GUEST COLUMN

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Au Revoir, System-On-Chip

The SoC Chip Business is Headed into Extinction

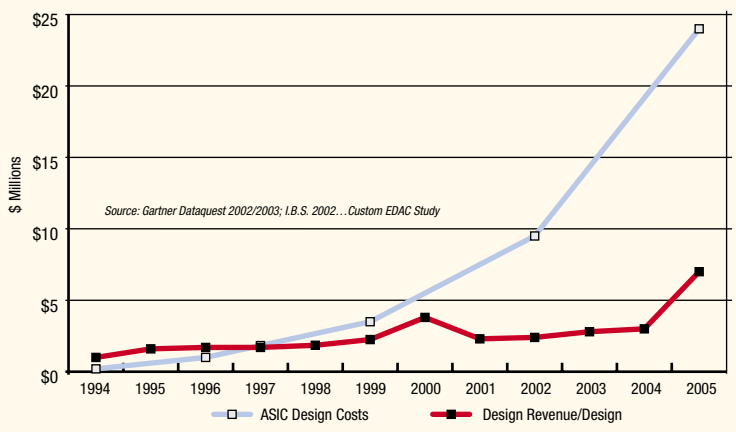
Remember the system on a chip (SoC), the idea of building a complete system on a single semiconductor chip? Well, it's a dying idea and companies banking on SoC revenue are at risk. The problem: How do you afford a SoC when price points are fixed and volumes are fickle? This wouldn't be so bad except new processing technology has gotten very expensive. All of this combines to make SoCs and their cousin, the application specific integrated circuit (ASIC), shaky investment premises.

The reason SoCs have become a moribund strategy is the consumer-like nature of today's markets. Much of what sells in volume is under what we call the non-spousal approval price point, a purchase that can be made without asking one's spouse. It could be a digital camera, PDA, GPS, instant messenger gadget or iPod, but it's usually at a price point where non-spousal approval applies.

Say that gadget is a golf swing analyzer priced at $299. In manufacturing terms, that means that the "silicon budget," or the amount the OEM allocates for chips, is around $25. That's not much of a budget if a new SoC targeted for that market typically costs upwards of $15 to $20 million to design, build, test and deliver. Amortizing the cost of rapidly rising SoC design costs will require large markets in excess of a billion dollars, which only a few consumer products enjoy.

To cover the SoC design cost, you need lots of volume. Maybe the investment will pay off if the market is big enough and lasts long enough, but those markets are hard to sustain when competition is trying to unseat your design and the OEM is demanding a second source to increase its business.

ASIC Design Costs Rise Faster Than Revenue — SoCs Look for the Home Run!



Originally, building a system on a chip was an extension of the semiconductor concept: integrate more separate components onto a single sliver of silicon. The components of a crowded PCB board (typically including a processor core, input/output logic and memory) were integrated onto a chip, cramming more functions on a silicon sliver for a specific application.

The cost per chip was less than building the boards, while the results were a smaller footprint with greater reliability. Because SoCs delivered a lower and lower cost per unit as the volume increased, the concept was a moneymaker for the OEM. For the integrated circuit (IC) company, once the design was paid for, the profits rolled in directly to the bottom line. Great strategy for the '90s. Devil's Island today.

The value proposition for a SoC or ASIC relied on three interlocked events. First was integration of discrete components into ICs. Second came the cost reduction through "shrinks," getting more chips per silicon wafer and then increasing volume through manufacturing scale by producing millions of the same chip. Third, as the price per chip dropped, the end-product price dropped, demonstrating elastic demand one of the miracles of economics: lower price equals more consumers and more consumers equals lower price. Watches, calculators, PCs, cell phones, VCRs and DVDs all followed this curve.

By 2000, the interlocking events blew apart. The explosion was a move toward a consumer-like semiconductor era, which required the sophistication of a military market product delivered at the non-spousal approval price point. For example Apple's iPod was built to

achieve cost, performance and size goals using standard IC products, not an SoC; forget integration or shrinks, iPod innovation came through packaging and design and the non-spousal approval price point has held as demand has grown.

Still, the SoC idea was so compelling in the late 1990s that venture capital firms bought heavily into SoC start-ups. The popular SoC model was a fabless semiconductor company that designed communication network processor SoCs to take advantage of the Internet explosion and the expectation for WiFi. At this point, venture portfolio theory andVC ego took over and more than 30 companies were funded to take 50% share of the new market.

