Scandinavian Journal of Disability Research
Vol. 12, No. 4, 2010, 305–319

Routledge
Taylor & Francis Group

Assistive devices and distributed processes: reflections on activity systems and impairments

Per Måseide* and Håvar Grøttland

Bodø University College, Faculty of Social Sciences, Bodø, Norway

(Received 18 June 2009; accepted 23 December 2009)

The article is based on an empirical research project involving persons with visual and hearing impairments and their use of assistive devices. The aim of the article is to develop a sociological understanding of the nature of assistive devices as impairments and disabilities are enacted within different everyday settings and mediated by tools and artefacts. Assistive devices include physical equipment, chemicals, animals, other persons, groups or organizations. They belong to different kinds that work at different levels of concreteness. The assistive devices mediate between the impaired body in the lived as well as the objective sense, and the material and socio-cultural environment through processes and types of activity. This takes place through what we term distributed physical and cognitive processes. These processes are constitutive for the practical understanding of assistive devices, impaired bodies and surroundings.

Keywords: assistive devices; distributed processes; activity systems; impairments

> The mental world – the mind – the world of information processing – is not limited by the skin. (Bateson 1972, 454)

> The deeper we probe into the nature of things, the *stranger* they tend to look. (Sokal 2008, 240)

Introduction

The aim of this article is to reflect on the nature of assistive devices and how they are enacted, instantiated and expanded from isolated objects to components belonging to physical and social systems. The category 'assistive device' may be associated with disabilities and impairments. In traditional disability research the terms 'disability' or 'disablement' refer to the social disadvantaging of people with impairment. It has been emphasized that the terms have nothing to do with body or impairment (Thomas 2007). Following this definition, we relate our analysis of assistive devices to 'impairment' rather than to 'disability'. Assistive devices are fundamentally embodied, practiced and integrated into an individual's repertoire of body techniques.

*Corresponding author. Email: per.maaseide@hibo.no

ISSN 1501-7419 print/ISSN 1745-3011 online

DOI: 10.1080/15017411003613203
http://www.informaworld.com

Characterizing impairment according to sex, gender, age or other social variables is not essential for the points made in this particular analysis.

This article is theoretical but derives from an empirical study of the use of assistive devices by persons who were born blind, persons who were visually impaired, deaf persons and persons with hearing impairments. The total sample consisted of 16 individuals from 18 to 45 years of age. Both sexes were equally represented and the subjects were students or employees. Data were collected from observations, video recordings of everyday activities involving use of assistive devices, and semi-structured interviews. Data from this study are occasionally mentioned in the following pages; when we for instance refer to 'interviews' or 'respondents', they belong to our sample and the interviews conducted.

Assistive devices may generically be understood as tools, artefacts or devices developed as means to reach specific ends. This understanding is correct enough, but also narrow and exclusive. We may call it an 'instrumental' understanding. A major purpose of our paper is to argue against such a restricted instrumental understanding. An instrumentally defined assistive device may restore or improve lacking or failing capacities, but these capacities need not be restored or improved as individually centred corporeal capacities; instead an externalized and distributed capacity consisting of interaction between internal or individual capabilities and external elements is established. In a restricted instrumental perspective, however, assistive devices may be reduced to the kind of technology criticized by Heidegger (1954/2003). His criticism points to four inadequacies of the instrumental understanding that we make relevant for our analysis. First, according to an instrumental understanding 'a piece of equipment is the piece of equipment it is no matter who uses it' (Dreyfus 1991, 151). This is 'assistive device' as institutionally understood; it is an unambiguous object independent of specific use and users. Second, an assistive device is an instrumental object developed specifically for persons with impairments to improve or substitute for reduced bodily functions. A simple example is prosthesis. This assistive device 'belongs' to the individual impairment and represents a piece of equipment developed for specific instrumental and functional purposes. Third, to quote Dreyfus (1991, 151) again, 'there is a normal (appropriate) way to use any piece of equipment', including assistive devices. This stresses a normative dimension of the assistive device that is not moral. It means that a given device is supposed to be used in defined and appropriate ways. The blind person must learn normal use of the white cane to improve mobility. Fourth, the assistive device has an individual character. A hearing aid is a piece of technology developed for, adapted to and appropriated by an individual user to improve his or her individual hearing capacity. The assistive device belongs to an individual sphere of activity and not to a wider constellation of elements and issues that determine if a hearing-aid works as intended or not. The understanding of technology outlined by the four points above is in many respects similar to Annemarie Mol's (2008) criticism of the extensive one-dimensional and instrumental conception of medical technology.

We do not reject the instrumental relevance and importance of assistive devices. However, our empirical data indicate that an adequate conception of what we term 'assistive devices' must be broader and more complex. It may for instance include objects not developed as assistive devices or other persons. 'Assistive device' may refer to what Heidegger (2003) referred to as a 'standing reserve' of potential instrumentality. The category is comprehensive and the phenomena it refers to are flexible, dynamic and interactive.

