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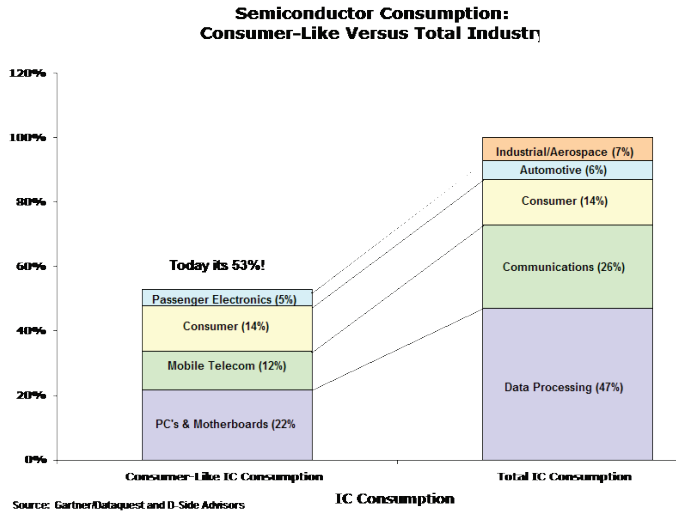
A Tale of Two Industries

Charles DiLisio, President & Senior Advisor, D-Side Advisors

It is the best of times … We are seeing the broadest proliferation and diffusion of integrated circuits (ICs) into all parts of our life. Today, over 50% of IC production goes into various consumer-related products. D-Side Advisors views this as the birth of the "Consumer-like" Silicon Era. This "Consumer-like" Silicon Era presents great opportunities for fabless semiconductor companies to leverage their inherent flexibility and innovation for success.

It is the worst of times... IC firms continuing to focus on ultra-deep submicron designs will be the big losers in the "Consumer-like" Silicon Era. Only a select few Category Gorillas will be able to amortize the cost of ultra-deep sub-micron over an increasing base of larger volumes. Ironically, the Category Gorillas are trapped by their "successful" business model that requires continued nurturing and feeding of ultra-deep sub-micron design and manufacturing processes. All the while, return on investment (ROI) continues to decline as design and manufacturing (DFM) costs accelerate.

Figure 1.



Category Gorillas are found in areas such as microprocessors, digital signal processors (DSPs) for cellular phones, DRAM memory and computer graphics. These areas are large and broad enough to support the increased design and process costs. In these markets the relentless pace of adding value through more transistors becomes siren song for all those involved, including electronic design automation (EDA) vendors.

For fabless IC firms "Consumer-like" has risks. Innovation through greater circuit design integration, as expressed in system-on-chips (SOCs) and Application-Specific Integrated Circuits (ASICs), which was the key differentiator for IC companies (IDMs or fabless), may not succeed in the low-priced, rapidly changing feature sets, and moderate volumes represented by the "Consumer-like Silicon Era."

An Everest of Complexity Versus Simplicity or Free

EDA vendors that have traditionally supported the Category Gorillas will see their software development costs rise, making it difficult for them to amortize their development costs over a smaller base of demanding users. These EDA and IC firms are climbing Everest together and are now operating at low-oxygen heights.

In addition, EDA firms are caught as their market is polarized by a willingness and ability to buy. The major EDA firm's mainstay, Category Gorillas, are very demanding users requiring a highly complex suite of tools. Meanwhile smaller fabless firms, where unit sales might be achieved, seek simplicity finding and low cost.

Rather than seeking simplicity, inexpensive tool integration or focusing on software development tools, they followed their big customers up Everest where the sub-micron technology vision is grand, but the air too thin to survive. EDA firms have staggered up the mountain to support their Category Gorilla customers with new highly integrated electronic system-level (ESL) tools at ever-rising design seat prices.

Meanwhile back at the base camp there is a give-a-way by programmable hardware platforms such as field-programmable gate

arrays (FPGAs) and microcontrollers. Free tools, application software and development kits erode the EDA company's value proposition.

Fabless semiconductor design companies aspiring to be like the Category Gorillas, need to rethink their business model or they too will be climbing Everest, above the base camp, with little oxygen for survival.

End of an Era

Traditionally, emerging fabless semiconductor design firms were developers of SOCs or ASICs for moderate volume markets, which also possessed relatively high-end product average selling prices (ASPs). In this environment, fabless semiconductor design firms could amortize design and IC production costs at low volumes given the relatively high- end product ASPs. This is no longer true in the "Consumer-like" Silicon Era as end-product ASPs start low and only become lower in price should volumes increase. Not only are the ASPs lower, but also the margins are vanishing to meet end-user price points. Skinny margins in consumer-like markets make developing a complex chip high risk. Today, we see consumer product original equipment manufacturers (OEMs) looking to FPGAs and structured ASICs as alternatives to build products around at low initial volumes. In addition, FPGAs and structured ASICs are beginning to move up into the areas that were the home of ASICs.

Figure 2.

