

# Dis/Ability teaches Design!

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## Abstract

What can Design learn from bodily Impairment or social Disability?

In our paper, we claim that general human and artificial communication systems might be enriched by acknowledging and adding specifics of different ways of communication, perception and locomotion that refer to bodily impairment (Bieling, 2009).

In this regard, we assume, that disability occurs not least through influence by design and culture (e.g. built environment). As Caspers (2006) believes: disability is the lacking ability to “deal with bad design”. Besides the assumption, that design provokes disability, we will furthermore describe how disability can inspire and alter design.

Schillmeier (2009, 79ff) sees disability less as an effect of bodily impairment, but more as a phenomenon of social construction. Oriented towards John Dewey (1929) and Michel Foucault (1963) as well as to Science, Technology and Society Studies (STS) he conceptualizes disability as an event. In this context he asks, who (when, where and how) becomes disabled or not. Schillmeier states ›dis/ability‹ as a “heterogenic, material event”, which connects “social and non-social relations of human and non-human actors, of things, bodies, technologies, sensorical practices” and becomes able to be experienced in the sense of disabling as well as enabling (›dis/abling‹) scenarios. (Waldschmidt/Schneider, 2009, 17)

„With the multiple objects of ›Disability‹, the parliament of things becomes obvious: the assembly of bodies, technologies, and things, as an articulation of reality of natures and cultures“.  
(Schillmeier, 2009, 79ff) By exploring disability from an ›out-of-center‹ position, we aim to use it as a “knowledge-constituting moment, for the analysis of the (majority of) society”.  
(Waldschmidt/Schneider, 2009, 15)

In our investigation we consequently focus on integrative processes: An improvement of social integration, as well as an improvement of communication systems and devices through design (research), inspired by and learning from communication patterns of the bodily (and therefore socially) impaired.

We will discuss results and examples of the design research project *Speechless*, an interdisciplinary project run at the *Design Research Lab of Deutsche Telekom Laboratories*, Berlin. One main focus of *Speechless* lies primarily on deaf and blind communication and perception, as well as on the transferability of alternative forms of communication to general human (interpersonal) communication and human-computer-interaction (HCI).

During the first project phase, we have been working together with deaf people (in collaboration with *Sinneswandel*, a Society to support deaf and hard of hearing people, as well as with students of Deaf Studies at *Humboldt University Berlin*). The enhanced visual sense, the three-dimensional communication space, as well as linguistic and psychological particularities (Koller, 2008) constitute the main focus of this project phase.

In addition, we developed workshops with sighted and hearing people. By consciously deactivating certain senses or bodily functions (e.g. blindfolding), we aim to gain knowledge for designing multimodal interfaces. How to navigate without seeing? How to communicate without spoken or written language? Etc...

One or more impaired senses sharpen the remaining senses (Montessori, 1952). This can lead to individual skills that differ from common ones. A deaf person for instance, might not hear the music in a discotheque, but in comparison to the hearing people, he or she can to a certain extent easier communicate during the loud music – even over distance.

If we, as e.g. interface designers, understood more about communicative variations caused by bodily impairment, we might be able to create systems that enrich general human communication, by transferring and combining properties of such different variations.

Thus in our research project, we have so far been developing concepts for service- and product-solutions, that might help to overcome some of the limitations caused by bodily impairment on the one hand, and help to enhance the communication and locomotion of “non-disabled” people on the other hand. We aim to open up new perspectives in HCI and add a completely new aspect to design driven inquiries in two respects:

- 1) By taking bodily impairment as a source of inspiration for the development of Information-Communication-Technology (ICT) in matters of human communication and perception
- 2) By investigating augmentative and alternative communication (e.g. sign language) from an interfacial point of view. (Bieling, 2009)

Our research project opens up a wide field of new ideas and problems to solve in the learning field about properties of alternative and augmentative communication. It becomes obvious a high potential of knowledge about and systematic use of such systems of communication (Bieling, 2009a), to open up perspectives for designing human-machine-interfaces in particular, as well as for design research in general.

### **Keywords**

Disability inspired Design/Research; Disability Studies; Alternative Communication; HCI; Social Innovation; Participatory Design; Cultural Studies.

This paper introduces an approach to implement an integrated model of disability in design research, a model aiming at merging aspects from the medical and social perspectives of disability.

The paper illustrates a framework for the approximation of two disciplines – Design Research and Disability Studies. By presenting examples of different aspects of design in a disability context and disability in a design context, the paper aims at revealing fundamental perspectives for design research.

We claim that general human and artificial communication systems might be enriched by acknowledging and adding specifics of different ways of communication, perception and locomotion that refer to bodily impairment (Bieling, 2009). The framework can be considered as an experimental stage set for design practice and theory, envisaging an inclusive comprehension of (inter- and trans-) disciplinary development.