Assistive devices must successfully interact with given surroundings, mediate between these surroundings and the user and be compatible with specific activities. Following Engeström's (1987) reasoning, introducing assistive devices into the everyday life of an individual may open up for unintended consequences and effects due to altered relationships between the devices introduced, the individual's physical condition, intentions or motives, the actual activities and the environment. The unintended consequences may be positive or negative. Some persons equipped with hearing aids are quick to leave them behind. They produce more problems than they solve. A person with a visual impairment may be able to read a newspaper when using a magnifying glass. But being able to read does not mean full reading capacity. Because of the magnifying glass the distance from the eyes of the reader to the written text may be reduced to about four inches and the reading speed is drastically reduced; reading becomes exhausting and time consuming. The assistive device solves one problem but generates another, even if the new problem may be preferable to the original.

Central concepts

Assistive devices form parts of 'activity systems' (Goodwin 1994) that also incorporate the impaired body. Activity systems are decentralized systems for problem solving; they consist of diverse and interacting parts and are not necessarily directed by a central processor. They resemble distributed cognitive systems. Ideas about externalized cognition were articulated by pragmatist philosophers (Dewey 1997; Mead 1972). More recently a concept of 'distributed cognition' has been developed within computer science, information processing and cognitive anthropology (Rumelhart et al. 1986; Norman 1988; Resnick 1994; D'Andrade 1995; Hutchins 1995). It is not easy to distinguish between cognitive and physical systems and processes. Cognition is biological or corporeal, cultural and environmental in both the social and physical sense. Other bodily functions, such as mobility, are also products of distributed or decentralized biological and physical processes throughout the body and between the body and the environment (Clark 2008).

The 'impaired body' is 'lived' as well as 'objective' to use Merleau-Ponty's terms (1962). It is lived in the sense that it is experienced by the person with impairment, who also experiences and acts in relation to the world through or by the body. It is objective as it is perceivable as object and invades practical and physical spaces; but also in the sense that it may be displayed, described and defined by professionals. The individual's bodily experience of corporeal impairment is also the experience of a physical reality.

'Assistive devices' are integrated in many types of activities or practices and they are not defined by their objective characteristics. They are connected to other participants in the ongoing activities, to relevant contexts, settings and surroundings. They belong to 'activity types' (Levinson 1979). This is a fuzzy category that refers to socially constituted, bounded and, in a certain sense, goal-directed activities tied to specific events and with participants whose contributions are regulated by their involvement in this type of activity.

'Surrounding' refers to physical surroundings whether fabricated, and sometimes fabricated specifically for disabled persons, or natural. 'Sites' and 'settings' may also be used. It may also refer to social contexts. 'Contexts' are social situations, socially occasioned gatherings or activities. Surroundings are not necessarily prefabricated or stable; as immediate surroundings they are fabricated by or exist, totally or in part, because of the participants' activities. Leading lines for blind persons on floors or

side walks belong to the immediate physical surroundings of the walking blind person, but they only exist as this specific kind of surrounding when they are used by blind persons to direct their mobility. Otherwise they are just patterns on the floor.

Our ideas about assistive devices are to some extent also influenced by cultural-historical psychology (Vygotsky 1978) and 'activity theory' (Leont'ev 1981; Star 1998). Connected to this approach are the concepts 'mediated action', which refers to actions conducted by use of some kind of physical or linguistic tool, and 'meditating means', which refers to the tools used to accomplish an activity (Wertsch 1991). Assistive devices function as mediating means and produce mediated actions.

The diversity of assistive devices

As humans we are not simply shaped by our natural environments. We are active 'beings-towards-the-thing through the intermediary of the body' (Merleau-Ponty 1962, 106), and to a considerable extent 'through the intermediary' of assistive devices, we might add. The 'thing' is the world or our surroundings. We are not just products of discourses, forms of governmentality (Shilling 2005) or social barriers as suggested by post-structuralists and prominent disability theorists (Corker and Shakespeare 2002). We are active in creating our life world and provide it with meaning, form and substance. Generating and developing a life world requires tools and artefacts. Tools and artefacts are vital for many activities typical of our life world. In general tools were prerequisites for the modernization process; they were further developed by the process they contributed to and they have always been with us, independent of historical epochs or cultures (Montagu 1983). Tools like assistive devices have multiple functions; they produce collective life and forms of sociability, but they also create individualism and individualization.

Our most basic tools are corporeal and include our hands with their thumbs together with spoken language. Our body may be seen as a tool or form of technology (Wolkowitz 2006). External tools include, for example, written language, watches, pens, paper, eyeglasses, bicycles, cars, refrigerators, cell phones or computers. Calendars or time planners are devices we use to improve our memory, generate collective or shared memories, direct our activities and organize our time. Assistive devices are so widespread and fundamental for our forms of life that we all use them.

