a lead user.

Yet, we see think this approach has merits that may go well beyond assistive devices. For example, Figure 1 introduces 2 areas of previous involvement of disabled persons as lead users. However, a third area is yet unexplored.

5 Acknowledgements

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