By challenging general concepts of disability and ability (<dis/ability>) our approach may be both contributing to the field of Design Research and the field of Disability Studies.

### **Background**

Against the background of the demographic change of growing life expectancy across the world, we are facing an increasing number of individuals becoming disabled or in need of care (Tervooren, 2002, 1). Thus the phenomenon “disability” is going to become a “universal experience of our society” (Hermes, 2007). Questions about and definitions of disability will have to be reformulated, in order to avoid exclusion of growing parts of society. This also means to analyze societal norms, traditions and values leading to certain perspectives on disability.

Major questions in this context are related to the general assumptions about what disability is about, and about who becomes disabled when and by what or whom. The World Health Organization (W.H.O.) recognizes disability as a “complex interaction between features of a person’s body and features of the environment and society in which he or she lives” (W.H.O. 2001). Against this background “disability” is particularly being viewed as social disability, caused by bodily variations. As Pullin (2009, 2) states: “People are [...] disabled by the society they live in, not directly by their impairment”.

Traditionally, for a long period disability has been subject of interest to the applied sciences (medicine, therapeutic-, special needs pedagogic etc), basically focusing on the prevention, deletion or relief of bodily “damage”.

The intention may be honourable however it contains at least two problems: First, the “problem-solving” approach can not cover the complexity of disability, since disability is a very common experience in human life and human beings are no machines, but highly vulnerable and breakable (and actually only “temporarily non-disabled”). Secondly, viewed from a historical and cultural anthropology position, it becomes obvious that disability has neither been a universal cultural category, nor a uniform social practice. (Waldschmidt/Schneider, 2009, 10)

To understand and analyse disability and phenomena of embodied difference as a historical, social and cultural construction, has been the starting point for ‘disability studies’ to develop alternative perspectives which correct or widen the medical/pedagogical approximations to disability.

Confronting the *medical model* with the *social model of disability* allows not least a critical reflection on fundamental concepts of order, which become manifested in antipodes like ‘normality and difference’ or ‘health and illness’.

### ***Different Models: The Social, the Medical, the Integrated.***

The *medical model* of disability (also known as the *deficit model*), defines disability as a direct consequence of an impairment. The biological-medical point of view declares disability as a medical condition of the body that is medically diagnosable. Disability activist groups view the medicalisation of disabled peoples’ everyday lives as a form of social oppression (Anderberg, 2005, 2; Johnson/Woll, 2003). Batavia (1999) describes how this point of view considers people with disabilities “paternalistically as dependent patients rather than as self-directed individuals fully capable of autonomy”. Turner (2001) misses in this context a focus on the “actual functions desired by the individual” (Anderberg, 2005, 2). A quantification of disability, by clinical measuring and classifying is being criticized by Anderberg (2005, 2), who claims that it is “alienating rather than supportive to the individual to be faced with a clinical analysis, a professional language of description and a lack of considerate interest for the functions most relevant in her/his own context”.

The *social model* of disability (UPIAS 1975) originally refers to a “rather materialistic view auf the causes of disability” (Anderberg, 2005, 2), but can generally be referred to the social construction of disability. Anderberg (2005a, 2) summarizes its key message as follows: “Societal structures should be changed to accommodate people with disabilities, not individuals that should be changed to fit into a rigid environment and society”. Disability is not seen as a “characteristic of the individual but rather the situated response to an inaccessible, inflexible and un-adapted environment and society” (ibid.).

However, neither the medical nor the social model of disability is exclusively satisfactory for design (Anderberg, 2005, 1). The medical model, as a “problem-oriented” approach, oversimplifies disability as an “individual characteristic and directs attention towards individual adjustments and means” (ibid.). The social model, on the other hand, directs attention towards ideological and political analysis, not towards proposals for “practical everyday solutions for experienced functioning” (ibid.), or suggestions to practically change situations into preferred ones.

Seelman (2003) introduces an *integrated model* as an attempt to merge, or bring closer the medical and social perspectives. Others have been contributing to this attempt, some of them linked to the fields of biocultural anthropology.

According to the social and medical models, Schillmeier counterposes an object-centred, experience- and occurrence-logical concept of the nature(s)/culture(s) of disability. He states ›dis/ability‹ (Schillmeier, 2009) as a “heterogenic, material event”, which connects “social and non-social relations of human and non-human actors, of things, bodies, technologies, sensory practices” and becomes able to be experienced in the sense of disabling as well as enabling (›dis/abling‹) scenarios. (Waldschmidt/Schneider, 2009, 17)

Schillmeier describes, how empirical research in STS on disability emphasizes the complex event-character of disabling and enabling realities in everyday practice. Disability, understood as “dis/abling practices” underlines the situational links and connections of human and non-human actors, processes and practices (Waldschmidt/Schneider, 2009, 91, according to: Schillmeier 2005; Law/Moser 1999; Struhlkamp 2004).