	Silicon Integration Era	Consumer-like Silicon Era
Market Focus	Big, deep markets, well-defined feature sets	Highly fragmented, ill defined or fickle feature sets
Product Focus	Incremental feature improvement based on 18+ month design cycle	Rapid feature set change against an ever-shortening design cycle that mirrors consumer whims
Customer Focus	Leverage vendors where predefined price reductions is all that matters — i.e. Dell Model	Look for best-in-class vendors who can provide whole product solution
Product Design Focus	Highest level of integration to reduce cost and expand market	Discrete design initially to validate customer demand, if volume accelerates then consider integration
IC Design Focus	Hardware design squeezing more transistors per millimeter of silicon	Software design what can be done in software for product flexibility
EDA Tools Focus	Hardware layout, simulation and verification	Software design and verification
Key Issues	Declining return on development given rising design and process costs requires large volumes	Protecting software IP as the major new markets have a disregard for IP rights

The Silicon Integration Era revolutionized electronics and brought many important developments like low-cost PCs and cell phones. In the Silicon Integration Era IC companies attacked big, deep markets through silicon hardware integration and used cheap CMOS process replication that drove IC cost down and fully elastic end-product demand. Today, only Category Gorilla companies can now profit from this model result. Fabless semiconductor design firms cannot continue to exercise the Silicon Integration Era model profitably. Opportunities abound for fabless semiconductor design firms to add value in the "Consumer-like" Silicon Era with software IP flexibility, systems knowledge and fast time-to-market.

The "Consumer-like" Silicon Era is defined by the following elements:

- Non-Spousal Approval Price Point — Consumer-like markets have fixed price points (i.e. $299, $199, $99, etc.).
- Al Dente Marketing — Consumer-like markets are highly segmented and demand is fickle. As a result, customers can't wait 18 months for a design.
- Elephant Costs and Canary Returns — Rising design cost ($15M to $20M to design a custom ASIC). To amortize this cost you need to be a $400M revenue company! A $400M revenue company implies significant volume, which most consumer markets don't exhibit.
- Value Created in Programmable Platforms — Consumer-like markets require flexibility in design, rapid time-to-market and moderate volumes.

Brave New Market Model

The new market model in the silicon era will be based on programmable platforms and software supporting ever-shortening development cycles.

Supporting the move to programmable platforms is Tony Fadell, VP engineering iPod Division, Apple Computer. He said during a September 2004 industry panel, sponsored by Silicon Valley Bank and D-Side Advisors, that value isn't necessarily more MIPs, MHz or features. For example, value in the iPod is not the technology but rather in the physical design (hardware and software) and the whole product offering of both iPod (hardware) and iTunes (content).

Fadell noted that the iPod innovations came from smaller, resourceful "best-in-class" IC companies that can focus their attention almost entirely on a company like Apple Computer. For the iPod these included Portal Player (control and software interface), Wolfson Microelectronics (audio) and Linear Technology (power management). But as the market becomes proven and the volumes increase, Apple may likely revert to its larger, proven supply-chain oriented vendors, who deliver a more integrated IC solution. However, the question remains, can the larger Category Gorilla provide hardware integration and system flexibly at relatively low volumes (iPod was forecasted to sell 10 million units in 2004) and make any money?

> One out of five consumer products makes it to market and one out of ten reaches volumes of one million units annually!

The level of innovation from Category Gorilla IC companies will continue to be low as inertia will have them focus expensive design and process investments. But for IC firms and their EDA partners who are still betting on tools and design for SOCs or ASICs, there is a message in the following design schedule from Gregg Zehr, formerly Hardware Engineering, PalmOne. In that same September 2004 industry panel sponsored by Silicon Valley Bank and D-Side Advisors, Zehr stressed that success in consumer markets is all about time-to-market. Zehr, responsible for creating the hardware platforms for the Palm, defines the typical new product development cycle:

- Month 0 to 3: Product idea, design and initial prototype
- Month 4: Finalize ICs that will be used and prototype
- Month 7: ICs delivered to factory for production
- Month 9: Initial manufacturing for product introduction

Such a development schedule spells death for an SOC with an 18-month design and test schedule. Also, Gregg's schedule assumes the IC works as designed the first time!

Both Zehr and Fadell are "canaries in the coal mine" for the

"Consumer-like" Silicon Era where today 53% of IC production goes into consumer products, and this percentage is projected to increase. But the "Consumer-like" Silicon Era doesn't just apply to semiconductor companies focusing on consumer products. As all products eventually diffuse broadly into the world markets, thus the consumer-like metaphor applies to all semiconductor companies. The good news is that in looking out across the landscape D-Side Advisors sees value, growth and profit in alignment for fabless semiconductor design firms and EDA vendors who embrace the new era.

The key for both fabless semiconductor design firms and the EDA tool vendors is to break with the old Silicon Integration Era models and methodologies. As in all change regimes, you need a methodology and mentoring to "break" past behaviors. D-Side Advisors suggests that companies ask the following questions.

Questions to Ask at Your Next Staff Meeting	
Value	What does the customer value?
	Historically, value was raw performance (MIPS, MHz). Today, consumers value need fulfillment (ease of use, modularity, reliability) over raw technology.
Growth	How will you grow your business?
	Historically, growth was identifying big, deep markets, typically in Europe or North America. Today, you need to identify a series of niches and build a billion dollar business a niche at a time.
Profit	How will you capture value?
	Historically, value was captured in the hardware design and ability to reproduce it cheaply in CMOS. Today, given rising design and process costs, value is in software and the whole product.

The "Consumer-like" Silicon Era represents the best of times for those fabless semiconductor design firms and EDA vendors who recognize the opportunities to migrate their business model to add value not through hardware integration, but software design. For those fabless semiconductor design firms and EDA vendors who continue to focus on the traditional Silicon Integration Era attributes of price/performance, large markets and deep sub-micron process, it could possibly be the worst of times. ■

About the Author

Charles DiLisio is president and senior advisor of D-Side Advisors. He has over 20 years' experience in marketing and financial modeling. For the last 10 years he has focused on tying market dynamics and customer demands to sound financial strategies in the semiconductor industry.