How to conceptualise AAC user-technology relationships: a study on eye control

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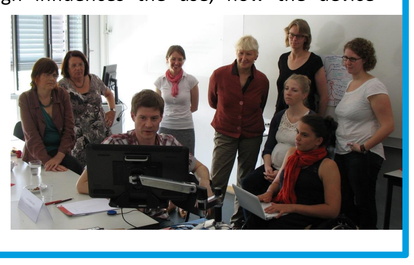
Introduction

In our project, we try to find new concepts to describe AAC user-technology relationships. Traditional conceptualisations tend to see the user on one side and technology on the other. The dynamics and the transformative power of the interaction as well as the many actors involved in the use of an eye-controlled AAC device are often ignored. In reality, all actors are negotiating the responsibilities between them. To investigate these negotiations and this network of responsibilities, we bring together experts from various disciplines and professional backgrounds who work with eye control in AAC: designers from the small German enterprise *alea technologies gmbh* (producing an eye-tracking system), therapists and teachers (esp. from the *Hegau-Jugendwerk*, a hospital and rehabilitation centre for children and adolescents), AAC counsellors (e.g. the AAC support and counselling centre of the *Spastikerhilfe Berlin e.V./e.G.*), researchers and users.

Together, we discuss questions like:

- How does the designer conceive of the typical user of his device?
- How do the therapists and teachers think about communication using a speech-generating device?
- How can a user learn to use her eyes – a sense organ normally working receptively on distance – to actively control an interface?
- When someone starts to communicate with an eye-controlled device: what do her relatives and friends expect?
- How can all these groups bring their experience together and design ideas for further development?

All involved parties gain insights through the discussion: the designers understand better how their design influences the use, how the device incorporates a scenario for the user. The therapists and teachers understand better what they expect from the user and from the device. Researchers learn more about the necessary qualifications of AAC specialists.



Aims

We investigate the network of human and non-human actors around the use of assistive technology. A lot of research on assistive technology focuses either on technical improvement/innovation or on user acceptance. These approaches consider technology and the user as separate spheres. By contrast, recent notions like "domestication" (derived from media and cultural studies, e.g. Berker 2006) suggest that user-technology relationships are dynamic: integrating technology into everyday life is a process through which both the user and the technology change.

We take eye control of AAC devices as an example: Eye tracking has become a robust way of controlling AAC devices, and a great demand for this technology has developed. Often, families place great hopes in eye tracking, because they consider it to be the last chance for a non-speaking person with severe motor impairment (Debeljak 2012). The great expectation involved in this technology makes it a very good example for analysis: Is a person's ability to speak only a matter of finding the "right" device with the best access method? How is the desire to communicate shaped by the tools, the situation, and the people we communicate with? We have to consider the relationship between user and technology as an interaction: the device includes a scenario for its use, but the user decides how to follow or re-write this "script" (Akrich 1992). Therefore, in integrating AAC technology into the family and home environment, both the user community (person who uses AAC/PWUAAC, family, therapists) and the technology change routines, meanings, structures etc.

Working hypothesis:

A **network model** with a sharing of responsibilities between **human and nonhuman actors** is more powerful to describe the use of eye control in AAC than a dualistic user-device model.

Methods

Based on a *Grounded Theory* approach, we use qualitative research methods such as participant observation and structured expert interviews. We suggest to take advantage of some concepts that have been developed in science and technology studies (STS) to shed light on the process of designing, customising and using an AAC device. These studies focus mainly on the *interaction* of users with technology. Therefore, *observations* of use of AAC devices (communication, training and service routines) seem most appropriate: such observations can make the interactions visible.

Up to now, we conducted 9 interviews with AAC specialists (speech therapists, special education teachers, educational psychologists, all of whom completed special AAC courses, e.g. through ISAAC-GSC).

Additionally, we observed three people who started to use an eye-tracker to control a speech-generating device (age 11 to 60, two male, one female). Analysing these interviews and observation protocols, we gained our first results.

Results

How are designing and using technology intertwined? People who design technology develop a scenario of the user doing something specific with the help of the device. This scenario is incorporated in the technical design of the device.