Furthermore he points out, that it is an empirical open question, how, where and when disability appears. He claims that ›dis/ability‹ refers to a complex interaction between bodies, senses, feelings, symbols, experiences, technologies and technological infrastructures, of situational constructed space-/time-relations etc. that let appear social practices in an enabling or disabling sense. (Waldschmidt/Schneider, 2009, 91)

According to Gilles Deleuze and Felix Guattari, becoming disabled is not to be understood as an “evolution through origin and heritage”, neither in a sense of individual impairment, nor as a result of societal structures. It rather appears through “alliances of human and non-human, social and non-social acteurs, objects and processes” (Schillmeier, 2009, 91; according to Deleuze/Guattari 1992, 325)

„With the multiple objects of ›Disability‹, the parliament of things becomes obvious: the assembly of bodies, technologies, and things, as an articulation of reality of natures and cultures“ (Schillmeier 2009, 79). Moser and Law (1999) and also Myriam Winance (2006) have in this context used ANT (Actor-Network-Theory) to elaborate on disability and ability. We propose to implement the ANT point of view into our perspective to re-examine the mentioned models.

How do these different models influence an understanding of and active contributions within or amongst the disciplinary fields surrounding design and disability? How is this linked to certain “properties” of these fields?

## **Situation and Disciplinary Properties**

Whenever it comes to combine the two parameters “Design” and “Disability”, discussions immediately turn to focus on what can generally be summarized under terms like “Universal Design” (Erlandson 2008, Herwig 2008, Mace et al. 1991), “Design for all”, “Design for accessibility”, “Barrier-free Design”, “Transgenerational Design” or “Inclusive Design” (Imrie/Hall, 2001). Despite the terminological and sometimes normative differences of these, Mitrasinovic (2008, 419) finds that “the ethical principles are analogous across countries and regions”.

According to our argumentation we consider these in the broader sense again to be summarized as *Design for Disability* (DfD). Meaning, that projects in such fields primarily focus on design development that is intended to protect people with disabilities from being excluded from “using” certain designed objects, processes, services, systems or environments.

Complementary to DfD we propose an approach that could simply be summarized as *Design by Disability* (DbD), meaning, that (not only) Design could be generally and specifically inspired by Disability, or better: by experiences linked to certain disabilities.

However in this regard we also acknowledge the existence of the opposite, which could be called *Disability by Design*. While Caspers (2006) describes how Design can provoke disability, and Anderberg (2005, 4) claims that “technology and design can [...] be seen as mediators of disability”, Jöhnsson (2005) sees “artefacts as being imprinted with the goals, visions, and thoughts of their constructors. [...] No neutral carriers of information”. Technology and its artefacts thus influence on the individual. They “affect how we relate to things and people [...] and how we perceive the world. [...] From a socio-cultural perspective, we learn and develop by using cognitive resources that are incorporated in the artefacts as information, procedures and routines. Our way of thinking is guided and coloured by the intellectual and physical tools we use”. (Säljö, 2000; in: Anderberg 2005)

The complex correspondence of the individual and technology within the world of artefacts is described at Goggin and Newell (2003), who explain the example of how the wheelchair can be “theoretically regarded as an aid to mobility”, but as an effective enabler it can only be regarded in a system where the environment is adapted to wheelchair use: “Without the necessary pavement, curbs, ramps, and funding of so-called access, the wheelchair as a system has different meanings and effects” (ibid.).

The correlation of body and space in this context is described by Freund (2001), who claims that spatial organisation constructs bodies and offers bodily possibilities and constraints: “The body is not simply a culturally constructed representation nor is it physically shaped like clay by social

force, but it is experienced and 'lived-in' differently in various socio-material environments and material cultures (e.g. technologies)" (Freund, 2001; in Anderberg 2005).

We can therefore assume, that disability occurs not least through influence by design and culture (e.g. built environment). As Anderberg (2005, 5) states: "The body and the various technical artefacts around us make up a system that enables or disables us to perform desired actions".

As a "manifestation of economical, political, social and cultural concepts and individual wishes and ideas" (Anderberg, 2005, 5), technology (and design), its consequences, its use and meanings become important for disability studies. Anderberg (2005, 5) complains that the Disability Studies Community fails to directly acknowledge the importance of technology and design for the field, which (if so true) would be unfortunate, because "technology and design are too important to be left only to the technicians and designers; it cannot be seen as being separate from other instances of the culture we live in. Technology and functional aids belong in the heart of Disability Studies." (ibid.).

