FABLESS FORUM

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*During 2003, the FSA is bringing you a series of articles analyzing issues such as shortening time-to-market, reducing design cycles, lengthening replacement cycles, increasing design costs (primarily in masks, simulation and test), fewer design starts (lowest design starts in any of the last recessions), increasing process costs (primarily due to smaller geometries, low-k, copper and 300mm), uncertain end-product demand and inventory flexibility. These articles are authored by Charles DiLisio, president and senior advisor at D-Side Advisors, an industry consulting firm.*

*While the FSA does not endorse any particular perspective, we believe whether you agree or disagree, these articles will encourage fabless companies and their partners to ask and begin identifying answers to some difficult and challenging questions regarding the future health of the fabless industry. To submit feedback on these issues, go to www.fsa.org/pubs/fablessforum.*

# How IC Firms can Profit in a Global Supply Chain (Part 3 of 4)

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For the fabless IC firm, communicating and collaborating effectively across an increasingly complex supply chain, maintaining profitability is a crucial issue. Just as old procurement methodologies are outmoded, the old profit models don't work in today's linked, global market.

The supply chain is a good metaphor for asking: "Where is the fabless IC company going to capture value?" The question is asked because both rely on a holistic view product design decisions, but distribute value only to the savvy.

Just as the supply chain needs to be plugged in with product design early, chip profitability must be understood early in the process. Such up-front reality can help guide engineering decision toward greater revenue and avoid losses. Those engineers with a Harrison Ford or Bruce Lee mindset might prefer to fight their way technically out of the problems after the chip has taped out, but market-savvy management must require linkage to profitability early in the design cycle. One key as always is knowing the customer.

A supply chain also gives a vision into the market never before obtained and by communicating and collaborating effectively in the fabless IC's complex world of design, build and deliver. It is a great mechanism for running the front end of the IC process. With a view, downstream IC manufacturers can look into the future and use the chain as a tool for understanding customer requirements, managing product mix and inventories. Plus, the supply chain adds value by managing product and process costs. Efficiency in the supply chain guides Adam Smith's "Invisible Hand" by letting the fabless IC company know immediately if its solution brings value or leads to a profitless pit.

The old test and assembly cycle was the first part of the supply chain integrated by most integrated device manufacturers (IDMs). The die were shipped off for test and assembly and returned to the factory for distribution to customers. For at least 20 years test and assembly was considered a necessary evil to IC design and a cost center. But, as the foundries grew as original equipment manufacturers (OEMs) disaggregated their business models to focus on their core competencies, semiconductor assembly and test services

(STAS) emerged as a key consideration in product cost and delivery. Today STAS is integral to the global supply chain and should be viewed as a key value element to not only the fabless IC vendor, but also product OEMs that need high levels of integration.

Today, packaging costs on average represent about 15% to 17% of the total cost of an IC. In general, the lower the I/O count, the less it costs to manufacture a given die and the more packaging contributes to the overall cost of the device.

Looking at changes at the back end of the semiconductor process, the insult to the fabless IC company is that is STAS is becoming expensive and consequential, adding both business and cost considerations to the final product. STAS is expensive because the complex ICs are more difficult is test, assemble and package. STAS is becoming consequential because it offers new flexibility to the OEM, which until recently was part of the semiconductor company's value proposition. This flexibility includes stack packaging and flexible substrates allowing the STAS firm to add value, which was once reserved for the IC house.

This evolution of test and assembly plays well into the global supply chain as STAS begins to look like an electronic manufacturing service (EMS). The comparison is simple; the EMS assembles boards while the STAS assembles chips, one being just a higher level of integration than the other. As STAS evolves, D-Side Advisors expects that the industry will see the STAS business grow into EMS to functions or for EMS acquire STAS capability.