The rationale was that the savvy VC would make the difference between failure and success, but this communications processor SoC company model clashed with the consumer-like model. A $25 bill-of-materials could not accommodate the expensive new processor chips, resulting in communications SoC investments taking a fall with their IP spilling into the gutter.

SoCs and Platform Markets

To win with SoCs, large volumes are needed justify their use.These large markets are platform markets, where IC cost reductions lead to end product price reduction and fully elastic demand. Such products are PCs, cell phones and Ethernet networking.The problem for platform IC companies is that such markets are few and far between and it takes deep pockets to continue to push design and process technology.

Intel, for example has been able to continue its dominance of the microprocessor as it first drove competitors out: with a one-two punch of accelerated product introductions and rapidly falling costs. This (and Intel's symbiosis with Microsoft) has driven costs down, resulting in nearly elastic demand for PCs.

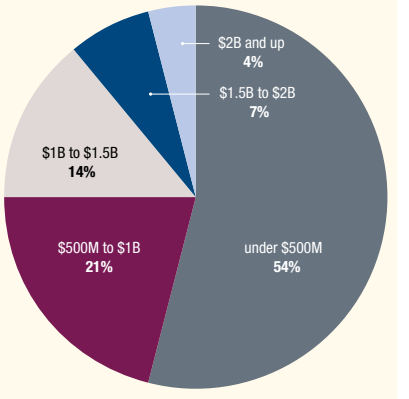
Other examples of platform IC companies are Texas Instruments (with DSPs for cell phones), Nvidia (with graphic ICs for PCs and other platforms), and Agere (with controller ICs for disk drives). All these firms possess the right combination of a big end market, strong customer support infrastructure, deep system software knowledge and deep pockets.

Shrinking Profits

In the '90s, many markets could have potentially afforded a SoC as the $5 million and 18 months to design was acceptable.Today, a SoC costs $15 to $25 million per design and still takes 18 months. Doing the math, to support a $15 to $25 million design, you'd need to find a $750 million to $1.25 billion market.

Even with the best market research, focus groups and interview capabilities, consumer electronics companies don't have a clue until a product reaches the consumers shelves if they have a big volume runner. So, these companies use "al dente marketing" — toss products into the market and see what sticks.

Application Markets That Support Value-Added ICs
(ASIC, ASSP, FPGA) *by size 2003*



Only 25% of the application markets for ASIC, ASSP and FPGA are above $1 billion and are controlled by large platform IC companies.

And today's six-month product cycle delivers the final blow to SoCs. Today it takes about 18 months from conception to delivery for a SoC. Thus the timelines clash, and it's to the guillotine for SoCs.

Where's the Value?

What's the alternative? The easy answer is an FPGA, but that probably won't hit the required price point. Instead, the best solution comes from the platform IC companies, which both understand their customer and can deliver the whole product. Moving forward, a key question for IC manufacturers will be, "Where do you capture value?" Is the IC company capturing the margin for its work, or is that margin passed down the value chain to the OEM, or most likely, the end consumer? More and more we see that value seems to accrue with system expertise, programmability or in delivering end-user benefits such as user interface.

Meanwhile, the SoC as a business model is doomed. Its best opportunities are in high-volume platform markets, which we believe, are limited in number or owned by some big platform IC companies. At first blush, the idea of integrating a crowded PCB board onto a chip, putting more functions on silicon for a specific application, was appealing. But the SoC era has passed as markets become more and more consumer-like.

Today, SoCs or ASICs take too long to build in a rapidly changing consumer marketplace. It's too expensive for markets where non-spousal approval is the key price point. The chances of a start-up becoming a SoC platform are slim. If they don't want to say "au revoir" to their investment, institutional investors should carefully re-evaluate their holdings of SoC-dependent IC firms, electronic design automation (EDA) software companies and semiconductor equipment companies. The dramatic changes being wrought by the new consumer-like silicon will clash with the traditional SoC business model. The smart money is on those who service the consumer-like market without a custom solution.

Charles DiLisio is president and senior advisor with D-Side Advisors. D-Side advises semiconductor companies seeking dominate position and market leading profitability and institutional investors on market trends and potential business opportunities within the semiconductor industry. Contact cdilisio@dside.com or www.dside.com for more information.

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