We cannot restrict our thinking about assistive devices to physical things. A person who helps another person is of course a physical thing and may function as that; but under many circumstances this thing character is not principled; more prominent is the person's self and social or personal identity. Another person may be used as a physical or cognitive tool for diverse purposes. The other person may move a heavy object, help the impaired person out of the bed or provide practical information or memory. It is possible to ask the other person about the time, when the bus leaves, where the door is, if he or she remembers this or that, etc. The use of another person may enable me to do something I otherwise could not do. I can catch the right bus, I can get out of the building or I may be reminded about the direction I took earlier at a certain juncture. A seeing person may be used as an assistive device by a blind person to get safely to his or her destination. But contrary to the relationship a blind person has to a physical device like the white cane, the relationship between the blind person and his or her personalized assistive device is explicitly social and moral, and this quality works both ways. This difference is

related to Hacking's (1999) distinction between 'indifferent' and 'interactive' kinds. Even if physical devices represent social objects and may be loaded with moral meanings, they still have a different social and moral status than the person; contrary to the person they are neither reflective nor self-reflecting.

The blind person relates corporeally to most assistive devices including the other person who acts as helper or guide. The contact between them is physical and intersubjective. But for the practical assistance as well as for the intersubjective character of this assistance, the physical contact and the form of this contact is essential. According to our blind respondents, the assisting person should not grab and push or steer the blind person in the (supposedly) relevant direction. Those forms of contact and corporeal acts were considered impropriate and insulting. The blind person is the one who should be in command of the situation; he or she should take hold of the helper's arm and agree to be led. This polite agreement is physically communicated when contact is made by the blind person. It gives the blind person a participant status not as dependent but as the one in command; the relationship is experienced as socially symmetric or perhaps with one-upmanship in favour of the blind person.

The use of many assistive devices must be learned. Some physical devices inform about how to be used through their design (Norman 1988). Electronic technology is often provided with systems that inform about use and identify faults. As demonstrated by Suchman (1987), however, such instructions may demand a capacity by users to interact with the device to solve problems or find out how to make the device work. In other cases an instructor is needed. Persons as assistive devices are able to instruct and interact with the user in ways that material devices cannot do.

Assistive devices and the body

Some assistive devices, like the magnifying glass, are external to the body; others, like contact lenses or cochlear implants, are more closely integrated with or implanted in the body. Independent of kind, an important aspect of assistive devices is that they should ideally be as natural or transparent as possible. 'Transparent technologies', according to Clark (2003, 28), 'are those that become so well fitted to, and integrated with, our own lives and projects that they are [. . .] pretty much invisible-in-use'.

We may distinguish between five major forms of assistive devices. The first are physical artefacts implanted in the body that function without learning, wilful control or consciousness. Examples are pacemakers or artificial heart valves. Next we have artefacts that are implanted but require training. An example is cochlear implants. This kind of assistive device will not provide instant normal hearing capacity; the user must learn how to use the assistive device, often with the help of a professional instructor. These first two kinds represent 'cyborgs' (Clark 2003). They are implanted in the body and make the physical body function as normal or almost normal. The third kind includes pharmacological or chemical products that are used, not for healing but for maintenance of capacity. Medication will not cure a person from asthma, but when properly used it may improve his or her respiratory capacity and permit participation in diverse activities. Another example is devices used by persons with diabetes that automatically measure their blood values and when needed provide necessary dosage of insulin. This kind of assistive device is almost transparent. A fourth kind includes assistive devices located explicitly outside the body. It is sometimes necessary to learn how to use such artefacts. This is the case

with the blind person's white cane used for mobility. Such assistive devices as computers also require a competent user. Other external assistive devices such as eyeglasses, magnifying glasses or hearing aids require little or no training, even if the user may be quite aware of them. A fifth kind is persons or social groups. The relationship to external assistive devices become cognitively, socially and morally challenging in a different way when they exist in the form of other persons or socially organized groups or systems. The relationship between user and personalized assistive device is not social in any abstract sense; it is essentially corporeal and intercorporeal. It may also be intimate. Because of the social and moral aspects of human forms of assistance, it is necessary to find acceptable ways of managing social relationships to persons who provide support and to deal with the inequality and partial dependence that characterize such relationships. The complicated relationship to persons on whom the impaired person may become dependent is described by Murphy (1987) in his autobiographical analysis of his own severe impairment. It has been suggested that it may be less complicated for persons with impairments to relate to professional helpers, hired assistants and other forms of institutionally organized assistance than to more intimate persons (Gregory 2005). According to Rivas (2003), the assistant who provides care may also function as an extension of the patient's body. As such, personal assistance may also become part of a distributed system.

The integration of assistive devices and impairments

External activation of individual physical or cognitive capacities and interaction with our surroundings is necessary for adequate seeing or hearing and for development of perceptual skills and biological structures in general (Thelen and Smith 1994; Fauconnier and Turner 2002). Following Wilson (2004) we label this perspective 'externalist'. It contrasts with a second stand termed 'individualist', which places cognitive or mental capacities within the confines of the individual body. The 'externalist thesis' argues for the essentially external or distributed nature of human embodiment and cognition. Andy Clark (2003, 61), a proponent of this thesis, makes a similar point with regard to our body-images:

> ...we discover that the body-image supported by a biological brain is quite plastic, and highly (and rapidly) responsive to coordinated signals from the environment. The image of the physical body with which we so readily align our pains and pleasures is highly negotiable. It is a mental construct, open to continual renewal and reconfiguration.

