When conventional wisdom isn't

YOUR PROFESSION, LIKE MANY OTHERS, operates on some standard assumptions and generally accepted wisdom. To give you some examples, you all know that high-speed pc boards are more difficult to lay out and test than slower ones, that more integration yields lower cost and higher reliability, and that LEDs are usually better than incandescent bulbs. In most cases, these assumptions are true or have only a few exceptions. By repeating them over and over, they become part of the canon of conventional wisdom and legends you need to function quickly and efficiently.

Yet, as professionals, you should also take the time when possible to recheck most of the conventional wisdom. A recent article dramatically demonstrated this point to me when it challenged the Amtrak mantra (**Reference 1**). As the passenger-rail system approached bankruptcy during the summer of 2002, commentators, pundits, analysts, and Amtrak officials repeated variations on one simple concept: "Long-distance passenger rail loses money, high-density corridor rail makes money." It sounded so obvious and self-evident that no one I heard or read gave it a second thought.

The article, by a transportation specialist who had worked at Amtrak and other railroads, came to a much more complicated conclusion. He showed, with hard numbers on capacity, usage, costs per passenger, revenue potential per passenger mile, and many other parameters, that the standard wisdom might be incorrect. Most important, he explained how many of the conclusions you reach depend on the numerous assumptions and approximations you make along the way regarding allocation of fixed and variable costs, short- and long-term expense, who pays for maintenance and facilities, and related factors. In the end, his analysis showed that no "right" answer exists and that the conventional, often-repeated wisdom can be reasonably right, somewhat right, or fairly wrong, depending on your biases and baselines.

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This potential confusion occurs in many of the analyses that engineers do, as well. You know that legitimate differences of opinion and judgment calls emerge on how to assign and allocate expenses and costs, and there are strategic as well as tactical reasons to do it one way or another. The same variability occurs for analysis of power consumption, system architecture, and many of the other factors that engineers juggle as part of their design challenge. Engineers know that the real world is not a simplistic binary-one or -zero domain; the real world is analog with shades of gray and many intertwined dimensions.

As engineers, your challenge is to be candid with yourself and others about the assumptions and repetitions of conventional wisdom you are making in your design when you present its rationale at the design review. In many cases, you may not even be consciously aware of them, so it's more difficult to expose them for re-examination and reconsideration or at least for public view. Often, you have to make simplifying assumptions to make the analysis practical or manageable, so you need to clarify where you have done so.

Similarly, when you attend design-review meetings, ask questions that highlight where the team is using these assumptions. Ask whether alternative interpretations exist of the data or conclusions that the team considered. By getting the often unspoken and subconscious assumptions out in the open, you'll be acting in the best interests of the design and product, as well as in the interest of good engineering practice.

REFERENCE

1. Kraft, Edwin R ("Chip"), "Amtrak Numbers Racket: What Amtrak Trains Really Cost," *Trains*, October 2002, pg 30.

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