> "Designers […] define actors with specific tastes, competences, motives, aspirations, political prejudices, and the rest, and they assume that morality, technology, science and economy will evolve in particular ways. A large part of the work of innovators is that of '*inscribing*' this vision of […] the world in the technical content of the new object. I will call the end product of this work a 'script' or a 'scenario'." (Akrich 1992, p. 208)

This "vision of the world" includes ideas about the delegation of competences and responsibilities: some competences lie in the device itself, other competences and responsibilities are delegated to the user and her environment. In her semiotic approach* to the network of actors, Akrich tries to avoid differentiations between non-human/technical and human/social elements in an ensemble, because all elements work hand in hand and all relationships between these actors are equally relevant.

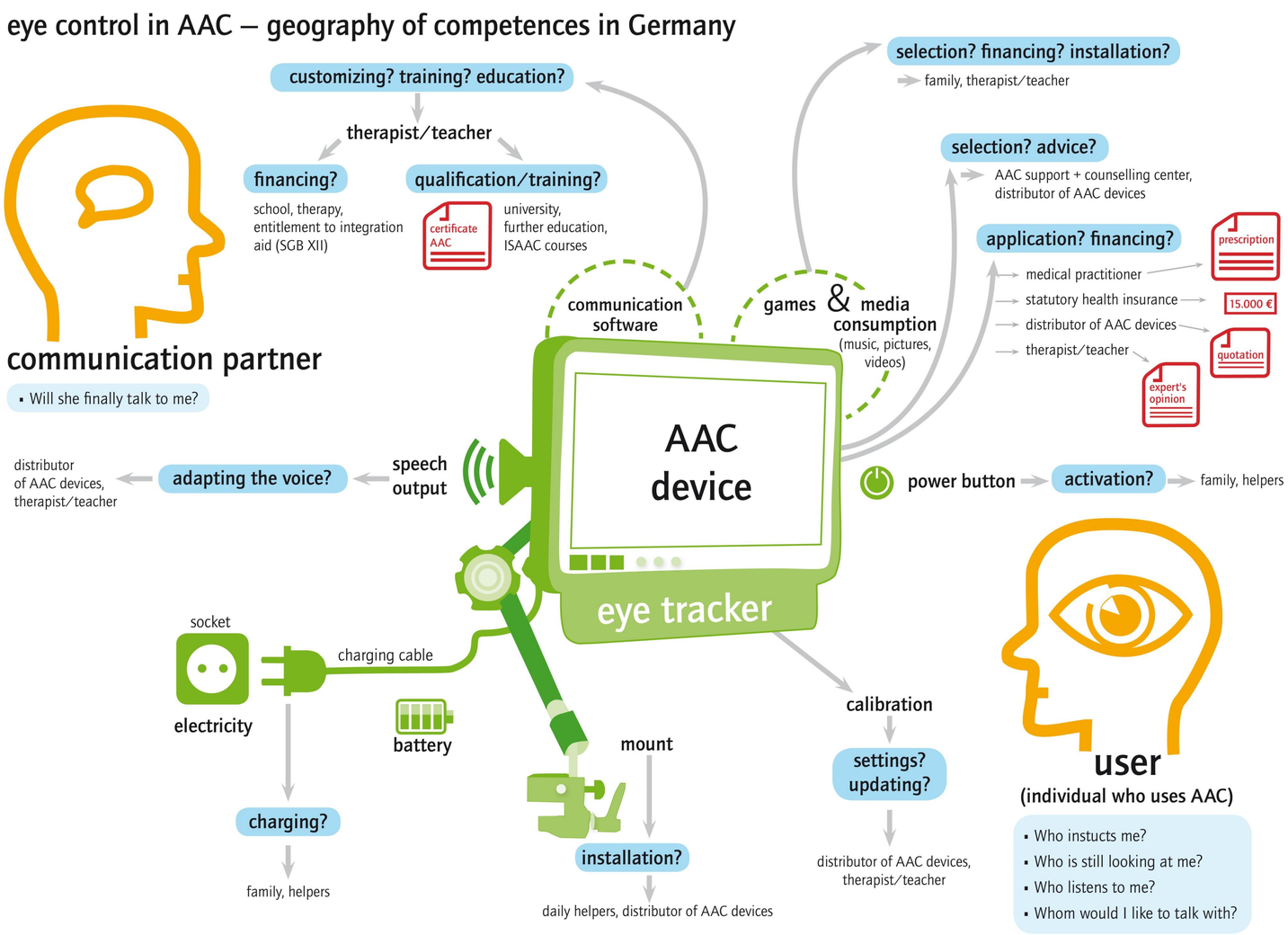
Thinking of *calibrating* an eye tracker, this distribution of competences becomes evident: If the calibration results are insufficient, there are several options.