As far as to our knowledge, the acknowledgement of technology (and Design) within parts of the Disability Studies Community has been evolving. Nevertheless we still assume Design as to be very important for the inclusion into Disability Studies. We like to mention two reasons for that: First, the consequences and correlation of Design and Disability, as we described, are very complex and not to deny. That means secondly a high potential of societal interventions and active change of situations, not least through the help of design.

In order to be able to analyze the correlation, the impact and the relevance of demographic and socio-cultural categories, especially concerning aspects of disability, on form and practice of design (process), as well as its effects on usage and practical use of design within these categories, it could be helpful to define and understand the relevance of the scientific approach of disability studies to design research (and vice versa), by taking a closer look to disability studies' fields of interest and 'self definition':

Carol Gill (1998), underlining that Disability Studies are based on the social model, points out, that disability in every society is being defined through a complex interplay of political, economical and cultural values. Thus Disability Studies are interdisciplinary, meaning that the construction of disability needs to be examined not only from a medical or pedagogical point of view, but also from the perspectives of e.g. sociology, law, economics, literature and media studies, historical or cultural sciences.

Disability studies therefore focus on the social/political/economical/cultural context of disability. A major goal is not, to avoid, optimize or heal certain individual impairments, but rather to critically analyze the social processes of disability. The analysis shall be less intended to find solutions to 'correct' disabled people, but rather to generally find ways out of excluding social systems and processes (Gill, 1998).

We argue that our approach of combining the two disciplines Design Research and Disability Studies might not least contribute to the latter intention, by additionally substantiating and clarifying an enhanced and reflected understanding of disability.

Design Research is especially destined to be complementarily involved in the Disability (Studies) debate, since it is not only descriptive (like Disability Studies could be occasionally recognized as), but also projective and proactive. Nevertheless this implies certain requirements to the discipline of Design Research, first of all a methodology that allows dealing with uncertainty, ambiguity and complexity in real-life situations.

However helpful for design's involvement in the disability debate, is the awareness of design's general stance and relation to "problems".

### ***Problem Solving and Problem Making***

Pullin describes how Disability can provoke problems in people's lives, either directly or indirectly. However such problems are "either viewed as being inherent in an impairment itself or as being created by the designed environment and other people's behaviors". (Pullin, 2009, 41) This point of view stands in close relation to Schillmeier's (Waldschmidt/Schneider, 2009, 17) characterization

of dis/ability as an event which connects “social and non-social relations of human and non-human actors”.

In the different disciplines dealing with disability, we recognize different approaches and understandings of disability. These stand in close relation to their respective educational backgrounds. Medical engineers for instance seem to be attuned to problems. After Pullin, a typical engineering methodology might start with “*Step 1: problem definition*, followed by *Step 2: solution generation*, and so on”. The discussion, to what extent design is to be defined in its broadest sense as problem solving, has been going on for a long period (Antonelli 2008; Funke 2003; Heufler 2005; Mayer 2004). Diefenthaler (2008, 307) claims that the problem solving process in design is “seldom linear because evaluation techniques are an essential feature. The varieties of possible solutions originate for the most part as short-term proposals ”which she relates to the fact that a design process is not always and “only influenced by a rational, analytical work method, but also by an emotional, intuitive process” (ibid.). While ongoing discussions seem to seek the role of a designer between the two poles of a designer as a “Problemsolver” or “Sensemaker”, Antonelli adds a third role, which is the “Problemmaker”. (Antonelli, 2009). An interesting alternative to the (long ago insufficient) term “Problemsolver” and the (also not really satisfying term) “Sensemaker”: The concept of “problemmaking” becomes especially interesting, since it contains two meanings: First, the acknowledgment of Rittel’s *wicked problems* (Rittel, 1973) and second, the idea to cause problems on purpose for instance by irritating people (respective users). The latter is described by Bredies (2008), who argues that “Innovative artefacts without established cultural conventions will necessarily irritate the user to a certain extend. [...] Designing innovative artefacts therefore provides an area where designers can exploit the irritating moment as an opportunity” (in context of Bredies’ Paper: for co-design in use).

We will argue in our paper, that without completely denying the aspect of “problem solving”, the concept of “problem making” is of high potential for approaching disability in context of design, as well as it is for backing up the societal process of modifying general perspectives on disability.

Because of the “nature” of disability and the “culture” of engineering, Pullin (2009, 41) sees design for disability and inclusive design as “usually approached as an exercise in problem solving [...] This also has something in common with the clinical tradition of diagnosis and treatment”.