When we use assistive devices, whether they are eyeglasses or hearing aids, we use something that does not belong naturally to our body to mediate between our body with its brain and neurological system and our surroundings and we do it to make the body functional for certain practices. The assistive devices are necessary for the functioning of the body, but the body and body techniques are also necessary for the assistive devices to work as intended.

Hearing difficulties and problems with visual impairments are corporeal and cognitive. Relevant assistive devices are developed to replace the loss of or to improve such perceptional capacities. When assistive devices are used, the individual capacities they are supposed to improve, or the loss of which they should compensate for, have expanded from the individual body and become distributed. The distribution of physical capacities represents an expansion of the individual physical body, and the distribution of cognitive capacities an extension of mental processes.

Distribution makes the boundaries between the physical body and its surroundings blurred. We will not go into the problems of mind-brain distinction, but body and mind produce adequate perception by being interconnected (or the mind might be said to reside in and be distributed throughout the body) and connected to external resources by material and symbolic mediating means (Clark 2008). Because of this, even the individual mind is expanded out of the brain and depends on external factors. According to this mind-body-environment model the white cane helps the blind person perceive and generate a space for mobility while it is seen by others as a sign of this person's blindness. This information has moral and practical consequences for seeing people and it makes a claim for such considerations by the blind person.

Assistive devices are often connected to activities beyond the individual task. Hearing aids are used under diverse circumstances. We are informed by our respondents that how they work or to which extent they advance social participation depends on a range of issues. It depends on how the room they are used within is materially equipped, its acoustics, the degree and kinds of background noise in given situations, the number of persons present, the kind of activity type, how the hearing impaired person is expected to participate and how he or she is spatially positioned. Is the hearing impaired person supposed to be active, is he or she supposed to attend to one speaker at a time or to several speakers located at various places in the room? Is it possible to have eye contact? Is it possible for a person using hearing aids to find the optimal position in the room? Is it possible, and if so, how morally and socially challenging is it to claim this optimal position? Is it possible to organize an activity so as to advance participation for a person with hearing problems and will persons with special needs feel socially uncomfortable if they have to make demands on how an activity should be organized and proceed to meet their special needs? Our respondents have told about the embarrassment they experience when they have to ask for special technical arrangements or make requests with regard to their bodily positioning to advance their hearing, or even worse, to have to make improvements or restore technical arrangements in the middle of a speech activity. It makes the impaired person visible and different; the impairment is highlighted.

Distributed systems and processes

In order to see, a biologically normal eye is needed together with a complex of physiological, neurological and cognitive conditions and processes. These are internal and corporeal preconditions for vision. However, to see, we need an adequate environment for vision. It must include light and something that activates our embodied systems for visual perception (we are aware that individuals under given circumstances and for neurological, chemical or mental reasons may see something that is not actually there 'out in the environment', but this does not affect our argument). Adequate light for seeing may be daylight, but many visual activities require artificial light or light that is stronger than ordinary daylight. Every time we switch the light on or off, we change the preconditions for seeing. When I enter my dark kitchen on an early winter morning I switch the light on. By switching the light on I use an assistive device that enables me to see, but I do not switch the light on just to watch the kitchen; I do it for a practical purpose, to be able to prepare my breakfast. By switching on the light, I access a room that in important and practical respects differs from those of the dark one. By illumination the room becomes a

practical environment that enhances activities that require seeing or which seeing is part of. With regard to material structures the room is the same whether it is dark or illuminated, but it is not the same when practical matters such as work are taken into consideration.

In order to hear, we need normal auditory anatomy; but we also depend on neurological and cognitive systems to recognize, organize and process our sensation of sound. Normally there must be sound waves that activate our bodily hearing systems (we are of course aware of the problem of tinnitus, the subjective sensation of sound others cannot hear, but this problem has no relevance for our argument). In addition an environment is needed that makes it possible to hear and distinguish specific sounds, such as music or voices that articulate speech. A concert hall has, for instance, a certain spatial and material construction to create optimal conditions for hearing music. For direct hearing we must be close enough to the source of sound and the aural environment should not be contaminated by other noise. We must also be bodily and cognitively oriented to sound and its source. In a similar manner successful walking depends on the individual body as a well-functioning and complex anatomical, physiological and neurological system. But among other physical prerequisites we also need ground to walk on. A correspondence always exists between the ground we walk on and our bodily movements and capacities; the efficiency of the body depends on the material environment. Studies of robotics support this view (Clark 2008). The material surroundings of urban sites are also planned and constructed in order to make walking possible, and to some extent easy, safe and comfortable (Freund and Martin 2004), even if it may be difficult to access or move within by impaired persons.