- We could say: "The device was malfunctioning or disturbed" and we delegate the responsibility to the technical object.
- We could also say: "We have to improve the installation, maybe the distance between you and the screen was not optimal" and we delegate the responsibility to the therapist or teacher who customises the device for the individual user.
- Another possibility would be to say "Maybe your eyes were not really open during this process. Could we try again?" and we delegate the responsibility to the user.

The disturbance shows how all the actors – the user, the professional helper, and the device – are negotiating their competences and responsibilities. We can take this aspect as a starting point to discuss questions as the following: What should the device do? What is the professional helper competent for? How can the helper instruct the user?

We designed a map showing the geography of competences and responsibilities regarding a person who uses an AAC device with eye control. This map represents the situation in Germany. Financing, health insurance structures, and professional education differ from country to country. With this map we show that the idea of a device that simply depends on its technical components is not appropriate. All components (switches, batteries, communication or eye-tracking software) are directly intertwined with human or social actions (switching, charging, covering the costs, customising an interface etc.).

* "Semiotic" in this context means "how meaning is built, […] how one privileged trajectory is built, out of an indefinite number of possibilities; in that sense, semiotics is the study of order building or path building and may be applied to settings, machines, bodies, and programming languages as well as texts" (Akrich & Latour 1992, p. 259)



Core area "eyes, eye contact, controlling with the eyes"

1.) A lot of the time all people in the room were looking at the screen, to follow the actions that the user initiated with her eyes. This means a loss of immediate contact. Interestingly, we found the same observation in Hélène Mialet's notes from her interview with Stephen Hawking (from her ethnographic study: "Hawking incorporated"): "We don't look at each other; we look at the computer instead." (Mialet 2012, p. 128)

2.) However, communication with the AAC device was regularly interrupted by direct communication with the PWUAAC: Either the communication partner or the user initiated direct eye contact and the communication partner asked something relevant to this special situation (e.g. "Did you trigger this box on purpose?", "Do you want to stop and play a game now?"). The PWUAAC would answer with her own communication signs (mostly eye movements, sometimes vocalisation or facial expressions).

Ad 1+2: At first, you might think it is not natural to control a communication interface with your eyes. But severely motor-impaired people are already familiar with using eye movements to communicate: Their yes-no communication signs are in some cases based on eye movements and they are used to "point" on something with the eyes. That's why eye control does not demand a new task or a new use of the visual sense from them. Furthermore, although the screen receives the main attention of all people involved, the users alternate quickly and fluent between eye control of the AAC device and eye contact with the communication partners. This eye contact is especially necessary to make visible emotional aspects of the communication that are not audible in the synthesised speech output. Communication partners can ask questions related to the situation, adding to the options represented on the communication interface. The PWUAAC can answer with her communication signs.

Conclusion

In our project, we focus on the user-technology relationships: Embodied in the technical object we find the designer's scenario of how the user should interact with the technology. This scenario includes a distribution and delegation of competences and responsibilities among all involved actors. Our hypothesis is that the use of eye control in AAC depends on a complex delegation of competences to many (human and non-human) actors. The first observations have proven this hypothesis to be right: For example in the calibration we can find an intertwinement of responsibilities of user, helper and eye tracker. If the calibration is not successful, it is in most cases not clear who is "responsible" for this result. Furthermore, the interplay between eye control of an AAC device and eye contact with communication partners shows that the communication device is not the exclusive mode of communication. Offering these concepts and observations to designers and therapists/ teachers, we hope to open up a new perspective on the playful and creative interactions with technology, keeping in mind how social communication and technology influence each other.

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alea technologies gmbh

Project management:

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University of Applied Sciences

Further information

Name of the research project:
EyeTrack4all

Duration:
Oct. 2013 – June 2016

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Federal Ministry of Education and Research

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Declaration of interest: The authors disclose they have no financial or other interest in objects or entities mentioned in this paper.
References: available as handout