We therefore agree on the point, that some of the challenges facing design for disability might “not best described as *problems to be solved*” and that “issues not easily defined as problems are likely to be overlooked” (Pullin, 2009, 41).

However in our general understanding and in the specific understanding that laid the foundations for our project, we do not (only) focus on *design for disability*, but wish to widen the research area in a sense of *disability by design – design by disability*. Now, why do we propose and how are we going to achieve this?

## **Convergence – Design Knowledge and Disability Knowledge**

Not all design, and especially not design research, is about solving problems. According to Fällman (2008) the process of a design research project can be seen as a triangular model defined by the activity areas of “design practice”, “design studies” and “design exploration”. The latter may still require solving problems that arise along the way, but “frequently as a means to an end rather than as an end in itself” (Pullin, 2009, 43). We may localize here a “subtle yet fundamental inversion of engineering methodologies that will usually include a creative exploration of alternatives, though as a means to the end of solving the core problem” (ibid.).

However a Designer may “revisit an object, a material, or a medium that has already been successfully designed, designed with, or designed within [...] before, in which case the value does not lie in solving an unsolved problem” (Pullin, 2009, 41). Especially Design Researchers may as well explore completely new fields, whilst potential questions or problems to be solved might appear not until the research process has been going on for a while already.

Many art and design school disciplines, for instance, involve exploration that can appear playful, vague, experimental and open-ended, but its intent may be no less serious for possible results to gain from it.

We believe that such exploration approach, which seems to be characteristic for design research, could be an enriching input for Disability Studies. On the other hand, the design exploration could receive important input from Disability Studies' social or integrated model perspective, for widening the spectre of possibilities by simulating or experiencing different role perspectives.

The Design-Research-from-a-Disability-Studies-perspective or the Disability-Studies-from-a-Design-Research-perspective might even be imaginable in a sense of an *about/for/through*-model (Fig 1): While Research *about* Disability would represent a rather critically analytical view on disability, possibly but not necessarily based on the social (or integrated) model, Research *for* Disability would represent the medical-engineering-, problem-oriented perspective, possibly but not necessarily based on the medical model. This second point of view might occasionally also apply to what we summarized before under DfD, but we admit that this might not generally be the case and maybe still has to be discussed). The third point of view would be Research *through* Disability, basically analogue to what we described before as Design *by* Disability. It would represent the most explorative part, where Design Research could provide a broad spectre of methods (empathic modelling, capability simulation, visualisation, prototyping, etc) to understand disability in a productive sense. It would be the field, where we could learn from Disability (better: from certain disabilities) in order to transfer knowledge into general or specific other fields (e.g. transfer properties from blind navigation into digital navigation systems).

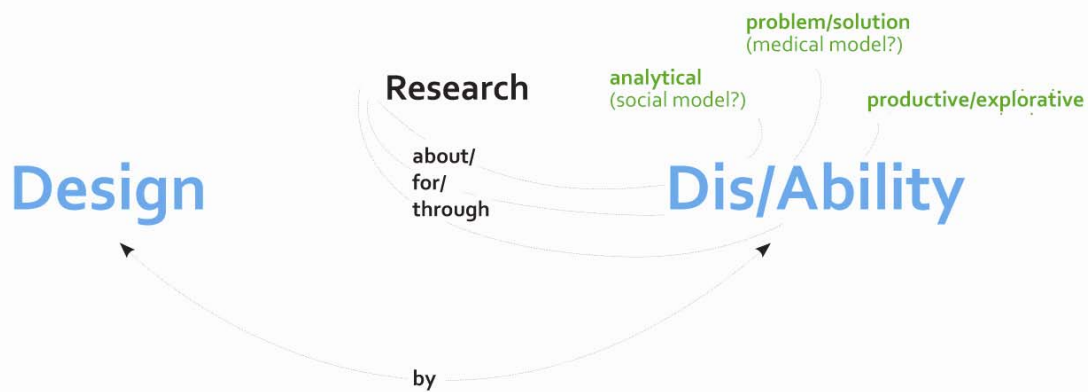


Fig 1 Research about/for/through Design and Dis/Ability

However we must obviously consider disciplinary differences in how we produce knowledge and how we use it.

Thoutenhoofd and Naue (2007) describe how knowledge is socio-culturally and socio-linguistically shared as much as it is empirically demonstrated and peer-validated. They claim that “lived experience is centre-staged as a bottom-up or grass-roots form of knowing that is as often intuitive (or ‘native’) and phenomenal as it is reflexive and objectified.” In their explanation, Thoutenhoofd/Naue (2007) describe deaf and disabled people as subjects of “highly formalised, normative kinds of knowledge practices – in fields as diverse as medicine, economics, biology, education and psychology – which do not speak *with* them, but *about* them (or worse, *for* them). [...] Knowledge within these fields is of the body as a site of multiple meanings that fractures any coherent sense of self and identity. In this third scholarly formation knowledge is essentially derivative of professional practice.”