Our walking also differs according to social circumstances. The concept of 'body technique' (Crossley 1995) may be used to describe specific forms of intercorporeality and corporeal behaviour among or typical for persons with hearing or vision impairments in specific situations or when involved in specific kinds of activities. From interviews we are informed that blind persons orient themselves spatially by recognizing physical changes or differences in the texture of the ground through their feet; their spatial perception is often subordinate to certain movements of their white cane and the contact between the cane and the ground. They may depend on direct corporeal contact with physical objects and structures or other persons. For persons with hearing impairments it may be necessary to locate themselves at certain places in a room or relate corporeally to specific persons in order to hear. This may also mean establishing physical contact with other persons, often strangers, or having their sphere of intimacy invaded in order to be able to hear or perceive adequately. In this respect not only the assistive devices, but also the bodily impairments are distributed, physically and socially. And the distribution of impairments is often mediated by use of assistive devices.

When driving a car, signs along the road inform us about speed limits, when we should stop or be alert, or they direct us to our destination. Road maps or electronic navigation systems may direct drivers or pedestrians exactly to the place they want to go. One of our blind respondents uses a cell phone with Global Positioning System (GPS) to direct her when walking. External devices make us into individually competent drivers or walkers. An ordinary microscope makes it possible for us to see something we could not see with our naked eye. An electronic microscope will increase our visual capability even more. Modern technology makes it possible to 'see' the inside of a body; the doctor's stethoscope improves his or her professional

hearing capacity and in combination with anatomical and physiological knowledge it enables him or her to determine pathological processes or conditions. A stenosis may, for instance, be identified when the special sound of the bloodstream it generates in an artery can be heard through a stethoscope. Hearing aids do similar things for a person with a hearing impairment and technical improvements of hearing aids have to some extent improved the user's hearing capacity. Another technical improvement for persons with hearing impairment is the induction loop. This external device is installed in rooms in buildings to improve the effect of ordinary hearing aids. So are FM senders and receivers. But even such devices require special ventures to become effective. Background noise may still be a problem, the induction loop may have limited reach, the sound quality may be poor and special social or spatial arrangements may be necessary to create an efficient and distributed hearing system.

Our body interacts with its surroundings. Therefore we term the activities mentioned above 'distributed processes'. When assistive devices are used, they become constitutive of and integrated in distributed processes. They are used in distributed processes and they generate these processes. To see does not only require interaction between a sense organ and its surroundings; the vision may be mediated by a pair of glasses and our perception is affected or changed by the quality of light. If we use eyeglasses with progressive lenses, these lenses force us to learn new ways of seeing. We must learn to move not only our pupils but also our head or body to gain adequate and undisturbed vision. These new corporeal ways of seeing will after a while become habitual, natural and automatic. Our vision from use of progressive lenses becomes embodied in a way different from seeing through ordinary glasses or without. A fairly simple distributed system would include a human body, eyeglasses with progressive lenses, artificial light and visible surroundings.

In the descriptions above the processual nature of cognition and social and physical practices have been emphasized. At the same time the distributed activities may be described in more static terms as systems. The term 'distributed system' highlights the elements that form the distributed processes. The combination of elements in distributed processes is sometimes fairly stable, sometimes almost institutionalized and often habitual. So even if the term 'system' is used, it does not exclude 'process'.

Assistive devices are involved in social activities in the full sense. Some of them generate activities and participation in activities. Reading might be impossible without a magnifying glass, but once the magnifying glass is obtained it may trigger reading. Use of the white cane improves the blind person's mobility and thus the opportunity to participate in a range of activities that connect to other socially occasioned activities; these may require other assistive devices and involve the person in other provinces of meaning than those connected to mobility. Hearing aids will also enhance social participation and generation of interpersonal relationships. Hence, the distributed system which includes the person with the impairment and the assistive device may develop, grow, multiply and change. Distributed systems and assistive devices develop and get integrated with other assistive devices and activity systems in ongoing and emerging processes.

Gregory Bateson (1979) gives an example of a distributed system. His example is the blind man who lacks the visual capacity to orient and move efficiently and safely in the physical world. To compensate for this lack of visual capacity the blind man uses a white cane. The white cane is an assistive device that makes perception possible. But perception is not completed by the white cane or by the hand that holds

the cane. What generates perception is a distributed system consisting of the cane, the hand holding the cane and the cane's contact with the physical surroundings. To acquire perceptually useful information, the blind man has to move the cane while it touches the ground to register physical differences. For the blind man, perceptual information comes from the registered differences on the ground through the cane and the sound resulting from the cane's touch of the ground. Bateson describes here not only a physically distributed process comprising interaction between a person's hand and the hand's connection to intrinsic neurological systems, his or her white cane and the ground; he describes a distributed cognitive system. This system expands the perceptual process beyond the limits of the individual body. Complications may occur if more participants are added to the distributed system. If we add snow or ice to the ground, for instance, it becomes difficult to register physical distinctions with the tip of the cane, the sound it makes may become unfamiliar and the perceptual system fails. To compensate for that, tips specially designed for use on ice or snow have been developed. Assistive devices may change or be developed to respond to new demands or be integrated in new activities or environments. Several kinds of tips for canes exist and since the tip chosen for the cane will affect the perceptual process, users may have different preferences.

