Is there any design left in engineering?

DESIGN AND ENGINEERING aren't what they used to be, as *EDN*'s audience well knows. Years ago, before processors and software ruled the world, designers would build up a circuit from relatively low-level building blocks, such as resistors, capacitors, small-scale ICs, transistors, and even vacuum tubes. They could configure a set of such components to provide functions that were defined primarily by final circuit topology; looking at the BOM (bill of materials), you would have only a hint concerning the design's final function.

Today's reality is that system-level ICs—whether we called them ASICs, ASSPs (application-specific standard products), SOCs (systems on a chip), or some other name—dominate in the circuit-versus-system debate. These ICs usually target a specific, carefully defined application, serve well in that application, and are ill-suited for almost anything else; graphics accelerator and 802.11 ICs are obvious examples. When you look at the product's BOM, the names of the key ICs give you a good idea of what the final system does. Although the design still contains plenty of passives and a few active, discrete devices, those devices no longer define circuit function; their role is to ensure that the IC can properly do its job with requisite bypassing or fill-in for functions that the designers could not integrate.

Reference 1 highlights the implications of this changed situation. It shows how nontraditional vendors are getting into the TV and multimedia business, because being a "vendor" now means specifying the required ICs and chip sets and then having an outsourced manufacturer buy them and put them on a pc board for you. The IC vendor handles the bulk of the detailed engineering work, supporting it with reference designs, application notes, and application-specific software and drivers. Most of the engineering design effort, therefore, concentrates not on design itself, but on making the prescribed design manufacturable at the right cost; integrating the enclosure, screen and keyboard, power supply, and other noncore portions of the product; and lining up vendors for the BOM.

No one knows the long-term implications of this change on the role of the design engineers. Will it cause them to lose sight of and comfort with low-level, design-related issues, which only a few practitioners will actually understand? Meanwhile, will the rest of them happily combine chip sets that were, in turn, designed by a handful of other engineers? Will the industry attract more software-only jockeys, for whom parameter passing and calling the RTOS define design life? Will it stop attracting engineers who know how to get into a design's dirty real-world details? Will design become a contradiction in terms for many who call themselves engineers? Will we need fewer "real" engineers?

MANY OF TODAY'S ENGINEERING DESIGN EFFORTS CONCENTRATE NOT ON DESIGN ITSELF, BUT ON MAKING THE PRESCRIBED DESIGN MANUFACTURABLE AT THE RIGHT COST.

Or, will engineers and their design challenge take on a new shape that we don't yet understand, as they concentrate on the struggle to get that final 5% of their product's design working reliably and ready for manufacture?

I don't know the answers, but I know what I'm going to do: build that four-transistor, software-free lightning detector I saw—the one that had no critical component values or layout constraints (**Reference 2**). It looks like pure engineering fun to me.□

REFERENCES

1. Ramstad, Evan "Flat-panel, plasma TV sets bring a flood of new brands," *The Wall Street Journal*, Jan 13, 2004.

2. Radmore, Bob, "A lighting detector for the shack," *QST*, April 2002, pg 59.

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