Design Research may also offer descriptions and explanations of what naturally or culturally exists, but unlike traditional science, Design aims at producing and conceiving artefacts. As Simon describes it as an “action aimed at changing existing situations into preferred ones”.

Design explores different possible solutions for a problematic situation (The definition of “problematic” is certainly a matter of perspective). Unlike traditional social sciences, it is rather about ‘what can be’ (and how it can be), than about ‘what is’. This stance about a future world state does necessarily involve uncertainty. Since knowledge about an existing situation “does not

necessarily lead to knowing how to change it, design knowledge [...] needs to be useful not only to inform reflection, but also anticipation and projection of those who design (DRLab, 2009).

Thus the knowledge produced in Design Research aims to inform and enable present and future design practice. It is therefore not only descriptive, but also projective. In other words: "it transcends the present to enable projective actions" (ibid.).

## Method

In order to disentangle the complex construct of guiding questions within the range of the two parameters "design" and "disability", we fragment it into sub-questions which again shall lead to sub-answers. With this rational method (Descartes), we draw parallels to Choopankareh's (2006) approach: The human subject as part of a society on one hand is being put into relation to the product/artefact as part of the environment on the other hand. In our research project we shall examine disability as a societal phenomenon leading to a complex of problems for (certain) individuals, in order to find out, what role design can play in that context.

In order to face the resulting subdivision into two relations – "Human - Artefact" and "Disability - Design" – we propose to implement these into Findeli's model for design/research questions/answers (Findeli 2008). If we took for example the following as a research question: What can Disability and Design learn from each other? Then, this broad question could be framed into several specific design questions, for example: How can we generally transfer knowledge from Alternative and Augmentative Communication (AAC) into human-computer-interfaces or specifically into ICT-Devices? Or more precisely: What functions (or aesthetics etc.) can an electronic device contain, that is inspired by certain disability related aspects? The possible design answers may here, in turn, be helpful in answering the research question(s).

In our case study, we laid a strong focus on empathic modelling, capability simulation, prototyping, visualisation, interviews or audio- and video-documentaries. In the following we will give an overview about three of our different method approaches (Collaborative workshops with experts and non-experts; Self-Experience; Fictional and non-fictional Input) and describe their application in the respective case. The results show how the methods help designers to structure and organize information about the context and identify productive opportunities of understanding, intervention and transferability for design.

### ***Collaborative Workshops with Experts and Non-Experts***

During the first project phase, we have been working together with deaf people (in collaboration with *Sinneswandel* a Society to support deaf and hard of hearing people, as well as with students of Deaf Studies at *Humboldt University* Berlin. The enhanced visual sense, the three-dimensional communication space, as well as linguistic and psychological particularities (Koller, 2009) constitute the main focus of this project phase.

In addition, we developed workshops with sighted and hearing people (Fig 2 + 3). By consciously deactivating certain senses or bodily functions (e.g. blindfolding), our aim was to gain knowledge for designing interactivity. One or more impaired senses sharpen the remaining senses (Montessori, 1952). This can lead to individual skills that differ from common ones. A deaf person for instance, might not hear the music in a discotheque, but in comparison to the hearing people, he or she can to a certain extent easier communicate during the loud music – even over distance.

Some of our guiding questions were: How to navigate without seeing? How to communicate without spoken or written language? These questions were meant to lead us to more general aspects: How can we change or widen the function of an interface? How can we transfer concepts into navigation systems or communication device?

Both types of the workshops were based on a participatory design approach. Whilst the workshops with 'non-disabled' people focused more on explorative aspects, the main focus of the workshops with Deaf people was on actual Co-Creation.



Thus in our workshop approach, we follow a two-poled model of participation, by collaborating with disabled people as experts (e.g. through ethnographic observation), and with non-disabled people as non-experts (e.g. through simulation or empathic modelling).



Figure 2



Figure 3

*Fig 2 How to reduce complexity and thereby avoid confusion caused by missing language skills? In this workshop the participants (age: 6-11 yrs) explored the idea of communication without written or spoken language, using visual communication and symbolic language.*

*Fig 3 In another workshop the participants produced prototypes in context of touchable and sensitive surfaces. How should certain functions or situations become tangible? Therefore they tried out different material and haptics (e.g. hard, soft, cold, rough, clean, even, flat, uneven, flexible etc.).*

## **Self-Experience**

In our research project we claim »action« as an important part to actually experience and understand the diverse perspectives that we collect. While we link these to existing knowledge and theory, and then synthesize the assumptions in roughly estimated principles, before we selectively involve external people in collaborative workshops, we try to experience as much on our own as possible. As an example we will present impressions and insights in extracts from our video documentary "One Day blind in Berlin" (Fig 4).