**Figure 1. The IC Cost Chain**

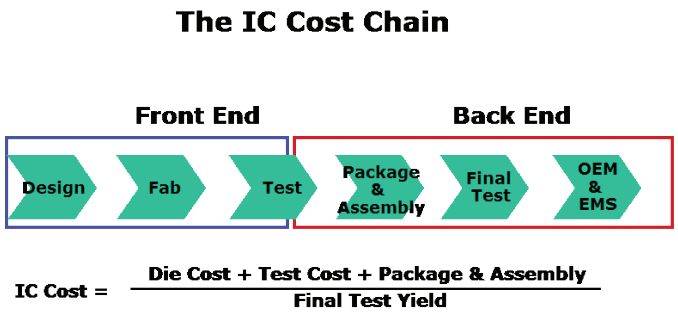


**Figure 2.**

| Front End Value-add | Back End Value-add |
|---|---|
| Fabless IC vendors:<br>• Integration<br>• Embedding end customers requirements<br>• Programmability<br>• Wrapping IC in software<br>• Branding | STAS Vendors:<br>• DFT, BIST<br>• New Technology<br>o Quad-flat pack no-lead<br>o Stacked packaging<br>o Flexible substrate<br>o Multi-chip modules |
| OEMs find value in:<br>• Performance<br>• Features<br>• Quality<br>• Responsiveness<br>• Delivery | OEMs find value in:<br>• EMS model<br>• TTM, delivery<br>• Smaller, form factors<br>• Lower volume capability |

*One reason for STAS recent emergence as a consequential force is that it offers many advantages in time to market, delivery and product specificity once reserved to FPGA and ASICs.*

The modern supply chain was created by the advent of global customers, suppliers and contract manufacturing. It provided a market function among design, OEM and contract manufacturer by linking product specifications and components to costs and profitability at each node. Little is hidden. It is as close to an open kimono as most companies care to get.

The almost-open kimono has forced discipline on the IC vendor, because the supply chain puts all competition and substitutes on view, just like digital cameras on CNET, to the contract manufacturer or OEM. It is with the global view that they gain an advantage.

This market overview gives the contract manufacturer and designer full view and specs of alternative and substitute products. Such an overview often forces price pressure upstream on the IC vendor, thus the IC vendor must be vigilant in looking for opportunities to build value differentiators into their silicon.

Being linked with the customer has resulted in the end market for the first time driving the IC business, moving customer behavior closer to design with attributes such as fixed price points, fragmented segments and shorter cycles.

## Where is the value in today's IC industry?

Every IC company must determine before the project begins how to make a profit and how to fight price erosion. Today, much of the projected margin desired by the fabless IC vendor is being absorbed by foundries, STAS, EMS, or further up the chain by the product OEM. The idea of building a chip for a potential market, then riding the volume curve to profitability is gone. For example new Wi-fi processors will find a $6.00 market waiting in 2004, even though the business plan places the average selling price (ASP) at $15 to $10.

Not understanding market dynamics or planning for profitability down the road can lead to a situation such as the disastrous future predicted here. Wireless Internet chips will see prices plummet as volumes grow. According to the research firm, TechKnowledge in Scottsdale, Arizona, "The average price for a chip that enables connections for an 802.11b wireless local area network (WLAN) was $16.06 in 2002, but that price will drop to $6.61 by the end of 2003. Revenue from the sales of all wireless chips is expected to decline to $340.2 million in 2003, from $368.7 million in revenue in 2002, even as volumes soar from 22.5 million to 41.3 million chips sold."[1]

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How can such erosion be fought? In this new market environment two questions IC executives should ask themselves are:

- How can I, the IC vendor, merge value into silicon?
- Where will I gain new profit on the way to new markets?

