

What my dad taught me about yield

By Prashant Maniar, Stratosphere Solutions Inc. -- Electronic News

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For the past decade, I have been trying in vain to explain the business of electronic design automation (EDA), and what I do in it, to my parents.

My dad is 73 years old, used to run two repair/service garage shops for cars early in his career, and then moved into the more lucrative trading business for metals and heavy electrical supplies.

I live and work in Silicon Valley and visit my parents in Mumbai, India, each year. Over the years, I have made attempts to educate them about our EDA industry. There's always much arm waving to try to convince him that we improve engineering productivity for chip design and the discussion always leaves me frustrated.

In order to explain the industry, I have used analogies that run the gamut from architects and buildings to computer aided design (CAD) tools. I intoned: "Architects are like chip design engineers. Architects design buildings, whereas chip design engineers design chips, the tiny semiconductors that are commonly seen in every household appliance today. The software tools these architects use to create the blueprint for the building are called CAD tools. Similarly, chip designers use EDA tools for creating the blueprint of the chip. Imagine how difficult it is to create the blueprint of a modern building without the help of software. Similarly, it is impossible to design modern chips without EDA tools." His eyes typically glazed over and his response was a shrug.

Then, several years ago, I moved from front-end EDA software to back-end yield improvement and this holiday season I tried to explain "yield and design for yield." My explanation started with how designers design a chip. Manufacturers take this chip design, make many of them on a round disc called a wafer, then dice them into individual chips, package them, and put them into devices such as cell phones and computers.

I also went into a quantitative explanation of how pricing is done based on yield — number of good parts divided by total number of parts — parts binning and how design for yield would help increase the total number of good parts. I explained that **design for manufacturability** and yield tools capture the vagaries of the manufacturing process into a model and then design engineers are able to project where a problem will arise when they send the **design for manufacturing**. They are able to then intelligently work around areas when they might encounter a manufacturing marginality.

He looked at me and said, "So, your products help reduce scrap." Scrap, I thought? All those slick three- and four-letter acronyms we have coined, such as **DFM**, OPC, DFY, RET, DFR, SSTA, and so on, and he says "we reduce scrap." Oh, come on, I groaned.

He explained that this is an age-old practice. Take for instances, plastic buckets. If there is a hole in the bucket, you cannot store water because there will be a catastrophic failure due to defectiveness. But, if there was a minor abnormality due to the manufacturing die, then that bucket could be sold at a cheaper cost, or what we call parts binning due to parametric failures.

If there was an issue with chemical composition, then the bucket would not last as long as promised due to reliability issues, he continued. In order to meet market demand, they would simply produce more

buckets. If there were any manufacturing problems, costs would increase, obviously. He further said that any financial return, due to a reduction in scrap and after deducting variable cost, goes directly to bottom-line profits.

“Finally, I understand what you do,” he said with a satisfied smile. And, I have a ready-made and visual explanation on what is design for yield (DFY).

It’s quite ironic that all of what we do is intuitive, and yet, I have always had a difficult time articulating the value proposition for DFY or EDA. Perhaps, it is because I am too mired in the details or try too hard to make a complicated subject even more complicated through a complicated explanation. Whatever the reason, it strikes me that I’m not alone — our industry suffers from an overwhelming urge to make something far more complicated than it already is. And, maybe, just maybe, it’s time to reduce our complicated ideas and products into more easily understood concepts by people outside of our industry. Scrap, indeed! What’s amazing is that as I grow older, it is my dad who seems to be getting wiser.

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