Fig 4 Standing next to a speaker, not being able to see, leads to a different posture of the head

Another example is our experience in Sign Language: One way to deal and to engage with a new communication system is to learn it. Therefore, we have been attending Sign Language classes, which has been a revealing experience physically as well as theoretically. It already gave us the chance to gain insights into the visual and expressive language of deaf communication, the deaf community and culture, as well as, how disability offers new horizons and perspectives to alternative ways of communication.

### ***Fictional and non-fictional Input***

As another important tool for our topic exploration, we organize so called *Disability Movie Nights*, where we show and discuss film-related material close to our field of interest. The material we show and watch may range from films, documentaries, short movies, video art to music clips.

We identified these film screenings as a helpful method to dive deeper into a topic and to inspire the design research process, since both the shown material and the involved audience broach the issues of different (external, internal, expert, non-expert, poetic or scientific) positions.

It is generally claimed that movies have an effect on people. Against this background, we see a possibly fruitful connection between science, mainstream and screen fiction. Depending on the platform, it allows different transfers: A documentary e.g. could underline the more analytical part (»What is?«), whilst a fictional movie could represent a rather projective part (»What, if...?«). Thus, we use film screenings for both a deeper understanding and associative thoughts.

### **Transfer / First Results**

The methods we used for exploration and production so far are generally based on a human-centred and participatory design approach perspective, as described in "Collaborative Workshops...". Nevertheless we maintain a cultural studies perspective in our process, as described in "Fictional and non-fictional Input".

As Design knowledge has different kinds of representations, the form of our knowledge collection ranges from more theoretical (principles) to more practical parts (specific configurations). Besides our verbal argumentation we therefore argue through visual or multisensual representations, like for example sketches (Fig 5-8), images, videos (Fig 9) or prototypes (Fig 10).

Thus in our research project, we have so far been developing concepts for service- and product-solutions, that might help to overcome some of the limitations caused by bodily impairment on the one hand, and help to enhance the communication and locomotion of "non-disabled" people on the other hand. We aim to open up new perspectives in HCI and add a completely new aspect to design driven inquiries in two respects:

- 1) By taking bodily impairment as a source of inspiration for the development of Information-Communication-Technology (ICT) in matters of human communication and perception
- 2) By investigating augmentative and alternative communication (e.g. sign language) from an interfacial point of view. (Bieling, 2009)

After collecting various data, including basic theoretical knowledge, experience based impressions, survey based information and collaborative workshop grounded results, the next step after analysing and interpreting has been to actually find out how to evaluate these data and synthesize them for possible design solutions.

In our investigation for example, we collect different characteristics of deaf communication that seem to be special from a non-deaf perspective. In the following we summarize and classify some of the important characteristics of deaf communication we found (Koller 2008). We claim that it might be interesting, whether these characteristics could be relevant for the communication of hearing people, for the future design of human-machine-interfaces or in design in general.

### **Relevant for communication of the Hearing:**

- . Discrete and focused communication, despite variable distance
- . Attention control
- . No constraints through loudness

### **Relevant for human-machine-interfaces:**

- . Referencing objects and persons in signing space
- . Definition of pronominal references in signing space
- . Concept of time in signing space
- . Dividing the signing space into categories of valuation
- . Roll change
- . Lifting, lowering and projecting the signing space
- . Whisper and Scream in Sign Language
- . Plural by repetition
- . Temporal aspects for the variation of sign language
- . Object placeholders (classificators)
- . A high amount of the singings can be differentiated by (body) movement
- . Non-manual means of expression

### **Of general interest:**

- . Advantage in occupational fields with focus on visual work
- . High information density through additional visual support
- . Impact on well-being
- . Visual Rhythm

After several workshops, the project resulted in various physical, visual and audiovisual prototypes that contributed to visualising the findings and theories explored.

Using the examples mentioned above as a basis for concepts, transfers and solutions, we will present in the following some results from our ideation sessions. An appropriate feasibility check needs to be done as next step. However it is rather important is to imagine concept and solutions, even though some of them might lie ahead. Subsequent, in apparent cases, we will analyse technical methods for solutions.

In the following, we collect some illustrations, resulting from our ideation.