The savvy executive in a fabless IC firm must find new value to incorporate into the offering. The key to profitability is to identify where the majority of profit is captured on the way to market. In most cases this will cause a semiconductor company to think outside the box of their comfort zone. Outside the box an IC vendor can merge value into silicon through:

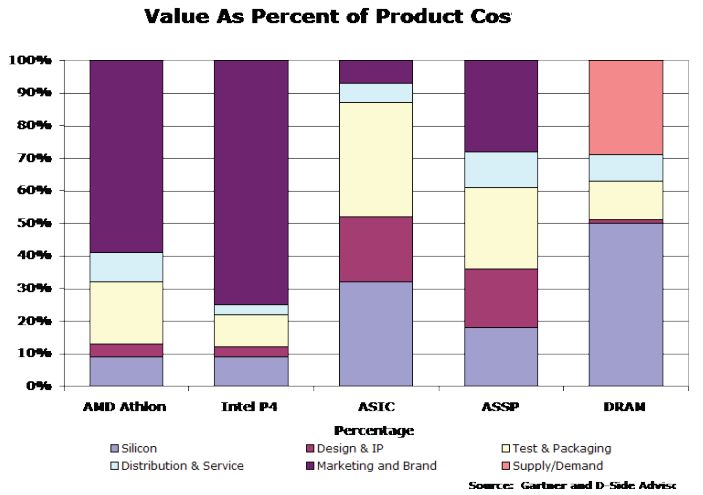
- Programmability: Giving the OEM or end user the ability to upgrade in the factory or field.

- Integration: Integrating more functions onto the chip is a standard tactic, which rewards the "first-to-market." The downside occurs when a fabless company chases after the "next greatest" function or the "sure-thing" standard.
- Software Intellectual Property (IP): Wrapping the chip in software value is a tricky task for hardware people, but profitable especially when built into a flexible architecture.
- Customer Focus: Embedding end-customer desires the global positioning system (GPS) phone is a good example of working towards customer demand.
- Branding: Intel, being the exception, IC companies from Weitek to NVIDIA have tried, but branding remains the province of the end-product vendor.

Engineers and managements of fabless IC vendors have typically held brand in low regard. The Harrison Ford or Bruce Lee engineering mindset is that value is derived through technology or design — not in the empty marketing fluff. Often there is a strong cultural bias against marketing and branding because it is not quantifiable, not taught in engineering schools, takes longer than a product cycle and high cost.

Brand is experiential. The experience is usually based on differentiation real or perceived, such as the difference between Shimano components for a bike and the rest of the market offering. Brand awareness is why one generation drinks Maxwell House and the next goes to Starbucks. What should be recognized is that branding and marketing is critical and a key element in the IC value equation.

**Figure 3.**




***It isn't the cost of silicon, design, test & packaging, distribution or service that makes a microprocessor more valuable & the Brand and Marketing!***

Good branding has value because it provides margin insurance. For example, brand allows a firm to build margin, which in turn provides return to investors and funding for research.

Chances are, if someone has had the better experience with a Shimano component, they can charge more, as long as Shimano meets expectations. In today's cutthroat electronic component business, having a few points margin assurance is a nice cushion. Branding is one of the margin building options, providing an anecdote to differentiation solely on price and becomes a product feature in the customer's mind.

## Is the emphasis on supply chain a tool for profitability or a canard?

Cost savings inherent in good supply-chain management can add to profitability. These savings are found in:

- Engineering Change Orders (ECOs): Manage product changes
- Time: Reduce time and cost of ramp
- Stability: Ensure supply throughout production

Global competition, increased customer expectations, and a faster pace of business are the key drivers forcing organizations to supply-chain management, in an effort to drive down costs and increase efficiencies.

The old profit models don't work in today's market. For example, the old model did not consider the growing strength at the EMS and the requirement to win the blueprint position with the system OEM, and then sell the EMS to win the build share. Just as the future profit model will need to take into consideration the increased cost of STAS and the potential to lose value to STAS as they become more EMS-like.

Fabless IC vendors must remind themselves that end users don't care about technology. The customer wants value! Only a few chips have end-user cachet (witness Intel's Pentium or NVIDIA GeForce). Simplicity is more and more important as it is moving to the foreground, while complexity moves to the background. Meanwhile, markets are acting more and more consumer-like. Expending cycles dreaming of volume revenue is like repairing the ice machine on the Titanic. The real question is – where is the profitability? Where is the savvy fabless IC vendor going to capture value, and how does the supply chain help? ■

***References***

[1] *IDG News Service, Wednesday, May 28, 2003*

***About the Author***

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