It's Not About the Technology, or Is It? Realizing AAC Through Hard and Soft Technologies

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Abstract

To many people, augmentative and alternative communication (AAC) implementation is synonymous with technologies of various types. For many others, technology is but one, sometimes small, piece of the implementation puzzle. So, is AAC about the technology or not? This paper presents a broad picture of technology as consisting of both hard and soft technologies. The article supports both types of technology as necessary for successful AAC implementation. For many individuals, hard technologies are necessary to support expressive communication. High-tech hard technologies have many options, but only a few fundamental principles, with truly unique new characteristics rarely being introduced. What does change, however, is the platform upon which the AAC devices are built. Originally, AAC devices were based on simple electronic circuits, then specialized computers, and, finally, general computers. Most recently, smart phones and pad computers have been used as the platform for AAC device functions. In this paper, I contend that it is not the technology that is critical; rather, it is our ability to take advantage of that technology for the benefit of people with complex communication needs.

Technology is defined as (emphasis added)

1. The branch of knowledge that deals with the *creation and use of technical means and their interrelation with life, society, and the environment*, drawing upon such subjects as industrial arts, engineering, applied science, and pure science
2. The terminology of an art, science, etc.; technical nomenclature
3. A technological process, invention, method, or the like
4. *The sum of the ways in which social groups provide themselves with the material objects of their civilization* (http://dictionary.reference.com/browse/technology)

Thus, technology is more than devices and other tangible items; it also includes the interrelationship of hardware, people, and contexts. We would like to believe that AAC technology is neutral—that is, neither inherently good nor bad—and not the dominant factor in AAC intervention. However, the ability to make tools (such as AAC devices) is what distinguishes humankind, and our tools ultimately control us when we become dependent on them (Wright, 2004). This dependence is less optional for people who have disabilities, and advances in technology can increase the gap between people who have disabilities and those who do not. It is appropriate to ask, just how neutral is AAC technology? Is there a minimum level of functionality required, with levels above that base that are optional? If so, are some levels actually detrimental due to complexity, consumption of energy, excessive weight, size,

and so on? Thus, the situation regarding technology is definitely one of mixed benefits and risks. This paper explores the impact of these technological implications on AAC.

Hard and Soft Technologies

In order to encompass the full definition of technology cited above, Odor (1984) described two basic types of assistive technologies: hard technologies and soft technologies. Hard technologies are readily available components that can be purchased and assembled into assistive technology systems. Their main distinguishing feature is that they are tangible. Speech generating devices (SGDs) are an example of hard technologies. Soft technologies are the human areas of decision-making, strategies, training, and concept formation, generally captured in one of three forms: people, written instructions or manuals, and computer help screens. Soft technologies are much more difficult to acquire than hard technologies but they can make the difference between failure and success in AAC implementations.

The Chicken or the Egg

Do needs drive the development of new technologies (e.g., a problem looking for a solution) or does technology drive new applications (e.g., a solution looking for a problem)? Both of these situations exist in AAC. Early in AAC history, the need was driving technology development. Many creative approaches emerged as clinicians began to contemplate how people who could not speak might use technology to communicate. Electric typewriters were modified to allow single switch access. Scanning communication devices were developed so that people who had only gross movements could select messages using one or more of the specialized switches accessible by various body parts. It was clear that communication using single finger typing or scanning was too slow for meaningful conversation, so rate enhancement techniques such as abbreviation expansion, word completion, and prediction were developed. These advances required AAC devices to be more intelligent, so computer-based electronics became the norm. Various approaches to language representation were also developed, and the need for augmentative communication to augment speech led to the application of voice synthesis. All of these hard technology developments were driven by need and supported, to varying degrees, by soft technologies (Cook & Polgar, 2008).

More recently, the need for AAC devices to be accessible to young children has led to the consideration of more appealing hard technology features (Light & Drager, 2007). Some of these features include multiple functions (e.g., social interaction, communication, play, humor, entertainment, telecommunication access, companionship, artistic expression, environmental controls); access to innovative functions (e.g., sound effects, virtual educational/play environments); enhancement of self-esteem, sound effects (e.g., animal sounds, car sounds, burping); and emotions (e.g., laughter, anger, crying). AAC systems were designed to be built up and broken down into units as necessary to accommodate the user's development. They also began to incorporate soft plush materials and lightweight systems appropriate for young children.

An example in which technology has driven application is visual scene displays (VSDs), which provide a different approach to selection of vocabulary for an AAC device. VSDs create displays that consist of digital images of events and environments familiar to the user, with "hot spots" that can be accessed to retrieve information (Blackstone, 2004). A *hot spot* is a specific region of a picture on the screen that the user can chose by pointing to it with a finger, mouse, or scanning cursor. A VSD may be a generic photograph or other graphical representation of an area (e.g., playroom) or event (e.g., a trip to the zoo). The availability of VSDs has led to a number of applications. The use of VSDs for beginning/emerging communicators allows the presentation of language concepts in context, providing support for understanding in the early stages of language learning (Light & Drager, 2007). VSDs provide an enhanced format for organizing language according to event experiences. They also prove

useful for adults with severe, chronic aphasia and apraxia (McKelvey, Dietz, Hux, Weissling, & Beukelman, 2007). Because the visual scene is contextualized, elements are depicted in relation to the environment, which establishes the context for a conversational interaction.