Fig 5: Potential for deaf/non-deaf: high/high

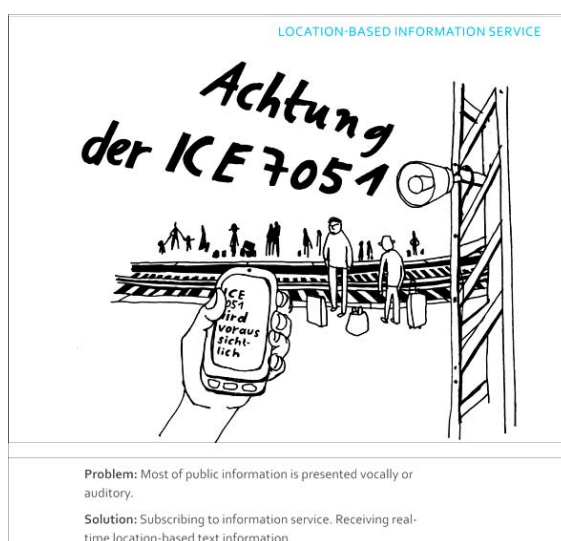


Fig 6: Potential for deaf/non-deaf: very high/very high



Fig 7: Potential for deaf/non-deaf: med./medium



Fig 8: Potential for deaf/non-deaf: very high/medium



Figure 9



Figure 10

Fig 9 Video Prototype "Virtual Placeholders". The concept of referencing objects in 3D signing space is conceivable for applications in HCI.

Fig 10 Prototype "HangUp" helps to support deaf communication. But also non-deaf people could use such device, for example while cooking driving or working.

## Conclusion

Our research project opens up a wide field in the learning field about properties of alternative and augmentative communication. It becomes obvious a high potential of knowledge about and systematic use of such systems of communication (Bieling, 2009a), to open up perspectives for designing human-machine-interfaces in particular, as well as for design research in general.

The transfer of such concepts from augmentative and alternative communication, not least to HCI, can serve designers, engineers, pedagogues in various ways. First of all it can help to overcome communication barriers (by a technique of mediation or translation). Moreover, it opens up new perspectives in learning (language, dialog, cultural/behavioural differences etc.). Furthermore, it widens the spectre of interactivity with the help of human interaction patterns, that are (if not intuitive) at least easy to learn and that have already been proven to function in certain contexts of human (e.g. deaf) communication systems.

For example Sign Language can be an input to human and human-machine-interaction, since it contains transferable rules for syntax and semantics and therefore alternative possibilities to collect, impress and present thoughts. It also enables to use different organs and parts of the body.

Not least in this project, our aim is to find out to what extent we can provide and use a confrontation with and through design within such processes, to evolve innovative methods, products/services and communicative models.

Based on these insights, our research project shall sensitise the design profession as well as related disciplines to realise the various perspectives for HCI, ICT and general human communication as well as for social inclusion through design research, inspired by observations on so called disability.

If we, as e.g. interface designers, understood more about communicative variations caused by bodily impairment, we might be able to create systems that enrich general human communication, by transferring and combining properties of such different variations.

By recognizing disabilities as expertise (e.g. a blind person as an expert in navigation through the dark; a Deaf person as an expert in communication in very loud environments), Design Research in collaboration with Disability Studies might contribute towards an advanced, reflective understanding of disability.

By exploring disability from an ›out-of-center‹ position, we aim to use it as a “knowledge-constituting moment, for the analysis of the (majority of) society”. (Waldschmidt/Schneider, 2009, 15). Siebers (2006, 64) points out the importance to “establish disability as a significant value in itself worthy of future development”. Especially in view of the future challenges of genetic engineering, reproduction and bio-ethics, we might have to reformulate questions concerning disability in modern, medicine-technically dominated societies. What characterizes disability in times of re-inventing the human body? And how do we have to evaluate societal meanings of ›embodied difference‹?

Linking Design Research and Disability Studies to explore ›embodied difference‹ leads towards knowledge, that is relevant not only for the so called ›persons concerned‹, but for the whole society. “Knowledge about disability and the relation between difference and normality [...] gives fundamental information about the relation of the individual, society and culture” (Waldschmidt/Schneider, 2009, 13; loosely translated). Thus it leads towards knowledge about im-/possible (use of) things, interactions or configuration of processes and artefacts.

## **Appendix**

As already mentioned above, some of the arguments concerning the fields of design and disability have been discussed in the context of “Universal Design”, “Design for All”, etc. These design approaches shall not be seen as oppositional but rather complementary to what we propose in our paper. However in our research project our aim is to emphasize on certain aspects that are not totally covered by the mentioned approaches. For instance one major focus in our topic is to determine how design can influence (and therefore maybe change) e.g. scientific, political or societal definitions and attitudes. We strongly believe in hybrid research settings and shall furthermore analyze how to use knowledge from other fields such as disability studies in design research. And vice versa: how to transfer design knowledge into other fields.

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