Distributed systems may include social organizations or institutional orders. For persons with physical impairments these comprise health care services, social services of different kinds, interest organizations or self-help groups. These kinds of assistive devices differ from the material ones in the sense that they are organized as social groups or institutions; they may have universal rather than individual aims and functions, they have their own collective dynamics and logics, sometimes unaffected by the individual user. The individual user may perhaps get the feeling that the organization or institution takes command in ways they may not feel comfortable with. Persons with physical impairments have reported that they refrain from contact with relevant health services because of that (Torkildsen Grytten and Måseide 2008).

When we turn to others for help or assistance, it is because capacities are socially and physically distributed. Each of us does not exactly or to the same extent have the same knowledge, experience, competence or physical capacity. We share knowledge and competence as cultural members, but much of this is also differentiated and unequally distributed within our society (Schutz 1946; Berger and Luckmann 1967). Differentiated and distributed knowledge and competence is necessary in a modern or late modern society. It is essential for many activity types and working teams; it makes the members avoid what Hutchins (1991) called the 'confirmation bias'. If groups consist of members with exactly the same knowledge and competence, mistakes would be slow to be corrected and improvements hardly or slowly developed. Many of the most commonly used social or personal assistive devices are products of differentiation.

A distributed system is always embedded in settings and contexts. For the blind person this has at least three meanings. First of all, the physical surroundings within which the blind person at any time is located and acts are inevitable parts of the same distributed system the blind person is part of. Second, the activities the blind person is involved in form parts of the same distributed system. The distributed system is instantiated by the activities of the blind person. We have observed that when a blind person walks on the sidewalk moving his or her white cane, people around him or her recognize the person with the white cane and move away and make a space for this person's undisturbed walk. The use of the white cane changes the immediate

environment that is part of the distributed system. So the blind person generates his or her own behavioural surroundings by use of the assistive device. And it is not so much the assistive device as physical tool that matters; it is its symbolic function. Third, the elements of the distributed system mentioned above are always embedded in wider material settings and social and cultural contexts. The physical surroundings change as the blind person moves from one place to another, and to reach the destination he or she has to be in touch with wider surroundings than the immediate sites that constantly must be related to during the trip. In the same manner a wider cultural context than the immediate and situational one provides the white cane with its symbolic meaning. The distributed system is constituted by an integration of these three meanings, and the integration takes place through mediation by the assistive device and the situated agency of the blind person.

Communicative characteristics and functions of assistive devices

Within certain regions of the life world assistive devices may reduce practical differences between persons with impairments and persons without. The term 'practical differences' does not refer to differences in kind but to differences in function. Special kinds of equipment make employees with a physical impairment able to achieve as well as other employees. But since the use of assistive devices takes place within a context of meaning, they may also highlight differences between persons with impairments and able bodied persons.

A tool or an artefact may make the user independent of personal assistants and autonomous, at least in a relative sense. To become autonomous has various consequences and meanings. Autonomy is highly valued in our individually oriented culture; it may be worth striving for. To maintain a valuable self image, it is important to be in control of the body, to accomplish the tasks of one's everyday life and be able to take care of oneself. The ability to do so has become an individual and in many cases a legal right. Autonomy is important in order to deal with the practicalities of everyday life and it affects the management of identity and relationship to self and others. In fundamental ways it also has to do with emotions and morality. Assistive devices may be essential to acquire independence and autonomy. To achieve this, however, it may be emotionally and morally less complicated to be dependent on an artefact or a guide dog than on another person. Relationships to persons on whom one gets dependent may be experienced as socially complicated by both parties (Wærnes 1984; Van Dongen and Elema 2001). Dependence on a spouse, your own children or other individuals who are close to you may be particularly intricate. A material assistive device does not produce the same problems. Material assistive devices may be symbolically and morally loaded, but not the way dependence on other persons is.

Hence, an assistive device may create an autonomous individual who under certain circumstances is independent of help from others. In such cases the assistive device functions not only as a tool but also as an identity marker. A hearing aid will improve individual hearing for the user and open the opportunity to enter a status as a hearing individual or to act as an ordinary hearer; but the hearing aid may also have a more emblematic function. It may be designed in specific ways to associate the user with certain subcultures or cultural flows (Pullin 2009). Social theorists have emphasized the value for members of our society to communicate and display

individuality and autonomous selves (Goffman 1967; Giddens 1991; Lemert and Branaman 1997).

On the other hand, an assistive device may highlight an individual's dependence. Being recognized as dependent on assistive devices may be experienced as self-threatening or leading to status degradation. Such experiences may be so awkward that the potential user abstains from using certain assistive devices; or if they are used, it may be important to stress forms of use that signify other identities than the identity as impaired. A blind person we have observed walks briskly on the sidewalk holding a white cane but not using it for mobility. This specific form of use shows a person, who in spite of the impairment indicated by the white cane acts as a competent and independent individual. Assistive devices are social objects with symbolic functions and they may be developed and used as symbols or sign systems just as the body is an emblematic meaning producing and meaning carrying object.

