



There's no shortage of engineering-shortage talk

YOU CAN'T PICK UP a magazine or paper or look at a few news-and-commentary Web sites without seeing knowledgeable voices bemoaning the engineering shortage. The presumed causes usually fall into a

few categories, such as the idea that too few students are taking up math and science or that engineering is a profession with perception problems that discourage students. Although I agree with the statements about student skills and the lack of a professional image, I disagree with what these statements mean to engineering.

The commentators have a solid understanding of the presumed impact of these shortages. They claim that this impact includes the fact that engineering jobs are going overseas to countries including India and China, where legions of trained, hard-working engineers can do the job and for much less. They also cite the loss of engineering expertise, a vital US resource, and other similar ideas.

I'm skeptical of this entire shortage outcry. I have been in this industry a long time—no, I did not watch William Shockley, John Bardeen, and Walter Brattain as they fired up that first transistor at Bell Labs in 1948—and I have been hearing about this shortage, with varying intensity, all that time. With few exceptions, such as when engineering unemployment neared the double-digits and engineers were driving cabs (not that there's anything wrong with that), the shortage story has outlasted just about every other premise in this industry, including Moore's Law.

A lot of the reasoning surrounding the shortage story seems circular. We don't have enough engineers coming into the field, so companies find the necessary skills overseas, which in turn diminishes the pro-

spects for US-based engineers, and so on. But, as is true with all circles, it's difficult to say where the reasoning starts. Which factor is the cause, and which one is the effect? Depending on your perspective, you could start your argument at any point on the circle's circumference.

Several points relate to this alleged shortage. First, globalization of technology, design, and manufacturing makes worldwide design

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an unavoidable fact—one that the number of engineers in the United States only somewhat affects; many other factors play a role. Second, engineering-design productivity, like so many other processes, has increased tremendously in the past decades, even more than the complexity of the projects themselves.

But more important, the people shouting "shortage" often have—and I'm sure we are all shocked, just shocked, here—a vested self-interest in the situation. Schools are looking for students to fill seats and to be research assistants. Companies want more engineers to choose from as they staff their projects.

The reality is that no one knows how many engineers our high-tech society needs. Although products have become more complex, the tools that engineers use have be-

come more powerful at an even faster rate. Having resources such as EDA, CAD, PLM (product-life management), stereolithography, and other project-design and -management tools means that the industry needs fewer engineers relative to the number of products. In addition, the industry is devoting itself to high-volume consumer products, which require enormous manufacturing resources but roughly the same number of engineers as a low- to moderate-volume product. Thus, the ratio of necessary engineers to product volume is shrinking.

Even the IEEE has mixed emotions on this subject. The institute, which, as a whole, has heavy aca-

demical leanings, speaks of shortage as a fact. But IEEE-USA, the part of the IEEE that represents working, nonacademic engineers in the United States, speaks of diminished opportunities, unemployment, underemployment, and uncertainty.

There is no doubt that a shortage of engineers exists—if you define an engineer as someone with two to five years' experience in the latest technologies, with finely honed skills, who is willing to work long hours for moderate pay and who can solve complex problems but get only modest reward for it. (A shortage of gold at \$30 per ounce also exists, but far less of one exists at \$500 per ounce.) The shortage is a myth, and the diverging mismatch of interests between engineers in school or industry and those who need their services perpetuates this myth. □