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SUMMIT
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Technologies May Come and Go, but Knowledge is Forever

Gary Breed
Editorial Director

I find the highly publicized battles over competing wireless technologies entertaining, because the so-called "winner" only has a temporary victory. Today's dominant technology is guaranteed to be replaced by something else in the future—sometimes the very near future.

For example, in historical terms, analog cellular technology existed just for an eyeblink, even less for most of the early digital formats. Now we have various technologies for high data rate 4G competing for a place in the wireless market, but even as the first LTE and WiMAX networks are being built, there is already talk about how the next generation of wireless may merge the technical strengths of both.

The displacement of past technologies isn't always so fast. We just completed a transition to digital broadcast television that has been in the works since the early 1990s. The analog NTSC technology it replaced was developed before World War II, with color capability added in 1953. Our AM broadcast technology goes back more than 100 years, although an overlaid digital system is now used by some stations. FM is operating similarly, but the technology developed by Armstrong isn't quite as old as AM, dating to the 1930s. The slower change in radio broadcasting can be attributed to entrenched commercial interest by the broadcasters, the monetary and social cost of change, and by a low level of interest in those particular frequency bands by competing wireless technologies. Still, despite the long lifetime of radio broadcast technology, it is now changing to digital transmission technologies.

Many technologies have been replaced quickly after failing to get the attention of consumers and regulators, or simply made obsolete by rapid development of something new. Over the past 50 years, music recordings have evolved repeatedly, from vinyl discs and reel-to-reel tapes, 8-track tapes, cassette tapes and CDs, to digital downloads and MP3 playback devices. In a similar time frame, overall electronic technology has changed from vacuum tubes to transistors, then to building block ICs and on to complex multi-function ICs. During this same time, many circuit functions have changed from analog operation to an implementation using numerically defined digital operations.

...and there are a thousand other examples.

Yes, change is inevitable. But past technologies—whether obsolete or the losers in marketplace battles—are valuable. They make a permanent contribution to our knowledge of how things work. For example, the Video Disc may have been a marketplace failure, but it was the first attempt at mass-produced video recording. During its development, engineers learned many of the lessons—good and bad—about the process of encoding signals and manufacturing an optics-based storage medium.

I was working in the broadcast industry when AM stereo was being developed. Another marketplace failure, it never achieved much deployment, even after a system was approved by the FCC. Yet, the development efforts and extensive debate over the various proposed methods provided an in-depth analysis of radio signal behavior, including propagation effects, interference potential, bandwidth occupancy, amplitude-phase relationships, antenna performance and other fundamental principles—the same set of issues involved in today's methods for transmitting digital signals.

All Lessons Learned Contribute to Our Knowledge

Another way to say this is that nothing you learn is wasted. Technical knowledge is cumulative; old knowledge is incorporated with new discoveries. Sure, concepts that were incomplete or mistaken are removed from our technical "database" of information, but they still play an important historical role, revealing how we go about the process of learning. At the very least, they remind us of mistakes that should not be repeated!

With these things in mind, it is important to maintain a record of the old information upon which new ideas are built. One of the present frustrations of using the Internet for research is that much of the older, but still valuable, reference material has not yet been archived in digital form. Hopefully, efforts will continue to digitize more of this "classic" material and make it available to the current generation of engineers—who usually begin a new project with an online search, not a trip to the company or university library.

Until those important past references are available online, try to find and study *all* the available resources. Your next engineering assignment will benefit from a better understanding of its historical and technical background!

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