The value of independence and autonomy for persons with impairments is further indicated by such training programmes as 'Active Daily Living Skills' (ADL). These programmes are supposed to improve the abilities of people with impairments to manage their everyday lives. From a positive point of view, becoming autonomous may represent a form empowerment. But if the person with impairment is socially isolated or marginalized because of the impairment, the introduction of autonomy-generating assistive devices may contribute to maintaining or strengthening the marginalization. Autonomy is gained, but so is also social isolation. It might be relevant to ask to what extent it is an undisputable advantage to become independent and if it is solely beneficial to become able to solve all problems alone. In the worst case, might not independence make persons with impairment into a kind of Robinson Crusoe in the middle of their communities? It is important to identify the positive value of being independent of others; but it is also important to ask if a positive value is attached to social and interpersonal dependence. These questions may be considered unreasonable or irrelevant; they are still addressed, however, in order to suggest the complex nature of assistive devices. Many persons who receive practical and personal assistance in their homes appreciate the social contact this implies. What may be called the 'normal condition' for members of our heterogeneous and differentiated late modern societies is also to be dependent on others. So contingent upon circumstances, dependence may be considered normal, it may be advantageous, but it may also become a problem.

To extend this line of reasoning, we may also ask if or in which sense assistive devices implicate or lead to forms of normalization for people with impairments, or if such ideas represent a misunderstanding. The problem is complex. To be able to complete ordinary tasks when using assistive devices may be experienced as a form of normalization by people with impairments, and as such it may be considered positive; but the need for an assistive device may not refer to a normal condition and may therefore be negatively recognized. It should also be asked if specific assistive devices are experienced by certain users in general as socially or morally burdening, or if users experience use of assistive devices as socially unacceptable or morally degrading under specific circumstances. It is probably not possible to get unambiguous answers to such questions, and it might also be difficult to interpret a potential diversity of responses. Assistive devices may at the same time be experienced as positive or negative, and depending on conditions the experiences may change.

Conclusions

Blindness, deafness, visual impairments and hearing impairments are as such objective physical conditions independent of social or cultural processes or conditions. However, these impairments represent something more than objective physical conditions, and this 'more' has an intricate meaning. For blind persons and persons with hearing impairments at least and probably for most people with impairments, 'assistive device' refers to a complex set of phenomena. They are material and social. Assistive devices in the form of artefacts are social objects with meanings beyond their purely instrumental functions. In addition they have social functions as they promote social participation. An artefact, a tool or a person becomes an assistive device as part of a distributed system, and for persons with impairments such systems are essentially social. The assistive devices make the impairment into something that is not just an individual and objective condition; the impairment also represents an expanded and distributed process. The assistive device changes the nature of the impairment and acts as mediator between the person with the impairment, his or her environment and the activities he or she is involved in. The assistive device makes a difference not only for the person with impairment, but also for the way the impairment may be experienced and enacted, whether by the person with the impairment or by other persons. Assistive devices are social in the specific sense that they also exist in the form of other persons. When the blind person takes hold of a seeing person's arm to be guided, the blind person makes the seeing person into 'standing reserve', a technology or an object that seemingly is controlled by the blind person, but not completely so. The blind person has to relate to this assistive device as a social subject. The relationship between user and assistive device is social and moral, and this quality goes both ways. But even when the assistive device is an artefact, the artefact generates involvement in social and moral affairs. The assistive device is part of a distributed system that connects it to social and moral dimensions of activities and activity types. They act as mediating means between the user's body, impairment and self and his or her social and material environment, but they also blur the boundaries between these parts of the system.

To be explicit about the practical relevance of this analysis is difficult. However, it indicates something about the dialectics between universalism and particularism in our understanding of assistive devices. While a broad understanding of assistive devices is needed, it is important to locate the assistive device within the context of concrete everyday life and its practices for individuals with impairments. In order to do so, a more differentiated perspective on impairment than presented here would be relevant.

References

Bateson, G. 1972. *Steps to an ecology of mind*. New York: Ballantine Books.

Bateson, G. 1979. *Mind and nature*. New York: Dutton.

Berger, P.L., and T. Luckmann. 1967. *The social construction of reality*. New York: Anchor Books.

Clark, A. 2003. *Natural-born cyborgs: Minds, technologies, and the future of human intelligence*. Oxford: Oxford University Press.

Clark, A. 2008. *Supersizing the mind: Embodiment, action and cognitive extension*. Oxford: Oxford University Press.

Corker, M., and T. Shakespeare, eds. 2002. *Disability/postmodernity: Embodying disability theory*. London: Continuum.

