Closing The Loop

Is a new era for assistive-listening systems about to dawn?

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Although I've been closely involved with assistive-listening-system (ALS) applications for well over 30 years, this is the first time that I've discussed the subject in this column. So, why now? Mainly, it's because I think we're at the beginning of a new chapter for ALS technology. As a result of this impending transition, there appears to be considerable confusion among the audio fraternity—and, indeed, among users and audiologists—as to what is happening and what systems already are (or may soon be) available.

Furthermore, with the relaxation of US Food and Drug Administration (FDA) regulations, several audio companies are taking a serious look at the market. Accordingly, a range of "hearables," or personal listening devices, is beginning to emerge. For example, Bose released its Hearphones in 2016; what's more, earlier this year, the company introduced its SoundControl hearing aids, which are the first approved, over-the-counter (OTC) hearing-assistance devices aimed at those with mild to moderate hearing loss. Also, earlier this year, Sennheiser sold its consumer division to Sonova, a hearing-aid manufacturer. The stage is therefore set for not merely a shakeup but, in fact, a quiet *(or should that be amplified?)* revolution in the traditional hearing-aid market.

People use personal listening systems to improve the perception and audibility of a range of sound sources—in particular, when listening in non-ideal situations, such as listening to a television when not seated close to it. These systems also prove useful when trying to follow a discussion in a meeting, engaging in a one-on-one conversation, and in other applications (e.g., transport, theaters and other entertainment venues, education environments) in which program material is available. Personal listening systems are not only widely used by those with normal hearing but also, in some instances, used by those who have a mild hearing loss. (The latter group either don't think they need a hearing aid or don't meet healthcare criteria for hearing-aid provision.)

Hearing aids are classified as medical devices, and they require an appropriately trained and competent hearing-aid professional to assess an individual's hearing and select and fit a suitable device. By contrast, personal listening systems do not generally fall within the current regulatory framework.

There also appears to be the impression that Bluetooth will take over (or perhaps *already has* taken over) from induction-loop systems and that hearing-loop systems are on their way out. Yet, that's not actually the case. Currently, Bluetooth technology is based on one-to-one, or perhaps one-to-two, transmission; conversely, hearing loops (and similar systems) require one-to-all transmission. Furthermore, with respect to installed applications, such as for theaters, concert halls, and large churches or other houses of worship, systems must cover relatively large areas. Such distances are well beyond the roughly 30-foot transmission limit of current Bluetooth technology. [Also, in the UK, for example, all commercial cinemas are provided with hearing loops to enable hard-of-hearing patrons better to hear and enjoy the dialogue.]

It's surprising how many audiologists, as well as those associated with hearing-aid sales, don't realize that hearing aids have significant limitations, acoustically speaking. Many seem to think that a digital hearing aid will resolve all issues and that supplementary systems—for example, hearing loops—are simply not necessary. However, according to British Standard (BS) 8300, which is the code of practice for the design of an accessible and inclusive built environment, hearing aids typically only have a working range of around six feet. Beyond that range, either room reverberation and reflections or noise (or both) tend to swamp the desired acoustic signal (i.e., speech) and degrade it. So, the need for additional audio assistance is clear.

Unfortunately, there's an increasing trend for contemporary hearing aids not to incorporate an inductive-loop pickup facility (a telecoil, or "T coil" for short); instead, they're being advertised with Bluetooth, as though that were a viable and compatible alternative. It most certainly is not. Yes, a hearing aid with Bluetooth can pick up an assistive-listening signal, but this must be via some form of intermediate device (e.g., a smartphone or dedicated receiver). Wi-Fi transmission has been around for a few years now, and it's certainly a growing and improving technology; however, the latency that a smartphone (and devices like it) introduces often seems to be ignored. It shouldn't be.

Tight audio and visual synchronization are essential for the hard-of-hearing user who might heavily rely on lip reading, whether consciously or unconsciously. The maximum latency should be less than approximately 50ms; however, many smartphones and Wi-Fi systems have latencies far greater than that. (Indeed, up to 600ms has been measured!)

A potential problem with inductive-loop pickups in hearing aids is that they take up more space than Bluetooth receivers do. As a result, none of the in-the-ear "invisible" models has them. A recent survey did suggest, though, that up to 75 percent of currently available hearing aids are equipped with T coils. Furthermore, hearing-loop

systems are consistently agreed by ALS users to be the preferred and most easily used systems. However, a new Bluetooth technology is appearing on the horizon—that is, Bluetooth Low Energy (BTLE). Unlike existing Bluetooth technology, BTLE is designed to enable transmission of one-to-many and over considerably greater distances (theoretically, up to around 300 feet), all with low latency. Here, at last, there might well be a replacement for hearing loops! However, the technology is still a few years away.

Not only must several technical issues be ironed out, but standards must be written for its use, as well as for device interoperability and compatibility. This technology, however, could be a game changer when it comes to ALSes. As an example, it could enable two channels of audio to be transmitted and, thus, provide a stereo (binaural) signal. That could enhance the concert-going experience, for example, or enable the delivery of an audio commentary for visually impaired listeners alongside the normal ALS program audio. Transmission could be direct to the hearing aid or via an intermediate controller. That would give users enhanced control, such as the ability to tweak the level and equalization (EQ) of the signal to their liking or to select preferred content.

Furthermore, installation will be much simpler, negating the need for phased-array or multi-array loops to cover a large area. Emergency announcements and warnings could be relayed automatically, directly to the hearing-aid user, bypassing the acoustic path and its inherent loss of intelligibility. That would enable users better to understand and react to emergency communications.

So, how long will it be before this sonic utopia comes closer to reality? That's hard to precisely predict, but I would say sometime in the next two to three years. Then, it will take a while to become established, have the bugs ironed out and bring products to market. However, over the next five to 10 years, there's likely to be a gradual transition from current ALSes to these new ones. So, now, perhaps, is the time to start considering and planning for the next generation of technologies in new facility builds and potential upgrades. But be aware that hearing loops aren't dead yet, and it will be quite a few years before the loop closes.