There are a number of fundamental principles that can be found in AAC technologies. Each principle enhanced interaction and became a generic characteristic found on many devices. Examples include (Cook, 2005):

- Scanning—sequential access
- Selection methods
- Programmable keyboards
- Head- and eye-pointing as control interfaces
- Speech synthesis
- Text-to-speech algorithms
- Digital speech compression
- Language organization, storage, and retrieval software
- Abbreviation expansion
- Word completion and prediction
- Dynamic displays
- EADL as an appliance control with IR output
- Visual scene displays
- Cell phone capability

There are also many mainstream features that are actually derivatives of assistive technology. These features include closed captioning, voice recognition, on-screen keyboards, speech synthesis, digitized speech, computer keyboard equivalents, MouseKeys, StickyKeys, T9 disambiguation, word completion/prediction, abbreviation expansion, single latches on laptops, on/off push button toggle switches, call-out control descriptions, screen enlargement system, color schemes, wearable computers, head-tracking devices, brainwave recognition units, and single-switch hardware interfaces (Marsden, personal communication, 2005).

Given the large number of features that have migrated from assistive technologies to the mainstream, it is appropriate to ask whether mainstream technologies are more accessible to people with disabilities. Do the skills developed in using assistive technology (including AAC technology) carry over to mainstream tech? The answer is probably *yes*, but it is not always obvious that the same features are available due to the physical challenges of using some mainstream products (e.g., small keyboards and displays). Another question is whether this succession of features leads to a lesser need for specialized assistive technologies. More important, will Medicare fund these devices, given their greater functionality and applicability to disability needs? These questions are becoming more important with the rapid proliferation of cell phone and pad computer applications, many of which are focused on assistive technology needs (including AAC).

It is also important to ask whether developments in technology are being made based on the actual needs of people with disabilities or as solutions to possible problems, where the task becomes finding people who will be able to use the technology. In the latter, the technology is driving the need or looking for a problem to solve. This scenario is clearly not as desirable as the need being foremost. Sometimes it seems that “new” devices are just reconfigurations of previous principles with “features” that are aimed at sales, but not functional improvement. This situation can turn into a feature war, where the features may or may not really contribute to enhanced communication. If we ask how many truly innovative changes (i.e., new principles) we see in a 5-year period, or over the past 5 years, the answer is *very few* (Cook & Polgar, 2008).

One area of rapid growth is the availability of applications for smart phones that support AAC. These applications can be economical, and many have features that challenge specially made AAC devices. But, there are some caveats. While these applications can be very powerful for some individuals, there can be access barriers for people with disabilities. Small mobile keyboards can be difficult to access, and alternative input methods need to be developed for those who have physical or motor disabilities. If the individual has a cognitive disability, as many users of AAC technologies do, then he/she will need simpler user interfaces and non-text menus (graphic or speech). The complexity of operating systems and multimedia presentations must be limited to ensure access. The benefits of smart phone and pad computer applications for people who need AAC are potentially large. However, increased independence and benefit will be limited if the user interface is appropriate. A challenge for all applications is keeping adaptations current when innovations in mainstream products are introduced.

In the United States, one of the major limitations is the lack of Medicare funding. Devices that have features beyond AAC are not paid for by Medicare, even if they broadly support communication (e.g., e-mail, social networking). Another limitation is the accessibility of cell phones or pad computers. Because often the developers are engineers or computer scientists who have little understanding of complex communication needs, the devices may not be accessible or useful. An additional issue is the robustness (i.e., reliability) of the apps. Finally, the lack of support with cell phone and pad computer apps (e.g., soft technologies) is a concern.

Summary

What does all this have to do with AAC? The primary goal for people with complex communication needs is to have effective communicative interactions. Technology can be more of a barrier than an aid in this process. Natural, easily used augmentative communication approaches are still elusive. The technology is important, but it must be both hard and soft. Not all technology is good technology. Sometimes sorting the wheat from the chaff can be difficult:

> Quality is like buying oats: If you want good clean oats, you must pay a fair price. If you are willing to settle for oats that have been through the horse, then they are a little cheaper.

The same principle applies to technology. Reliable technology solutions will be more expensive than less reliable, poorly conceived applications done quickly on a mainstream technology. The future for AAC will not be driven by advances in technology, but rather by how well we can take advantage of those advancements for the enhancement of communicative opportunities for individuals who have complex communication needs.

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