Crossley, N. 1995. Body techniques, agency and intercorporeality: On Goffman's relations in public. *Sociology* 29: 133–49.
D'Andrade, R. 1995. *The development of cognitive anthropology*. Cambridge: Cambridge University Press.
Dewey, J. 1997. *How we think*. Mineola, NY: Dover.
Dreyfus, H.L. 1991. *Being-in-the-world. A commentary on Heidegger's Being and Time, Division I*. Cambridge, MA: The MIT Press.
Engeström, Y. 1987. *Learning by expanding: An activity-theoretical approach to developmental research*. Helsinki: Orienta konsultit.
Fauconnier, G., and M. Turner. 2002. *The way we think*. New York: Basic Books.
Freund, P., and G. Martin. 2004. Walking and motoring: Fitness and the social organization of movement. *Sociology of Health & Illness* 26: 273–86.
Giddens, A. 1991. *Modernity and self-identity*. London: Polity Press.
Goffman, E. 1967. *Interaction ritual*. New York: Anchor Books.
Goodwin, C. 1994. Professional vision. *American Anthropologist* 96: 606–33.
Gregory, S. 2005. Living with chronic illness in the family setting. *Sociology of Health & Illness* 27: 372–92.
Hacking, I. 1999. *The social construction of what?* Cambridge, MA: Harvard University Press.
Heidegger, M. 1954/2003. The question concerning technology. In *Philosophy of technology*, eds. R.C. Scharff and V. Dusek, 252–64. Oxford: Blackwell.
Hutchins, E. 1991. The social organization of distributed cognition. In *Perspectives on socially shared cognition*, eds. L.B. Resnick, J.M. Levine, and S.D. Teaseley, 283–307. Washington, DC: American Psychological Association.
Hutchins, E. 1995. *Cognition in the wild*. Cambridge, MA: The MIT Press.
Lemert, C. and A. Branaman, eds. 1997. *The Goffman reader*. Oxford: Blackwell.
Leont'ev, A.N. 1981. The problem of activity in psychology. In *The conception of activity in Soviet psychology*, ed. J.V. Wertsch, 37–71. Armonk, NY: Sharpe.
Levinson, S.C. 1979. Activity types and language. *Linguistics* 17: 356–99.
Mead, G.H. 1972. *Mind, self, & society*. Chicago: The Chicago University Press.
Merleau-Ponty, M. 1962. *Phenomenology of perception*. London: Routledge.
Mol, A. 2008. *The logic of care: Health and the problem of patient choice*. London: Routledge.
Montagu, A. 1983. Toolmaking, hunting, and the origin of language. In *The sociogenesis of language and human conduct*, ed. B. Bain, 3–14. New York: Plenum Press.
Murphy, R.F. 1987. *The body silent*. New York: Henry Holt and Company.
Norman, D.A. 1988. *The psychology of everyday things*. New York: Basic Books.
Pullin, Graham. 2009. *Design meets disability*. Cambridge, MA: The MIT Press.
Resnick, J. 1994. *Turtles, termites, and traffic jams*. Cambridge, MA: The MIT Press.
Rivas, L.M. 2003. Invisible labours: Caring for the independent person. In *Global woman: Nannies, maids and sex workers in the new economy*, eds. B. Ehrenreich and A.R. Hochshild, 70–84. London: Granta Books.
Rumelhart, D., J. McClelland, and the PDP Research Group. 1986. *Parallel distributed processing*. Cambridge, MA: The MIT Press.
Schutz, A. 1946. The well-informed citizen: An essay on the social distribution of knowledge. *Social Research* 13: 463–78.
Shilling, C. 2005. *The body in culture, technology & society*. London: Sage.
Sokal, A. 2008. *Beyond the hoax: Science, philosophy and culture*. Oxford: Oxford University Press.
Suchman, Lucy. 1987. *Plans and situated actions: The problem of human-machine communication*. Cambridge: Cambridge University Press.
Thelen, E., and L.B. Smith. 1994. *A dynamic systems approach to the development of cognition and action*. Cambridge, MA: The MIT Press.
Thomas, C. 2007. *Sociologies of disability and illness: Contested ideas in disability studies and medical sociology*. Houndmills, UK/New York: Palgrave Macmillan.
Torkildsen Grytten, N., and P. Måseide. 2008. 'I am the one who knows my body': Experiences of health care encounters among people with multiple sclerosis.
Van Dongen, E., and R. Elema. 2001. The art of touching: The culture of 'body work'. *Anthropology and Medicine* 8: 149–210.

Vygotsky, L. 1978. *Mind in society: The development of higher psychological processes*. Cambridge, MA: Harvard University Press.
Wertsch, J.V. 1991. *Voices of the mind: A sociocultural approach to mediated action*. London: Harvester Wheatsheaf.
Wilson, R.A. 2004. *Boundaries of the mind: The individual in the fragile sciences*. Cambridge: Cambridge University Press.
Wolkowitz, Carol. 2006. *Bodies at work*. London: Sage.
Wærnes, Kari. 1984. The rationality of caring. *Economic and Industrial Democracy* 5: 185–211.